FORMER LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE

SUFFOLK COUNTY

PORT JEFFERSON STATION, NEW YORK

SITE MANAGEMENT PLAN
-REDACTED FOR PUBLIC DISTIBUTION-

NYSDEC Site Number: 152016

USEPA ID # NYD002041531

Prepared for:

New York State Department of Environmental Conservation

Contract #D009808, Work Assignment #27

625 Broadway

Albany, New York

Prepared by:

HRP Associates, Inc.

1 Fairchild Square, Suite 110, Clifton Park, New York

518-877-7101

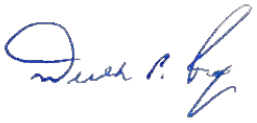
Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

OCTOBER 8, 2025

CERTIFICATION STATEMENT

I DEREK ROY certify that I am currently a Qualified Environmental Professional as in defined in 6 NYCRR Part 375 and that this Site Management Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and Green Remediation (DER-31).



DEREK ROY, PG

OCTOBER 8, 2025

TABLE OF CONTENTS

FORMER LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE

SUFFOLK COUNTY

PORT JEFFERSON, NEW YORK

SITE MANAGEMENT PLAN

Section	Description	Page
LIST OF ACRONYMS		**v**
ES	**EXECUTIVE SUMMARY**	**1**
1.0	**INTRODUCTION**	**3**
1.1	General	3
1.2	Revisions and Alterations	4
1.3	Notifications	5
2.0	**SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS**	**7**
2.1	Site Location and Description	7
2.2	Physical Setting	8
2.2.1	Land Use	8
2.2.2	Geology	8
2.2.3	Hydrogeology	9
2.3	Investigation and Remedial History	9
2.4	Remedial Action Objectives	14
2.5	Remaining Contamination	15
2.5.1	Soil	15
2.5.2	Concrete	16
2.5.3	Sediment	18
2.5.4	Groundwater	19
2.5.5	Surface Water	21
3.0	**INSTITUTIONAL AND ENGINEERING CONTROL PLAN**	**24**
3.1	General	24
3.2	Institutional Controls	24
3.3	Engineering Controls	25
3.3.1	Criteria for Completion of Remediation/Termination of Remedial Systems	25
3.3.2	Criteria for Completion of Remediation/Termination of Remedial Systems	26
3.3.3	Sub-Slab Depressurization Systems	26

3.3.4 Groundwater Treatment System Facility System Termination 27
3.3.5 Monitoring Wells Associated with Source Removal 27

4.0 MONITORING AND SAMPLING PLAN 28

4.1 General 28
4.2 Site-wide Inspection 28
4.3 Treatment System Monitoring and Sampling 29
4.3.1 Remedial System Monitoring 29
4.3.2 Remedial System Sampling 30
4.4 Post-Remediation Media Monitoring and Sampling 31
4.4.1 Groundwater Sampling 31
4.4.2 Surface Water Sampling 33
4.4.3 Monitoring and Sampling Protocol 34

5.0 OPERATION AND MAINTENANCE PLAN 35

5.1 General 35
5.2 Remedial System Performance Criteria 35
5.3 Operation and Maintenance of Groundwater Treatment Facilities 35
5.3.1 System Start-Up and Testing 36
5.3.2 Routine System Operation and Maintenance 36
5.3.3 Non-Routine Operation and Maintenance 36
5.3.4 System Monitoring Devices and Alarms 37
5.3.5 Fire Safety 37

6.0 PERIODIC ASSESSMENTS/EVALUATIONS 38

6.1 Climate Change Vulnerability Assessment 38
6.2 Green Remediation Evaluation 38
6.2.1 Timing of Green Remediation Evaluations 39
6.2.2 Remedial Systems 39
6.2.3 Building Operations 40
6.2.4 Frequency of System Checks, Sampling and Other Periodic Activities 42
6.2.5 Metrics and Reporting 42
6.3 Remedial System Optimization 42

7.0 REPORTING REQUIREMENTS 44

7.1 Site Management Reports 44
7.2 Periodic Review Report 45
7.2.1 Certification of Institutional and Engineering Controls 48
7.3 Corrective Measures Work Plan 49
7.4 Remedial System Optimization Report 50

8.0 REFERENCES 51

List of Tables

		Page
Table 1	Notifications	5
Table 2	Site Tax Parcels	7
Table 3	Groundwater Elevation Measurements (FOLLOWS TEXT)	
Table 4A	Remaining Soil Sample Exceedances (FOLLOWS TEXT)	
Table 4B	Remaining Soil Sample Exceedances – Concrete Coupon Investigation (FOLLOWS TEXT)	
Table 4C	Remaining Exceedances – Oil Analytical Results (FOLLOWS TEXT)	
Table 4D	Remaining Exceedances – 2024 Concrete Analytical Results (FOLLOWS TEXT)	
Table 4E	Remaining Exceedances – 2025 Concrete Analytical Results (FOLLOWS TEXT)	
Table 5A-5C	Remaining Sediment Sample Exceedances (FOLLOWS TEXT)	
Table 6A-6B	Remaining Groundwater Water Sample Exceedances (FOLLOWS TEXT)	
Table 7	Remaining Surface Water Sample Exceedances (FOLLOWS TEXT)	
Table 8A-8B	Remedial System Monitoring Requirements and Schedule	29
Table 9	Groundwater Sampling Requirements and Schedule (FOLLOWS TEXT)	
Table 10	Monitoring Well Construction Details (FOLLOWS TEXT)	
Table 11	Surface Water Sample Locations	32
Table 12	Schedule of Monitoring/Inspection Reports	43

List of Figures

Figure 1	Site Location Map
Figure 2	Site Layout Map (Sample Locations, Boundaries, Tax Parcels, etc.)
Figure 2a	Class-4 Site Boundary
Figure 3	Geologic Cross Section
Figure 4	Groundwater Contour Maps
Figure 5A	2024 Soil Sample Map
Figure 5B	2024-2025 Concrete Investigation Map
Figure 6	Remaining Sediment Sample Exceedances
Figure 7	Remaining Groundwater Sample Exceedances
Figure 8	Remaining Surface Water Sample Exceedances

List of Appendices

Appendix A-1 EPA Federal Register Notice of Site Deletion
Appendix A-2 Environmental Easement/Notice/Deed Restriction
Appendix A-3 Responsibilities of Owner and Remedial Party
Appendix B List of Site Contacts
Appendix B2 Sub-Slab Depressurization Contacts
Appendix C Cross Sections
Appendix D Monitoring Well Construction Logs
Appendix E Excavation Work Plan
Appendix F Health and Safety Plan
Appendix G Field Sampling Plan
Appendix H Quality Assurance Project Plan
Appendix I Site Management Forms
Appendix J-1 LAI O&M Manual
Appendix J-2 OMP O&M Manual
Appendix K-1 Green Remediation Metrics
Appendix K-2 Green Remediation Measures
Appendix K-3 SEFA Spreadsheets
Appendix L Remedial System Optimization Table of Contents

List of Acronyms

AOC	Area of Concern
AS	Air Sparging
ASP	Analytical Services Protocol
AST	Aboveground Storage Tank
AWQS	Ambient Water Quality Standard
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
BMP	Best Management Practice
C/D	Construction and Demolition
CAMP	Community Air Monitoring Plan
CCP	Coal Combustion Product
CDM	Camp Dresser & McKee
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulation
CLP	Contract Laboratory Program
COC	Certificate of Completion
CO2	Carbon Dioxide
CP	Commissioner Policy
CVOC	Chlorinated Volatile Organic Compounds
DCA	Dichloroethane
DCE	Dichloroethene
DER	Division of Environmental Remediation
DMM	Department of Materials Management
DO	Dissolved Oxygen
DOH	Department of Health
DUSR	Data Usability Summary Report
EC	Engineering Control
ECL	Environmental Conservation Law
ELAP	Environmental Laboratory Approval Program
EPA	U.S. Environmental Protection Agency
ERP	Environmental Restoration Program
EWP	Excavation Work Plan
FEMA	Federal Emergency Management Agency
FS	Feasibility Study
GAC	Granular Activated Carbon
GHG	Greenhouse Gas
GWE&T	Groundwater Extraction and Treatment
GWTF	Groundwater Treatment Facility
HASP	Health and Safety Plan
HDR	HDR Engineering, Inc.
IC	Institutional Control
ISCO	In-situ Chemical Oxidation
LAI	Lawrence Aviation Industry

LGAC	Liquid-Phase Granular Activated Carbon
LIPA	Long Island Power Authority
LIRR	Long Island Railway
LTRA	Long-term Response Action
MTBE	Methyl tert-butyl ether
NPL	National Priorities List
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
NYCRR	New York Codes, Rules, and Regulations
O&M	Operation and Maintenance
OM&M	Operation, Maintenance and Monitoring
OMP	Old Mill Pond
ORP	Oxidation-Reduction Potential
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PAHs	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethylene
P.E. or PE	Professional Engineer
PFAS	Per- and Polyfluoroalkyl Substances
PID	Photoionization Detector
PLC	Programmable Logic Controller
PPE	Personal Protective Equipment
PPM	Parts per million
PRP	Potentially Responsible Party
PRR	Periodic Review Report
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QEP	Qualified Environmental Professional
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RCA	Recycled Concrete Aggregate
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
ROW	Right-of-way
RP	Remedial Party
RSO	Remedial System Optimization
SAC	State Assistance Contract
SCG	Standards, Criteria, and Guidance
SCHD	Suffolk County Health Department
SCO	Soil Cleanup Objective
SEFA	Spreadsheets for Environmental Analysis
SMP	Site Management Plan

SOP	Standard Operating Procedures
SOW	Statement of Work
SPDES	Stormwater Pollution Discharge Elimination System
SSDS	Sub-slab Depressurization System
SVE	Soil Vapor Extraction
SVI	Soil Vapor Intrusion
SVOCs	Semi-volatile Organic Compounds
TAL	Target Analyte List
TCE	Trichloroethylene
TCL	Target Compound List
TCP	1,2,3-Trichloropropane
TCLP	Toxicity Characteristic Leachate Procedure
UST	Underground Storage Tank
VC	Vinyl Chloride
VFD	Variable Frequency Drive
VGAC	Vapor-Phase Granular Activated Carbon
VOCs	Volatile Organic Compounds

ES EXECUTIVE SUMMARY

The following provides a brief summary of the controls implemented for the Site, as well as the inspections, monitoring, maintenance, and reporting activities required by this Site Management Plan (SMP):

Site Identification: DEC Site ID 152016 – Former Lawrence Aviation Industries, Inc. Site	
Institutional Controls (ICs):	1. The property may be used for commercial and industrial use.
	2. Environmental Easement
	3. All Engineering Controls (ECs) must be inspected at a frequency and in a manner defined in the SMP.
	4. Restriction of Groundwater Use
	5. Vapor Intrusion Evaluation for New Construction
	6. Operations and Maintenance Plan
	7. Excavation Workplan
	8. Monitoring Plan
Engineering Controls:	1. Fencing and Signage at Old Mill Pond (OMP) Creek and LAI
	2. LAI Property Groundwater Treatment Facility (GWTF)
	3. OMP GWTF
	4. Monitoring Wells
	5. Sub-slab Depressurization Systems (SSDS)

Site Identification: DEC Site ID 152016 – Former Lawrence Aviation Industries, Inc. Site	
Inspections:	Frequency
1. GWTFs	Monthly
2. Facility Perimeter (LAI and OMP)	Monthly
3. Extraction Wells	Monthly
4. Injection Wells	Annually
5. Monitoring Wells	Annually – in conjunction with groundwater sampling
6. Severe Weather/Emergency	As Needed
Monitoring:	Frequency
1. GWTF (LAI and OMP)	Monthly
2. Groundwater Monitoring Wells (41 locations)	Every 15 Months
Maintenance:	Frequency
1. GWTF	As Needed, See Operation and Maintenance (O&M) Manual
2. Blower maintenance	As Needed, See O&M Manual
3. Air Stripper Blower Maintenance	As Needed, See O&M Manual
4. SSDS Maintenance	As Needed
Reporting:	Frequency
1. Groundwater Sampling Data	Every 15 Months, following groundwater sampling activities
2. GWTF Discharge Sampling Data	Annually
3. Periodic Review Report (PRR)	Every 5 years

Further descriptions of the above requirements are provided in detail in the latter sections of this SMP.

1.0 INTRODUCTION

1.1 General

This SMP is a required element of the remedial program for the former Lawrence Aviation Industries, Inc. (LAI) Superfund Site located in Port Jefferson Station, New York (hereinafter referred to as the "Site"). See Figure 1. The Site is currently in the New York State (NYS) State Superfund Program under Site Code 152016 which is administered by New York State Department of Environmental Conservation (NYSDEC or Department) and the U.S. Environmental Protection Agency (EPA) National Priorities List (NPL) Site No. NYD002041531.

This SMP is prepared as per the requirements of the Record of Decision (ROD) dated September 29, 2006, and will be used by NYSDEC to manage the Site. Suffolk County Land Bank (SCLB Holdings LLC) entered into a Declaration of Covenants, Restrictions and Environmental Easement (Environmental Easement) on July 18, 2024, with NYSDEC to continue site management and remedial system optimization (RSO) tasks at the site.

The Site was entered into the NPL by the EPA on February 4, 2000, as EPA ID NYD 002041531. EPA performed remedial investigation (RI), feasibility study (FS), pre-design investigation, design, construction, and ten-year operation of the two treatment systems.

In March 2025, The EPA deleted the land and soils portion of the LAI Site from the NPL. On March 5, 2025, the EPA partial deletion was published in the Federal Register for the 125-acre land and soils portion of the former LAI Site. The groundwater plume will not be considered for deletion as part of this action and will not be proposed for deletion from the NPL until cleanup criteria specified in the ROD have been met. The EPA will continue to review the Site every five years, until the groundwater plume reaches compliance in accordance with the ROD. The Federal Register Notice of Partial Deletion and the community update are provided as Appendix A1.

In 2025, NYSDEC reclassified the Site from a Class-2 Site, to Class-4 for continued Site management and operation of the active GWTFs. The reclassification includes the modification of the Industrial Site boundary from 36.27-acres to approximately 5.50-acres which includes Tax Parcel 159-1-26 and a portion of Parcel 159-2-29. The NYSDEC Class-4 Site will include the groundwater treatment area encompassing an area of approximately 5.50-acres on the western, west central, and southern portion of the former industrial area, which includes the LAI GWTF on the southwest corner of the property (Parcel 159-1-26), and the active treatment area that overlies the west-central portion of the industrial area (Parcel 159-2-19), extending out to, and along the western and southern property boundary. A figure showing the site location and boundaries of this site is provided on Figures 2 and 2a, and the Class-4 Site is further described in Section 2.0. The boundaries of the site are more fully described in the metes and bounds site description that is part of the Environmental Easement provided in Appendix A2, and the Owners responsibilities are provided as Appendix A3.

After completion of the remedial work, some contamination was left at this site, which is hereafter referred to as "remaining contamination." ICs and ECs have been incorporated into the site remedy to control exposure to remaining contamination to ensure protection of public health and the

environment. An Environmental Easement granted to NYSDEC, and recorded with the Suffolk County Clerk, requires compliance with this SMP and all ECs and ICs placed on the site.

This SMP was prepared to manage remaining contamination at the site until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. This plan has been approved by NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of NYSDEC.

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the Environmental Easement, which is grounds for revocation of the Certificate of Completion (COC); and
- Failure to comply with this SMP is also a violation of Environmental Conservation Law, the New York Codes, Rules, and Regulations (NYCRR), 6 NYCRR Part 375, and the Declaration of Covenants, Restrictions, and Environmental Easement, dated July 18, 2024, for the site, and thereby subject to applicable penalties.

All reports associated with the site can be viewed by contacting NYSDEC or its successor agency managing environmental issues in NYS. A list of contacts for persons involved with the site is provided in Appendix B of this SMP.

This SMP was prepared by HRP Associates, Inc. (HRP), on behalf of NYSDEC, in accordance with the requirements of NYSDEC's Division of Environmental Remediation (DER)-10 ("Technical Guidance for Site Investigation and Remediation"), dated May 3, 2010, and the guidelines provided by NYSDEC. This SMP addresses the means for implementing the ICs and/or ECs that are required by the Environmental Easement for the site.

1.2 Revisions and Alterations

Revisions and alterations to this plan will be proposed in writing to NYSDEC's project manager. NYSDEC can also make changes to the SMP or request revisions from the remedial party. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or shut down of a remedial system, post-remedial removal of contaminated sediment or soil, or other significant change to the site conditions. All approved alterations must conform with Article 145 Section 7209 of the Education Law regarding the application of professional seals and alterations. For example, any changes to as-built drawings must be stamped by a NYS Professional Engineer (PE). In accordance with the Environmental Easement for the site, the NYSDEC project manager will provide a notice of any approved changes to the SMP and append these notices to the SMP that is retained in its files.

1.3 Notifications

Notifications will be submitted by the property owner to NYSDEC, as needed, in accordance with NYSDEC's DER – 10 for the following reasons:

1. Sixty-day advance notice of any proposed changes in site use that are required under the terms of the Declaration of Covenants, Restrictions, and Environmental Easement, 6 NYCRR Part 375 and/or Environmental Conservation Law.
2. Seven-day advance notice of any field activity associated with the remedial program.
3. Fifteen-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan (EWP). If the ground-intrusive activity qualifies as a change of use as defined in 6 NYCRR Part 375, the above-mentioned 60-day advance notice is also required.
4. Notice within 48 hours of any intrusive work or damage to the existing foundations or EC that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.
5. Notice within 48 hours of any non-routine maintenance activities.
6. Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the site, with written confirmation within seven days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
7. Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the site or the responsibility for implementing this SMP will include the following notifications:

1. At least 60 days prior to the change, NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the Declaration of Covenants, Restrictions, and Environmental Easement and all approved work plans and reports, including this SMP.
2. Within 15 days after the transfer of all or part of the site, the new owner's name, contact representative, and contact information will be confirmed in writing to NYSDEC.

Table 1 on the following page includes contact information for the above notifications. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B.

Table 1 – Notifications*		
Name	**Contact Information**	**Required Notification****
Kira Bruno, Environmental Program Specialist Trainee - NYSDEC Site Project Manager	(518) 402-8068 Kira.bruno@dec.ny.gov	All Notifications
Payson Long, P.E. – NYSDEC Section Chief, Remedial Section B, Remedial Bureau E, Project Managers Supervisor	(518) 402-9651 Payson.Long@dec.ny.gov	All Notifications
Michael Cruden – NYSDEC Section Chiefs Supervisor	(518) 402-9825 Michael.Cruden@dec.ny.gov	All Notifications
Kelly Lewandowski – NYSDEC Site Control	(518) 402-9569 Kelly.Lewandowski@dec.ny.gov	Notifications 1 and 8
Mark Sergott – NYSDOH Project Manager	518-402-7860 mark.sergott@health.ny.gov	Notifications 4, 6, and 7
Stephanie Selmer – NYSDOH Public Health Specialist	518-402-7860 Stephanie.selmer@health.ny.gov	Notifications 4, 6, and 7
Mathew Kappel – Suffolk County Land Bank, Executive Director	631-853-3127 Matthew.Kapell@suffolkcountyny.gov	Notifications 1, 4, 6, 7, and 9

* Note: Notifications are subject to change and will be updated, as necessary.

** Note: Numbers in this column reference the numbered bullets in the notification list in this section.

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

2.1 Site Location and Description

The site is located in Port Jefferson Station, Suffolk County, New York and is formerly comprised of seven parcels on the Suffolk County Tax Map (see Figure 2a). Table 2 includes the Suffolk County parcel IDs, ownership status, acreage, and land use code at the time of issuance of this report.

Table 2 – Site Tax Parcels

Parcel ID	Parcel Owner (at time of SMP issuance)	Land Use Code (at time of SMP issuance)	Acres
LAI Industrial Facility Parcels			
200-159-2-19	SCLB Holdings LLC	499-Commercial Under Construction	35.35
200-159-1-26	SCLB Holdings LLC	311 – Vacant Residential	2.64
200-180-4-1	Town of Brookhaven	330 – Vacant Commercial	4.5
Former Outlying Parcels			
200-180-4-2.2	Town of Brookhaven	None listed	34.75
200-180-4-2.1	SCLB Holdings LLC	None listed	8.42
200-159-2-20	SCLB Holdings LLC	330 – Vacant Commercial	24.97
200-136-2-22	SCLB Holdings LLC	340 – Vacant Industrial	13.61

The former LAI Site encompassed approximately 124 acres and consists of the former LAI industrial facility and outlying parcels. The former industrial facility area is approximately 36.27-acres in size and includes the former manufacturing area which previously included ten buildings, housing titanium manufacturing equipment, and titanium manufacturing processes, including chemical plating and pickling operations. The former industrial facility area is identified by Suffolk County Tax records as Tax Parcels 159-1-26, 159-2-19, and 180-4-1-0. The former outlying parcels are undeveloped, wooded areas located south and southeast of the former industrial facility area and consist of four Tax Parcels Identified as 159-2-20, 136-2-22, 180-4-2-1, and 180-4-22.

The former 124-acre LAI Site is bounded to the north by Long Island Railroad and Sheep Pasture Road; to the west residential developments and a commercial property; to the northeast by residential developments; and to the south by Long Island Power Authority electrical transmission lines. A New

York State Department of Transportation (NYSDOT) right-of-way (ROW) used for mixed-use recreational purposes bifurcates the southeastern corner of the former industrial area (Parcels 159-2-19 and Parcel 180-4-1-0) and is delineated by security fencing. In 2024, the Town of Brookhaven purchased 40-acres to the southeast across the NYSDOT ROW and is planned to remain as open greenspace (Tax Parcels 180-4-1 and 180-4-2-2).

As noted in Section 1, The Site has been reclassified, and the site boundary modified and is further explained in the following Section.

2.2 Physical Setting

2.2.1 Land Use

The Class-4 Site consists of the following: an approximate 5.5-acre area within the former the 36-acre former LAI Industrial Facility. The Class-4 Site includes the groundwater treatment area encompassing on the western, west central, and southern portion of the former industrial area, which includes the LAI GWTF on the southwest corner of the property (Parcel 159-1-26), the active treatment area that overlies the west-central portion of the industrial area (Parcel 159-2-19), extending out to, and along the western and southern property boundary (Figure 2a) Current Site access for daily commuting vehicles, operations and maintenance visits, and Site visitors is through a locked gate at the dead end of Park Avenue. Heavy equipment and trucking operations are to use the locked gate at 100 Sheep Pasture Road, across the Long Island Railway (LIRR) crossing.

The former LAI Facility is zoned as Light Industrial/ commercial and is restricted to light industrial and commercial use. The Site is currently vacant. At the time of the drafting of this SMP, there are no Site occupants.

2.2.2 Geology

The Site is located on a localized plateau at the top of the Harbor Hill moraine. Ground surface topography reaches an elevation of 271 feet above mean sea level (amsl), immediately north of the Site and drops to sea level at Port Jefferson Harbor over a distance of approximately 1.3 miles. The Site area is relatively hilly, with rolling hills and valleys, compared with the topography to the west and south, which is predominantly flat. The Site is directly underlain by 325 to 350 feet of Pleistocene-age glacial deposits. The upper 70 feet of glacial material is composed of till that makes up the Harbor Hill moraine. The Harbor Hill moraine is the terminal moraine of the most recent Wisconsin glacial advance. The till is composed primarily of sand and gravel with occasional lenses of silty sand and silt. The moraine deposits thin to the south and to the north. Ten to twenty feet of recent alluvium are present near OMP and Old Mill Creek in the downgradient plume area, comprised of silty sand, peat, and clay. The Upper Glacial deposits range in thickness from more than 300 feet at the LAI facility to approximately 100 feet at Port Jefferson Harbor. A geologic cross section is provided in previous groundwater reports published in June 2022 or earlier.

Geologic cross sections are included in Appendix C. Site-specific well construction logs generated are provided in Appendix D.

2.2.3 Hydrogeology

Potentiometric surface contours from the 2008 baseline, and subsequent events show that groundwater flow from the LAI facility is generally to the north toward Port Jefferson Harbor. The Upper Glacial aquifer is generally under unconfined conditions, and the upper limit is defined by the water table. Synoptic groundwater level data from the 2008 baseline monitoring event were used to evaluate the horizontal and vertical distribution of hydraulic head at the site. It was determined that groundwater flows from the LAI facility to the north, toward Port Jefferson Harbor under an average hydraulic gradient of approximately 0.0048 feet per foot (ft/ft). Viewed in cross-section, along the approximate centerline of the plume, a downward vertical hydraulic gradient is evident at the LAI facility that changes to an upward gradient further to the north, in proximity to Port Jefferson Harbor. These vertical gradients are indicative of groundwater recharge and discharge zones. The Upper Glacial aquifer appears to be under artesian conditions at MPW-09, which is near the OMP facility and OMP as a result of low permeability silts, clay lenses, and silty sands in that area. Submarine groundwater discharge into Port Jefferson Harbor is unlikely; however, diffuse discharge along the shoreline, within the high and low tidal extents, is more likely. Diffuse discharge in the vicinity of OMP is suggested by the upward vertical hydraulic gradient, artesian wells, natural springs that are developed along the escarpment, localized pond features, and transition to overland flow in drainages north of the escarpment.

Groundwater contour maps are shown on Figures 4A and 4B. Groundwater elevation data is provided in Table 3.

2.3 Investigation and Remedial History

Historical uses of the Site include a turkey farm owned by LAI's corporate predecessor, Ledkote Products Co. of New York. In 1951, Ledkote Products Co. established a business operation at the Site to produce lead gutters and downspouts for roof drains. In 1959, the business was re-established as LAI and began manufacturing titanium sheet metal for the aeronautics industry and consumer products such as golf clubs. The LAI industrial facility ceased operations in 2004.

Past disposal practices resulted in releases of various contaminants including trichloroethylene (TCE), tetrachloroethylene (PCE), acid wastes, oils, sludge, grease, heavy metals, and other industrial plant wastes. Initial investigations conducted in the vicinity of the site suggested that releases of hazardous substances from the facility have affected site soils, groundwater, sediments, and surface water downgradient of the site.

The following narrative provides a remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the Site. Full titles for each of the reports referenced below are provided in Section 8.0 – References.

Limited Remedial Investigation Report, Lawrence Aviation Industries Site, Prepared by NYSDEC dated May 1997

Preliminary Remedial Investigation Report, Lawrence Aviation Industries Site, Prepared by Camp Dresser & McKee (CDM) dated May 2000

Several investigations lead by Suffolk County and NYSDEC concerning contamination of the LAI industrial facility were conducted during the 1970s and 1980s. During these studies, fluoride, toluene, carbon tetrachloride, and metals were detected in samples collected from sumps, puddles, laboratory cesspools, and surface water runoff at the LAI facility. Fluoride, nitrates, TCE, 1,1-dichloroethene (1,1-DCE), cis-1,2-dichloroethene (cis-1,2-DCE), PCE, and metals were detected in groundwater samples collected from adjacent residential wells. The EPA provided bottled water to homes with private wells affected by contaminated groundwater and subsequently connected those homes to the public water supply as part of response action conducted in 1987. NYSDEC, Region 1 Resource Conservation and Recovery Act (RCRA) Hazardous Substance Group oversaw a major drum removal action at the site in 1991. The Suffolk County Water Authority, under contract with NYSDEC, connected homes affected by groundwater contamination attributed to LAI to public water supplies throughout the 1990s. NYSDEC conducted a limited RI in 1997. The results of this investigation revealed that chlorinated volatile organic compounds (CVOCs) were detected in the groundwater and surface water. Based on the above investigations, EPA prepared a hazard ranking system report and proposed the site for inclusion on the NPL on October 22, 1999. The site was listed on the NPL February 4, 2000.

Final Remedial Investigation Report/Feasibility Study, Lawrence Aviation Industries Site, Prepared by CDM dated March 2006

In April 2003, NYSDEC performed a multi-media inspection of the LAI site as a result of previous findings of contamination. NYSDEC documented violations of air, soil, solid waste, chemical bulk storage, and hazardous waste regulations. LAI was ordered by NYSDEC to cease production until all violations were resolved. The property has been inactive and unoccupied since 2004.

The EPA conducted an RI at the site from August 2003 to May 2005 through the Remedial Action (RA) Contract program. The RI documented a CVOC plume and identified polychlorinated biphenyl (PCB)-contaminated soil at the site. The EPA personnel also noted conditions at the Site that warranted emergency removal action. During the RI, EPA Region 2's Removal Action Branch removed approximately 1,300 drums, cylinders, and other containers containing various flammable solids, acids, bases, gases, and unknown compounds, and inventoried the laboratory area; identifying at least 390 containers. Most of the drums and containers were disposed offsite in October and November 2004. Non-hazardous materials were considered the property owner's responsibility and left at the Site. Approximately 13.5-tons of transformers and capacitors filled with suspected PCB liquid were removed from the site and disposed of as part of the 2004 removal action. During these actions, EPA personnel identified approximately thirty additional electrical transformers in several areas of the site.

A FS was completed in July 2006 by CDM Smith on behalf of the EPA. The FS presented remedial alternatives for groundwater, soil, surface water, and sediment. A ROD for the Site that addressed both soil and groundwater was signed on September 29, 2006.

Remedial Action Report, Groundwater Extraction and Treatment System for the Groundwater Remedy on the Lawrence Aviation Industries Property, Prepared by CDM dated August 2011

In January 2009, the EPA began removing soils contaminated with PCBs from the site. A partial removal of PCB contaminated soils was completed in three designated areas of concern (AOCs) at the site. Excavation depths ranged from 6 to 114 inches. A total of approximately 20,000 tons of impacted soil was reportedly removed and shipped from the site for disposal. Post excavation samples were collected in 2009 and 2010 by the EPA at AOC-1, AOC-2, and AOC-3. Sample results indicated the presence of PCBs in certain sections of the excavations above the ROD-specified cleanup criteria of one part per million (1 ppm).

The USEPA remedial action also included in-situ chemical oxidation reduction injections. Additional USEPA response actions also included drum removal actions. Onsite transformers were characterized for PCBs greater than 50 ppm. These transformers were either emptied and/or removed By USEPA from the site. All remaining transformers were removed under the NYSDEC Spill Response program.

The NYSDEC Spill response unit, over the course of almost a decade, conducted a number of oil recovery operations from the onsite abandoned with some interconnected hydraulic fluids press pit, collection sumps, and tanks located in the industrial portion of the site. The spills unit also identified abandoned underground storage tanks and continued to follow up until the site owner or NYSDEC Spills fund paid for their removal.

Over the course of operations at the Lawrence Aviation Industries site by the facility owner and operator, a number of RCRA violations were identified and notices of violation(s) issued by the NYSDEC RCRA program. The Lawrence Aviation Industries Site was always in interim status and never received a full RCRA permit. This NYSDEC oversight has been delegated by the USEPA to the NYSDEC under what is now known as the Division of Materials Management.

Following discussions with the EPA and NYSDEC, it was determined that surface soils extending from grade to two feet below grade (2 fbg) were to be remediated to the ROD specified 1 ppm cleanup criteria, while subsurface soils greater than 2 fbg would be remediated to the NYSDEC Commercial Use Soil Cleanup Objective (SCO) of 10 ppm (as specified in 6 NYCRR Part 375-6). The soil and sediment remedies were completed in March 2011 and included excavation and removal of approximately 550 tons of contaminated soil from the site. recycled concrete aggregate (RCA) material was used as backfill following the completion of site excavations.

The soil and sediment remedies were completed in March 2011 and included excavation and removal of approximately 550 tons of PCB-contaminated material from the site. The groundwater remedy included the installation of two groundwater extraction and treatment systems: one at LAI and one at OMP, and in-situ chemical oxidation (ISCO) injections at the LAI onsite source area.

The soil and sediment remedies were completed in March 2011 and included excavation and removal of approximately 16,000 tons of contaminated material and soil from the Site. The groundwater remedy included the installation of the two groundwater extraction and treatment systems. and ISCO

treatment at the LAI source area. One system is located on the LAI Facility property, and the other is located within the plume area near OMP. The treatment system at the Lawrence Aviation property is designed to capture and treat contaminated groundwater to drinking water standards and to minimize further migration of the groundwater plume to downgradient areas; ISCO was applied as an initial enhancement within the area of high TCE concentrations in groundwater at the LAI Facility property. The downgradient treatment system located near OMP is designed to capture and treat contaminants in groundwater that have left the Lawrence Aviation property in the past, as well as minimize contaminated water from discharging into the OMP, Old Mill Creek, and Port Jefferson Harbor. Both groundwater treatment systems were constructed and are operating.

Remedial Action Report, Lawrence Aviation Industries Site, Prepared by the EPA Removal Support Team 3 dated September 2014

Additional excavation of PCB-impacted soils was completed in July 2013, December 2013, and January 2014. Nine designated AOCs were excavated by the EPA. Post excavation soil samples were collected and analyzed for PCBs in order to determine the extent of each excavation. The EPA in coordination with the NYSDEC Spills Division assessed and drained oils and fluids from the onsite abandoned machinery and transformers and removed and disposed of sludge and liquid wastes from the Electrode Melt Facility that contained PCBs, 28 drums filled with lubricant waste, disposed of a roll-off container of waste sludge, and twenty PCB-containing transformers.

In March 2013, additional soil sampling for lead and PCBs was conducted by the EPA at the Site and along the NYSDOT ROW. None of the samples collected in the NYSDOT ROW exhibited exceedances of SCOs. Excavation of nine total areas reportedly occurred in August and December 2013 through January 2014. 1,064 tons of impacted soil was excavated and transported offsite for disposal for AOC 2 and AOCs 4 through 12. Clean soil was used as backfill for each of the excavations.

Final 2017 Comprehensive Sampling Report, Lawrence Aviation Industries Superfund Site, Prepared by HDR Engineering, Inc. (HDR) dated March 2018

A third extraction well was installed at the downgradient OMP GWTF and became operational in 2014. In 2017, multiple upgrades to the OMP treatment facility plumbing, air stripper pump, and system flow capacity were completed. Groundwater samples were collected to measure the performance of the two remediation systems in 2017. Based on dissolved oxygen (DO) and positive oxidation-reduction potential (ORP) levels observed in most groundwater samples collected in 2017, it was determined that decreases in contamination are primarily due to remedial activities performed at the Site and not natural attenuation.

Recent Site History and Progress

2021 EW-3 Installation – Report

In 2021 the LAI GWTF was expanded to include a third extraction well. Extraction well EW-03 was installed and became operational in September 2021. In 2022, due to excessive aluminum fouling, the air stripper portion of the GWTF was taken offline and replaced with liquid phase treatment with the

installation of four granular activated carbon (GAC) vessels. The system is currently operating as modified in 2021-2022.

2023-2025

Between October 2023 and February 2024 site demolition activities were performed and all fifteen Site structures, with the exception of the Water Treatment facility, were demolished and removed, including all remaining transformers, equipment, machinery, propane aboveground storage tanks (ASTs), and associated wastes which were disposed of and/or recycled offsite. Additionally, as part of demolition activities, the pits and sumps housing machinery were properly drained of fluids, cleaned of trash and debris, abandoned in place by breaking up the bottom of each pit to allow for water infiltration, and were backfilled to grade with RCA. The building foundations were not removed and remain in place. Approximately 2,314 tons of asbestos-containing materials (ACM) were disposed of, and approximately 2,500 tons of steel were hauled offsite and recycled by the demolition contractor. During this period, the NYSDEC Spills team coordinated the removal and disposal of thirty-nine 55-gallon drums of machine and transformer oils drained from the remaining machinery and electrical transformers. Additionally, the NYSDEC Spills Team coordinated the removal and disposal of approximately 119,243 gallons of oily impacted water extracted from the former machine pits. During this phase, another 50,000 gallons of non-oily water were processed through the onsite groundwater treatment system by HRP.

Starting in March 2024, subsurface investigations were conducted by HRP following the demolition of site buildings to identify any remaining AOCs at the Site. PCBs and lead were identified in shallow soils at concentrations above the Commercial Use SCO southeast of Building 30 and adjacent to the Greenway Trail. The upper foot of impacted soils was excavated at the request of NYSDEC in June 2024. Five post excavation samples were collected by HRP. PCBs and lead were not detected in any of the post excavation samples at concentrations that exceeded the Commercial Use SCO. A total of 26 cubic yards of impacted soil was excavated during this mobilization. The excavation was backfilled using clean soil from outside of the excavation area.

In January to April 2025, all remaining sanitary structures, including thirty-two cesspools/septic tanks, nineteen dry wells, twelve building floor drains, and four underground storage tanks (USTs) were abandoned in accordance with Suffolk County Health Department (SCHD) SOP 9-95 and the NYSDEC Commercial SCOs. Following the abandonment of these sanitary structures no contamination remained at concentrations greater than the applicable criteria. During this period approximately 205 tons of contaminated soil was generated during the abandonment of these sanitary features including approximately 6,400-gallons of sanitary water extracted from septic tanks and was disposed of offsite. Additionally, during this period the NYSDEC Spills Division directed the excavation of an approximate 1,000-gallon sized orphan fuel oil UST identified during ground penetrating radar survey of the former Administrative Building area. The Spills Division removed eighteen 55-gallon drums of petroleum impacted soil for offsite disposal. The Spills division also disposed of approximately 16,000 gallons of oily impacted water removed from machine pits and the fuel oil UST, and approximately 390 cubic yards of oily contaminated concrete generated during the demolition of a machine pit. HRP processed approximately 50,000 gallons of non-oily water removed from machine pits through the onsite groundwater treatment system.

Following the Site building demolition conducted in 2023-2024, and during a Site inspection by the DEC PM and engineering team in late 2024, stained areas of concrete were identified on select sections of the remaining building foundations at the former buildings identified as buildings E, F, G, 30, and 10. This was recognized as a change in Site conditions as the concrete was thoroughly cleaned by the demolition contractor at the completion of demolition activities, and any surface staining only became apparent after the building slabs were exposed to the elements over time. As a result, a concrete investigation was initiated to characterize the nature and extent of the potential impacts which included sampling of the concrete building slabs, underlying soils, and oily residues on the surface of the concrete slabs. The sample results identified total PCBs at concentrations greater than 1 ppm and less than 10 ppm in limited areas of the building foundations, within the former industrial area and outside the Class-4 Site boundary.

2.4 Remedial Action Objectives

The RA Objectives (RAOs) for the Site as listed in the ROD or Decision Document dated September 29, 2006, are as follows:

RAOs for Groundwater

- Prevent or minimize potential, current, and future human exposures including inhalation, ingestion, and dermal contact with volatile organic compound (VOC)-contaminated groundwater;
- Minimize the potential for offsite migration of VOC-contaminated groundwater;
- Restore groundwater to levels which meet NYS Groundwater and Drinking Water Quality Standards within a reasonable time frame; and
- Prevent or minimize VOC-contaminated groundwater from discharging into Port Jefferson Harbor.

RAOs for Soil

- Prevent or minimize human exposure with soils having VOC, PCB, or metals concentrations in excess of SCOs; and
- Manage ecological risks.

RAOs for Surface Water

- Prevent or minimize potential, current, and future human exposures including inhalation, ingestion, and dermal contact with VOC-contaminated surface water;
- Restore surface water to levels which meet Surface Water Quality Standards within a reasonable time frame; and
- Prevent or minimize VOC-contaminated surface water that exceeds water quality standards from discharging into Port Jefferson Harbor.

RAOs for Sediment

Potential risks to ecological receptors from exposures to the VOCs detected in sediment were determined to be low and, after remediation of groundwater, Site-related VOC contamination will not persist in the surface water sediments. Therefore, no RA was required for surface water sediments in OMP and Old Mill Creek.

The following RAOs have been identified for LAI Facility catch basin sediments:

- Prevent current and future ecological and human exposures to contaminated sediment; and
- Prevent or minimize the potential release of contamination in catch basin sediments to soil and/or groundwater.

2.5 Remaining Contamination

2.5.1 Soil

Site investigations have concluded that no surficial soil impacts remain on the former industrial manufacturing area and outlying parcels, and current soil conditions are in compliance with Part 375 Commercial Use SCOs.

- VOCs in soil: VOCs were only sporadically detected in onsite and offsite soil samples and have not exceeded the Commercial SCOs; therefore, VOCs are not considered contaminants of concern in soil.
- PCBs in soil: PCBs were detected at concentrations exceeding SCOs and the RAOs in onsite soils. Historical information indicates that piles of potentially PCB-containing transformers were stored on the LAI Facility. PCB remediation via multiple excavations was performed by the EPA and DEC. In 2023-2024, the former industrial buildings were removed to their foundations. Soil investigations following building removal identified select locations where PCBs were detected at concentrations greater than the Commercial SCO of 1 ppm in surficial soils beneath the concrete slabs. These locations, however, are at depths greater than 1 foot and are capped by a concrete slab with an approximate thickness of 0.5 to 1 foot thickness. In 2024, a small excavation of PCB impacted soil was excavated by removing the upper 1 foot of soil. Therefore, PCBs are not considered to be contaminants of concern for soils.
- Metals in soil – A variety of metals were frequently detected at concentrations exceeding SCOs in soils. LAI historically engaged in the manufacturing, processing, treating, and finishing of metals, primarily titanium. It is likely other metals were used as alloys or in the stages of titanium manufacturing. Metals are also naturally occurring constituents of soils. Metals such as iron, sodium, calcium, and magnesium are considered to have low toxicity and are not considered contaminants of concern in soil. The following metals have been considered to be contaminants of concern for soil: antimony, arsenic, beryllium, cadmium, copper, lead, mercury, nickel, selenium, titanium, vanadium, and zinc. RIs and source removal actions have demonstrated

compliance with the Commercial SCOs; therefore, metals are not considered to be contaminants of concern for soils.

- Pesticides in soil – Samples were collected and analyzed for pesticide concentrations from several locations at the site but were not detected at concentrations to be considered contaminants of concern.

The ROD soil remedy called for the excavation, transport, and offsite disposal of LAI facility surface soils exhibiting PCB concentrations greater than 1 ppm at an offsite regulated waste disposal facility.

Figure 5 depicts the 2024 soil sample locations collected following removal of the former industrial buildings and indicates that no exceedances remain above the Commercial Use SCOs at the site after completion of the soil investigation. Table 4A presents the results of the 2024 soil and machine pit investigation.

2.5.2 Concrete

As noted in Section 2.3, an investigation of the remaining building slabs was triggered by the observed surficial staining that became evident following removal of the Site buildings in 2023-2024. As noted, the slabs were cleaned thoroughly of debris at the completion of the demolition activities, and the staining only became apparent once the slabs were exposed to the elements over time, and the observed staining appeared to coincide with the locations of former machinery. An investigation of the concrete building slabs, underlying soils, and oily residues on the surface of the concrete slabs was performed to determine the nature and extent of PCB impacts in these media. The PCB impacts within the existing building slabs identified were not widespread, but at limited areas within former building 10, and at concentrations greater than the Commercial Use SCO but less than the Industrial Use SCO.

- PCBs in concrete: Investigations performed in 2025, following building demolition, identified specific areas of PCB impacts to the porous building foundation at former building 10, within the former industrial manufacturing area but outside of the Class-4 Site. These impacts were identified in the shallow concrete surface at select areas of building slab at concentrations between 1.02 ppm and 7.6 ppm.
- PCBs in soil: PCBs were identified in two soil samples beneath the concrete, but because the samples were collected under an existing foundation and at a depth of approximately 1 foot or greater, the soils are in compliance with the commercial SCO. Both samples were horizontally and vertically delineated, and the detected impacts were determined to be limited to the soil directly under the concrete slab.
- PCBs in oily stained areas: PCBs were identified in the surficial stained areas on the concrete slabs at building 10, E, and G, at concentrations ranging between 1.56 ppm and 8.97 ppm.

Figure 5B presents the 2025 concrete sample locations and Table 4B through 4E presents the results of the 2024-2025 concrete investigation laboratory analytical results.

2.5.2.1 Application of TASCA Federal Regulation 40 CFR Part 761 for Low Occupancy Areas

The NYSDEC only regulates cleanup levels for PCBs in soil. The positive PCB results reported for the LAI Site were detected in concrete; therefore, the Toxic Substances Control Act (TSCA) 40 Code of Federal Regulations (CFR) Part 761 was employed to evaluate the PCB impacts on the LAI site. Part 761 is a set of EPA regulations focused on the disposal and remediation of PCBs. TSCA authority, unlike RCRA, is ***not*** delegated to the individual States. There are, at a minimum, five benchmarks required to be defined and evaluated prior to any action(s) performed for the PCBs at the LAI Site: 1) cleanup/disposal approach, 2) type of waste, 3) cleanup levels, 4) cleanup verification, and 5) deed restrictions.

1) **Cleanup/Disposal Approach**: Part 761 outlines three approaches that can be used for the cleanup and disposal of PCB Remediation Waste at a contaminated site. The first option, which is the selected approach for the LAI Site, allows a company to conduct the cleanup and disposal of remediation waste pursuant to the prescriptive regulatory requirements for certain types of remediation waste (refer to 40 CFR 761.61(a)). These types of cleanups are commonly referred to as "self-implementing cleanups." Specific waste cleanup and disposal options under the "self-implementing cleanups" include notification to the EPA and TSCA Regional Administrator(s), prescriptive sampling requirements, and the ability to send waste to a municipal landfill as long as the total PCB concentration is < 50ppm. However, it is important to note that even if material is <50 ppm total PCBs, it still may be regulated.
2) **Type of Waste**: As defined by 40 CFR 761.61(a)(4)(a), for purposes of cleaning, decontaminating, or removing PCB Remediation Waste, there are four general waste categories: bulk PCB Remediation Waste, non-porous surfaces, porous surfaces, and liquids. Per 40 CFR 761.3, the PCBs detected in concrete are considered a bulk PCB Remediation Waste, which denotes waste containing PCBs as a result of a spill, release, or other unauthorized disposal. PCB Remediation Waste means soil, rags, and other debris generated as a result of any PCB spill cleanup, including, but not limited to: Buildings and other man-made structures (such as concrete floors, wood floors, or walls contaminated from a leaking PCB or PCB-Contaminated Transformer), porous surfaces, and nonporous surfaces.
3) **Cleanup Levels**: Under 40 CFR 761.61(a)(5), cleanup levels are based on the type of material (in this case, bulk PCB Remediation Waste) and the potential exposure to PCBs left after cleanup is completed. Under the Self-Implementing rule and by the definition of "Bulk PCB Remediation Waste," there are two cleanup levels which are defined as high occupancy Areas and low occupancy areas. Based on the projected end use of the LAI site and reported PCB concentrations; the low occupancy cleanup level option from 40 CFR 761.61(a)(5)(B)(1) is summarized as follows:
    a. Low occupancy areas:
        i. The cleanup level for bulk PCB remediation waste in low occupancy areas is ≤25 ppm unless otherwise specified in this paragraph.
        ii. Low occupancy areas under the Self Implementing Option are defined as: an area where PCB remediation waste has been disposed of on-Site and where occupancy for any individual not wearing dermal or respiratory protection for a calendar year is 335 hours, or an average of 6.7 hours per week.

4) **Cleanup Verification:** As part of 40 CFR 761.61(a)(6) Subpart O, there are two steps in the Cleanup Verification process; 1) Sampling and analysis and 2) Verification:
    a. Sampling and Analysis (40 CFR 761.61(a)(6)(i)): Any person collecting and analyzing samples to verify the cleanup and on-site disposal of bulk PCB remediation wastes and porous surfaces must do so in accordance with subpart O of this part.
    b. Verification (40CFR 761.61(a)(6)(ii)(A): Where sample analysis results in a measurement of PCBs less than or equal to the levels specified in paragraph 40 CFR 761.(a)(4)(a) of this section, self-implementing cleanup is complete.
5) **Deed Restrictions for Caps, Fences and Low Occupancy Area: 40 CFR 761(a)(8)(i)-(ii)** When a cleanup activity conducted under this section includes the use of a fence or a cap, the owner of the site must maintain the fence or cap, in perpetuity. In addition, whenever a cap, or the procedures and requirements for a low occupancy area, is used, the owner of the site must meet the following conditions: The deed restriction will require disclosure in perpetuity that PCB waste is present onsite, that all future owners must maintain the fence or cap, if one is required, and the property is limited to low occupancy commercial/industrial use only (per EPA, no children under six may have access to the property). Under NYSDEC definitions, the planned use of the Site for solar electrical power generation meets the definition of commercial/industrial use.

2.5.2.2 Change in Land Use for a Cleanup Site. – Application of 40 CFR 761.61(a)(4)(v)

Where there is an actual or proposed change in use of an area cleaned up to the levels of a low occupancy area, and the exposure of people or animal life in or at that area could reasonably be expected to increase, resulting in a change in status from a low occupancy area to a high occupancy area, the owner of the area shall clean up the area in accordance with the high occupancy area cleanup levels in paragraphs 40 CFR 761.61 (a)(4)(i) through (a)(4)(iv) – The high occupancy cleanup level for bulk remediation waste is ≤1 ppm without further conditions.

The concentration of the PCB impacts detected within the porous building foundation combined with the proposed commercial/industrial Site redevelopment and the establishment of an Environmental Easement covering the entire 36-acre former industrial area meet the conditions of EPA – 40 CFR 176.61 for low occupancy areas. Any disturbance of site soil or remaining building foundations requires compliance with the Excavation Workplan (Appendix E).

2.5.3 Sediment

Impacts to the sediments in OMP and Old Mill Creek remain from the 2003 RI. The contaminants of concern identified for sediment at OMP and Old Mill Creek near the offsite OMP facility are as follows:

- VOCs in sediment: PCE, TCE, and vinyl chloride (VC) were identified as contaminants of concern for sediment at the site.
- Semi-volatile organic compounds (SVOCs) in sediment: SVOC contamination is primarily limited to polycyclic aromatic hydrocarbons (PAHs) in sediment samples in the OMP and Old Mill Creek. PAHs are widespread in the environment and their

presence in the offsite surface waters may be related to other offsite sources. PAHs are not considered to be contaminants of concern for sediment.

- Metals in sediment: Antimony, copper, lead, mercury, nickel, and zinc were identified as contaminants of concern for sediment at the site. Similar to surface water, commonly detected metals such as calcium, sodium, magnesium, manganese, and iron were not considered to be contaminants of concern for sediment. Metals concentrations were detected at elevated concentrations in sediments in other water bodies. These metals are considered to be site-related.

The ROD acknowledged that sediment in the OMP and Old Mill Creek was also contaminated by groundwater discharge, but no RA was required as part of the initial response.

Tables 5a, 5b, and 5c and Figure 6 summarize the results of all sediment samples collected during the RI that exceed the applicable NYSDEC standards, criteria, and guidance (SCGs) prior to completion of the RA. The last sampling event of offsite sediments was 2003, therefore, recent data is not included as sediment sample collection is not included in the long-term monitoring program.

2.5.4 Groundwater

The contaminants of concern identified for groundwater at the Site are as follows:

- VOCs in groundwater: TCE, PCE, and cis-1,2-DCE were detected in groundwater samples at the Site and in downgradient monitoring wells. Historical information supports the past use and release of TCE and PCE at the site.
- Metals in groundwater: Arsenic, cadmium, fluoride, lead, nickel, selenium, and zinc were identified as contaminants of concern for the site.
- Fluoride: Hydrofluoric acid was used in metal finishing operations at the LAI Facility. Historical information indicates that hydrofluoric acid was released from the LAI Facility. Fluoride is considered to be contaminant of concern for groundwater.
- Per- and polyfluoroalkyl substances (PFAS): PFAS is considered a contaminant of concern at the site due to historical metal plating and metal finishing operations and was added to the groundwater sampling plan to evaluate emerging contaminants. PFAS compounds can originate from many different sources and sampling for PFAS does not imply that the site is a contributing source of PFAS in groundwater in the area.
- 1,4-dioxane (1,4-D): 1,4-dioxane (1,4-D) is considered a contaminant of concern at the site due to historical site operations and was added to the groundwater sampling plan to evaluate emerging contaminants. 1,4-Dioxane can originate from many different sources and sampling for 1,4-D does not imply that the site is a contributing source to groundwater in the area.

In 2008, the groundwater contamination plume extended approximately 6,000 feet to the northwest of the site to Port Jefferson Harbor and was approximately 1,000 feet in width. CVOC concentration ranged from approximately 2,000 parts per billion (ppb) to less than 1 ppb, with TCE accounting for greater than 95 percent (%) of the plume. Vertically, the plume migrated downwards from

the facility, where the water table was identified at a depth of approximately 190 feet (28 feet amsl), and then upwards as the plume approaches Port Jefferson Harbor. Past sampling events concluded that both horizontal and vertical migration were consistent with the flow of groundwater from upland areas near the LAI facility to discharge areas at the harbor.

Primary CVOC results from the most recent comprehensive groundwater sampling event conducted in March-April 2024 are summarized as follows:

- TCE was detected in 62 of the 77 groundwater samples with concentrations ranging from 0.160 to 260 micrograms per liter (µg/L). Concentrations in 25 of the samples collected exceeded the NYSDEC Ambient Water Quality Standard (AWQS) of 5 µg/L. The highest concentration of TCE, 260 µg/L, was detected from downgradient well MW-PD-16, screened approximately 125 feet below the groundwater table.
- PCE was detected in 47 of the 77 groundwater samples with concentrations ranging from 0.16 to 12 µg/L. Concentrations of PCE in three of the samples were greater than or equal to the AWQS of 5 µg/L. The highest concentration of PCE, 12 µg/L, was from monitoring well MPW-09-C.
- 1,2,3-Trichloropropane (1,2,3-TCP) was detected in 5 of the 77 groundwater samples with concentrations ranging from 0.04 to 0.36 µg/L. Concentrations of 1,2,3-TCP in all 5 samples were greater than the AWQS of 0.04 µg/L. The highest concentration of 1,2,3-TCP, 0.360 µg/L, was detected in monitoring well MPW-01-C.
- Cis-1,2-DCE was detected in 16 of the 77 groundwater samples with concentrations ranging from 0.16 to 1.3 µg/L. All the cis-1,2-DCE detections were below the AWQS. The highest concentration of cis-1,2-DCE, 1.3 µg/L, was detected from downgradient monitoring well ERT-MW-2D.
- The following compounds were detected in one or more samples at concentrations less than their respective AWQS: 1,1,1-trichloroethane, 1,1- dichloroethane (1,1-DCA), 1,1-DCE, chloroform, methylcyclohexane, methyl tert-butyl ether (MTBE), and toluene.
- The highest concentration of TCE detected in the source area wells during the March 2024 sampling event was in extraction well EW-03 at a concentration of 170 µg/L.

The 2024 sampling event indicates the current plume extent is similar to the pre- remediation plume in overall length but appears to have bifurcated into on Site or source area, and downgradient portion of the plume. The current site wide lateral distribution of the TCE plume is depicted on Figure 7A, the onsite TCE plume depicted on Figure 7B, and the vertical distribution is shown on Figure 8.

The lateral and vertical limits of the source area plume are generally consistent with the pre-remediation plume, though the concentrations defining the plume have decreased by approximately 75-85% of the pre-remediation plume concentrations. The TCE plume greater than 100 µg/L near the LAI facility is limited to the immediate contaminant source area. The TCE contaminant plume (greater than 5 µg/L) at the source area extends to well MPW-04, located approximately 1200 feet downgradient of the LAI facility.

The current offsite portion of the TCE plume at concentrations greater than 100 µg/L near the OMP facility extends from ERT-MW-2 (downgradient of OMP) to a point upgradient of MW-PD-16. The estimated upgradient extent was based on groundwater flow conditions between the LAI facility and MW-PD-16 and is shown on Figures 7A and 8. Analytical data from March 2024 sampling indicates the vertical migration pathway of the current plume is consistent with the pre-remediation plume. As shown on Figure 8, the offsite TCE plume appears to have split into two smaller plumes to the north and south of the OMP facility. TCE was detected at concentrations greater than 100 µg/L in wells ERT-EW-6 and MW-PD-16 to the north of OMP, and in monitoring well ERT-MW-2B located south of OMP. TCE was not detected above 100 µg/L in any of the wells located at the OMP GWTF. A comparison of the current distribution of the downgradient portion of the plume with OMP extraction wells indicates the OMP system is targeting the most highly concentrated portion of the plume both horizontally and vertically. The reduction in TCE detected in the OMP site wells (ERT-MW-1 through ERT-MW-6) indicates that contaminant removal at the OMP facility is resulting in a reduction in the extent of the plume.

Based on the results of the 2024 groundwater sampling event, concentrations of CVOCs are continuing to decrease in both the onsite and offsite contaminant plumes. Reductions of CVOCs in groundwater can be attributed to the operation of the LAI and OMP GWTFs, as well as natural attenuation of the groundwater plume.

Continued monitoring of groundwater is recommended to evaluate the movement and attenuation of the groundwater plumes as well as remedial system effectiveness. NYSDEC has approved a groundwater sampling frequency of every fifteen months; therefore, the next round of comprehensive sampling is scheduled for June 2025.

Table 6A-6B and Figure 7A and 7B summarize the results of groundwater sampling from the most recent sampling events that exceed Site SCGs after completion of the RA.

2.5.5 Surface Water

The contaminants of concern identified for surface water are as follows:

- VOCs in surface water: TCE, PCE, cis-1,2-DCE, and VC were detected in surface water samples collected from downgradient water bodies. Historical information supports the use and potential release of TCE and PCE at the site. Cis-1,2-DCE and VC are common dechlorination products of TCE and PCE post-reduction. Therefore, TCE, PCE, cis-1,2-DCE, and VC are considered to be contaminants of concern for surface water.
- PFAS in surface water: PFAS is considered a contaminant of concern at the site due to historical metal plating and metal finishing operations and was added to the groundwater sampling plan to evaluate emerging contaminants. PFAS compounds can originate from many different sources and sampling for PFAS does not imply that the site is a contributing source of PFAS in groundwater in the area.
- 1,4-dioxane in surface water: 1,4-D is considered a contaminant of concern at the site due to historical site operations and was added to the groundwater sampling plan to evaluate emerging contaminants. 1,4-Dioxane can originate from many different

sources and sampling for 1,4-D does not imply that the site is a contributing source to groundwater in the area.

Old Mill Pond

- TCE concentrations in surface water samples from OMP have decreased considerably from 2014 levels and have demonstrated a decreasing trend since monitoring began. In 2014, TCE concentrations were greater than 100 µg/L in SW-06 (220 µg/L) and SW-07 (180 µg/L). Since 2016 the highest concentrations observed in 2016, 2018, 2020, 2022, and 2024 were 19 µg/L (SW-07), 16 µg/L (SW-06), 20 µg/L (SW-07), 8.78 µg/L (SW-16), and 5.9 µg/L (SW-06), respectively.

Port Jefferson Harbor

- TCE concentrations in surface water from the Port Jefferson Harbor samples have fluctuated over time but remain within the range of concentrations since 2014. TCE concentrations at SW-15, collected near the mouth of Old Mill Creek, have been consistently non-detect or just above the reporting limit of 0.50 µg/L. The TCE concentration at SW-16 was 1.4 µg/L in 2024, which is a significant decrease from 2022 (8.78 µg/L), while previous TCE concentrations at SW-16 ranged between 1 to 15 µg/L. The difference may be related to different plume concentrations discharging to the harbor, the degree of mixing after discharge or a combination of the two.
- The concentrations detected at SW-16 are consistent with the suspected discharge of the plume into the harbor at this location (ERT-MW-2). Sample location SW-15 is located near the eastern edge of the plume where only trace levels of TCE have been recorded (e.g., ERT-MW-4 and ERT-MW-5). Sample location SW-15 is located in an open area where increased boat traffic combined with discharge from Old Mill Creek contributes to mixing in the harbor. Sample location SW-16 is in a shallower, more protected corner of the harbor. In addition to the relative concentrations of TCE, the contaminant mix at SW-16 (1,1-DCA, cis-1,2-DCE, PCE and TCE) is similar to that observed in samples from the ERT-MW-2 location, although approximately an order of magnitude lower in concentration.
- Long term monitoring results indicate that surface water at both OMP and Port Jefferson Harbor have been impacted by local sources of contamination. Detectable concentrations of MTBE, benzene, xylene, and styrene were observed in multiple surface water samples from both water bodies in 2014, 2016, 2018, and 2020 annual sampling events. It is not known if the presence of these contaminants is a result of groundwater discharge or surface runoff. Based on discussions with the Village of Port Jefferson, storm water in the area of OMP and the area between the pond and harbor is captured by a storm sewer system that discharges to Old Mill Creek downstream of the pond. In 2024, MTBE was detected in surface water samples collected from SW-07 and SW-08 at trace concentrations of 0.170 µg/L and 0.180 µg/L, respectively.
- Concentrations are expected to decrease with time due to the increased flow capacity of the OMP treatment facility. The upgrades performed at OMP GWTF in April 2016 were calculated to extend the capture zone of the plume; therefore, less contamination

is expected to reach OMP and Port Jefferson Harbor, and the most recent results of surface water sampling support this notion.

Based on the results of the 2024 surface water sampling event, concentrations of CVOCs are continuing to decrease in the contaminant plumes. CVOC concentrations in surface water (Port Jefferson Harbor) have decreased since the initial sampling in 2014 and have stabilized since 2022. Reductions of CVOCs in groundwater and surface water can be attributed to the operation of the LAI and OMP GWTFs, as well as natural attenuation of the groundwater plume.

Table 7 and Figure 9 summarize the results of surface water samples collected from the most recent sampling event that exceed the SCGs after completion of the RA.

3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN

3.1 General

Since remaining contamination exists at the site, ICs and ECs are required to protect human health and the environment. This IC/EC Plan describes the procedures for the implementation and management of all IC/ECs at the site. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC project manager.

This plan provides:

- A description of all IC/ECs on the site;
- The basic implementation and intended role of each IC/EC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of IC/ECs, such as the implementation of the EWP (as provided in Appendix E) for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the site; and
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs required by the site remedy, as determined by the NYSDEC project manager.

3.2 Institutional Controls

A series of ICs is required by the ROD to: 1) implement, maintain, and monitor Engineering Control systems; 2) prevent future exposure to remaining contamination; and 3) limit the use and development of the site to commercial and industrial uses only. Adherence to these ICs on the site is required by the Environmental Easement and will be implemented under this SMP. ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement. The IC boundaries are shown on Figures 2 and 2a. These ICs are:

- The property may be used for: commercial and industrial use;
- All ECs must be operated and maintained as specified in this SMP;
- All ECs must be inspected at a frequency and in a manner defined in the SMP;
- The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the Suffolk County Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;
- Groundwater and other environmental or public health monitoring must be performed as defined in this SMP;

- Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP;
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;
- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP;
- Access to the site must be provided to agents, employees, or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement;
- The potential for vapor intrusion must be evaluated for any buildings developed in the area within the IC boundaries noted on Figure 2a, and any potential impacts that are identified must be monitored or mitigated;
- The Site has been remediated for commercial/ industrial use only. Any future intrusive work requires compliance with the Excavation Workplan (Appendix E); and
- Vegetable gardens and farming on the site are prohibited.

3.3 Engineering Controls

The ECs for the site are the following:

- Groundwater treatment and groundwater source area control
- Offsite groundwater wells and monitoring
- Vapor intrusion mitigation systems at affected offsite properties

A Health and Safety Plan (HASP) is required for all sites with ECs. Refer to Appendix F for the site HASP.

3.3.1 Criteria for Completion of Remediation/Termination of Remedial Systems

Two GWTFs were installed by the EPA for active groundwater treatment. One facility was installed onsite to treat the LAI groundwater plume at the onsite source area, and the other installed adjacent to OMP to treat the plume and source control bear the harbor. Figure 2 shows the LAI and OMP GWTF locations.

Construction of the LAI treatment system was performed from December 2009 through September 2010 and was originally constructed with two extraction wells, EW-1 and EW-2, an air stripper, and two vapor-phase GAC units. In 2021, the system was upgraded to include an additional extraction well, EW-3. In 2022, the air stripper was taken off-line due to excessive aluminum fouling. The vapor-phase carbon was replaced with two 1,000-pound liquid-phase GAC (LGAC) vessels, and two additional 600-pound LGAC vessels. Hydraulic plume control of the source area is achieved by extracting contaminated groundwater via the three extraction wells and treated groundwater is discharged back into the aquifer via five injection wells (IW-01 through IW-05) located hydraulically upgradient of the Site under a NYSDEC Stormwater Pollution Discharge Elimination System (SPDES)

discharge equivalent. O&M activities for the onsite groundwater treatment system will continue until the RAOs are met.

The design and installation of the downgradient treatment facility at OMP was completed by EPA Region 2 Removal Action Branch, and operations at the OMP facility started on August 22, 2011. The system was originally constructed with an air stripper, three 2,000-pound vapor-phase GAC (VGAC) and two 2,000-pound. LGAC units, and following the initial installation, several upgrades were conducted at the OMP facility. Treated water is discharged to OMP and Old Mill Creek under a SPDES discharge equivalent. A third extraction well was installed at the OMP facility (ERT-EW-6) and turned on in 2014. In April 2016, several conveyance components of the OMP treatment system, including all pipes, valves, and fittings between the extraction wells and the start of the effluent discharge lines to OMP and Old Mill Creek, were upgraded from 3- to 6-inch diameter parts. A 15-horsepower air stripper transfer pump was installed to replace the previous 7.5-horsepower transfer pump. The upgrade increased treatment capacity while expanding the capture zone of the distal end of the groundwater plume. The system flow capacity increased from approximately 150 gallons per minute to 225 gallons per minute. EW-3 and EW-4 are standby wells and are not utilized for the extraction of groundwater due to elevated iron levels. Extraction well EW-5 is not used for groundwater extraction and hydraulic control since the well is not of adequate size or depth for a pump.

3.3.2 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered completed when monitoring indicates that the remedy has achieved the RAOs identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.4 of NYSDEC DER-10. Unless waived by NYSDEC, confirmation samples of applicable environmental media are required before terminating any RAs at the site. Confirmation samples require Category B deliverables and a Data Usability Summary Report (DUSR).

As discussed below, NYSDEC may approve termination of a groundwater monitoring program. When a remedial party receives this approval, the remedial party will decommission all site-related monitoring, injection and recovery wells as per the NYSDEC CP-43 policy.

The remedial party will also conduct any needed site restoration activities, such as asphalt patching and decommissioning treatment system equipment. In addition, the remedial party will conduct any necessary restoration of vegetation coverage, trees, and wetlands, and will comply with NYSDEC regulations and guidance. Also, the remedial party will ensure that no ongoing erosion is occurring on the site.

3.3.3 Sub-Slab Depressurization Systems

Five offsite SSDS were previously installed related to the Site contaminants in 2008. The properties' addresses and contacts are listed in Appendix B2.

The SSDS will not be discontinued unless prior written approval is granted by the NYSDEC and NYSDOH project managers. If monitoring data indicates that the SSDS may no longer be required, a

proposal to discontinue the SSDS will be submitted by the remedial party to the NYSDEC and NYSDOH project managers.

3.3.4 Groundwater Treatment System Facility System Termination

The GWTF system will not be discontinued unless prior written approval is granted by the NYSDEC project manager. In the event that monitoring data indicates that the GWTF system may no longer be required, a proposal to discontinue the system, including the results of an impact study, will be submitted by the remedial party. Conditions that may warrant discontinuing the GWTF system include contaminant concentrations in groundwater that: 1) reach levels that are consistently below the AWQS or the site SCGs as appropriate, 2) have become asymptotic to a low level over an extended period of time as accepted by NYSDEC; or 3) NYSDEC has determined that the GWTF system has reached the limit of its effectiveness. This assessment will be based in part on post-remediation contaminant levels in groundwater collected from monitoring wells located throughout the site. Systems will remain in place and operational until permission to discontinue their use is granted in writing by the NYSDEC project manager.

3.3.5 Monitoring Wells Associated with Source Removal

Groundwater monitoring activities associated with source removal will continue, as determined by the NYSDEC project manager in consultation with NYSDOH project manager, until residual groundwater concentrations are found to be consistently below the AWQS, the site SCGs, or have become asymptotic at an acceptable level over an extended period. If monitoring data indicates that monitoring may no longer be required, a proposal to discontinue the monitoring will be submitted by the remedial party. Monitoring will continue until permission to discontinue is granted in writing by the NYSDEC project manager. If groundwater contaminant levels become asymptotic at a level that is not acceptable to NYSDEC, additional source removal, treatment and/or control measures will be evaluated.

4.0 MONITORING AND SAMPLING PLAN

4.1 General

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring and Sampling Plan may only be revised with the approval of the NYSDEC project manager. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of site management for the site are included in the Field sampling Plan in Appendix G and the Quality Assurance Project Plan (QAPP) provided in Appendix H.

This Monitoring and Sampling Plan describes the methods to be used for:

- Sampling and analysis of all appropriate media (e.g., groundwater, air, solids);
- Assessing compliance with applicable NYSDEC SCGs, particularly groundwater standards and Part 375 SCOs for soil; and
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment.

To adequately address these issues, this Monitoring and Sampling Plan provides information on:

- Sampling locations, protocol and frequency;
- Information on all designed monitoring systems;
- Analytical sampling program requirements;
- Inspection and maintenance requirements for monitoring wells;
- Monitoring well decommissioning procedures; and
- Annual inspection and periodic certification.

Reporting requirements are provided in Section 7.0 of this SMP.

4.2 Site-wide Inspection

Site-wide inspections will be performed routinely and as necessary or at a minimum of once per year. These periodic inspections must be conducted when the ground surface is visible (i.e., no snow cover). Site-wide inspections will be performed by a qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in NYS, or a qualified person who directly reports to a PE who is licensed and registered in NYS. Modification to the frequency or duration of the inspections will require approval from the NYSDEC project manager. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring devices. During these inspections, an inspection form will be completed as provided in Appendix H – Site Management Forms. The form will compile sufficient information to assess the following:

- Compliance with all ICs, including site usage;
- An evaluation of the condition and continued effectiveness of ECs;

- General site conditions at the time of the inspection;
- Whether stormwater management systems, such as basins and outfalls, are working as designed;
- The site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection; and
- Confirm that Site records are up to date.

Inspections of all remedial components installed at the site will be conducted. A comprehensive site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the PRR. The inspections will determine and document the following:

- Whether ECs continue to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;
- Achievement of remedial performance criteria; and
- If site records are complete and up to date.

Reporting requirements are outlined in Section 7.0 of this plan.

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of ECs in place at the site, verbal notice to the NYSDEC project manager must be given by noon of the following day. In addition, an inspection of the site will be conducted within five days of the event to verify the effectiveness of the IC/ECs implemented at the site by a qualified environmental professional, as defined in 6 NYCCR Part 375. Written confirmation must be provided to the NYSDEC project manager within seven days of the event, which includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public. The remedial party will submit follow-up status reports to NYSDEC within 45 days of the event on actions taken to respond to any emergency event requiring ongoing responsive action, describing and documenting actions taken to restore the effectiveness of the ECs.

4.3 Treatment System Monitoring and Sampling

4.3.1 Remedial System Monitoring

Monitoring of the LAI and OMP GWTFs will be performed on a routine basis, as identified in Table 8 Remedial System Monitoring Requirements and Schedule (see below). The monitoring of remedial systems must be conducted by a qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in NYS, or a qualified person who directly reports to a PE who is licensed and registered in NYS. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager. A visual inspection of the complete system will be conducted during each monitoring event. Unscheduled inspections and/or sampling may take place

when a suspected failure of the GWTF systems has been reported, or an emergency occurs that is deemed likely to affect the operation of the system.

A complete list of components to be inspected is provided in the Inspection Checklist, provided in Appendix I – Site Management Forms. If any equipment readings are not within their specified operation range, any equipment is observed to be malfunctioning or the system is not performing within specifications; maintenance and repair, as per the O&M Plan, is required immediately.

4.3.2 Remedial System Sampling

Samples shall be collected from the OMP and LAI GWTFs on a monthly basis. Sampling locations required analytical parameters and schedule are provided in Tables 8A and 8B – Remedial System Sampling Requirements and Schedule below. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager.

Table 8A – LAI GWTF Remedial System Sampling Requirements and Schedule

Sampling Location	Analytical Parameters					Schedule
	VOCs (EPA Method 8260)	Metals* (EPA Method 6010B)	Fluoride (EPA Method 300.0)	PFAS (EPA Method 1633)	1,4-Dioxane (EPA Method 8270)	
EW-1	X	X	X	X	X	Monthly
EW-2	X	X	X	X	X	Monthly
EW-3	X	X	X	X	X	Monthly
Facility Effluent	X	X	X	X	X	Monthly
Post Carbon LGAC-01	X					Quarterly
Post Carbon LGAC-02	X					Quarterly
*Metals: aluminum, chromium, iron, lead, manganese, nickel						

Table 8B – OMP GWTF Remedial System Sampling Requirements and Schedule

Sampling Location	Analytical Parameters						Schedule
	VOCs (EPA Method 8260)	Metals* (EPA Method 6010B)	Wet Chemistry (Fluoride)	PFAS (EPA Method 1633)	1,4-Dioxane (EPA Method 8270)	VOCs (EPA Method TO-15)	
EW-1	X	X	X	X	X		Monthly
EW-2	X	X	X	X	X		Monthly
EW-6	X	X	X	X	X		Monthly
Facility Groundwater Effluent	X	X	X	X	X		Monthly
Mid-Point LGAC	X						Quarterly
AirStripper Influent						X	Monthly
AirStripper Effluent						X	Monthly
Post VGAC-01						X	Quarterly
Post VGAC-02						X	Quarterly
*Metals: chromium, copper, iron, zinc							

Detailed sample collection and analytical procedures and protocols are provided in Appendix G – Field Activities Plan and Appendix H – QAPP.

The remedial party will properly dispose of all wastes generated by the remedial system at offsite disposal facilities according to local, state, and federal laws and regulations. Wastes will be tested before disposal to comply with the permit conditions of the disposal facility. Wastes generated at this site include, spent activated carbon, and monitoring well installation and investigation derived waste. Spent carbon and drilling spoils will be handled and transported by a licensed waste disposal hauler and disposed of at a permitted and NYSDEC-approved waste disposal facility. Waste will be sampled by the engineering contractor to establish a waste profile with the NYSDEC Department of Materials Management (DMM) to obtain a Contained-In Determination. Waste characterization results and the Contained-In Determination will be provided to the waste contractor and the appropriate disposal facility.

4.4 Post-Remediation Media Monitoring and Sampling

Groundwater samples shall be collected from the monitoring well network on a routine basis. Required sampling locations, required analytical parameters and schedule are provided in Table 9 – Groundwater Sampling Requirements and Schedule. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager.

Detailed sample collection and analytical procedures and protocols are provided in Appendix G – Field Activities Plan and Appendix H – QAPP.

4.4.1 Groundwater Sampling

Groundwater monitoring will be performed every fifteen months to assess the performance of the remedy. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager.

The network of monitoring wells has been installed to monitor onsite and downgradient groundwater conditions at the site. The network of onsite and downgradient wells has been designed based on the following criteria:

Table 9 summarizes the wells' identification numbers, as well as the purpose, location, depths, diameter, and screened intervals of the wells. As part of the groundwater monitoring program 45 wells are sampled to evaluate the effectiveness of the remedial system, and include nine LAI and OMP GWTF wells, nine multiport wells (with a total of 38 zones sampled), four piezometers, and 22 single completion wells. The remedial party will measure depth to the water table for each monitoring well in the network before sampling.

In general, monitoring wells have been installed at multiple depths along the entire length of the plume migration path to characterize the full horizontal and vertical extent of the CVOC plume. Each well identification number, location, total depth, diameter, and screened interval is summarized in Table 9. Monitoring well construction logs are included in Appendix D.

Sampling will be conducted using EPA Region 2 low-flow groundwater sampling protocols. Conventional monitoring wells will be purged with a submersible pump and sampled according to EPA low-flow procedures with minimal groundwater drawdown. Multi-port wells will be purged and sampled in accordance with manufacturer instructions. An electronic water quality meter will be used to measure temperature, pH, ORP, specific conductance, turbidity, and DO. A separate turbidity meter will be used to measure turbidity or to confirm turbidity measurements from the multi-parameter meter. The water level in each well will also be monitored during the purging process using an electronic water level meter to document minimal drawdown conditions. Groundwater samples will be collected after stabilization of field parameters.

Analytical samples will be shipped under strict management and Chain-of-Custody procedures in accordance with the QAPP.

Groundwater samples are to be analyzed for:

- VOCs by EPA Method 8260;
- Total Analyzable Metals (TAL) by EPA Method 6010D, mercury by 7470A;
- PFAS by EPA Draft Method 1633; and
- 1,4-Dioxane by EPA Method 8270-SIM.

Monitoring well construction details for all active Site wells are summarized in Table 10 – Monitoring Well Construction Details.

If biofouling or silt accumulation occurs in the onsite and/or offsite monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced if an event renders the wells unusable.

Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

The NYSDEC project manager will be notified prior to any repair or decommissioning of any monitoring well for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent PRR. Well decommissioning without replacement will be done only with the prior approval of the NYSDEC project manager. Well abandonment will be performed in accordance with NYSDEC's guidance entitled "CP-43: Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that are decommissioned because they have been rendered unusable will be replaced in kind in the nearest available location, unless otherwise approved by the NYSDEC project manager.

The sampling frequency may only be modified with the approval of the NYSDEC project manager. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC project manager.

Deliverables for the groundwater monitoring program are specified in Section 7.0 – Reporting Requirements.

4.4.2 Surface Water Sampling

Surface water sampling will be performed in accordance with the fifteen-month groundwater sampling cycle to assess the performance of the remedy. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager.

The network of offsite surface water sample locations has been designed based on the following criteria:

- Surface water samples will be collected from locations at the OMP and Port Jefferson Harbor where previous investigations indicated that the plume may potentially be discharging to surface water. Samples will be collected directly into certified pre-cleaned sample jars. The samples will be analyzed for the following:
    - VOCs via Method 8260
    - 1,4-dioxane via Method 8270
    - PFAS via Method 1633
- Surface water samples will be handled, shipped, managed, and analyzed in the same manner as the groundwater samples, as discussed above. Water quality parameters DO, temperature, conductivity, pH, turbidity, and ORP will be measured in the field at the time of sample collection. Table 11 identifies the surface water sample locations, and the locations depicted on Figure 8.

Table 11 Surface water Sample Locations

Sample ID	X Coordinate	Y Coordinate	VOCs (8260)	PFAS (1633)	1,4-Dioxane (8270)
SW-05	1240241.93	284183.55	X	X	X
SW-06	1240278.21	284357.85	X	X	X
SW-07	1240327.17	284371.39	X	X	X
SW-08	1240366.23	284350.04	X	X	X
SW-15	1241004.83	285682.85	X	X	X
SW-16	1240364.29	285520.26	X	X	X

The sampling frequency may only be modified with the approval of the NYSDEC project manager. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC project manager.

Deliverables for the surface water sampling program are specified in Section 7.0 – Reporting Requirements.

4.4.3 Monitoring and Sampling Protocol

All sampling activities will be recorded in a field book and associated sampling log as provided in Appendix I – Site Management Forms. Other observations (e.g., groundwater monitoring well integrity) will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network. Additional detail regarding monitoring and sampling protocols are provided in the site-specific Field Activities Plan provided as Appendix F of this document.

5.0 OPERATION AND MAINTENANCE PLAN

5.1 General

This O&M Plan provides a brief description of the measures necessary to operate, monitor and maintain the mechanical components of the remedy selected for the site. This O&M Plan:

- Includes the procedures necessary to allow individuals unfamiliar with the site to operate and maintain the GWTF systems;
- Will be updated periodically to reflect changes in site conditions or the manner in which the GWTF systems are operated and maintained; and
- Includes two O&M plans, one for the LAI GWTF and the OMP GWTF.

Further detail regarding the O&M of the GWTFs is provided in Appendix I – Operation and Maintenance Manual. A copy of the O&M Manuals, along with the complete SMP, is to be maintained at the site. This O&M Plan is not to be used as a stand-alone document, but as a component document of this SMP.

5.2 Remedial System Performance Criteria

The minimum operating requirements for the components of the treatment system at LAI and OMP are included in their respective O&M Manuals and relevant referenced documents are provided in Appendix I – O&M Manual.

5.3 Operation and Maintenance of Groundwater Treatment Facilities

The following sections provide a description of the operations and maintenance of each GWTF. Cut-sheets and as-built drawings for each GWTF are provided in Appendix J – O&M Manual.

Process and instrumentation diagrams show how components of the system are related and give specific details of each. The following components are present at the GWTFs:

<u>LAI GWTF</u>

- Transfer pump
- Bag Filters
- Extraction well pump
- Liquid Phase Carbon Vessels (4)
- Injection Wells

<u>OMP GWTF</u>

- Air Stripper
- Transfer pump

- Bag Filters
- Extraction well pump
- Vapor Phase Carbon Vessels (3)
- Liquid phase GAC Unit (2)

5.3.1 System Start-Up and Testing

LAI GWTF

System start up and testing procedures of the following systems are provided in Section 4 of the LAI O&M Manual (Appendix I).

OMP GWTF System

Start up and testing procedures of the following systems is provided in Section 4 of the OMP O&M Manual (Appendix I).

The system testing described above will be conducted if, in the course of each of the GWTF systems' lifetimes, the system goes down or significant changes are made to the system, and the system must be restarted.

5.3.2 Routine System Operation and Maintenance

LAI GWTF

The system is comprised of several commercially available equipment, instrumentation, and appurtenances. Routine system O&M of the LAI GWTF is provided in the LAI O&M Manual in Operation Section 6.0 in Appendix I.

OMP GWTF

The system is comprised of several commercially available equipment, instrumentation, and appurtenances. Routine system O&M of the OMP GWTF is provided in the OMP O&M Manual in Operation Section 6.0 in Appendix I.

5.3.3 Non-Routine Operation and Maintenance

LAI GWTF

Non-Routine procedures for the LAI GWTF are provided in section 6.0 of the LAI O&M Manual in Appendix I; emergency procedures are addressed in Section 9 of Appendix G.

OMP GWTF

Non-routine and emergency procedures for the OMP GWTF are provided in Section 10 of the OMP O&M Manual in Appendix I.

5.3.4 System Monitoring Devices and Alarms

Both GWTF systems have warning devices to indicate that the systems are not operating properly. In the event that a warning device is activated, applicable maintenance and repairs will be conducted, as specified in the O&M Manual (Appendix J), and the systems will be restarted. Operational problems will be noted in the annual reports.

5.3.5 Fire Safety

Security and fire alarm system operation guides are specified in the O&M Manual (Appendix I).

Monthly fire safety inspections will be performed during monthly O&M at each facility and will include the following activities and documented in the O&M monthly inspection form:

- Fire extinguishers – monthly and annual inspections
- Emergency lighting – 90-minute test
- Emergency exits – free from debris
- Alarm system – local or broadcast
- Electrical system

The remedial party will conduct an annual facility walk with the local fire chief and/or fire suppression team. The site walk will allow for the addition of the facility to any local preplanning efforts. The NYSDEC project manager will be provided with the local fire chief's/fire suppression team's recommendations as soon as they become available. Following review, the NYSDEC project manager may direct the remedial party to implement the recommendations and/or revise the SMP.

6.0 PERIODIC ASSESSMENTS/EVALUATIONS

6.1 Climate Change Vulnerability Assessment

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that the site and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

This section provides a current vulnerability assessment that evaluates the vulnerability of the site and/or ECs to severe storms/weather events and associated flooding. This section also identifies vulnerability assessment updates that will be conducted for the site in PRRs.

No vulnerability assessments have been prepared for the site at the time of preparation of the SMP. The site is not located within a Federal Emergency Management Agency (FEMA) identified floodplain. Long Island is not regularly exposed to tornados, earthquakes, or blizzards. The greatest vulnerability threatening the Site is power outages. Hurricanes or high wind events have the potential to cause power outages at the site GWTFs and damage site remedial equipment. According to Climate Central's Program on Sea Level Rise, the site is not likely to be affected by flooding from up to ten inches of sea level rise. No vulnerable areas of the Site have been identified at this time.

6.2 Green Remediation Evaluation

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section provides an environmental footprint analysis of the remedy, as implemented at the time of this SMP. This section of the SMP also provides a summary of green remediation evaluations to be completed for the site during site management and reported in PRRs.

<u>Discussion and Measurement of Environmental Impacts</u>

The following items will be routinely assessed to monitor green and sustainable operations at the Site.

- Energy usage (electrical usage for operation of remedial systems, site lighting, security systems, etc.).
- Emissions (vapor-phase remedial system emissions, fuel usage for transportation to and from the site for inspections and/or sampling, operation of gas-powered generators, etc.).
- Water usage (identify sources of decontamination water, irrigation water, etc.). Note that while infiltration systems for runoff may be appropriate green technologies for

some sites, elevated protection of groundwater SCOs may indicate a need to minimize infiltration in certain areas and/or at certain sites.

- Land and/or ecosystems (describe any disturbances and restoration of land and/or ecosystems as part of implementation/operation of the remedy).
- Material use and Recycling
- Sustainable and Best Management Site Practices

6.2.1 Timing of Green Remediation Evaluations

For major remedial system components, green remediation evaluations and corresponding modifications will be undertaken as part of a formal RSO, or at any time that the NYSDEC project manager feels appropriate, (e.g., during significant maintenance events or in conjunction with storm recovery activities).

Modifications resulting from green remediation evaluations will be routinely implemented and scheduled to occur during planned/routine O&M activities after approval from the DER project manager. Reporting of these modifications will be presented in the PRR.

6.2.2 Remedial Systems

Remedial systems will be operated properly considering the current site conditions to conserve materials and resources to the greatest extent possible. Consideration will be given to operating rates and the use of reagents and consumables. Spent materials will be sent for recycling, as appropriate.

A Footprint Analysis was completed using the EPA's Spreadsheets for Environmental Analysis (SEFA) and is included in Appendix K-1 through K-2. Since tracking of green and sustainable operations have not been historically tracked, the SEFA spreadsheets will be utilized to monitor and assess green and sustainable operations and will be summarized in the PRRs.

Both the LAI and OMP GWTFs were constructed using green remedial measures and are summarized below, fact sheets are provided in Appendix K.

- High efficiency motors were used for all process equipment where possible.
- Each well pump is run by a variable frequency drive (VFD) to maximize motor efficiency.
- The treatment facility programmable logic controller (PLC) has remote alarm acknowledgement and programming capabilities to reduce fuel consumption associated with driving to the site.
- 100% of the energy used during facility O&M will be purchased through a green power program for the local utility company, Long Island Power Authority (LIPA; Renewable Energy Certificates).
- Spent GAC from the vapor phase GAC units will be replaced with regenerated carbon.

- LAI air stripper taken offline due to aluminum fouling and the vapor phase treatment eliminated and converted to liquid phase treatment only, reducing field visits and system maintenance operations.
- Reuse and recycling of equipment components reutilized from other DEC remediation sites to reduce waste.

6.2.3 Building Operations

Structures including buildings and sheds will be operated and maintained to provide for the most efficient operation of the remedy, while minimizing energy, waste generation and water consumption.

- 100% of electricity purchased during the treatment facility construction and operations came from renewable sources available through a green power program for the local utility company, LIPA (Renewable Energy Certificates).
- A geothermal heat pump was installed in both treatment facilities to circulate treated effluent water under an open loop system. The heat pump serves as a renewable energy source for heating the process area of the building. The heat pump contains an internal electric heater to provide heat during system shutdowns as required.
- SoyTherm® spray insulation was installed at OMP and is a soy-based material that is free of formaldehyde, petroleum, asbestos, fiberglass, and VOCs. The material is an air barrier that limits the amount of pollen and dust penetrating into the workspace and reduces energy consumption due to climate control. SoyTherm® provides for noise reduction, an important issue to the surrounding residential property owners. It comes in various "models" of thickness, allowing for site tailored requirements for noise and climate control to be met. The material is a 100% renewable resource and is made in the U.S.
- Industrial grade insulation curtains were installed on the inside of the treatment facility building roll-up doors to improve the low "R" value of the doors. The insulation curtains will save energy and reduce heating costs.
- Skylights were utilized in the facility process equipment area to minimize the use of electrical lighting.
- High efficiency lighting was used in the treatment facility.
- High efficiency motors were used for all process equipment where possible.
- The tankless hot water heater was installed for the bathroom sink and emergency shower which can have an energy efficiency of up to 99.5%.
- Ultra-low sulfur diesel was used for all construction vehicles. A total of 2,500 gallons of ultra-low sulfur diesel was used over the course of site construction.
- Equipment idling time during construction was held to five minutes or less to reduce fuel consumption.
- 100% of the craft labor for this project was local to the area to reduce fuel consumption associated with driving to the site.

- Soil Re-use: Soils excavated during trenching were used as trench backfill material rather than importing new material from offsite. Existing topsoil was stripped during clearing and used to re-establish.
- Coal Combustion Products (CCP) in Concrete: The concrete poured at the site used CCP materials such as fly ash to replace a portion of traditional cement. The mix for structural concrete that was used for the building foundation contains 122 pounds of fly ash per cubic yard of concrete. A total of three tons of fly ash was used.
- Recycled Steel: Approximately 70% of the pre-engineered metal building consists of recycled steel, which equates to 5.1 tons of recycled material.
- RCA: RCA was used in place of crushed stone for the treatment facility access roads and parking areas, for the temporary access roads, and backfilling the AOC 2 excavation. The total quantity of RCA placed was 320 tons.
- Asphalt: Approximately 60 tons of demolition asphalt for the pipe trenching was transported for offsite recycling. Asphalt using recycled materials was used to restore the asphalt that was demolished.
- Cleared Vegetation: Chipping of cleared vegetation was performed by the neighboring local commercial tree chipping facility instead of disposing the material offsite. Approximately 75 cubic yards of cleared material were chipped.
- Re-usable Concrete Form Work: Approximately 1,000 square feet of re-usable concrete forms were used during pouring of concrete for the GWTF foundation.
- Site Re-Use: The GWTF was constructed on a previously developed site (at the LAI facility), which minimizes habitat destruction and minimizes the amount of infrastructure required to service the facility.
- Vegetation Protection: Vegetation was cleared only as required for construction activities, and yard piping was routed to minimize the clearing required.

The following green remediation practices will be performed during facility operations:

- 100% of the energy used during facility O&M will be purchased through a green power program for the local utility company, LIPA (Renewable Energy Certificates).
- Spent GAC from the vapor phase GAC units will be replaced with regenerated carbon.
- Pending waste disposal sampling results, spent carbon will be disposed of at a carbon regeneration facility.
- Selection of local contractors and vendors to reduce travel and shipping impacts
- Equipment required for maintenance, repairs or system modifications may be re-adopted from other NYSDEC sites when applicable.

6.2.4 Frequency of System Checks, Sampling and Other Periodic Activities

Transportation to and from the Site, use of consumables in relation to visiting the Site in order to conduct system checks and/or collect samples, and shipping samples to a laboratory for analyses have direct and/or inherent energy costs. The schedule and/or means of these periodic activities have been prepared so that these tasks can be accomplished in a manner that does not impact remedy protectiveness but reduces expenditure of energy or resources.

Consideration shall be given to:

- Reduced sampling frequencies;
- Reduced site visits and system checks;
- Bundling routine system operation checks, inspections, periodic sampling, and other site management activities with other nearby sites;
- Coordination/consolidation of activities to maximize foreman/labor time; and
- Use of mass transit for site visits, where available, and carpooling.

6.2.5 Metrics and Reporting

As discussed in Section 7.0 and as shown in Appendix I – Site Management Forms, information on energy usage, solid waste generation, transportation and shipping, water usage and land use and ecosystems will be recorded to facilitate and document consistent implementation of green remediation during site management and to identify corresponding benefits. A set of metrics has been developed and will be evaluated over time to ensure that green remediation actions are achieving the desired results.

6.3 Remedial System Optimization

An RSO study will be conducted any time that the NYSDEC project manager or the remedial party requests in writing that an in-depth evaluation of the remedy is needed. An RSO may be appropriate if any of the following occur:

- The RAs have not met or are not expected to meet RAOs in the time frame estimated in the Decision Document;
- The management and operation of the remedial system is exceeding the estimated costs;
- The remedial system is not performing as expected or as designed;
- Previously unidentified source material may be suspected;
- Plume shift has potentially occurred;
- Site conditions change due to development, change of use, change in groundwater use, etc.;
- There is an anticipated transfer of the site management to another remedial party or agency; and

- A new and applicable remedial technology becomes available.

An RSO will provide a critique of a site's conceptual model, give a summary of past performance, document current cleanup practices, summarize progress made toward the site's cleanup goals, gather additional performance or media specific data and information and provide recommendations for improvements to enhance the ability of the present system to reach RAOs or to provide a basis for changing the remedial strategy.

The RSO study will focus on overall site cleanup strategy, process optimization, and management with the intent of identifying impediments to cleanup and improvements to site operations to increase efficiency, cost effectiveness, and remedial time frames. Green remediation technology and principles are to be considered when performing the RSO.

An RSO was completed by the EPA as part of the transfer of operational responsibilities to NYSDEC in 2021. Extraction well EW-3 was installed at the LAI Facility to maximize groundwater treatment operations and efficiencies.

7.0 REPORTING REQUIREMENTS

7.1 Site Management Reports

All site management inspection, maintenance and monitoring events will be recorded on the appropriate site management forms provided in Appendix I. These forms are subject to NYSDEC revision. All site management inspection, maintenance, and monitoring events will be conducted by a qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in NYS, or a qualified person who directly reports to a PE who is licensed and registered in NYS.

All applicable inspection forms and other records, including media sampling data and system maintenance reports generated for the site during the reporting period will be provided in electronic format to NYSDEC in accordance with the requirements of Table 12 and summarized in the PRR.

Table 12: Schedule of Monitoring/Inspection Reports

Task/Report	Reporting Frequency*
Groundwater Monitoring Report	Every 15-months, report due within 60 days of receipt of laboratory analytical data
O&M Report	Annually, report due within 60 days of receipt of December laboratory analytical data
PRR*	Every 5 years, or as otherwise determined by NYSDEC

* The frequency of events will be conducted as specified until otherwise approved by the NYSDEC project manager.

All monitoring/inspections reports will include, at a minimum:

- Date of event or reporting period;
- Name, company, and position of person(s) conducting monitoring/inspection activities;
- Description of the activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet);
- Type of samples collected (e.g., sub-slab vapor, indoor air, outdoor air);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;

- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);
- Any observations, conclusions, or recommendations; and
- A determination as to whether contaminant conditions have changed since the last reporting event.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting maintenance activities;
- Description of maintenance activities performed;
- Any modifications to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

Non-routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;
- Description of non-routine activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and
- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

Data will be reported in digital format as determined by NYSDEC. Currently, data is to be supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link http://www.dec.ny.gov/chemical/62440.html.

7.2 Periodic Review Report

After submittal of the initial PRR, the next PRR shall be submitted every five years to the NYSDEC project manager or at another frequency as may be required by the NYSDEC project manager. In the event that the site is subdivided into separate parcels with different ownership, a single PRR will be prepared that addresses the site described in Appendix A -Environmental Easement. The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each

certification period. Media sampling results will also be incorporated into the PRR. The report will include:

- Identification, assessment, and certification of all ECs/ICs required by the remedy for the site.
- Results of the required annual site inspections, fire inspections, and severe condition inspections, if applicable.
- Description of any change of use, import of materials, or excavation that occurred during the certifying period.
- All applicable site management forms and other records generated for the site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.
- Identification of any wastes generated during the reporting period, along with waste characterization data, manifests, and disposal documentation.
- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.
- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These tables and figures will include a presentation of past data as part of an evaluation of contaminant concentration trends, including but not limited to:
    - Trend monitoring graphs that present groundwater contaminant levels from before the start of the remedy implementation to the most current sampling data;
    - Trend monitoring graphs depicting system influent analytical data on a per event and cumulative basis;
    - O&M data summary tables;
    - A current plume map for sites with remaining groundwater contamination; and
    - A groundwater elevation contour map for each gauging event.
- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQuIS^{TM} database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html.
- A site evaluation, which includes the following:
    - The compliance of the remedy with the requirements of the site-specific RA Work Plan (RAWP), ROD, or Decision Document;
    - The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications;

- Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;
- Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan;
- An update to the climate change vulnerability assessment if site or external conditions have changed since the previous assessment, and recommendations to address vulnerabilities;
- A summary of the Green Remediation evaluation, including a quantitative and qualitative overview of a site's environmental impacts and recommendations to improve the remedy's environmental footprint. The PRR will include the completed Summary of Green Remediation Metrics form provided in Appendix K;
- An evaluation of trends in contaminant levels in the affected media to determine if the remedy continues to be effective in achieving remedial goals as specified by the RAWP, ROD, or Decision Document; and
- The overall performance and effectiveness of the remedy.

- A performance summary for all treatment systems at the site during the calendar year, including information such as:
  - The number of days the system operated for the reporting period;
  - The average, high, and low flows per day;
  - The contaminant mass removed and the cost per pound of mass removed during the certification period and during the life of the treatment system;
  - A description of breakdowns and/or repairs along with an explanation for any significant downtime;
  - A description of the resolution of performance problems;
  - Alarm conditions;
  - Trends in equipment failure;
  - A summary of the performance, effluent, and/or effectiveness monitoring; and
  - Comments, conclusions, and recommendations based on data evaluation. Recommendations must address how receptors would be impacted. Recommendations can include:
    - Proposals to address efficiency and costs such as: instituting remote operation, system changes to decrease maintenance costs and downtime, and system changes to decrease energy use; and
    - Proposals to modify or shut down a treatment system due to remediation completion, system performance or changed conditions. System shutdowns are addressed in Section 6.4 of DER-10.

7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a qualified environmental professional as defined in 6 NYCRR Part 375 or PE licensed to practice and registered in NYS will prepare, and include in the PRR, the following certification as per the requirements of NYSDEC DER-10:

> "For each institutional or engineering control identified for the site, I certify that all of the following statements are true:
>
> - The inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;
> - The IC and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;
> - Nothing has occurred that would impair the ability of the control to protect the public health and environment;
> - Nothing has occurred that would constitute a violation or failure to comply with any SMP for this control;
> - Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;
> - If a financial assurance mechanism is required under the oversight document for the site, the mechanism remains valid and sufficient for the intended purpose under the document;
> - Use of the site is compliant with the environmental easement;
> - The engineering control systems are performing as designed and are effective;
> - To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program and generally accepted engineering practices; and
> - The information presented in this report is accurate and complete.
>
> I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, Derek Roy, of HRP Associates, Inc., am certifying as Remedial Party's Designated Site Representative. I have been authorized and designated by all site owners/remedial parties to sign this certification for the site."

At the end of each certifying period, as determined by the NYSDEC project manager, the following certification will be provided to the NYSDEC project manager:

"For each institutional control identified for the site, I certify that all of the following statements are true:

- *The institutional control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*
- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;*
- *Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *If a financial assurance mechanism is required under the oversight document for the site, the mechanism remains valid and sufficient for the intended purpose under the document;*
- *Use of the site is compliant with the environmental easement.*
- *The information presented in this report is accurate and complete.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Owner or Owner's Designated Site Representative] and I have been authorized and designated by all site owners to sign this certification for the site."

The signed certification will be included in the PRR.

The PRR will be submitted, in electronic format, to the NYSDEC project manager and the NYSDOH project manager. The PRR may also need to be submitted in hard-copy format if requested by the NYSDEC project manager.

7.3 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional or engineering control or failure to conduct site management activities, a Corrective Measures Work Plan will be submitted to the NYSDEC project manager for approval. This plan will explain the failure and provide the details and schedule for performing the work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC project manager.

7.4 Remedial System Optimization Report

If an RSO is to be performed (Section 6.3), upon completion of an RSO, an RSO report must be submitted to the NYSDEC project manager for approval. A general outline for the RSO report is provided in Appendix L. The RSO report will document the research/ investigation and data gathering that was conducted, evaluate the results and facts obtained, present a revised conceptual site model and present recommendations. RSO recommendations are to be implemented upon approval from NYSDEC. Additional work plans, design documents, HASPs etc., may still be required to implement the recommendations, based upon the actions that need to be taken. A final engineering report and update to the SMP may also be required.

The RSO report will be submitted, in electronic format, to the NYSDEC project manager and the NYSDOH project manager.

8.0 REFERENCES

6 NYCRR Part 375, Environmental Remediation Programs. December 14, 2006.

NYSDEC DER-10 – "Technical Guidance for Site Investigation and Remediation". May 3, 2010 (revised April 9, 2019).

USEPA – 40 CFR Part 761 for PCB Waste Cleanup and Disposal. February 26, 2004.

NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. June 1998 (April 2000 addendum).

Koszalka, E.J., 1984. Geohydrology of the northern part of the Town of Brookhaven, Suffolk County, New York. USGS Water-Resources Investigations Report 83-4042. 37p.

Wiedemeier, T.H., Rifai, H.S., Newell, C.J., and Wilson, J.T. 1998. Natural Attenuation of Fuels and Solvents in the Subsurface: John Wiley and Sons. New York.

NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. June 1998 (April 2000 addendum).

Franke, O.L., and McClymonds, N.E., 1972. Summary of the Hydrologic Situation on Long Island, New York, as a Guide to Water-Management Alternatives. Geological Survey Professional Paper 627-F, 59 pp.

CDM Smith. Final Remedial Investigation Report. Lawrence Aviation Industries Site, Port Jefferson Station, New York. March 2006.

CDM Smith. Remedial Action Report Groundwater Extraction and Treatment System for the Groundwater Remedy on the Lawrence Aviation Industries Property. Region 2 RAC 2 Remedial Action Contract. Work Assignment No. 034-RARA-02PF. August 2011.

CDM Smith. October 31, 2012. Comprehensive Sampling Event Report. Lawrence Aviation Industries Site, Long-term Response Action. Port Jefferson Station, New York. Contract No.: EP-W-09-002, WA#: 044-RALR-02NS.

HDR Engineering, Inc. 2013 Comprehensive Sampling Event Report. Region 2 Architect-Engineering Services Contract, Contract #EP-W-09-009. Lawrence Aviation Industries Long-Term Response Action. September 2013.

Weston Solutions Inc. Remedial Action Report, Lawrence Aviation Industries Site. September 2014.

HDR Engineering, Inc. 2014 Comprehensive Sampling Event Report. Region 2 Architect-Engineering Services Contract, Contract #EP-W-09-009. Lawrence Aviation Industries Long-Term Response Action. September 2014.

HDR Engineering, Inc. 2015 Comprehensive Sampling Event Report. Region 2 Architect-Engineering Services Contract, Contract #EP-W-09-009. Lawrence Aviation Industries Long-Term Response Action. September 2015.

HDR Engineering, Inc. Uniform Federal Policy for Quality Assurance Project Plans. Region 2 Architect-Engineering Services Contract, Contract #EP-W-09-009. Lawrence Aviation Industries Long-Term Response Action. April 2016. Revision 3.

HDR Engineering, Inc. 2016 Comprehensive Sampling Event Report. Region 2 Architect- Engineering Services Contract, Contract #EP-W-09-009. Lawrence Aviation Industries Long-Term Response Action. September 2016.

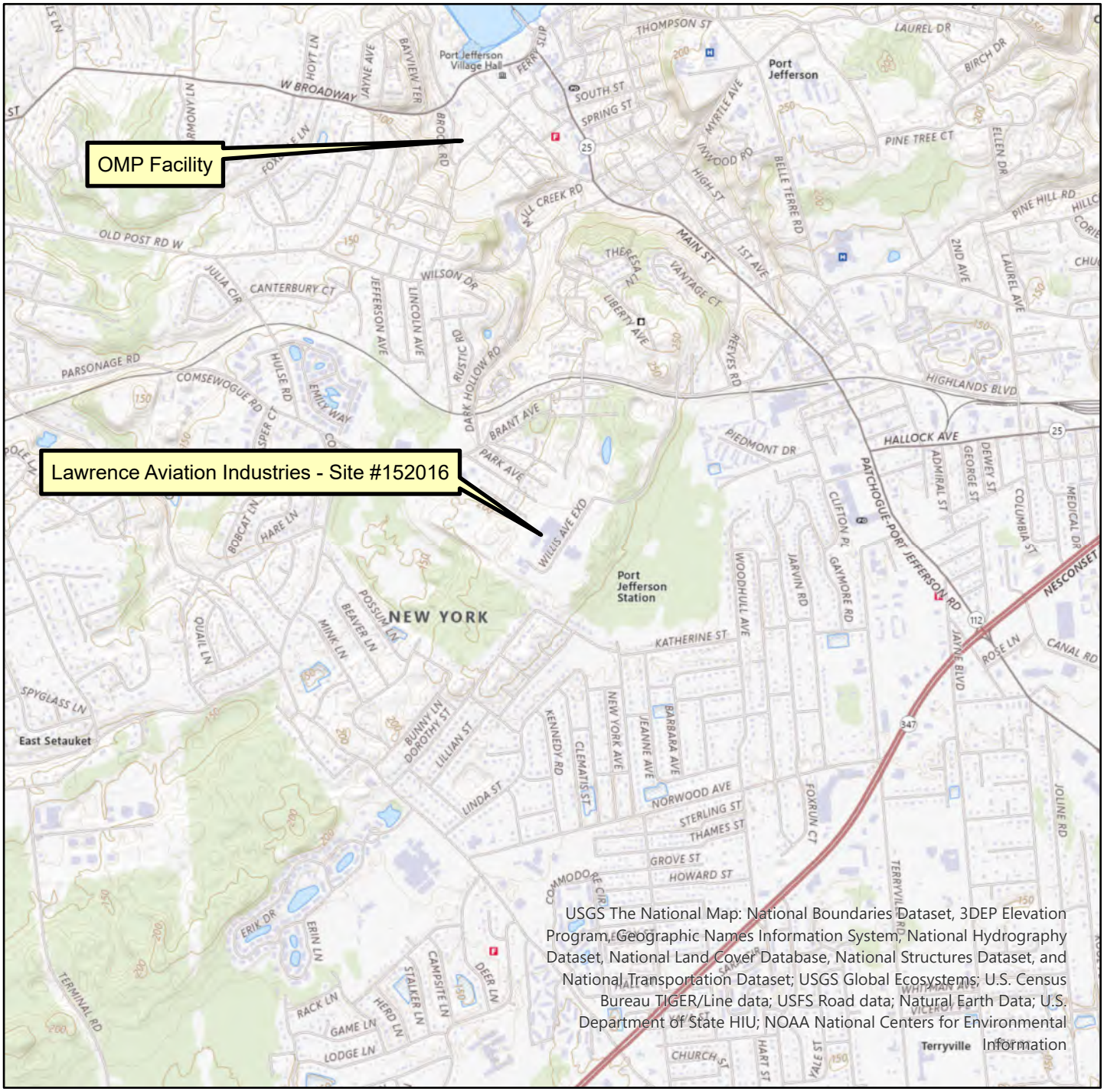
Nelson, Pope, & Voorhis, LLC. Lawrence Aviation Superfund Site Reuse Feasibility Study for the Suffolk County Landbank Corporation. December 2017.

HDR Engineering, Inc. 2018 Comprehensive Sampling Event Report. Region 2 Architect- Engineering Services Contract, Contract #EP-W-09-009. Lawrence Aviation Industries Long-Term Response Action. March 2018.

HydroGeoLogic, Inc. Operations and Maintenance Plan and Manual, Lawrence Aviation Industries Groundwater Treatment System. Lawrence Aviation Industries Superfund Site, Operable Unit 1, Long Term Remedial Action. February 2022

HRP Associates, Inc. March 2024 Groundwater Sampling Report. Lawrence Aviation Industries Superfund Site.

FIGURES



USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road data; Natural Earth Data; U.S. Department of State HIU; NOAA National Centers for Environmental Information

1:24,000

USGS Quadrangle Information
Quad ID: o40073h1
Name: Port Jefferson

Figure 1
Site Location
100 Sheep Pasture Road,
Port Jefferson Station, Brookhaven, NY
HRP #DEC1027.OM
Scale 1" = 2,000'

MOVE YOUR ENVIRONMENT FORWARD

ONE FAIRCHILD SQUARE
SUITE 110
CLIFTON PARK, NY 12065
(518) 877-7101
HRPASSOCIATES.COM

Path: S:\Data\NYDEC - NYSDEC\BROOKHAVEN\SHEEP PASTURE ROAD, PORT JEFFERSON STATION, NY 11776\DEC1027OM\GIS\GWM Figures\Site Location\Site Location.aprx

Esri, NASA, NGA, USGS, FEMA, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Sources: Esri, Maxar, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap, and the GIS user community

Port Jefferson Harbor

Garant Harborfront Park

Port Jefferson

The Steam Room

Port Jefferson Free Library

Port Jefferson Village Hall

Port Jefferson Fire Department

Jefferson School

Maryhaven Center of Hope

Infant Jesus Roman Catholic Church

Greek Orthodox Church of the Assumption

Verizon

A

A'

SW-15

SW-16

SW-07

SW-06

SW-08

SW-05

ERT-MW-2A

ERT-MW-2B

ERT-MW-2C

ERT-MW-2D

ERT-MW-1A

ERT-MW-1B

SDW-01

ERT-MW-5A

ERT-MW-5B

ERT-MW-4A

ERT-MW-4B

MPW-08

ERT-MW-6A

ERT-MW-6B

ERT-MW-3

MPW-09

ERT-EW-5

ERT-EW-4

MW-PD-15

ERT-EW-2

ERT-EW-1

ERT-EW-6

ERT-EW-3

OMP Facility

MW-PD-16

MW-PD-17

MPW-05

MPW-06

MW-PD-14

MW-PD-13

MW-PD-12

MPW-10

MW-PD-11

MPW-03

MPW-04

MPW-02

EW-02

EW-03

EW-01

MW-ISCO-02

MW-ISCO-01

IW-ISCO-11

MW-ISCO-04

IW-ISCO-06

IW-ISCO-5

PZ-05

PZ-07

PZ-06

MW-05

IW-ISCO-13

IW-ISCO-10

IW-ISCO-08

PZ-01

IW-ISCO-09

MW-ISCO-03

IW-ISCO-07

IW-ISCO-03

MPW-07

PZ-04

IW-ISCO-02

MW-ISCO-05

PZ-02

IW-02

IW-03

IW-04

IW-01

IW-05

IW-ISCO-0

MPW-01

LAI Facility

Former LAI Industrial Area

Approximate Former LAI Outlying Properties

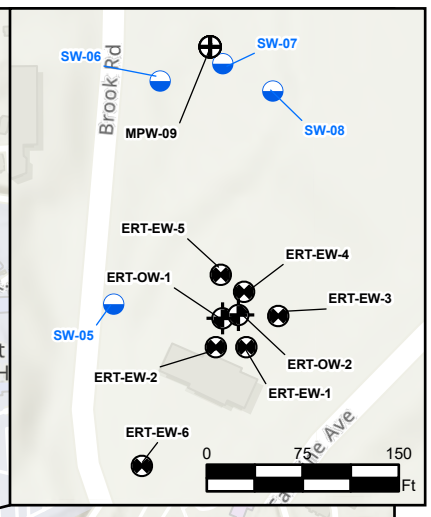
231 ft

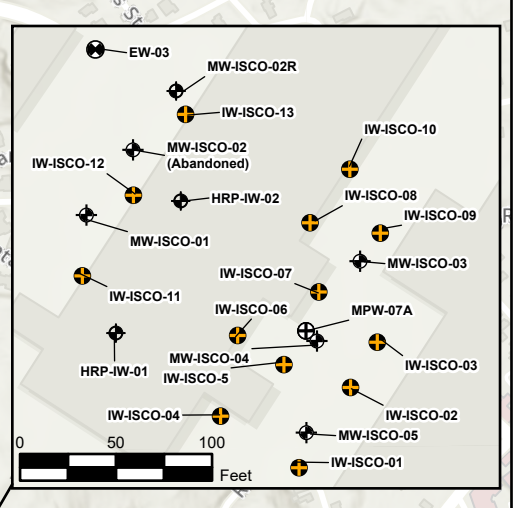
241 ft

181 ft

182 ft

153 ft





Legend

- Cross Section A-A'
- Former LAI Outlying Properties
- Outfall to Old Mill Pond
- Surface Water Body
- ISCO Injection Well
- Piezometer
- ERT Extraction Well
- Injection Well
- Multiport Well
- Monitoring Well
- Surface Water Sample
- LAI Site Boundary

HRP
MOVE YOUR ENVIRONMENT FORWARD

197 SCOTT SWAMP ROAD
FARMINGTON, CT 06032
(860) 674-9570
HRPASSOCIATES.COM

Site Layout Map
Lawrence Aviation Industries
SITE No. 152016
Sheep Pasture Road
Port Jefferson, New York

JH DESIGNED BY:	11X17 SHEET SIZE:
BOB DRAWN BY:	06/18/2024 DATE:
DR REVIEWED BY:	DEC1027.OM PROJECT NUMBER:

North

1" = 700'

0 350 700 Ft

FIGURE 2

Path: S:\Data\NNYDEC - NYSDEC\BROOKHAVEN\SHEEP PASTURE ROAD, PORT JEFFERSON STATION, NY 11776\DEC1027OM\GIS\GWM Figures\Figures.aprx

Legend

- NYS DOT Setauket-Port Jefferson Station Greenway Trail
- LAI Site Boundary
- Suffolk County NY Tax Parcels
- Groundwater Treatment Building
- Class-4 Inactive Hazardous Waste Disposal Site
- System Piping
- Approximate Underground Water Line
- Approximate Underground Electric
- ISCO Injection Well
- Piezometer
- ERT Extraction Well
- Injection Well
- Multiport Well
- Monitoring Well

136-2-22

159-2-20

Class 4 Site
5.50 Acres

159-2-19
35.349 Acres

159-1-26
2.639 Acres

180-4-1-0
4.544 Acres

180-4-2-1

180-4-2-2

HRP
MOVE YOUR ENVIRONMENT FORWARD
197 SCOTT SWAMP ROAD
FARMINGTON, CT 06032
(860) 674-9570
HRPASSOCIATES.COM

NORTH

0 75 150
Feet

REVISIONS

NO	DATE	DESCRIPTION

DESIGNED:	DRAWN:	REVIEWED:	APPROVED:
DR	BOB	DR	DR

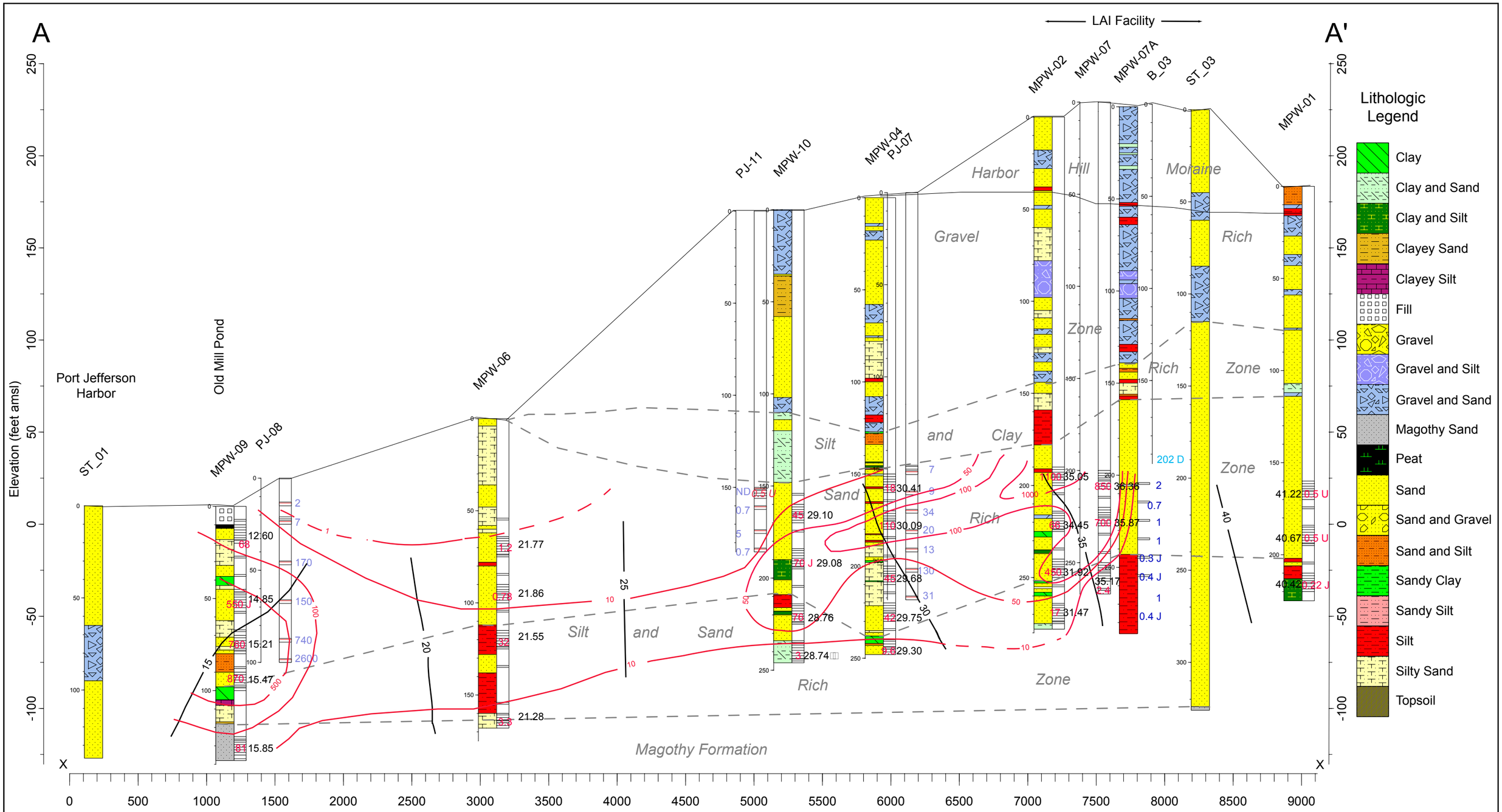
SCALE:	ISSUE DATE:	PROJECT NUMBER:	SHEET SIZE:
1"=150'	03/06/2025	DEC1027.OM	24"X36"

Lawrence Aviation Industries
Site #152016
100 Sheep Pasture Road
Port Jefferson Station, New York

Class-4 Site Boundary

FIGURE NO.
2a

Path: S:\Data\NY\DEC - NY\SEC\BROOKHAVEN\SHEEP PASTURE ROAD, PORT JEFFERSON STATION, NY 11776\DEC1027.OM\GIS\Demolition\Parcels - Delisting\Parcels - Delisting.aprx



LEGEND

U or ND - Not Detected, if U value to is the detection limit

59 - TCE Results, Round 1 Groundwater samples, April-May 2005

202 D - TCE Results, groundwater screening sample, 12/3/1997

J - Estimated

D - Dilluted Sample

E - Estimated, result above calibration range

U - Not Detected

2600 - SCHD TCE Groundwater Screening Data, July 1991-March 1992

1 - TCE Groundwater Screening Data, Summer 2004

0.5 U - TCE Results, 10/23/2003

12.53 - Water Level Elevation, feet amsl, April 25, 2005

MPW - multiport monitoring well

PJ - Suffolk County Health Dept. (SCHD) Groundwater Screening Location

ST - Stratigraphic boring

amsl - above mean sea level

- Potentiometric surface contour, dashed where inferred, April 25, 2005, feet amsl

- TCE Isoconcentration contour, dashed where inferred, April-May 2005, micrograms/liter

All TCE Data is in micrograms/liter

Vertical Exagerration: 14
Horizontal Scale: 1:8400
Vertical Scale: 1:600

Figure 3-11A
Cross Section A-A'
Round 2 Water Level and TCE Data
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

CDM

Legend

- ISCO Injection Well
- Piezometer
- ERT Extraction Well
- Injection Well
- Multiport Well
- Monitoring Well
- LAI Site Boundary
- Surface Water Body
- Cross Section A-A'
- Groundwater Flow Direction
- Approximate Potentiometric Surface ft (amsl)

ERT-MW-2A [9.04'] ERT-MW-2B [9.17'] ERT-MW-2C (NC) ERT-MW-2D [NC] ERT-MW-1A [9.29'] ERT-MW-1B [10.37'] SDW-01 [5.68'] ERT-MW-5A [7.52'] ERT-MW-5B [7.80'] ERT-MW-4A [7.66'] ERT-MW-4B [NC] MPW-09 [13.38'] MPW-08 [4.22'] ERT-MW-3 [16.22] ERT-EW-5 [16.14'] ERT-EW-4 [16.35'] MW-PD-15 [16.38'] ERT-EW-2 ERT-EW-1 ERT-EW-6 ERT-MW-6A [11.84'] ERT-MW-6B [13.49'] ERT-EW-3 [15.88'] MW-PD-17 [19.35'] MW-PD-16 [19.93'] MPW-05 [NC] MPW-06 [20.09] MW-PD-13 [26.80'] MPW-10 [25.93'] MW-PD-12 [28.10'] MW-PD-11 [28.93'] MPW-04 [27.89'] MPW-03 [30.85'] EW-02 [NC] MW-05 [34.43'] PZ-07 [35.07'] MPW-02 [32.41'] PZ-06 [34.24'] EW-03 [NC] IW-ISCO-13 [NC] EW-01 [NC] IW-ISCO-10 [34.76'] MW-ISCO-02 [35.00'] IW-ISCO-08 [NC] PZ-01 [35.86'] MW-ISCO-01 [NC] IW-ISCO-09 [NC] IW-ISCO-11 [NC] MW-ISCO-03 [NC] MW-ISCO-04 [NC] IW-ISCO-07 [NC] IW-ISCO-06 [NC] IW-ISCO-5 [NC] IW-ISCO-03 [NC] PZ-05 [35.72'] PZ-02 [36.55'] IW-02 MPW-07 [NC] IW-03 PZ-04 [36.27'] IW-01 IW-ISCO-02 [NC] IW-ISCO-04 [NC] IW-05 IW-04 MW-ISCO-05 [35.80'] MPW-01 [37.47']

10' 15' 20' 25' 30' 35'

A A'

Approximate Former LAI Property Boundary

NOTES:
ERT=Emergency Response Team
ISCO=In Situ Chemical Oxidation
LAI=Lawrence Aviation Industries
OMP=Old Mill Pond
NC=Not Collected

Esri, NASA, NGA, USGS, FEMA, Esri Community Maps Contributors, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, USFWS

Path: S:\Data\NNYDEC - NYSDEC\BROOKHAVEN\SHEEP PASTURE ROAD, PORT JEFFERSON STATION, NY 11776\DEC1027OM\GIS\GWM Figures\Figures.aprx

HRP
MOVE YOUR ENVIRONMENT FORWARD
197 SCOTT SWAMP ROAD
FARMINGTON, CT 06032
(860) 674-9570
HRPASSOCIATES.COM

March 2024 Upper Glacial Aquifer Potentiometric Surface

Lawrence Aviation Industries
SITE NO. 152016
Sheep Pasture Road
Port Jefferson, New York

JH DESIGNED BY:	11X17 SHEET SIZE:
BOB DRAWN BY:	06/05/2024 DATE:
DR REVIEWED BY:	DEC1027.OM PROJECT NUMBER:

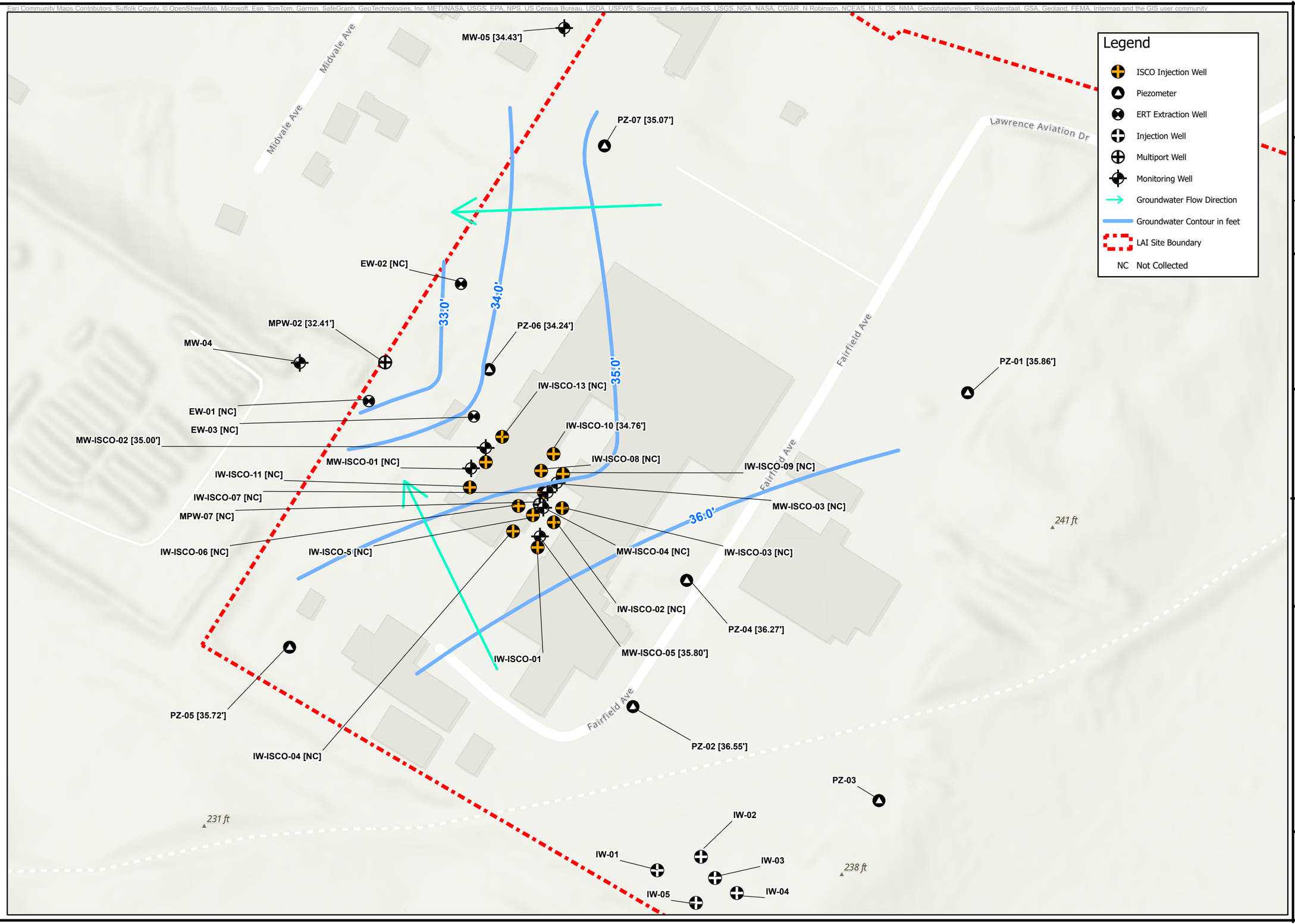
North

1" = 700'

0 350 700 Ft

FIGURE 4A

Esri Community Maps Contributors, Suffolk County, © OpenStreetMap, Microsoft, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, USFWS, Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community



HRP
MOVE YOUR ENVIRONMENT FORWARD
ONE FAIRCHILD SQUARE
SUITE 110
CLIFTON PARK, NY 12065
(518) 877-7101
HRPASSOCIATES.COM

Revisions						
No.	Date					

Designed By:	Drawn By:	Reviewed By:
JH	BOB	DR

Issue Date:	Project No:	Sheet Size:
06/05/2024	DEC1027.OM	11x17

GWM - LAI Facility Flow Map

Lawrence Aviation Industries
Site No. 125016
Sheep Pasture Road
Port Jefferson, New York

FIGURE NO.

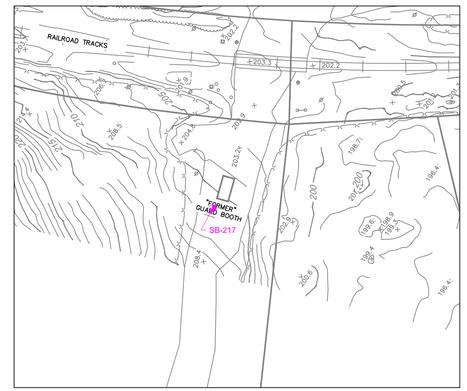
4B

Path: S:\Data\NNYDEC - NYSDEC\BROOKHAVEN\SHEEP PASTURE ROAD, PORT JEFFERSON STATION, NY 11776\DEC1027OM\GIS\GWM Figures\Figures.aprx

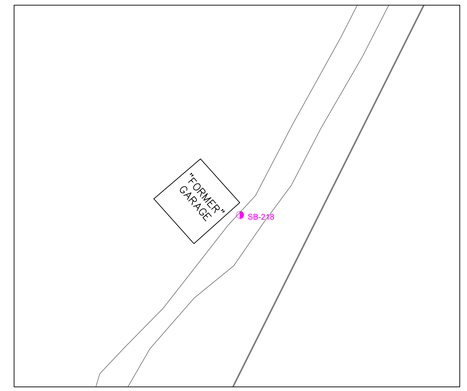
LEGEND

- -SOIL BORING
- -ISCO INJECTION WELL
- -PIEZOMETER
- -ERT EXTRACTION WELL
- -INJECTION WELL
- -MULTIPORT WELL
- -MONITORING WELL
- -REMEDIAL EXCAVATION
- -FORMER MACHINE PIT/TRENCH

Setauket-Port Jefferson Station Greenway Trail (Park)



FORMER GUARD BOOTH LOCATED ON THE NORTHEAST CORNER OF THE PROPERTY OFF OF SHEEP PASTURE ROAD



FORMER GARAGE LOCATED ON THE NORTHEAST CORNER OF THE PROPERTY OFF OF SHEEP PASTURE ROAD



FORMER ADMINISTRATIVE BUILDING LOCATED ON THE NORTHWEST CORNER OF THE PROPERTY OFF OF PARK AVENUE

HRP
MOVE YOUR ENVIRONMENT FORWARD

ONE FAIRCHILD SQUARE
SUITE 110
CLIFTON PARK, NY 12065
(518) 877-7101
HRPASSOCIATES.COM

NORTH

0 25' 50'

REVISIONS

NO.	DATE	DESCRIPTION

DESIGNED: CVP
DRAWN: CVP
REVIEWED: DR
APPROVED: TRB
SCALE: 1" = 50'
ISSUE DATE: 06/26/2024
PROJECT NUMBER: DEC1027.OM
SHEET SIZE: 24"x36"

P.E. SEAL

LAWRENCE AVIATION INDUSTRIES

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

100 SHEEP PASTURE ROAD
PORT JEFFERSON, NEW YORK

2024 Soil Boring Map

SHEET NO.

Fig. 5A

DRAWING NAME: S:\Data\NY\NYHC - NYSDEC\BROOKHAVEN\SHEEP PASTURE ROAD, PORT JEFFERSON STATION, NY 11776\DEC1027OM\CAD\Composite Map.dwg LAYOUT: Figure 5 - Proposed Concrete Removal Plan 19,OFTHATI1 Mar 07, 2025 - 2:30pm OBERATOR, ROB

LEGEND

- STRUCTURE DEMOLISHED, FORMER BUILDING SLABS REMAIN
- CAPPED PITS
- PITS, USTS AND TANKS TO BE CAPPED
- DW-XX DRYWELLS ABANDONED AND BACKFILLED
- CESS-XX CESSPOOLS ABANDONED AND BACKFILLED
- FD-# FLOOR DRAIN ABANDONED AND BACKFILLED
- SOIL SAMPLE CONTAINED PCBs AT CONCENTRATIONS GREATER THAN 1 mg/kg
- CONCRETE COUPON INVESTIGATION AREA
- COMPOSITE CONCRETE SAMPLE CONTAINED TOTAL PCBs AT CONCENTRATIONS GREATER THAN 1 mg/kg
- OIL/PRODUCT SAMPLE FROM AREA CONTAINED TOTAL PCBs AT CONCENTRATIONS GREATER THAN 1 mg/kg
- COMPOSITE CONCRETE SAMPLES CONTAINED TOTAL PCBs AT CONCENTRATION LESS THAN 1 mg/kg
- OIL/PRODUCT SAMPLE FROM AREA CONTAINED TOTAL PCBs AT CONCENTRATIONS LESS THAN 1 mg/kg
- CONCRETE COMPOSITE GRID SAMPLES
- GRID IMPACTED WITH PCBs AT CONCENTRATIONS GREATER THAN 1 mg/kg and less than 9 mg/kg
- CLASS-4 INACTIVE HAZARDOUS WASTE DISPOSAL SITE

Sound View Avenue

Setauket-Port Jefferson Station Greenway Trail (Park)

FORMER GAS LINE (ABANDONED)

"FORMER" PROPANE BLDG

"FORMER" PROPANE TANKS

"FORMER" SHED

POTENTIAL STRUCTURE

"FORMER" BLDG 10X CHEM MILL

"FORMER" BUILDING G

"FORMER" CHEM MILL

"FORMER" BUILDING C

"FORMER" MELT FACILITY

"FORMER" ELECTRO

"FORMER" ELECTRODE WELDING BUILDING

"FORMER" STORAGE BUILDING

"FORMER" INDUSTRIAL WASTE STORAGE BUILDING

"FORMER" TRUCK SCALE

"FORMER" BUILDING F

"FORMER" ADMINISTRATIVE BUILDING

"FORMER" GARAGE

GROUNDWATER TREATMENT BLDG

FORMER FD TK

FORMER SHED

AREA 10-1 AREA 10-2 AREA 10-3 AREA 10-4

AREA G-1 AREA G-2 AREA G-3 AREA G-4 AREA G-5 AREA G-6 AREA G-7

AREA 30-1 AREA 30-2 AREA 30-3

AREA E-1 AREA E-2 AREA E-3

AREA F-1

DW-1A DW-1 DW-2 DW-2A DW-2C DW-3 DW-4 DW-5 DW-6 DW-7 DW-9 DW-10 DW-11 DW-12 DW-13 DW-15

CESS-1 CESS-1A CESS-2 CESS-2A (SEPTIC TANK) CESS-3 CESS-3A CESS-3B (SEPTIC TANK) CESS-4 CESS-4B CESS-5 CESS-6 CESS-6A CESS-6B CESS-6C CESS-7 CESS-7A (SEPTIC TANK) CESS-7B CESS-7C CESS-8A CESS-9B CESS-10 CESS-10A CESS-10B CESS-10C (FORMER SEPTIC TANK) CESS-11 (SEPTIC TANK) CESS-11A CESS-12 (SEPTIC TANK) CESS-12A CESS-13 CESS-14 (SEPTIC TANK)

UST-1 UST-2 UST-3 UST-4

P-33

OUTFALL-02 OUTFALL-0

FORMER GARAGE LOCATED ON THE NORTHEAST CORNER OF THE PROPERTY OFF OF SHEEP PASTURE ROAD

FORMER ADMINISTRATIVE BUILDING LOCATED ON THE NORTHWEST CORNER OF THE PROPERTY OFF OF PARK AVENUE

GENERAL NOTES:

1. NOT ALL UTILITIES MAY BE SHOWN. ALL UTILITIES AND STRUCTURES MUST BE VERIFIED BY CONTRACTOR.
2. ALL WELLS WITHIN THE CONSTRUCTION SITE ARE TO BE PROTECTED AND MAINTAINED THROUGHOUT CONSTRUCTION ACTIVITIES.
3. SITE TO BE CLEARED AND GRUBBED AS NECESSARY TO PERFORM THE WORK.

SUGGESTED CONSTRUCTION SEQUENCE

4. INSTALL STOCKPILE/STAGING AREAS IN ACCORDANCE WITH SHEETS C2.0.
5. INSTALL FENCING IN ACCORDANCE WITH SHEET C2.0.
6. FOLLOWING COORDINATION WITH NYSDEC TO DEWATER AND CLEAN THE VARIOUS PITS, CONTRACTOR SHALL BACKFILL THE PITS, CESS POOLS, DRYWELLS AND USTS TO EXISTING GRADE.
7. REMOVE ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES AND TEMPORARY FENCING AFTER ALL AREAS HAVE BEEN WELL ESTABLISHED AND THE SITE HAS BEEN INSPECTED AND APPROVED BY THE OWNER AND/OR THE OWNER'S REPRESENTATIVE.

HRP
MOVE YOUR ENVIRONMENT FORWARD
ONE FAIRCHILD SQUARE
SUITE 110
CLIFTON PARK, NY 12065
(518) 877-7101
HRPASSOCIATES.COM

NORTH

0 25' 50'

REVISIONS

NO.	DATE	DESCRIPTION

DESIGNED: CVP
DRAWN: CVP
REVIEWED: DR
APPROVED: TRB
SCALE: 1" = 50'
ISSUE DATE: 06/26/2024
PROJECT NUMBER: DEC1027.OM
SHEET SIZE: 24"x36"

P.E. SEAL

LAWRENCE AVIATION INDUSTRIES

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

100 SHEEP PASTURE ROAD
PORT JEFFERSON, NEW YORK

2024-2025 CONCRETE INVESTIGATION MAP

SHEET NO.

Fig. 5B

DRAWING NAME: S:\Jan\NY\HYK - NYSDEC\BROOKHAVEN\SHEEP PASTURE ROAD, PORT JEFFERSON STATION, NY 11776\DEC1027OM\CAD\Concrete Removal\Concrete Investigation Map.dwg LAYOUT: Figure 2 - Concrete Investigation Map JLOT DATE: Aug 26, 2025 - 9:32am OPERATOR: JKOB

File Path: c:\ims\gis\lai_3223147\ri_data_posting_basemaps.apr

	SD-15-R1 10/14/2003 0 to 6 in
SVOC	(µg/kg)
Benzo(a)anthracene	170 J
Chrysene	220 J
Benzo(b)fluoranthene	210 J
Benzo(k)fluoranthene	180 J
Benzo(a)pyrene	130 J
Indeno(1,2,3-cd)pyrene	110 J
Pesticides	(µg/kg)
4,4'-DDD	16
4,4'-DDT	8.9
alpha-Chlordane	3.3
gamma-Chlordane	2.7 J

	SD-14-R1 10/14/2003 0 to 6 in
SVOC	(µg/kg)
Fluorene	140 J
Phenanthrene	2100
Benzo(a)anthracene	1400
Chrysene	1600
bis(2-Ethylhexyl) phthalate	3000
Benzo(b)fluoranthene	1600
Benzo(k)fluoranthene	1200
Benzo(a)pyrene	1200
Indeno(1,2,3-cd)pyrene	970
Pesticides	(µg/kg)
Heptachlor epoxide	8.6
4,4'-DDE	18
4,4'-DDD	12 J
4,4'-DDT	10
alpha-Chlordane	13 J
gamma-Chlordane	15

	SD-16-R1 10/14/2003 0 to 6 in
SVOC	(µg/kg)
Benzo(a)anthracene	190 J
Chrysene	240 J
Benzo(b)fluoranthene	240 J
Benzo(k)fluoranthene	190 J
Benzo(a)pyrene	140 J
Indeno(1,2,3-cd)pyrene	150 J
Metals	(mg/kg)
Copper	25

	SD-13-R1 10/16/2003 0 to 6 in
SVOC	(µg/kg)
Benzo(a)anthracene	230 J
Chrysene	270 J
Benzo(b)fluoranthene	270 J
Benzo(k)fluoranthene	220 J
Benzo(a)pyrene	170 J
Indeno(1,2,3-cd)pyrene	140 J
Pesticides	(µg/kg)
4,4'-DDT	4.9 J
alpha-Chlordane	3.4 J
gamma-Chlordane	3.2 J

	SD-09-R1 10/16/2003 0 to 6 in
VOC	(µg/kg)
Trichloroethene	370 D
SVOC	(µg/kg)
Benzo(a)anthracene	67 J
Chrysene	77 J
Benzo(b)fluoranthene	96 J
Benzo(k)fluoranthene	65 J
Benzo(a)pyrene	54 J
Pesticides	(µg/kg)
4,4'-DDE	18 J
4,4'-DDD	23 J
4,4'-DDT	8.3 J
alpha-Chlordane	3.1 JN
Metals	(mg/kg)
Arsenic	15

	SD-12-R1 10/16/2003 0 to 6 in
SVOC	(µg/kg)
Fluorene	230 J
Phenanthrene	2600
Benzo(a)anthracene	1200
Chrysene	1200
Benzo(b)fluoranthene	1100
Benzo(k)fluoranthene	840
Benzo(a)pyrene	590
Indeno(1,2,3-cd)pyrene	440
Pesticides	(µg/kg)
Heptachlor	2.5 J
4,4'-DDE	7.3 J
4,4'-DDD	21 J
4,4'-DDT	8.2 J
alpha-Chlordane	18 J
gamma-Chlordane	19 J

	SD-07-R1 10/20/2003 0 to 6 in
Pesticides	(µg/kg)
4,4'-DDE	22 J
4,4'-DDD	16 J
4,4'-DDT	13 J
alpha-Chlordane	4 JN
gamma-Chlordane	3.7 J
Metals	(mg/kg)
Lead	43

	SD-10-R1 10/16/2003 0 to 6 in
SVOC	(µg/kg)
Benzo(a)anthracene	80 J
Chrysene	88 J
Benzo(b)fluoranthene	89 J
Benzo(k)fluoranthene	73 J
Benzo(a)pyrene	64 J
Indeno(1,2,3-cd)pyrene	55 J
Pesticides	(µg/kg)
4,4'-DDE	4.8 J
4,4'-DDD	13 J
Metals	(mg/kg)
Lead	38

	SD-11-R1 10/16/2003 0 to 6 in
SVOC	(µg/kg)
Benzo(a)anthracene	67 J
Chrysene	94 J
Benzo(b)fluoranthene	110 J
Benzo(k)fluoranthene	76 J
Benzo(a)pyrene	49 J
Pesticides	(µg/kg)
4,4'-DDE	6.2 J
4,4'-DDD	7.6 J
4,4'-DDT	14 J

	SD-06-R1 10/20/2003 0 to 6 in
VOC	(µg/kg)
Vinyl Chloride	4 J
Trichloroethene	3000 J
Tetrachloroethene	21
Pesticides	(µg/kg)
4,4'-DDE	22 J
4,4'-DDD	6.8 J
4,4'-DDT	17 J
Metals	(mg/kg)
Copper	31

	SD-08-R1 10/20/2003 0 to 6 in
SVOC	(µg/kg)
Benzo(a)anthracene	790 J
Chrysene	900 J
Benzo(b)fluoranthene	1200 J
Benzo(k)fluoranthene	810 J
Benzo(a)pyrene	730 J
Indeno(1,2,3-cd)pyrene	460 J
Pesticide	(µg/kg)
4,4'-DDT	15 J
Metals	(mg/kg)
Copper	17 J
Lead	58 J
Nickel	18 J

	SD-04-R1 10/15/2003 0 to 6 in
SVOC	(µg/kg)
Benzo(a)anthracene	230 J
Chrysene	250 J
Benzo(b)fluoranthene	270 J
Benzo(k)fluoranthene	220 J
Benzo(a)pyrene	220 J
Indeno(1,2,3-cd)pyrene	180 J
Pesticides	(µg/kg)
4,4'-DDE	9.7 J
4,4'-DDT	28
gamma-Chlordane	2.9 J

	SD-17-R1 10/20/2003 0 to 6 in
SVOC	(µg/kg)
Benzo(a)anthracene	130 J
Chrysene	140 J
Benzo(b)fluoranthene	160 J
Benzo(k)fluoranthene	130 J
Benzo(a)pyrene	100 J
Pesticides	(µg/kg)
4,4'-DDE	7 J
4,4'-DDD	9.8 J
4,4'-DDT	8.3 J
Metals	(mg/kg)
Copper	17 J

	SD-05-R1 10/17/2003 0 to 6 in
VOC	(µg/kg)
Trichloroethene	120
SVOC	(µg/kg)
Benzo(a)anthracene	190 J
Chrysene	190 J
Benzo(b)fluoranthene	170 J
Benzo(k)fluoranthene	160 J
Benzo(a)pyrene	120 J
Indeno(1,2,3-cd)pyrene	120 J
Pesticides	(µg/kg)
4,4'-DDT	5.3 J
alpha-Chlordane	3.1 J
gamma-Chlordane	2.8 J

	SD-03-R1 10/14/2003 0 to 6 in
SVOC	(µg/kg)
Benzo(a)anthracene	100 J
Chrysene	130 J
Benzo(b)fluoranthene	130 J
Benzo(k)fluoranthene	80 J
Benzo(a)pyrene	99 J
Indeno(1,2,3-cd)pyrene	66 J

	SD-02-R1 10/14/2003 0 to 6 in
SVOC	(µg/kg)
Benzo(a)anthracene	64 J
Chrysene	78 J
Benzo(b)fluoranthene	77 J
Benzo(k)fluoranthene	64 J
Benzo(a)pyrene	76 J
Indeno(1,2,3-cd)pyrene	59 J

	SD-01-R1 10/14/2003 0 to 6 in
SVOC	(µg/kg)
Fluorene	350 J
Phenanthrene	3100
Benzo(a)anthracene	1300 J
Chrysene	1100 J
Benzo(b)fluoranthene	940 J
Benzo(k)fluoranthene	810 J
Benzo(a)pyrene	380 J
Indeno(1,2,3-cd)pyrene	310 J
Pesticides	(µg/kg)
4,4'-DDE	5.8 J
4,4'-DDT	19
alpha-Chlordane	6.3 J
gamma-Chlordane	5.8
Metals	(mg/kg)
Copper	18
Zinc	190

Site-Specific Stream Sediment Delineation Criteria

VOC	(µg/kg)
Vinyl Chloride	0.84
Trichloroethene	24
Tetrachloroethene	9.6
SVOC	(µg/kg)
Fluorene	96
Phenanthrene	1440
Benzo(a)anthracene	15.6
Chrysene	15.6
bis(2-Ethylhexyl) phthalate	2394
Benzo(b)fluoranthene	15.6
Benzo(k)fluoranthene	15.6
Benzo(a)pyrene	15.6
Indeno(1,2,3-cd)pyrene	15.6
Pesticides/PCB's	(µg/kg)
Heptachlor	0.0096
Heptachlor epoxide	0.0096
4,4'-DDE	0.00012
4,4'-DDD	0.00012
4,4'-DDT	0.00012
alpha-Chlordane	0.012
gamma-Chlordane	0.012
Metals	(mg/kg)
Arsenic	6
Copper	16
Lead	31
Zinc	120

Values that exceed Delineation Criteria are highlighted in yellow

Site-Specific Pond Sediment Delineation Criteria

SVOC	(µg/kg)
Benzo(a)anthracene	92.3
Chrysene	92.3
Benzo(b)fluoranthene	92.3
Benzo(k)fluoranthene	92.3
Benzo(a)pyrene	92.3
Indeno(1,2,3-cd)pyrene	92.3
Pesticides	(µg/kg)
4,4'-DDE	0.00071
4,4'-DDD	0.00071
4,4'-DDT	0.00071
alpha-Chlordane	0.071
gamma-Chlordane	0.071
Metals	(mg/kg)
Copper	16
Lead	31
Nickel	16

Values that exceed Delineation Criteria are highlighted in yellow

Site-Specific Harbor Sediment Delineation Criteria

SVOC	(µg/kg)
Benzo(a)anthracene	4.9
Chrysene	4.9
Benzo(b)fluoranthene	4.9
Benzo(k)fluoranthene	4.9
Benzo(a)pyrene	4.9
Indeno(1,2,3-cd)pyrene	4.9
Pesticides	(µg/kg)
4,4'-DDD	0.00007
4,4'-DDT	0.00007
alpha-Chlordane	0.007
gamma-Chlordane	0.007
Metals	(mg/kg)
Copper	16

Values that exceed Delineation Criteria are highlighted in yellow

SD-16
Old Mill Stream Discharge
SD-15
SD-14
SD-12
SD-13
SD-11
Old Mill Stream
SD-10
SD-09
SD-07
SD-06
SD-08
SD-04
SD-17
Old Mill Pond
SD-03
SD-05
SD-02
SD-01

LEGEND

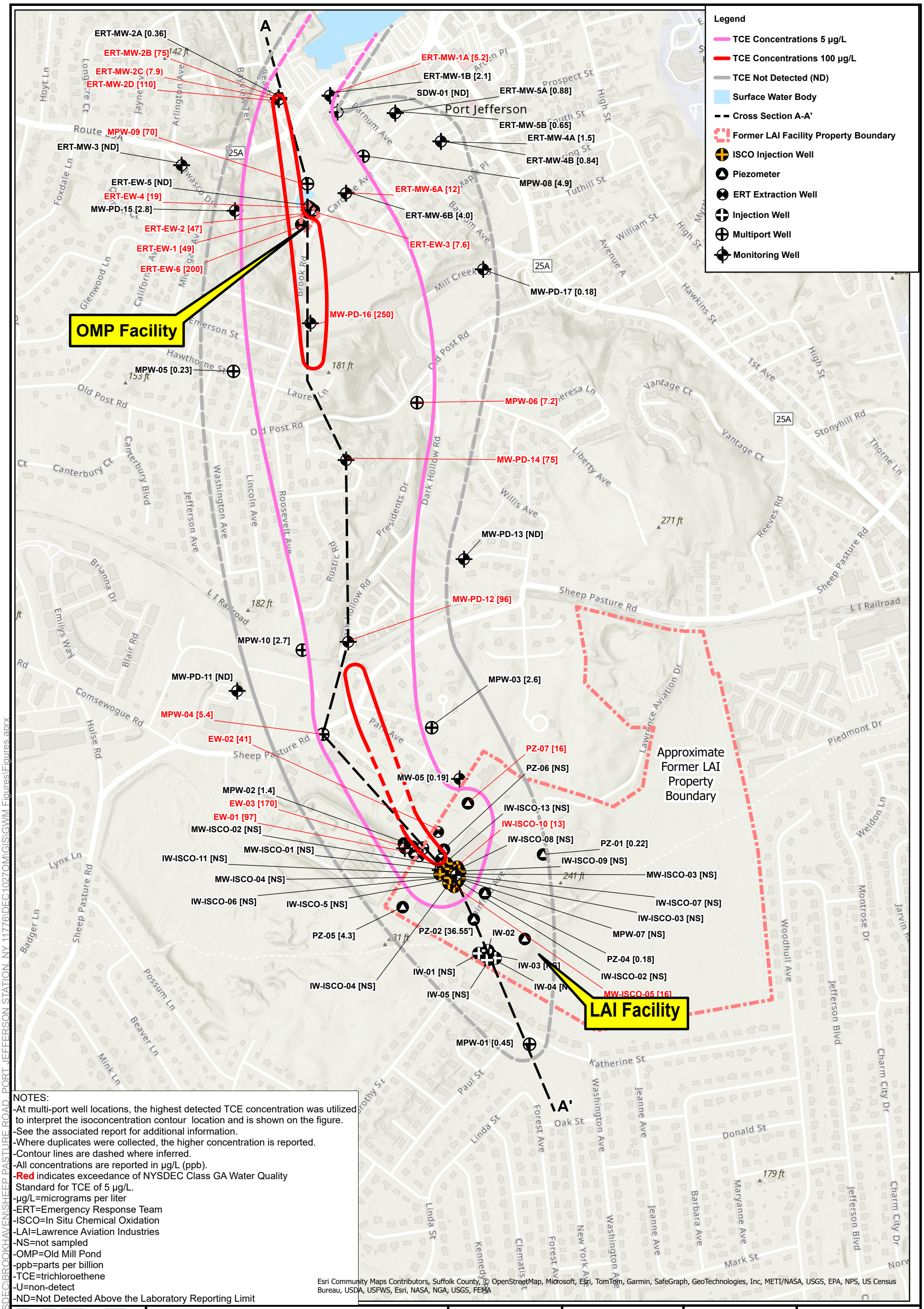
J - Estimated data
D - Dilution
N - Recovery not within control limits
ug/kg - microgram per kilogram
mg/kg - milligram per kilogram
in - inches
VOC - Volatile Organic Compound
SVOC - Semivolatile Organic Compound
PCB - Polychlorinated biphenyl

Sediment Sampling Location
NYDOT ROW
LAI Facility
Outlying Parcels
Waterbody
Obscured Ground
Dirt Trail
Long Island Railroad
Buildings
Fence
25 Foot Topographic Contour
5 Foot Topographic Contour

N
0 200 400 Feet

Figure 4-20
Old Mill Pond, Stream and Harbor
Exceedences of Sediment Delineation Criteria
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

CDM



NOTES:
-At multi-port well locations, the highest detected TCE concentration was utilized to interpret the isoconcentration contour location and is shown on the figure.
-See the associated report for additional information.
-Where duplicates were collected, the higher concentration is reported.
-Contour lines are dashed where inferred.
-All concentrations are reported in µg/L (ppb).
-**Red** indicates exceedance of NYSDEC Class GA Water Quality Standard for TCE of 5 µg/L.
-µg/L=micrograms per liter
-ERT=Emergency Response Team
-ISCO=In Situ Chemical Oxidation
-LAI=Lawrence Aviation Industries
-NS=not sampled
-OMP=Old Mill Pond
-ppb=parts per billion
-TCE=trichloroethene
-U=non-detect
-ND=Not Detected Above the Laboratory Reporting Limit

HRP
MOVE YOUR ENVIRONMENT FORWARD
197 SCOTT SWAMP ROAD
FARMINGTON, CT 06032
(860) 674-9570
HRPASSOCIATES.COM

March 2024 TCE Isoconcentration Contours

Lawrence Aviation Industries
Site No. 152016
Sheep Pasture Road
Port Jefferson, New York

JH — DESIGNED BY:	11X17 — SHEET SIZE:
BOB — DRAWN BY:	06/05/2024 — DATE:
DR — REVIEWED BY:	DEC1027.OM — PROJECT NUMBER:

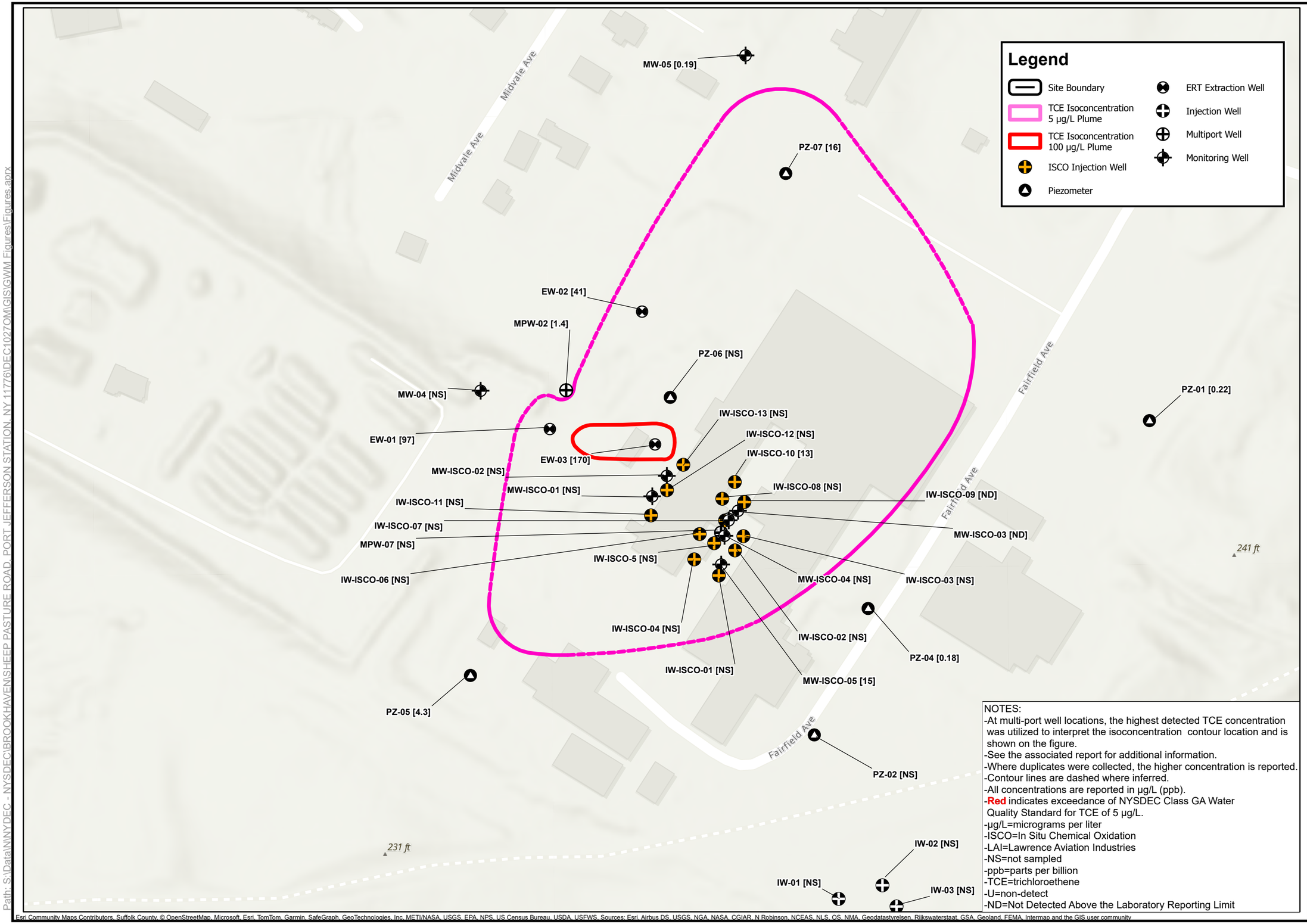
North

1" = 700'

0 350 700 Ft

FIGURE 7A

Path: S:\Data\NNYDEC - NYSDEC\BROOKHAVEN\SHEEP PASTURE ROAD, PORT JEFFERSON STATION, NY 11776\DEC1027OM\GIS\GWM Figures\Figures.aprx



NOTES:
-At multi-port well locations, the highest detected TCE concentration was utilized to interpret the isoconcentration contour location and is shown on the figure.
-See the associated report for additional information.
-Where duplicates were collected, the higher concentration is reported.
-Contour lines are dashed where inferred.
-All concentrations are reported in µg/L (ppb).
-**Red** indicates exceedance of NYSDEC Class GA Water Quality Standard for TCE of 5 µg/L.
-µg/L=micrograms per liter
-ISCO=In Situ Chemical Oxidation
-LAI=Lawrence Aviation Industries
-NS=not sampled
-ppb=parts per billion
-TCE=trichloroethene
-U=non-detect
-ND=Not Detected Above the Laboratory Reporting Limit

Esri Community Maps Contributors, Suffolk County, © OpenStreetMap, Microsoft, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, USFWS, Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

Path: S:\Data\NNYDEC - NYSDEC\BROOKHAVEN\SHEEP PASTURE ROAD, PORT JEFFERSON STATION, NY 11776\DEC1027OM\GIS\GWM Figures\Figures.aprx

HRP
MOVE YOUR ENVIRONMENT FORWARD
ONE FAIRCHILD SQUARE
SUITE 110
CLIFTON PARK, NY 12065
(518) 877-7101
HRPASSOCIATES.COM

North

0 75 150
Feet

Revisions						
No.						
Date						

Designed By: JH
Drawn By: BOB
Reviewed By: DR

Issue Date: 06/05/2024
Project No: DEC1027.OM
Sheet Size: 11x17

GWM - LAI Facility TCE Plume

Lawrence Aviation Industries
Site No. 152016
Sheep Pasture Road
Port Jefferson, New York

FIGURE NO.

7B

DRAWING NAME: S:\Data\NY\NYDEC - NYSDEC\BROOKHAVEN\SHEEP PASTURE ROAD, PORT JEFFERSON STATION, NY 11776\DEC1027OM\GIS\GWM Figures\Figure 8.dwg LAYOUT: 11 x 17 - BOTTOM TITLE - SSM PLOT DATE: Aug 23, 2024 - 12:06pm OPERATOR: BOB

A NORTH — A' SOUTH

ELEVATION (FT AMSL)

DISTANCE ALONG BASELINE (FT)

LEGEND:

- WATER TABLE, ESTIMATED
- GROUND SURFACE ELEVATION
- TCE ISOCONCENTRATION CONTOUR IN PPB FROM April 2024: PROJECTED WELLS NOT USED
- INFERRED TCE ISOCONCENTRATION CONTOUR IN PPB FROM April 2024
- 100 ppm
- 5.0 ppm

GROUNDWATER SAMPLE RESULTS

- 0.5U TETRACHLOROETHENE(PCE)
- 3.2 TRICHLOROTHENE(TCE)
- 0.5U CIS-1,2-DICHLOROETHENE(CIS-1,2-DCE)
- 0.5U VINYL CHLORIDE

NOTE:
1. ALL RESULTS ARE SHOWN IN MICROGRAMS PER LITER.
2. AN AVERAGE WATER TABLE ELEVATION WAS USED FOR MPWS AND CLUSTERED WELLS.
3. GROUNDWATER GENERALLY TRENDS IN A NORTH – NORTHWESTERN DIRECTION FROM THE LAI FACILITY TO THE OMP FACILITY.
4. AT MULTI-PORT WELLS THE HIGHEST CONCENTRATIONS ARE SHOWN ON THIS FIGURE AND USED FOR TCE ISOCONCENTRATION CONTOUR CREATION.

ACRONYMS:

ERT – EMERGENCY RESPONSE TEAM
EW – EXTRACTION WELL
FT AMSL – FEET ABOVE MEAN SEA LEVEL
ISCO – IN-SITU CHEMICAL OXIDATION
J – ESTIMATED VALUES (– INDICATE LIKELY DIRECTION OF BIAS)
L – OFF-SCALE LOW
MPW – MULTIPORT WELL WITH PORT LETTER
MW – MONITORING WELL
NS – NOT SAMPLED
PPB – PARTS PER BILLION
PZ – PIEZOMETER
U – ANALYZED BUT NOT DETECTED

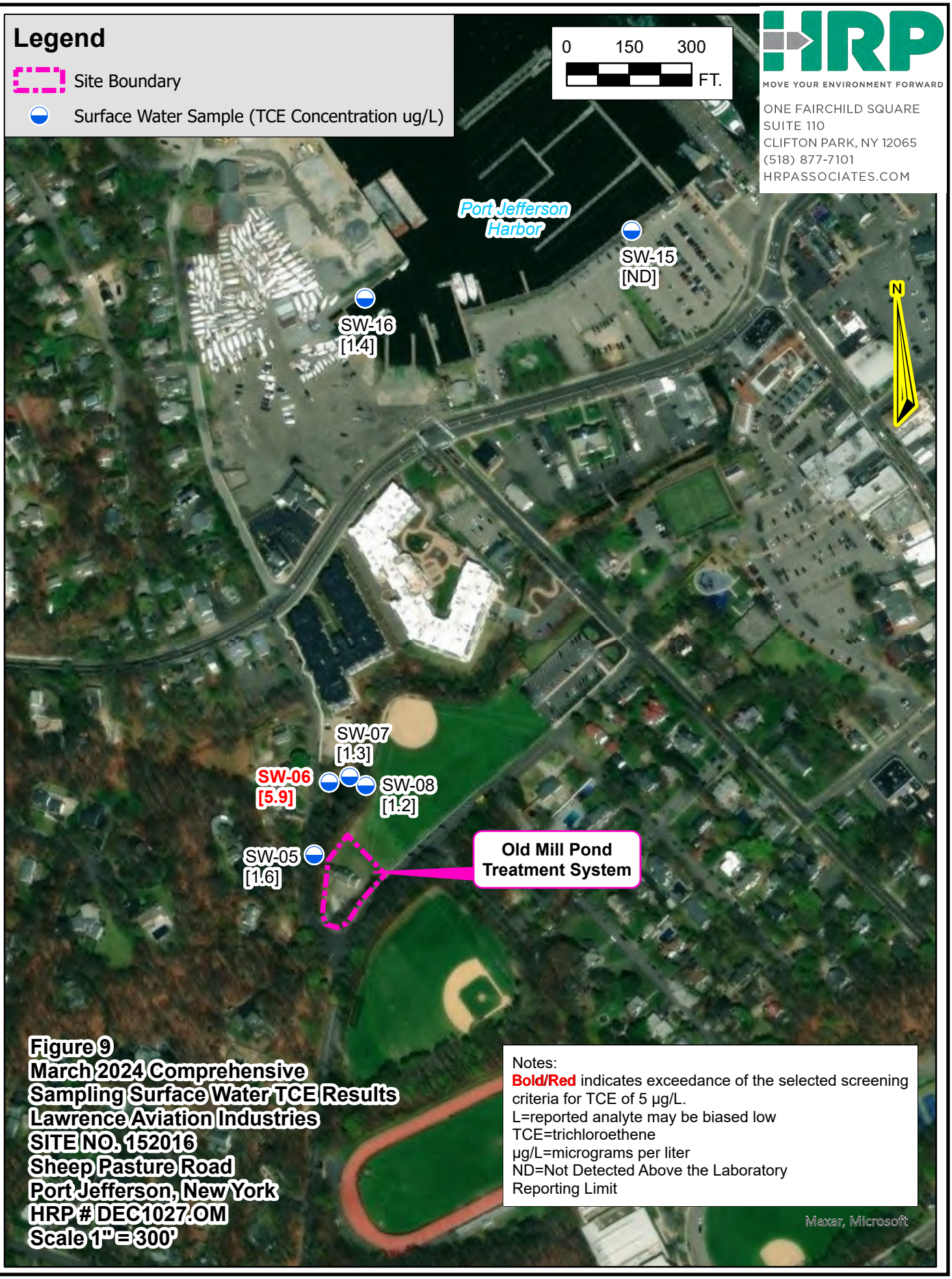
HRP
MOVE YOUR ENVIRONMENT FORWARD
ONE FAIRCHILD SQUARE
SUITE 110
CLIFTON PARK, NY 12065
(518) 877-7101
HRPASSOCIATES.COM

DESIGNED BY:	REVIEWED BY:	ISSUE DATE:
JH	DR	06/06/2024
DRAWN BY:	**PROJ. NUMBER:**	**SHEET SIZE:**
BOB	DEC1027.OM	11"x17"

2024 Comprehensive Sampling Event
TCE Isoconcentration Contours
Cross Section

Lawrence Aviation Industries
SITE NO. 152016
Sheep Pasture Road
Port Jefferson, New York

FIGURE NO.
8



HRP
MOVE YOUR ENVIRONMENT FORWARD
ONE FAIRCHILD SQUARE
SUITE 110
CLIFTON PARK, NY 12065
(518) 877-7101
HRPASSOCIATES.COM

Figure 9
March 2024 Comprehensive Sampling Surface Water TCE Results
Lawrence Aviation Industries
SITE NO. 152016
Sheep Pasture Road
Port Jefferson, New York
HRP # DEC1027.OM
Scale 1" = 300'

Notes:
Bold/Red indicates exceedance of the selected screening criteria for TCE of 5 µg/L.
L=reported analyte may be biased low
TCE=trichloroethene
µg/L=micrograms per liter
ND=Not Detected Above the Laboratory Reporting Limit

Path: S:\Data\NYDEC - NYSDEC\BROOKHAVEN\SHEEP PASTURE ROAD, PORT JEFFERSON STATION, NY 11776\DEC1027OM\GIS\GWM Figures\Figures.aprx

TABLES

Table 3
March 2024 Groundwater Elevations
Lawrence Aviation Industries
Port Jefferson Station, New York

Well ID	Top of Casing Elevation (ft amsl)	Depth To Water (ft btoc)	March 2024 Groundwater Elevation Data (ft amsl)
ERT-EW-1	22.58	33.51	-10.93
ERT-EW-2	22.76	53.06	-30.30
ERT-EW-3	22.88	7.0	15.88
ERT-EW-4	22.56	6.21	16.35
ERT-EW-5	22.84	6.70	16.14
ERT-EW-6	18.97	51.33	-32.36
ERT-MW-1A	11.33	2.04	9.29
ERT-MW-1B	11.38	1.01	10.37
ERT-MW-2A	12.61	3.57	9.04
ERT-MW-2B	12.71	3.54	9.17
ERT-MW-2C	8.81	NCA	NCA
ERT-MW-2D	8.67	NCA	NCA
ERT-MW-3	109.37	93.15	16.22
ERT-MW-4A	7.74	0.08	7.66
ERT-MW-4B	7.79	NCA	NCA
ERT-MW-5A	9.18	1.66	7.52
ERT-MW-5B	9.17	1.37	7.80
ERT-MW-6A	16.52	4.68	11.84
ERT-MW-6B	16.52	3.03	13.49
ERT-OW-1	22.65	9.21	13.44
ERT-OW-2	22.73	8.06	14.67
EW-01 *	219.30	NC	NC
EW-02 *	222.61	NC	NC
EW-03 *	228.28	NC	NC
IW-01 *	225.99	NC	NC
IW-02 *	225.27	NC	NC
IW-03 ***	224.99	NC	NC
IW-04 ***	225.68	NC	NC
IW-05 *	224.48	NC	NC
IW-ISCO-2	228.50	NC	NC
IW-ISCO-3	228.50	NC	NC
IW-ISCO-4	228.50	NC	NC
IW-ISCO-5	228.50	NC	NC
IW-ISCO-6	228.50	NC	NC
IW-ISCO-7	228.50	NC	NC
IW-ISCO-8	228.50	NC	NC
IW-ISCO-9	228.50	NC	NC
IW-ISCO-10	228.50	193.74	34.76
IW-ISCO-11	228.10	NC	NC
IW-ISCO-13	227.20	NC	NC
MPW-01-A	183.40	145.79	37.61
MPW-01-B	183.40	145.93	37.47
MPW-01-C	183.40	148.38	35.02
MPW-02-A	221.02	188.05	32.97
MPW-02-B	221.02	188.61	32.41
MPW-02-C	221.02	190.45	30.57
MPW-02-D	221.02	190.30	30.72
MPW-03-A	189.73	160.49	29.24
MPW-03-B	189.73	158.88	30.85
MPW-03-C	189.73	161.52	28.21
MPW-03-D	189.73	161.67	28.06
MPW-04-A	177.23	148.89	28.34
MPW-04-B	177.23	149.34	27.89
MPW-04-C	177.23	149.69	27.54
MPW-04-D	177.23	149.46	27.77
MPW-04-E	177.23	149.77	27.46
MPW-05-A*	156.80	NC	NC
MPW-05-B*	156.80	NC	NC
MPW-05-C*	156.80	168.58	--

Table 3
March 2024 Groundwater Elevations
Lawrence Aviation Industries
Port Jefferson Station, New York

Well ID	Top of Casing Elevation (ft amsl)	Depth To Water (ft btoc)	March 2024 Groundwater Elevation Data (ft amsl)
MPW-05-D*	156.80	154.90	--
MPW-06-A	57.29	36.36	20.93
MPW-06-B	57.29	37.34	19.95
MPW-06-C	57.29	37.2	20.09
MPW-06-D	57.29	37.68	19.61
MPW-07-A	229.11	NC	NC
MPW-07-B	229.11	NC	NC
MPW-07-C	229.11	NC	NC
MPW-08-A	17.08	NC	NC
MPW-08-B	17.08	12.86	4.22
MPW-08-C	17.08	7.06	10.02
MPW-08-D	17.08	11.21	5.87
MPW-08-E	17.08	12.54	4.54
MPW-09-A**	9.66	-1.72	11.38
MPW-09-B**	9.66	-3.72	13.38
MPW-09-C**	9.66	-3.21	12.87
MPW-09-D**	9.66	-3.9	13.56
MPW-09-E**	9.66	-1.91	11.57
MPW-10-A	170.73	144.15	26.58
MPW-10-B	170.73	144.80	25.93
MPW-10-C	170.73	144.99	25.74
MPW-10-D	170.73	145.47	25.26
MW-05	220.63	186.20	34.43
MW-ISCO-01	228.11	NC	NC
MW-ISCO-02	227.24	192.24	35.00
MW-ISCO-03	228.50	NC	NC
MW-ISCO-04	228.58	NC	NC
MW-ISCO-05	228.43	192.63	35.80
MW-PD-11	164.90	135.97	28.93
MW-PD-12	142.70	114.60	28.10
MW-PD-13	177.30	150.50	26.80
MW-PD-14	177.62	NC	NC
MW-PD-15	95.26	78.88	16.38
MW-PD-16	86.11	66.18	19.93
MW-PD-17	24.74	5.39	19.35
PZ-01	224.04	188.18	35.86
PZ-02	226.99	190.4	36.55
PZ-03	227.90	NC	NC
PZ-04	224.63	188.36	36.27
PZ-05	226.81	191.09	35.72
PZ-06	230.20	195.96	34.24
PZ-07	218.14	183.07	35.07
SDW-01	13.14	7.46	5.68

Notes:
ft amsl = Feet above mean sea level
ft btoc = Feet below top of casing
NC = Not collected
NCA = Not collected due to artesian conditions
* = Waterloo transducer depth to water frequency output not available for MPW-05 well cluster
** Depth to water is calculated using in situ transducers.
Samples collected from LAI and OMP treatment systems were collected from the systems sampling port.
Depth to water and groundwater elevation readings in Waterloo multiport wells were calculated using

Table 4A
2024 Geoprobe Soil Analytical Results
Lawrence Aviation
Port Jefferson, New York

Location:		OUTFALL-01	SB-100	SB-100	SB-100R*	SB-100R	SB-100R	SB-100A	SB-100A	SB-100A	SB-100B*	SB-100B	SB-100B	SB-100C	SB-100C	SB-100C	SB-100D	SB-100D	SB-100E	SB-100E	SB-100F	SB-100G	SB-100H	SB-100H	SB-100I	SB-100I	SB-100J	SB-100J
Date Collected:		03/26/2024	03/11/2024	03/11/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/29/2024	04/29/2024	04/29/2024	04/29/2024	04/29/2024	04/30/2024	04/30/2024	04/30/2024	05/02/2024	05/02/2024	05/02/2024	05/02/2024
Sample ID:	Part 375 Commercial	Outfall-01(0-1)	SB-100 (1.8-3)	SB-100 (4-5)	SB-100R (0-2)	SB-100R (2-4)	SB-100R (6-8)	SB-100A (0-2)	SB-100A (2-4)	SB-100A (6-8)	SB-100B (0-2)	SB-100B (2-4)	SB-100B (6-8)	SB-100C (0-2)	SB-100C (2-4)	SB-100C (6-8)	SB-100D (0-2)	SB-100D (2-4)	SB-100E (0-2)	SB-100E (2-4)	SB-100F (0-2)	SB-100G (0-2)	SB-100H (0-2)	DUP04302024(0-2)	SB-100I (0-2)	SB-100I (2-4)	SB-100J (0-2)	SB-100J (2-4)
Laboratory Sample ID:		24C3013-24	24C1382-01	24C1382-02	24D0346-01	24D0346-02	24D0346-03	24D0346-04	24D0346-05	24D0346-06	24D0346-07	24D0346-08	24D0346-09	24D0346-10	24D0346-11	24D0346-12	24E0019-01	24E0019-02	24E0019-03	24E0019-04	24E0019-05	24E0019-06	24E0019-07	24E0019-08	24E0677-01	24E0677-02	24E0677-03	24E0677-04
Volatile Organic Compounds (VOCs) (mg/kg)																												
2-Butanone (MEK)	500	< 0.033	< 0.024	< 0.035	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	500	< 0.082	< 0.061	**0.046 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	44	< 0.0016	< 0.0012	< 0.0018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	500	< 0.0016	< 0.0012	< 0.0018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane		< 0.016	< 0.012	< 0.018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene		< 0.0016	< 0.0012	< 0.0018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate		< 0.0016	< 0.0012	< 0.0018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane		< 0.0016	< 0.0012	< 0.0018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	500	< 0.016	< 0.012	< 0.018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	150	< 0.0016	< 0.0012	< 0.0018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	500	< 0.0016	< 0.0012	< 0.0018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	200	< 0.0016	< 0.0012	**0.0010 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane		< 0.0082	< 0.0061	< 0.0088	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organic Compounds (SVOC) (mg/kg)																												
1,1'-Biphenyl		< 0.72	< 0.84	< 1.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene		< 0.18	< 0.21	< 0.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	500	< 0.18	< 0.21	< 0.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	500	< 0.18	< 0.21	< 0.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	5.6	< 0.18	< 0.21	< 0.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	1	< 0.18	< 0.21	< 0.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	5.6	< 0.18	< 0.21	< 0.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate		< 0.36	< 0.43	**1.7**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzyl phthalate		< 0.36	< 0.43	< 0.56	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	56	< 0.18	< 0.21	< 0.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	350	< 0.36	< 0.43	< 0.56	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate		< 0.36	< 0.43	< 0.56	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	500	< 0.18	< 0.21	< 0.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	500	< 0.18	< 0.21	< 0.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	6	< 0.36	< 0.43	< 0.56	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	500	< 0.18	< 0.21	< 0.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	500	< 0.18	< 0.21	< 0.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	500	< 0.36	< 0.43	< 0.56	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	500	< 0.18	< 0.21	< 0.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)																												
Aluminum		**3900**	**3900**	**8500**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony		< 1.7	**24**	**1.2 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	16	< 3.4	**3.2 J**	**4.1 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	400	**9.5**	**19**	**40**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	590	**0.17 J**	**0.32**	**1.7**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	9.3	< 0.34	**0.50**	**2.1**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium		**350**	**570**	**2000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	1500	**7.7**	**17**	**48**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt		**2.7**	**2.0**	**0.95 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	270	**9.1**	**25**	**110**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron		**6500**	**6500**	**13000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	1000	**25**	**1100**	**280**	410	**200**	**270**	**53**	**31**	**70**	240	**2000**	**10**	**440**	**260**	**85**	**8.8**	**29**	**86**	**7**	**91**	**12**	**48**	**110**	**94**	**120**	**87**	**240**
Magnesium		**930**	**670**	**530**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	10000	**100**	**190**	**270**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	2.8	**0.013 J**	**0.049**	**0.072**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	310	**7.4**	**21**	**60**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium		**240**	**270**	**1200**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	1500	< 3.4	**1.2 J**	< 5.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	1500	< 0.34	< 0.39	< 0.53	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium		< 170	< 200	**240 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium		< 1.7	**3.7**	**34**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium		**14**	**90**	**870**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	10000	**29**	**87**	**230**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Polychlorinated Biphenyls (PCB) (mg/kg)																												
PCB, Total	1	NA	**0.4**	**0.71**	**1.64**	**0.91**	**0.56**	**0.161**	**0.193**	**0.1**	**3.23**	**1.76**	< 0.09	**0.55**	**0.204**	< 0.097	< 0.081	<0.083	<0.079	<0.087	<0.080	<0.086	<0.081	<0.081	**0.114**	**0.123**	**0.110**	**0.66**
PCB-1016	1	< 0.083	< 0.1	< 0.13	< 0.09	< 0.091	< 0.089	< 0.085	< 0.084	< 0.084	< 0.043	< 0.12	< 0.09	< 0.12	< 0.084	< 0.097	< 0.081	<0.083	<0.079	<0.087	<0.080	<0.086	<0.081	<0.081	<0.086	<0.088	<0.081	<0.086
PCB-1242	1	< 0.083	< 0.1	< 0.13	< 0.09	< 0.091	< 0.089	< 0.085	< 0.084	< 0.084	< 0.043	< 0.12	< 0.09	< 0.12	< 0.084	< 0.097	< 0.081	<0.083	<0.079	<0.087	<0.080	<0.086	<0.081	<0.081	<0.086	<0.088	<0.081	<0.086
PCB-1248	1	< 0.083	< 0.1	< 0.13	< 0.09	< 0.091	< 0.089	< 0.085	< 0.084	< 0.084	< 0.043	< 0.12	< 0.09	**0.18 D**	< 0.084	< 0.097	< 0.081	<0.083	<0.079	<0.087	<0.080	<0.086	<0.081	<0.081	<0.086	<0.088	<0.081	<0.086
PCB-1254	1	< 0.083	**0.26 D**	**0.49 D**	**1.4 D**	**0.71 D**	**0.40 D**	**0.12 D**	**0.13 D**	**0.059 JD**	**2.7 D**	**1.4 D**	< 0.09	**0.27 D**	**0.14 D**	< 0.097	< 0.081	<0.083	<0.079	<0.087	**0.049 D**	<0.086	**0.18 D**	**0.24 D**	**0.055 D**	**0.059 D**	**0.059 D**	**0.44 D**
PCB-1260	1	< 0.083	**0.14 D**	**0.22 D**	0.24 D	**0.20 D**	**0.16 D**	**0.041 JD**	**0.063 JD**	**0.041 JD**	0.53 D	**0.36 D**	< 0.09	**0.10 JD**	**0.064 JD**	< 0.097	< 0.081	**0.043 D**	**0.023 D**	<0.087	**0.032 D**	<0.086	**0.042 D**	**0.055 D**	**0.059 D**	**0.064 D**	**0.051 D**	**0.22 D**
PCB-1268	1	< 0.083	< 0.1	< 0.13	< 0.09	< 0.091	< 0.089	< 0.085	< 0.084	< 0.084	< 0.043	< 0.12	< 0.09	< 0.12	< 0.084	< 0.097	< 0.081	<0.083	<0.079	<0.087	<0.080	<0.086	<0.081	<0.082	<0.086	<0.088	<0.081	<0.086
PFAS Compounds (µg/kg)																												
Perfluorodecanoic acid (PFDA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorododecanoic acid (PFDoA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoroheptanoic acid (PFHpA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorohexanoic acid (PFHxA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorononane sulfonic acid (PFNS)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorononanoic acid (PFNA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorooctanesulfonic acid (PFOS)	440	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorooctanoic acid (PFOA)	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoropentanoic acid (PFPeA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorotetradecanoic acid (PFTeDA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorotridecanoic acid (PFTrDA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoroundecanoic acid (PFUnA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Legend	
<1	Parameter not detected above the laboratory reporting limit
1	Parameter reported at a concentrations greater than Part 375 Commercial SCOs
1	Parameter reported above the laboratory reporting limit but below the applicable regulatory standard/criterion

Notes:
Only compounds detected above the laboratory reporting limits are presented
mg/L = milligrams per liter
µg/L = micrograms per liter
ng/L = nanograms per liter
NA = Not Analyzed
NE = No criteria established
NYSDEC = New York State Department of Environmental Conservation
SCO = Soil Cleanup Objectives
* Soil samples SB-100R and SB-100B were excavated on 6/26/2024

Table 4A
2024 Geoprobe Soil Analytical Results
Lawrence Aviation
Port Jefferson, New York

Location:		SB-100K	SB-100K	SB-100L	SB-100L	SB-100M	SB-100M	PE-01	PE-02	PE-03	PE-04	PE-05	SB-101	SB-101	SB-102	SB-102	SB-103	SB-103	SB-104	SB-104	SB-105	SB-105	SB-106	SB-106	SB-107	SB-107	SB-108	SB-108
Date Collected:		05/02/2024	05/02/2024	05/02/2024	05/02/2024	05/02/2024	05/02/2024	06/26/2024	06/26/2024	06/26/2024	06/26/2024	06/26/2024	03/11/2024	03/11/2024	03/11/2024	03/11/2024	03/11/2024	03/11/2024	03/11/2024	03/11/2024	03/11/2024	03/11/2024	03/11/2024	03/11/2024	03/11/2024	03/11/2024	03/11/2024	03/11/2024	03/11/2024
Sample ID:	Part 375 Commercial	SB-100K (0-2)	SB-100K (2-4)	SB-100L (0-2)	SB-100L (2-4)	SB-100M (0-2)	SB-100M (2-4)	PE-01 (0-1)	PE-02 (0-1)	PE-03 (0-1)	PE-04 (0-1)	PE-05 (1-2)	SB-101 (0.5-2)	SB-101 (3-5)	SB-102 (0.5-2)	SB-102 (3-5)	SB-103 (0.5-2)	SB-103 (3-5)	SB-104 (0.5-2)	SB-104 (8-10)	SB-105 (4-6)	SB-105 (13-15)	SB-106 (4-6)	SB-106 (13-15)	SB-107 (1-3)	SB-107 (11-13)	SB-108 (1-3)	SB-108 (11-13)
Laboratory Sample ID:		24E0677-05	24E0677-06	24E0677-07	24E0677-08	24E0677-09	24E0677-10	24F3836-01	24F3836-02	24F3836-03	24F3836-04	24F3836-05	24C1382-03	24C1382-04	24C1382-05	24C1382-06	24C1382-07	24C1382-08	24C1382-09	24C1382-10	24C1383-01	24C1382-12	24C1382-13	24C1382-14	24C1382-15	24C1382-16	24C1383-02	24C1382-18
Volatile Organic Compounds (VOCs) (mg/kg)																												
2-Butanone (MEK)	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.028	< 0.021	< 0.025	< 0.023	< 0.019	< 0.019	< 0.022	< 0.021	< 0.026	< 0.022	< 0.016	< 0.02	< 0.02	< 0.021	< 0.023	< 0.022
Acetone	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.069	< 0.053	< 0.063	< 0.058	< 0.047	< 0.049	< 0.056	< 0.052	< 0.066	< 0.056	< 0.041	< 0.051	< 0.049	< 0.053	< 0.057	< 0.056
Benzene	44	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.0014	< 0.0011	< 0.0013	< 0.0012	< 0.00093	< 0.00097	< 0.0011	< 0.001	< 0.0013	< 0.0011	< 0.00082	< 0.001	< 0.00099	< 0.0011	< 0.0011	< 0.0011
cis-1,2-Dichloroethene	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.0014	< 0.0011	< 0.0013	< 0.0012	< 0.00093	< 0.00097	< 0.0011	< 0.001	< 0.0013	< 0.0011	< 0.00082	< 0.001	< 0.00099	< 0.0011	< 0.0011	< 0.0011
Dichlorodifluoromethane		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.014	< 0.011	< 0.013	< 0.012	< 0.0093	< 0.0097	< 0.011	< 0.01	< 0.013	< 0.011	< 0.0082	< 0.01	< 0.0099	< 0.011	< 0.011	< 0.011
Isopropylbenzene		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.0014	< 0.0011	< 0.0013	< 0.0012	< 0.00093	< 0.00097	< 0.0011	< 0.001	< 0.0013	< 0.0011	< 0.00082	< 0.001	< 0.00099	< 0.0011	< 0.0011	< 0.0011
Methyl acetate		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.0014	< 0.0011	< 0.0013	< 0.0012	< 0.00093	< 0.00097	< 0.0011	**0.0064**	< 0.0013	< 0.0011	< 0.00082	< 0.001	< 0.00099	< 0.0011	< 0.0011	< 0.0011
Methylcyclohexane		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.0014	< 0.0011	< 0.0013	< 0.0012	< 0.00093	< 0.00097	< 0.0011	< 0.001	< 0.0013	< 0.0011	< 0.00082	< 0.001	< 0.00099	< 0.0011	< 0.0011	< 0.0011
Methylene chloride	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.014	< 0.011	< 0.013	< 0.012	< 0.0093	< 0.0097	< 0.011	< 0.01	< 0.013	< 0.011	< 0.0082	< 0.01	< 0.0099	< 0.011	< 0.011	< 0.011
Tetrachloroethene	150	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.0014	< 0.0011	< 0.0013	< 0.0012	< 0.00093	< 0.00097	< 0.0011	< 0.001	**0.00066 J**	< 0.0011	**0.00053 J**	< 0.001	< 0.00099	< 0.0011	< 0.0011	< 0.0011
Toluene	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.0014	< 0.0011	< 0.0013	< 0.0012	< 0.00093	< 0.00097	< 0.0011	< 0.001	< 0.0013	< 0.0011	< 0.00082	< 0.001	< 0.00099	< 0.0011	< 0.0011	< 0.0011
Trichloroethene	200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.0014	< 0.0011	< 0.0013	< 0.0012	< 0.00093	< 0.00097	< 0.0011	< 0.001	< 0.0013	< 0.0011	< 0.00082	< 0.001	< 0.00099	< 0.0011	< 0.0011	< 0.0011
Trichlorofluoromethane		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.0069	< 0.0053	< 0.0063	< 0.0058	< 0.0047	< 0.0049	< 0.0056	< 0.0052	< 0.0066	< 0.0056	< 0.0041	< 0.0051	< 0.0049	< 0.0053	< 0.0057	< 0.0056
Semivolatile Organic Compounds (SVOC) (mg/kg)																												
1,1'-Biphenyl		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.72	< 0.74	< 0.68	< 0.68	< 0.71	< 0.76	< 0.72	< 0.76	< 0.72	< 0.71	< 0.75	< 0.71	< 0.7	< 0.74	< 0.75	< 0.71
2-Methylnaphthalene		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.19	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.19	< 0.18
Acenaphthene	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.19	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.19	< 0.18
Anthracene	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.19	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.19	< 0.18
Benzo(a)anthracene	5.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.19	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.19	< 0.18
Benzo(a)pyrene	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.19	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.19	< 0.18
Benzo(b)fluoranthene	5.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.19	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.19	< 0.18
Bis(2-ethylhexyl)phthalate		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.36	< 0.37	< 0.35	< 0.34	< 0.36	< 0.38	< 0.36	< 0.38	< 0.36	< 0.36	< 0.38	< 0.36	< 0.35	< 0.38	< 0.38	< 0.36
Butylbenzyl phthalate		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.36	< 0.37	< 0.35	< 0.34	< 0.36	< 0.38	< 0.36	< 0.38	< 0.36	< 0.36	< 0.38	< 0.36	< 0.35	< 0.38	< 0.38	< 0.36
Chrysene	56	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.19	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.19	< 0.18
Dibenzofuran	350	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.36	< 0.37	< 0.35	< 0.34	< 0.36	< 0.38	< 0.36	< 0.38	< 0.36	< 0.36	< 0.38	< 0.36	< 0.35	< 0.38	< 0.38	< 0.36
Dimethyl phthalate		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.36	< 0.37	< 0.35	< 0.34	< 0.36	< 0.38	< 0.36	< 0.38	< 0.36	< 0.36	< 0.38	< 0.36	< 0.35	< 0.38	< 0.38	< 0.36
Fluoranthene	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.19	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.19	< 0.18
Fluorene	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.19	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.19	< 0.18
Hexachlorobenzene	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.36	< 0.37	< 0.35	< 0.34	< 0.36	< 0.38	< 0.36	< 0.38	< 0.36	< 0.36	< 0.38	< 0.36	< 0.35	< 0.38	< 0.38	< 0.36
Naphthalene	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.19	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.19	< 0.18
Phenanthrene	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.19	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.19	< 0.18
Phenol	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.36	< 0.37	< 0.35	< 0.34	< 0.36	< 0.38	< 0.36	< 0.38	< 0.36	< 0.36	< 0.38	< 0.36	< 0.35	< 0.38	< 0.38	< 0.36
Pyrene	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.19	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.19	< 0.19	< 0.18
Metals (mg/kg)																												
Aluminum		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**5400**	**5800**	**980**	**1300**	**3500**	**5500**	**6200**	**7300**	**7300**	**2300**	**3600**	**1800**	**4000**	**4700**	**3200**	**1700**
Antimony		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.8	< 1.8	< 1.7	< 1.7	< 1.8	< 1.8	< 1.8	< 1.9	< 1.8	< 1.7	< 1.8	< 1.8	< 1.7	< 1.8	< 1.8	< 1.7
Arsenic	16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**2.2 J**	**1.9 J**	**0.57 J**	**0.82 J**	**1.6 J**	**3.3 J**	**2.6 J**	**2.3 J**	**3.2 J**	**1.3 J**	**2.7 J**	**0.79 J**	**1.7 J**	**1.9 J**	**3.4 J**	**1.6 J**
Barium	400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**13**	**14**	**3.4**	**4.7**	**15**	**20**	**19**	**18**	**22**	**5.6**	**11**	**4.6**	**13**	**19**	**13**	**7.1**
Beryllium	590	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.22**	**0.23**	< 0.17	**0.084 J**	**0.20**	**0.30**	**0.29**	**0.28**	**0.32**	**0.13 J**	**0.18**	**0.089 J**	**0.19**	**0.35**	**0.19**	**0.11 J**
Cadmium	9.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.36	< 0.36	< 0.34	< 0.34	< 0.36	< 0.37	< 0.36	< 0.39	**0.27 J**	< 0.35	< 0.36	< 0.36	**0.16 J**	< 0.36	< 0.37	< 0.35
Calcium		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**140**	**54**	**36**	**42**	**410**	**490**	**230**	**220**	**870**	**90**	**460**	**120**	**1800**	**1100**	**180**	**370**
Chromium	1500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**6.2**	**7.3**	**2.6**	**2.7**	**5.2**	**9.5**	**8.9**	**8.9**	**10**	**3.6**	**6.6**	**3.3**	**6.9**	**11**	**6.1**	**4.7**
Cobalt		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**2.1**	**2.4**	**0.91 J**	**1.1 J**	**2.2**	**3.2**	**3.0**	**3.1**	**2.8**	**2.2**	**2.0**	**1.2 J**	**2.2**	**3.5**	**3.2**	**1.6 J**
Copper	270	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**5.3**	**3.8**	**2.5**	**3.3**	**5.1**	**7.9**	**6.3**	**5.7**	**10**	**3.3**	**5.8**	**2.2**	**6.4**	**9.0**	**8.7**	**4.6**
Iron		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**6600**	**7000**	**2200**	**2800**	**5200**	**9100**	**8700**	**7800**	**11000**	**3800**	**5500**	**2900**	**5700**	**9900**	**6900**	**4100**
Lead	1000	**130**	**190**	**13**	**140**	**140**	**64**	**140**	**120**	**5.9**	**3.4**	**56**	**5.8**	**4.2**	**1.2**	**2.0**	**5.1**	**9.3**	**6.1**	**5.4**	**34**	**2.5**	**8.8**	**1.7**	**20**	**5.4**	**3.7**	**2.0**
Magnesium		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**830**	**770**	**210**	**320**	**870**	**1000**	**1000**	**960**	**1100**	**610**	**770**	**360**	**1600**	**1700**	**930**	**440**
Manganese	10000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**87**	**83**	**79**	**94**	**150**	**230**	**160**	**87**	**120**	**190**	**120**	**78**	**140**	**180**	**220**	**120**
Mercury	2.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.036**	**0.027**	**0.022 J**	**0.015 J**	**0.043**	< 0.026	**0.019 J**	**0.024 J**	**0.018 J**	< 0.025	**0.014 J**	< 0.025	< 0.024	< 0.027	< 0.028	< 0.027
Nickel	310	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**4.4**	**5.0**	**1.6**	**1.9**	**4.4**	**6.3**	**5.6**	**5.6**	**6.4**	**3.3**	**5.2**	**2.3**	**5.2**	**7.5**	**6.2**	**2.7**
Potassium		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**230**	**170 J**	**87 J**	**120 J**	**440**	**430**	**300**	**290**	**320**	**210**	**240**	**120 J**	**310**	**600**	**330**	**210**
Selenium	1500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**2.0 J**	**1.9 J**	< 3.4	**1.0 J**	**1.4 J**	**2.5 J**	**2.4 J**	**2.1 J**	**2.7 J**	**1.2 J**	**1.8 J**	**1.1 J**	**1.7 J**	**2.9 J**	**2.3 J**	**1.3 J**
Silver	1500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.36	< 0.36	< 0.34	< 0.34	< 0.36	< 0.37	< 0.36	< 0.39	< 0.35	< 0.35	< 0.36	< 0.36	< 0.35	< 0.36	< 0.37	< 0.35
Sodium		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 180	< 180	< 170	< 170	< 180	< 180	< 180	< 190	**52 J**	< 170	< 180	< 180	< 170	**78 J**	< 180	< 170
Thallium		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.8	< 1.8	< 1.7	< 1.7	< 1.8	< 1.8	< 1.8	< 1.9	< 1.8	< 1.7	< 1.8	< 1.8	< 1.7	**0.59 J**	< 1.8	< 1.7
Vanadium		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**9.4**	**11**	**2.9**	**3.1**	**7.6**	**12**	**12**	**13**	**14**	**5.2**	**8.0**	**4.0**	**10**	**15**	**7.9**	**4.6**
Zinc	10000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**12**	**12**	**3.2**	**4.6**	**12**	**17**	**14**	**11**	**75**	**7.6**	**13**	**4.4**	**19**	**27**	**12**	**5.4**
Polychlorinated Biphenyls (PCB) (mg/kg)																												
PCB, Total	1	**0.204**	**0.177**	**0.050**	**0.45**	**0.46**	**0.42**	**0.271**	**0.172**	<0.077	<0.079	**0.215**	< 0.084	< 0.082	< 0.076	< 0.078	**0.049**	**0.078**	< 0.082	< 0.087	**0.031**	< 0.079	< 0.084	< 0.084	< 0.08	< 0.082	< 0.083	< 0.079
PCB-1016	1	<0.083	<0.082	<0.082	<0.081	<0.079	<0.079	<0.083	<0.082	<0.077	<0.079	<0.079	< 0.084	< 0.082	< 0.076	< 0.078	< 0.081	< 0.088	< 0.082	< 0.087	< 0.084	< 0.079	< 0.084	< 0.084	< 0.08	< 0.082	< 0.083	< 0.079
PCB-1242	1	<0.083	<0.082	<0.082	<0.081	<0.079	<0.079	<0.083	<0.082	<0.077	<0.079	<0.079	< 0.084	< 0.082	< 0.076	< 0.078	< 0.081	< 0.088	< 0.082	< 0.087	< 0.084	< 0.079	< 0.084	< 0.084	< 0.08	< 0.082	< 0.083	< 0.079
PCB-1248	1	<0.083	<0.082	<0.082	<0.081	<0.079	<0.079	<0.083	<0.082	<0.077	<0.079	<0.079	< 0.084	< 0.082	< 0.076	< 0.078	< 0.081	< 0.088	< 0.082	< 0.087	< 0.084	< 0.079	< 0.084	< 0.084	< 0.08	< 0.082	< 0.083	< 0.079
PCB-1254	1	**0.12 D**	**0.11 D**	**0.050 D**	**0.29 D**	**0.31 D**	**0.30 D**	**0.22 D**	**0.12 D**	<0.077	<0.079	**0.17 D**	< 0.084	< 0.082	< 0.076	< 0.078	**0.032 JD**	**0.041 JD**	< 0.082	< 0.087	< 0.084	< 0.079	< 0.084	< 0.084	< 0.08	< 0.082	< 0.083	< 0.079
PCB-1260	1	**0.084 D**	**0.067 D**	<0.082	**0.16 D**	**0.15 D**	**0.12 D**	**0.051 D**	**0.052 D**	<0.077	<0.079	**0.045 D**	< 0.084	< 0.082	< 0.076	< 0.078	**0.017 JD**	**0.037 JD**	< 0.082	< 0.087	**0.031 JD**	< 0.079	< 0.084	< 0.084	< 0.08	< 0.082	< 0.083	< 0.079
PCB-1268	1	<0.083	<0.082	<0.082	<0.081	<0.079	<0.079	<0.083	<0.082	<0.077	<0.079	<0.079	< 0.084	< 0.082	< 0.076	< 0.078	< 0.081	< 0.088	< 0.082	< 0.087	< 0.084	< 0.079	< 0.084	< 0.084	< 0.08	< 0.082	< 0.083	< 0.079
PFAS Compounds (µg/kg)																												
Perfluorodecanoic acid (PFDA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	< 0.2	NA
Perfluorododecanoic acid (PFDoA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	< 0.2	NA
Perfluoroheptanoic acid (PFHpA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	< 0.2	NA
Perfluorohexanoic acid (PFHxA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	< 0.2	NA
Perfluorononane sulfonic acid (PFNS)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	< 0.2	NA
Perfluorononanoic acid (PFNA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	< 0.2	NA
Perfluorooctanesulfonic acid (PFOS)	440	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.090 J**	NA	NA	NA	NA	NA	**0.057 J**	NA
Perfluorooctanoic acid (PFOA)	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	< 0.2	NA
Perfluoropentanoic acid (PFPeA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.39	NA	NA	NA	NA	NA	< 0.39	NA
Perfluorotetradecanoic acid (PFTeDA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	< 0.2	NA
Perfluorotridecanoic acid (PFTrDA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	< 0.2	NA
Perfluoroundecanoic acid (PFUnA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	< 0.2	NA

Legend	
<1	Parameter not detected above the laboratory reporting limit
1	Parameter reported at a concentrations greater than Part 375 Commercial SCOs
1	Parameter reported above the laboratory reporting limit but below the applicable regulatory standard/criterion

Notes:
Only compounds detected above the laboratory reporting limits are presented
mg/L = milligrams per liter
µg/L = micrograms per liter
ng/L = nanograms per liter
NA = Not Analyzed
NE = No criteria established
NYSDEC = New York State Department of Environmental Conservation
SCO = Soil Cleanup Objectives
* Soil samples SB-100R and SB-100B were excavated on 6/26/2024

Table 4A
2024 Geoprobe Soil Analytical Results
Lawrence Aviation
Port Jefferson, New York

Location:		SB-109	SB-109	SB-109	SB-110	SB-110	SB-111	SB-111	SB-112	SB-112	SB-113	SB-113	SB-114	SB-114	SB-115	SB-115	SB-116	SB-116	SB-117	SB-117	SB-118	SB-118	SB-119	SB-119	SB-119	SB-120	SB-120	SB-121
Date Collected:		03/11/2024	03/11/2024	03/11/2024	03/11/2024	03/11/2024	03/11/2024	03/11/2024	03/12/2024	03/12/2024	03/12/2024	03/12/2024	03/12/2024	03/12/2024	03/12/2024	03/12/2024	03/12/2024	03/12/2024	03/12/2024	03/12/2024	03/12/2024	03/12/2024	03/12/2024	03/12/2024	03/12/2024	03/12/2024	03/12/2024	03/12/2024
Sample ID:	Part 375 Commercial	DUP-01	SB-109 (2-4)	SB-109 (13-15)	SB-110 (2-4)	SB-110 (13-15)	SB-111 (2-4)	SB-111 (13-15)	SB-112 (18-20)	SB-112 (28-30)	SB-113 (18-20)	SB-113 (28-30)	SB-114 (18-20)	SB-114 (28-30)	SB-115 (18-20)	SB-115 (28-30)	SB-116 (18-20)	SB-116 (28-30)	SB-117 (3-5)	SB-117 (13-15)	SB-118 (3-5)	SB-118 (13-15)	DUP-02	SB-119 (3-5)	SB-119 (13-15)	SB-120 (3-5)	SB-120 (13-15)	SB-121 (3-5)
Laboratory Sample ID:		24C1384-05	24C1382-19	24C1382-20	24C1384-01	24C1384-02	24C1383-03	24C1384-04	24C1384-06	24C1384-07	24C1384-08	24C1384-09	24C1384-10	24C1384-11	24C1384-12	24C1384-13	24C1383-04	24C1384-15	24C1384-16	24C1384-17	24C1383-05	24C1384-19	24C1385-05	24C1384-20	24C1385-07	24C1385-01	24C1385-02	24C1385-03
Volatile Organic Compounds (VOCs) (mg/kg)																												
2-Butanone (MEK)	500	< 0.028	< 0.027	< 0.019	< 0.02	< 0.021	< 0.024	< 0.023	< 0.044	< 0.042	< 0.047	< 0.037	< 0.03	< 0.031	< 0.038	< 0.054	< 0.045	< 0.029	< 0.028	< 0.037	< 0.043	< 0.036	< 0.03	< 0.031	< 0.031	< 0.038	< 0.034	< 0.033
Acetone	500	< 0.069	< 0.067	< 0.048	< 0.049	< 0.053	< 0.059	< 0.056	< 0.11	< 0.11	< 0.12	< 0.092	< 0.074	< 0.078	< 0.094	< 0.14	< 0.11	< 0.072	< 0.071	< 0.092	< 0.11	< 0.09	< 0.074	< 0.076	< 0.078	< 0.095	< 0.085	< 0.084
Benzene	44	< 0.0014	< 0.0013	< 0.00096	< 0.00099	< 0.0011	< 0.0012	< 0.0011	< 0.0022	< 0.0021	< 0.0024	< 0.0018	< 0.0015	< 0.0016	< 0.0019	< 0.0027	< 0.0022	< 0.0014	< 0.0014	< 0.0018	**0.00079 J**	< 0.0018	< 0.0015	< 0.0015	< 0.0015	< 0.0016	< 0.0019	< 0.0017
cis-1,2-Dichloroethene	500	< 0.0014	< 0.0013	< 0.00096	< 0.00099	< 0.0011	< 0.0012	< 0.0011	< 0.0022	< 0.0021	< 0.0024	< 0.0018	< 0.0015	< 0.0016	< 0.0019	< 0.0027	< 0.0022	< 0.0014	< 0.0014	< 0.0018	< 0.0021	< 0.0018	< 0.0015	< 0.0015	< 0.0015	< 0.0016	< 0.0019	< 0.0017
Dichlorodifluoromethane		< 0.014	< 0.013	< 0.0096	< 0.0099	< 0.011	< 0.012	< 0.011	< 0.022	< 0.021	< 0.024	< 0.018	< 0.015	< 0.016	< 0.019	< 0.027	< 0.022	< 0.014	< 0.014	< 0.018	< 0.021	< 0.018	< 0.015	< 0.015	< 0.015	< 0.016	< 0.019	< 0.017
Isopropylbenzene		< 0.0014	< 0.0013	< 0.00096	< 0.00099	< 0.0011	< 0.0012	< 0.0011	< 0.0022	< 0.0021	< 0.0024	< 0.0018	< 0.0015	< 0.0016	< 0.0019	< 0.0027	< 0.0022	< 0.0014	< 0.0014	< 0.0018	< 0.0021	< 0.0018	< 0.0015	< 0.0015	< 0.0015	< 0.0016	< 0.0019	< 0.0017
Methyl acetate		< 0.0014	< 0.0013	< 0.00096	< 0.00099	< 0.0011	< 0.0012	< 0.0011	< 0.0022	< 0.0021	< 0.0024	< 0.0018	< 0.0015	< 0.0016	< 0.0019	< 0.0027	< 0.0022	< 0.0014	< 0.0014	< 0.0018	< 0.0021	< 0.0018	< 0.0015	< 0.0015	< 0.0015	< 0.0016	< 0.0019	< 0.0017
Methylcyclohexane		< 0.0014	< 0.0013	< 0.00096	< 0.00099	< 0.0011	< 0.0012	< 0.0011	< 0.0022	< 0.0021	< 0.0024	< 0.0018	< 0.0015	< 0.0016	< 0.0019	< 0.0027	< 0.0022	< 0.0014	< 0.0014	< 0.0018	< 0.0021	< 0.0018	< 0.0015	< 0.0015	< 0.0015	< 0.0016	< 0.0019	< 0.0017
Methylene chloride	500	< 0.014	< 0.013	< 0.0096	< 0.0099	**0.00078 J**	**0.0038 J**	< 0.011	< 0.022	< 0.021	< 0.024	< 0.018	< 0.015	< 0.016	< 0.019	< 0.027	< 0.022	< 0.014	< 0.014	< 0.018	< 0.021	< 0.018	< 0.015	< 0.015	< 0.015	< 0.016	< 0.019	< 0.017
Tetrachloroethene	150	< 0.0014	< 0.0013	< 0.00096	< 0.00099	< 0.0011	< 0.0012	< 0.0011	< 0.0022	< 0.0021	< 0.0024	< 0.0018	< 0.0015	< 0.0016	< 0.0019	< 0.0027	< 0.0022	< 0.0014	< 0.0014	< 0.0018	< 0.0021	< 0.0018	< 0.0015	< 0.0015	< 0.0015	< 0.0016	< 0.0019	< 0.0017
Toluene	500	< 0.0014	< 0.0013	< 0.00096	< 0.00099	< 0.0011	< 0.0012	< 0.0011	< 0.0022	< 0.0021	< 0.0024	< 0.0018	< 0.0015	< 0.0016	< 0.0019	< 0.0027	< 0.0022	< 0.0014	< 0.0014	< 0.0018	**0.0042**	< 0.0018	< 0.0015	< 0.0015	< 0.0015	< 0.0016	< 0.0019	< 0.0017
Trichloroethene	200	< 0.0014	< 0.0013	< 0.00096	< 0.00099	< 0.0011	< 0.0012	< 0.0011	< 0.0022	< 0.0021	< 0.0024	< 0.0018	< 0.0015	< 0.0016	< 0.0019	< 0.0027	< 0.0022	< 0.0014	< 0.0014	< 0.0018	**0.0024**	< 0.0018	< 0.0015	< 0.0015	< 0.0015	< 0.0016	< 0.0019	< 0.0017
Trichlorofluoromethane		< 0.0069	< 0.0067	< 0.0048	< 0.0049	< 0.0053	< 0.0059	< 0.0056	< 0.011	< 0.011	< 0.012	< 0.0092	< 0.0074	< 0.0078	< 0.0094	< 0.014	< 0.011	< 0.0072	< 0.0071	< 0.0092	< 0.011	< 0.009	**0.00096 J**	< 0.0076	< 0.0078	< 0.0095	< 0.0085	< 0.0084
Semivolatile Organic Compounds (SVOC) (mg/kg)																												
1,1'-Biphenyl		< 0.71	< 0.72	< 0.72	< 0.71	< 0.66	< 0.73	< 0.82	< 0.67	< 0.66	< 0.71	< 0.73	< 0.68	< 0.67	< 0.71	< 0.83	< 0.7	< 0.67	< 0.74	< 0.72	< 0.77	< 0.72	< 0.71	< 0.73	< 0.71	< 0.72	< 0.72	< 0.74
2-Methylnaphthalene		< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.21	< 0.17	< 0.17	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.21	< 0.18	< 0.17	< 0.19	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19
Acenaphthene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.21	< 0.17	< 0.17	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.21	< 0.18	< 0.17	< 0.19	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19
Anthracene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.21	< 0.17	< 0.17	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.21	< 0.18	< 0.17	< 0.19	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19
Benzo(a)anthracene	5.6	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.21	< 0.17	< 0.17	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.21	< 0.18	< 0.17	< 0.19	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19
Benzo(a)pyrene	1	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.21	< 0.17	< 0.17	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.21	< 0.18	< 0.17	< 0.19	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19
Benzo(b)fluoranthene	5.6	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.21	< 0.17	< 0.17	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.21	< 0.18	< 0.17	< 0.19	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19
Bis(2-ethylhexyl)phthalate		< 0.36	< 0.37	< 0.36	< 0.36	< 0.34	< 0.37	< 0.42	< 0.34	< 0.34	< 0.36	< 0.37	< 0.35	< 0.34	< 0.36	< 0.42	< 0.36	< 0.34	< 0.37	< 0.36	< 0.39	< 0.37	< 0.36	< 0.37	< 0.36	< 0.36	< 0.36	< 0.37
Butylbenzyl phthalate		< 0.36	< 0.37	< 0.36	< 0.36	< 0.34	< 0.37	< 0.42	< 0.34	< 0.34	< 0.36	< 0.37	< 0.35	< 0.34	< 0.36	< 0.42	< 0.36	< 0.34	< 0.37	< 0.36	< 0.39	< 0.37	< 0.36	< 0.37	< 0.36	< 0.36	< 0.36	< 0.37
Chrysene	56	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.21	< 0.17	< 0.17	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.21	< 0.18	< 0.17	< 0.19	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19
Dibenzofuran	350	< 0.36	< 0.37	< 0.36	< 0.36	< 0.34	< 0.37	< 0.42	< 0.34	< 0.34	< 0.36	< 0.37	< 0.35	< 0.34	< 0.36	< 0.42	< 0.36	< 0.34	< 0.37	< 0.36	< 0.39	< 0.37	< 0.36	< 0.37	< 0.36	< 0.36	< 0.36	< 0.37
Dimethyl phthalate		< 0.36	< 0.37	< 0.36	< 0.36	< 0.34	< 0.37	< 0.42	< 0.34	< 0.34	< 0.36	< 0.37	< 0.35	< 0.34	< 0.36	< 0.42	< 0.36	< 0.34	< 0.37	< 0.36	< 0.39	< 0.37	< 0.36	< 0.37	< 0.36	< 0.36	< 0.36	< 0.37
Fluoranthene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.21	< 0.17	< 0.17	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.21	< 0.18	< 0.17	< 0.19	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19
Fluorene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.21	< 0.17	< 0.17	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.21	< 0.18	< 0.17	< 0.19	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19
Hexachlorobenzene	6	< 0.36	< 0.37	< 0.36	< 0.36	< 0.34	< 0.37	< 0.42	< 0.34	< 0.34	< 0.36	< 0.37	< 0.35	< 0.34	< 0.36	< 0.42	< 0.36	< 0.34	< 0.37	< 0.36	< 0.39	< 0.37	< 0.36	< 0.37	< 0.36	< 0.36	< 0.36	< 0.37
Naphthalene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.21	< 0.17	< 0.17	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.21	< 0.18	< 0.17	< 0.19	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19
Phenanthrene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.21	< 0.17	< 0.17	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.21	< 0.18	< 0.17	< 0.19	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19
Phenol	500	< 0.36	< 0.37	< 0.36	< 0.36	< 0.34	< 0.37	< 0.42	< 0.34	< 0.34	< 0.36	< 0.37	< 0.35	< 0.34	< 0.36	< 0.42	< 0.36	< 0.34	< 0.37	< 0.36	< 0.39	< 0.37	< 0.36	< 0.37	< 0.36	< 0.36	< 0.36	< 0.37
Pyrene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.21	< 0.17	< 0.17	< 0.18	< 0.19	< 0.17	< 0.17	< 0.18	< 0.21	< 0.18	< 0.17	< 0.19	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19
Metals (mg/kg)																												
Aluminum		**1400**	**4800**	**2900**	**3300**	**1200**	**8200**	**2900**	**2600**	**570**	**5000**	**5300**	**1900**	**610**	**2900**	**860**	**2400**	**1300**	**4300**	**3900**	**5200**	**3000**	**4800**	**4100**	**4500**	**3000**	**4600**	**5100**
Antimony		< 1.7	< 1.7	< 1.8	< 1.7	< 1.7	< 1.8	< 2	< 1.6	< 1.6	< 1.8	< 1.8	< 1.7	< 1.6	< 1.7	< 2	< 1.7	< 1.7	< 1.8	< 1.8	< 1.9	< 1.8	< 1.7	< 1.8	< 1.7	< 1.8	< 1.8	< 1.8
Arsenic	16	**1.1 J**	**2.5 J**	**2.0 J**	**1.5 J**	**1.0 J**	**2.6 J**	**2.3 J**	**3.9**	**0.96 J**	**5.2**	**5.0**	**2.1 J**	**1.7 J**	**4.9**	**3.2 J**	**1.9 J**	**2.8 J**	**1.6 J**	**2.2 J**	**3.5 J**	**2.1 J**	**2.4 J**	**2.0 J**	**2.2 J**	**2.1 J**	**2.0 J**	**2.1 J**
Barium	400	**7.7**	**22**	**16**	**15**	**6.6**	**20**	**12**	**17**	**3.4**	**17**	**19**	**7.2**	**3.7**	**12**	**3.9**	**9.3**	**5.4**	**9.7**	**18**	**19**	**11**	**17**	**11**	**20**	**8.5**	**20**	**16**
Beryllium	590	**0.074 J**	**0.29**	**0.17 J**	**0.21**	< 0.17	**0.28**	**0.17 J**	**0.096 J**	< 0.16	**0.26**	**0.29**	**0.12 J**	< 0.16	**0.15 J**	< 0.2	**0.18**	**0.074 J**	**0.13 J**	**0.23**	**0.23**	**0.14 J**	**0.23**	**0.17 J**	**0.26**	**0.13 J**	**0.26**	**0.19**
Cadmium	9.3	< 0.35	< 0.35	< 0.35	< 0.35	< 0.34	< 0.37	< 0.4	< 0.32	< 0.33	< 0.35	< 0.36	< 0.35	< 0.32	< 0.34	< 0.4	< 0.35	< 0.33	< 0.36	< 0.35	< 0.37	< 0.36	< 0.34	< 0.36	< 0.35	< 0.35	< 0.36	< 0.36
Calcium		**100**	**3300**	**14000**	**640**	**86**	**1700**	**2300**	**360**	**130**	**620**	**680**	**310**	**230**	**300**	**300**	**420**	**440**	**130**	**150**	**1500**	**360**	**4500**	**260**	**220**	**140**	**160**	**81**
Chromium	1500	**3.3**	**8.4**	**15**	**5.8**	**2.6**	**11**	**6.2**	**5.9**	**3.5**	**9.1**	**10**	**4.5**	**7.2**	**7.7**	**4.4**	**7.7**	**4.2**	**6.1**	**5.8**	**9.5**	**5.2**	**11**	**5.8**	**6.9**	**4.9**	**7.9**	**7.6**
Cobalt		**1.4 J**	**3.6**	**2.5**	**3.2**	**1.3 J**	**3.9**	**2.4**	**4.0**	**0.88 J**	**5.5**	**6.1**	**2.7**	**1.0 J**	**3.6**	**1.8 J**	**4.8**	**2.8**	**1.8**	**3.4**	**2.9**	**2.2**	**2.8**	**2.2**	**2.9**	**3.3**	**2.6**	**2.0**
Copper	270	**4.0**	**9.8**	**8.4**	**5.3**	**4.4**	**6.7**	**6.7**	**8.7**	**3.5**	**18**	**15**	**8.6**	**4.0**	**11**	**5.8**	**14**	**7.4**	**3.2**	**6.3**	**7.3**	**6.5**	**6.5**	**4.4**	**7.2**	**4.8**	**7.9**	**4.0**
Iron		**3300**	**9300**	**7800**	**5800**	**2600**	**9300**	**5600**	**7500**	**2200**	**12000**	**13000**	**6500**	**3600**	**7400**	**3100**	**10000**	**4900**	**4600**	**6100**	**7800**	**5100**	**6700**	**5900**	**6900**	**5100**	**6900**	**6700**
Lead	1000	**1.5**	**4.9**	**2.7**	**3.8**	**1.7**	**7.2**	**11**	**2.8**	**1.3**	**4.6**	**4.5**	**2.2**	**1.5**	**3.9**	**2.7**	**2.7**	**2.3**	**3.6**	**4.6**	**10**	**17**	**20**	**6.7**	**3.4**	**3.9**	**3.8**	**16**
Magnesium		**410**	**1400**	**970**	**980**	**280**	**1300**	**720**	**1300**	**230**	**1900**	**2000**	**750**	**240**	**940**	**420**	**730**	**550**	**550**	**1000**	**1300**	**640**	**2300**	**680**	**1100**	**500**	**1100**	**670**
Manganese	10000	**110**	**220**	**170**	**670**	**130**	**180**	**200**	**220**	**42**	**470**	**470**	**260**	**69**	**280**	**86**	**440**	**200**	**54**	**220**	**170**	**140**	**190**	**120**	**300**	**220**	**180**	**120**
Mercury	2.8	< 0.025	< 0.024	< 0.026	< 0.025	< 0.024	< 0.026	< 0.029	< 0.025	< 0.025	< 0.026	< 0.024	< 0.025	< 0.024	< 0.024	< 0.029	< 0.023	< 0.025	< 0.027	< 0.025	**0.027**	< 0.025	< 0.025	**0.017 J**	< 0.026	< 0.026	< 0.025	**0.015 J**
Nickel	310	**2.4**	**7.8**	**6.1**	**5.7**	**2.5**	**8.5**	**5.3**	**5.6**	**1.3**	**11**	**12**	**5.2**	**2.2**	**7.4**	**3.2**	**7.6**	**6.1**	**3.1**	**6.0**	**9.2**	**4.9**	**5.9**	**4.3**	**5.5**	**6.5**	**5.6**	**4.9**
Potassium		**180**	**650**	**380**	**360**	**150 J**	**360**	**310**	**1500**	**130 J**	**640**	**680**	**220**	**120 J**	**330**	**240**	**230**	**150 J**	**170 J**	**550**	**500**	**240**	**620**	**330**	**700**	**180 J**	**590**	**200**
Selenium	1500	**1.3 J**	**2.6 J**	**2.1 J**	**2.1 J**	**1.0 J**	**2.9 J**	**1.7 J**	**2.4 J**	**0.87 J**	< 3.5	< 3.6	**2.3 J**	**1.4 J**	**2.2 J**	**1.0 J**	**3.0 J**	**1.6 J**	**1.5 J**	**2.0 J**	**2.2 J**	**1.5 J**	**1.8 J**	**1.9 J**	**2.0 J**	**1.8 J**	**2.1 J**	**1.9 J**
Silver	1500	< 0.35	< 0.35	< 0.35	< 0.35	< 0.34	< 0.37	< 0.4	< 0.32	< 0.33	< 0.35	< 0.36	< 0.35	< 0.32	< 0.34	< 0.41	< 0.34	< 0.33	< 0.36	< 0.36	< 0.39	< 0.36	< 0.34	< 0.36	< 0.36	< 0.34	< 0.34	< 0.35
Sodium		< 170	**100 J**	**80 J**	< 170	< 170	< 180	< 200	< 160	< 160	**41 J**	**42 J**	< 170	< 160	**66 J**	< 200	< 170	< 170	< 180	< 180	< 190	< 180	< 170	< 180	< 170	< 180	< 180	< 180
Thallium		< 1.7	**0.52 J**	**0.74 J**	**0.55 J**	< 1.7	**0.57 J**	< 2	**0.88 J**	< 1.6	< 1.8	< 1.8	< 1.7	< 1.6	< 1.7	< 2	< 1.7	< 1.7	< 1.8	< 1.8	< 1.9	< 1.8	**0.60 J**	< 1.8	**0.59 J**	< 1.8	< 1.8	< 1.8
Vanadium		**4.2**	**11**	**7.7**	**7.1**	**3.0**	**15**	**6.9**	**12**	**2.8**	**12**	**13**	**5.8**	**4.6**	**7.2**	**3.5**	**8.9**	**4.5**	**8.1**	**8.1**	**11**	**7.2**	**9.8**	**8.0**	**9.8**	**6.4**	**9.5**	**9.7**
Zinc	10000	**5.1**	**17**	**8.4**	**29**	**5.3**	**17**	**11**	**17**	**2.9**	**24**	**26**	**12**	**5.0**	**14**	**6.2**	**16**	**11**	**5.8**	**13**	**23**	**18**	**20**	**11**	**13**	**10**	**14**	**14**
Polychlorinated Biphenyls (PCB) (mg/kg)																												
PCB, Total	1	< 0.084	< 0.081	< 0.08	< 0.083	< 0.078	< 0.085	**0.029**	< 0.079	< 0.079	< 0.08	< 0.083	< 0.08	< 0.077	< 0.084	< 0.098	< 0.078	< 0.075	< 0.082	< 0.087	**0.17**	**0.21**	**0.86**	**0.124**	< 0.082	< 0.082	< 0.08	< 0.083
PCB-1016	1	< 0.084	< 0.081	< 0.08	< 0.083	< 0.078	< 0.085	< 0.091	< 0.079	< 0.079	< 0.08	< 0.083	< 0.08	< 0.077	< 0.084	< 0.098	< 0.078	< 0.075	< 0.082	< 0.087	< 0.094	< 0.084	< 0.084	< 0.089	< 0.082	< 0.082	< 0.08	< 0.083
PCB-1242	1	< 0.084	< 0.081	< 0.08	< 0.083	< 0.078	< 0.085	< 0.091	< 0.079	< 0.079	< 0.08	< 0.083	< 0.08	< 0.077	< 0.084	< 0.098	< 0.078	< 0.075	< 0.082	< 0.087	< 0.094	< 0.084	< 0.084	< 0.089	< 0.082	< 0.082	< 0.08	< 0.083
PCB-1248	1	< 0.084	< 0.081	< 0.08	< 0.083	< 0.078	< 0.085	< 0.091	< 0.079	< 0.079	< 0.08	< 0.083	< 0.08	< 0.077	< 0.084	< 0.098	< 0.078	< 0.075	< 0.082	< 0.087	< 0.094	< 0.084	< 0.084	< 0.089	< 0.082	< 0.082	< 0.08	< 0.083
PCB-1254	1	< 0.084	< 0.081	< 0.08	< 0.083	< 0.078	< 0.085	< 0.091	< 0.079	< 0.079	< 0.08	< 0.083	< 0.08	< 0.077	< 0.084	< 0.098	< 0.078	< 0.075	< 0.082	< 0.087	**0.17 D**	**0.15 D**	**0.86 D**	**0.098 D**	< 0.082	< 0.082	< 0.08	< 0.083
PCB-1260	1	< 0.084	< 0.081	< 0.08	< 0.083	< 0.078	< 0.085	**0.029 JD**	< 0.079	< 0.079	< 0.08	< 0.083	< 0.08	< 0.077	< 0.084	< 0.098	< 0.078	< 0.075	< 0.082	< 0.087	< 0.094	**0.060 JD**	< 0.084	**0.026 JD**	< 0.082	< 0.082	< 0.08	< 0.083
PCB-1268	1	< 0.084	< 0.081	< 0.08	< 0.083	< 0.078	< 0.085	< 0.091	< 0.079	< 0.079	< 0.08	< 0.083	< 0.08	< 0.077	< 0.084	< 0.098	< 0.078	< 0.075	< 0.082	< 0.087	< 0.094	< 0.084	< 0.084	< 0.089	< 0.082	< 0.082	< 0.08	< 0.083
PFAS Compounds (µg/kg)																												
Perfluorodecanoic acid (PFDA)		NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	< 0.2	NA	NA	NA	NA	< 0.2	NA	NA
Perfluorododecanoic acid (PFDoA)		NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	< 0.2	NA	NA	NA	NA	< 0.2	NA	NA
Perfluoroheptanoic acid (PFHpA)		NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	< 0.2	NA	NA	NA	NA	< 0.2	NA	NA
Perfluorohexanoic acid (PFHxA)		NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	< 0.2	NA	NA	NA	NA	< 0.2	NA	NA
Perfluorononane sulfonic acid (PFNS)		NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	< 0.2	NA	NA	NA	NA	< 0.2	NA	NA
Perfluorononanoic acid (PFNA)		NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	< 0.2	NA	NA	NA	NA	< 0.2	NA	NA
Perfluorooctanesulfonic acid (PFOS)	440	NA	NA	NA	NA	NA	**0.13 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	**0.32**	NA	NA	NA	NA	**0.65**	NA	NA
Perfluorooctanoic acid (PFOA)	500	NA	NA	NA	NA	NA	**0.045 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	< 0.2	NA	NA	NA	NA	< 0.2	NA	NA
Perfluoropentanoic acid (PFPeA)		NA	NA	NA	NA	NA	< 0.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.39	NA	NA	NA	< 0.4	NA	NA	NA	NA	< 0.4	NA	NA
Perfluorotetradecanoic acid (PFTeDA)		NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	< 0.2	NA	NA	NA	NA	< 0.2	NA	NA
Perfluorotridecanoic acid (PFTrDA)		NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	< 0.2	NA	NA	NA	NA	< 0.2	NA	NA
Perfluoroundecanoic acid (PFUnA)		NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	< 0.2	NA	NA	NA	NA	< 0.2	NA	NA

Legend	
<1	Parameter not detected above the laboratory reporting limit
1	Parameter reported at a concentrations greater than Part 375 Commercial SCOs
1	Parameter reported above the laboratory reporting limit but below the applicable regulatory standard/criterion

Notes:
Only compounds detected above the laboratory reporting limits are presented

mg/L = milligrams per liter
µg/L = micrograms per liter
ng/L = nanograms per liter
NA = Not Analyzed
NE = No criteria established
NYSDEC = New York State Department of Environmental Conservation
SCO = Soil Cleanup Objectives
* Soil samples SB-100R and SB-100B were excavated on 6/26/2024

Table 4A
2024 Geoprobe Soil Analytical Results
Lawrence Aviation
Port Jefferson, New York

Location:		SB-121	SB-122	SB-122	SB-123	SB-123	SB-124	SB-124	SB-125	SB-125	SB-126	SB-126	SB-127	SB-127	SB-128	SB-128	SB-129	SB-129	SB-130	SB-130	SB-130	SB-131	SB-131	SB-132	SB-132	SB-133	SB-133	SB-134	SB-134
Date Collected:		03/12/2024	03/13/2024	03/13/2024	03/13/2024	03/13/2024	03/13/2024	03/13/2024	03/13/2024	03/13/2024	03/13/2024	03/13/2024	03/13/2024	03/13/2024	03/13/2024	03/13/2024	03/13/2024	03/13/2024	03/13/2024	03/13/2024	03/13/2024	03/13/2024	03/13/2024	03/13/2024	03/14/2024	03/14/2024	03/14/2024	03/14/2024	03/14/2024	03/14/2024
Sample ID:	Part 375 Commercial	SB-121 (13-15)	SB-122 (5-7)	SB-122 (15-17)	SB-123 (5-7)	SB-123 (15-17)	SB-124 (5-7)	SB-124 (15-17)	SB-125 (5-7)	SB-125 (15-17)	SB-126 (5-7)	SB-126 (15-17)	SB-127 (5-7)	SB-127 (15-17)	SB-128 (5-7)	SB-128 (15-17)	SB-129 (5-7)	SB-129 (15-17)	DUP-03	SB-130 (5-7)	SB-130 (15-17)	SB-131 (5-7)	SB-131 (15-17)	SB-132 (3-5)	SB-132 (13-15)	SB-133 (3-5)	SB-133 (13-15)	SB-134 (3-5)	SB-134 (13-15)
Laboratory Sample ID:		24C1385-04	24C1749-01	24C1749-02	24C1749-03	24C1749-04	24C1749-05	24C1749-06	24C1749-07	24C1749-08	24C1749-09	24C1749-10	24C1749-11	24C1749-12	24C1749-13	24C1749-14	24C1749-15	24C1749-16	24C1753-01	24C1749-17	24C1749-18	24C1748-02	24C1749-20	24C1753-02	24C1753-03	24C1748-03	24C1753-05	24C1753-06	24C1753-07
Volatile Organic Compounds (VOCs) (mg/kg)																													
2-Butanone (MEK)	500	< 0.03	< 0.027	< 0.024	< 0.031	< 0.022	< 0.026	< 0.029	< 0.027	< 0.023	< 0.028	< 0.032	< 0.045	< 0.028	< 0.026	< 0.025	< 0.027	< 0.034	< 0.03	< 0.031	< 0.022	< 0.024	< 0.031	< 0.039	< 0.032	< 0.039	< 0.037	< 0.038	< 0.024
Acetone	500	< 0.074	< 0.068	< 0.06	< 0.078	< 0.054	< 0.066	< 0.073	< 0.067	< 0.057	< 0.07	< 0.079	< 0.11	< 0.07	< 0.066	< 0.062	< 0.068	< 0.085	< 0.075	< 0.077	< 0.056	< 0.059	< 0.078	< 0.097	< 0.079	< 0.097	< 0.093	< 0.095	< 0.06
Benzene	44	< 0.0015	< 0.0014	< 0.0012	< 0.0016	< 0.0011	< 0.0013	< 0.0015	< 0.0013	< 0.0011	< 0.0014	< 0.0016	< 0.0022	< 0.0014	< 0.0013	< 0.0012	< 0.0014	< 0.0017	< 0.0015	< 0.0015	< 0.0011	< 0.0012	< 0.0016	< 0.0019	< 0.0016	< 0.0019	< 0.0019	< 0.0019	< 0.0012
cis-1,2-Dichloroethene	500	< 0.0015	< 0.0014	< 0.0012	< 0.0016	< 0.0011	< 0.0013	< 0.0015	< 0.0013	< 0.0011	< 0.0014	< 0.0016	< 0.0022	< 0.0014	< 0.0013	< 0.0012	< 0.0014	< 0.0017	< 0.0015	< 0.0015	< 0.0011	< 0.0012	< 0.0016	< 0.0019	< 0.0016	< 0.0019	< 0.0019	< 0.0019	< 0.0012
Dichlorodifluoromethane		< 0.015	< 0.014	< 0.012	< 0.016	< 0.011	< 0.013	< 0.015	< 0.013	< 0.011	< 0.014	< 0.016	< 0.022	< 0.014	< 0.013	< 0.012	< 0.014	< 0.017	< 0.015	< 0.015	< 0.011	< 0.012	< 0.016	< 0.019	< 0.016	< 0.019	< 0.019	< 0.019	< 0.012
Isopropylbenzene		< 0.0015	< 0.0014	< 0.0012	< 0.0016	**0.00048 J**	< 0.0013	< 0.0015	< 0.0013	< 0.0011	< 0.0014	< 0.0016	< 0.0022	< 0.0014	< 0.0013	< 0.0012	< 0.0014	< 0.0017	< 0.0015	< 0.0015	< 0.0011	< 0.0012	< 0.0016	< 0.0019	< 0.0016	< 0.0019	< 0.0019	< 0.0019	< 0.0012
Methyl acetate		< 0.0015	< 0.0014	< 0.0012	< 0.0016	< 0.0011	< 0.0013	< 0.0015	< 0.0013	< 0.0011	< 0.0014	< 0.0016	< 0.0022	< 0.0014	< 0.0013	< 0.0012	< 0.0014	< 0.0017	< 0.0015	< 0.0015	< 0.0011	< 0.0012	< 0.0016	< 0.0019	< 0.0016	< 0.0019	< 0.0019	< 0.0019	< 0.0012
Methylcyclohexane		< 0.0015	< 0.0014	< 0.0012	< 0.0016	< 0.0011	< 0.0013	< 0.0015	< 0.0013	< 0.0011	< 0.0014	< 0.0016	< 0.0022	< 0.0014	< 0.0013	< 0.0012	< 0.0014	< 0.0017	< 0.0015	< 0.0015	< 0.0011	< 0.0012	< 0.0016	< 0.0019	< 0.0016	< 0.0019	< 0.0019	< 0.0019	< 0.0012
Methylene chloride	500	< 0.015	< 0.014	< 0.012	< 0.016	< 0.011	< 0.013	< 0.015	< 0.013	< 0.011	< 0.014	< 0.016	< 0.022	< 0.014	< 0.013	< 0.012	< 0.014	< 0.017	< 0.015	< 0.015	< 0.011	< 0.012	< 0.016	< 0.019	< 0.016	< 0.019	< 0.019	< 0.019	< 0.012
Tetrachloroethene	150	< 0.0015	< 0.0014	< 0.0012	< 0.0016	< 0.0011	< 0.0013	< 0.0015	< 0.0013	< 0.0011	< 0.0014	< 0.0016	< 0.0022	< 0.0014	< 0.0013	< 0.0012	< 0.0014	< 0.0017	< 0.0015	< 0.0015	< 0.0011	< 0.0012	< 0.0016	< 0.0019	< 0.0016	< 0.0019	< 0.0019	< 0.0019	< 0.0012
Toluene	500	< 0.0015	< 0.0014	< 0.0012	< 0.0016	< 0.0011	< 0.0013	< 0.0015	< 0.0013	< 0.0011	< 0.0014	< 0.0016	< 0.0022	< 0.0014	< 0.0013	< 0.0012	< 0.0014	< 0.0017	< 0.0015	< 0.0015	< 0.0011	< 0.0012	< 0.0016	< 0.0019	< 0.0016	< 0.0019	< 0.0019	< 0.0019	< 0.0012
Trichloroethene	200	< 0.0015	< 0.0014	< 0.0012	< 0.0016	< 0.0011	< 0.0013	< 0.0015	< 0.0013	< 0.0011	< 0.0014	< 0.0016	< 0.0022	< 0.0014	< 0.0013	< 0.0012	< 0.0014	< 0.0017	< 0.0015	< 0.0015	< 0.0011	< 0.0012	< 0.0016	< 0.0019	< 0.0016	< 0.0019	< 0.0019	< 0.0019	< 0.0012
Trichlorofluoromethane		< 0.0074	< 0.0068	< 0.006	**0.010**	**0.0073**	< 0.0066	< 0.0073	< 0.0067	< 0.0057	< 0.007	< 0.0079	< 0.011	< 0.007	< 0.0066	< 0.0062	< 0.0068	< 0.0085	< 0.0075	< 0.0077	< 0.0056	< 0.0059	< 0.0078	< 0.0097	< 0.0079	< 0.0097	< 0.0093	< 0.0095	< 0.006
Semivolatile Organic Compounds (SVOC) (mg/kg)																													
1,1'-Biphenyl		< 0.72	< 0.7	< 0.72	< 0.73	< 0.75	< 0.76	< 0.71	< 0.71	< 0.71	< 0.7	< 0.71	< 0.76	< 0.71	< 0.7	< 0.71	< 0.71	< 0.7	< 0.71	< 0.7	< 0.72	< 0.75	< 0.83	< 0.69	< 0.74	< 0.7	< 0.69	< 0.69	< 0.69
2-Methylnaphthalene		< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.21	< 0.18	< 0.19	< 0.18	< 0.17	< 0.18	< 0.18
Acenaphthene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.21	< 0.18	< 0.19	< 0.18	< 0.17	< 0.18	< 0.18
Anthracene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.21	< 0.18	< 0.19	< 0.18	< 0.17	< 0.18	< 0.18
Benzo(a)anthracene	5.6	< 0.18	< 0.18	< 0.18	< 0.18	**0.080 J**	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.21	< 0.18	< 0.19	< 0.18	< 0.17	< 0.18	< 0.18
Benzo(a)pyrene	1	< 0.18	< 0.18	< 0.18	< 0.18	**0.071 J**	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.21	< 0.18	< 0.19	< 0.18	< 0.17	< 0.18	< 0.18
Benzo(b)fluoranthene	5.6	< 0.18	< 0.18	< 0.18	< 0.18	**0.095 J**	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.21	< 0.18	< 0.19	< 0.18	< 0.17	< 0.18	< 0.18
Bis(2-ethylhexyl)phthalate		< 0.36	< 0.35	< 0.36	**0.13 J**	**0.45**	< 0.38	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.39	< 0.36	< 0.35	< 0.36	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.38	< 0.42	< 0.35	< 0.37	< 0.35	< 0.35	< 0.35	< 0.35
Butylbenzyl phthalate		< 0.36	< 0.35	< 0.36	< 0.37	**1.8**	< 0.38	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.39	< 0.36	< 0.35	< 0.36	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.38	< 0.42	< 0.35	< 0.37	< 0.35	< 0.35	< 0.35	< 0.35
Chrysene	56	< 0.18	< 0.18	< 0.18	< 0.18	**0.085 J**	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.21	< 0.18	< 0.19	< 0.18	< 0.17	< 0.18	< 0.18
Dibenzofuran	350	< 0.36	< 0.35	< 0.36	< 0.37	< 0.38	< 0.38	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.39	< 0.36	< 0.35	< 0.36	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.38	< 0.42	< 0.35	< 0.37	< 0.35	< 0.35	< 0.35	< 0.35
Dimethyl phthalate		< 0.36	< 0.35	< 0.36	< 0.37	< 0.38	< 0.38	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.39	< 0.36	< 0.35	< 0.36	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.38	< 0.42	< 0.35	< 0.37	< 0.35	< 0.35	< 0.35	< 0.35
Fluoranthene	500	< 0.18	< 0.18	< 0.18	< 0.18	**0.18 J**	< 0.19	< 0.18	**0.087 J**	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.21	< 0.18	< 0.19	< 0.18	< 0.17	< 0.18	< 0.18
Fluorene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.21	< 0.18	< 0.19	< 0.18	< 0.17	< 0.18	< 0.18
Hexachlorobenzene	6	< 0.36	< 0.35	< 0.36	< 0.37	< 0.38	< 0.38	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.39	< 0.36	< 0.35	< 0.36	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.38	< 0.42	< 0.35	< 0.37	< 0.35	< 0.35	< 0.35	< 0.35
Naphthalene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.21	< 0.18	< 0.19	< 0.18	< 0.17	< 0.18	< 0.18
Phenanthrene	500	< 0.18	< 0.18	< 0.18	< 0.18	**0.18 J**	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.21	< 0.18	< 0.19	< 0.18	< 0.17	< 0.18	< 0.18
Phenol	500	< 0.36	< 0.35	< 0.36	< 0.37	< 0.38	< 0.38	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.39	< 0.36	< 0.35	< 0.36	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.38	< 0.42	< 0.35	< 0.37	< 0.35	< 0.35	< 0.35	< 0.35
Pyrene	500	< 0.18	< 0.18	< 0.18	< 0.18	**0.20**	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.21	< 0.18	< 0.19	< 0.18	< 0.17	< 0.18	< 0.18
Metals (mg/kg)																													
Aluminum		**3100**	**3800**	**4100**	**5600**	**6300**	**4000**	**4000**	**4400**	**4100**	**1800**	**3400**	**12000**	**4400**	**4200**	**4500**	**4400**	**4000**	**4300**	**4200**	**4700**	**2400**	**3100**	**3300**	**2800**	**1300**	**2200**	**2800**	**2100**
Antimony		< 1.8	< 1.7	< 1.8	< 1.8	**0.56 J**	< 1.9	< 1.8	< 1.7	< 1.7	< 1.7	< 1.8	< 1.9	< 1.7	< 1.7	< 1.7	< 1.8	< 1.7	< 1.7	< 1.7	< 1.7	< 1.8	< 2.1	< 1.7	< 1.8	< 1.7	< 1.7	< 1.7	< 1.8
Arsenic	16	**2.0 J**	< 3.4	< 3.5	**2.7 J**	**5.3**	**1.9 J**	**2.5 J**	**2.2 J**	**2.2 J**	**0.96 J**	**1.7 J**	**3.4**	**3.5 J**	**1.9 J**	**2.1 J**	< 3.5	**3.1 J**	< 3.5	**2.0 J**	< 3.5	< 4.2	< 3.4	< 3.6	< 4.2	< 3.5	< 3.5	< 3.3	< 3.5
Barium	400	**12**	**9.8**	**14**	**24**	**90**	**12**	**13**	**15**	**18**	**6.3**	**13**	**26**	**15**	**13**	**18**	**10**	**11**	**20**	**12**	**20**	**4.7**	**8.8**	**7.0**	**9.9**	**3.3**	**9.9**	**11**	**12**
Beryllium	590	**0.18**	**0.15 J**	**0.18**	**0.26**	**0.29**	**0.19**	**0.20**	**0.21**	**0.22**	**0.072 J**	**0.15 J**	**0.40**	**0.21**	**0.18**	**0.22**	**0.17 J**	**0.21**	**0.23**	**0.17**	**0.27**	**0.10 J**	**0.13 J**	**0.13 J**	**0.15 J**	< 0.18	**0.12 J**	**0.14 J**	**0.11 J**
Cadmium	9.3	< 0.35	< 0.34	< 0.35	< 0.36	**0.33 J**	< 0.38	< 0.35	< 0.34	< 0.34	< 0.34	< 0.36	< 0.37	< 0.34	< 0.35	< 0.34	< 0.35	**0.22 J**	< 0.35	< 0.34	< 0.35	< 0.36	< 0.42	< 0.34	< 0.36	< 0.35	< 0.35	< 0.33	< 0.35
Calcium		**99**	**8700**	**6700**	**16000**	**88000 D**	**9400**	**10000**	**10000**	**2100**	**2500**	**13000**	**5800**	**5600**	**9100**	**4400**	**150**	**290**	**260**	**6800**	**3600**	**1900**	**3500**	**96**	**990**	**87**	**55**	**86**	**120**
Chromium	1500	**7.4**	**16**	**19**	**11**	**35**	**7.2**	**6.5**	**9.9**	**10**	**3.4**	**7.8**	**17**	**14**	**8.8**	**17**	**6.7**	**5.8**	**15**	**7.9**	**20**	**4.0**	**14**	**4.5**	**4.6**	**2.2**	**3.7**	**4.2**	**4.0**
Cobalt		**2.2**	**1.7**	**2.0**	**3.7**	**2.7**	**2.2**	**2.0**	**2.5**	**2.4**	**1.5 J**	**1.8**	**3.1**	**2.3**	**2.8**	**2.8**	**3.6**	**2.0**	**3.1**	**2.1**	**3.0**	**1.7 J**	**2.2**	**2.0**	**2.2**	**1.1 J**	**1.6 J**	**2.0**	**1.6 J**
Copper	270	**4.4**	**5.2**	**6.3**	**9.0**	**31**	**4.6**	**5.0**	**5.4**	**6.5**	**2.7**	**3.7**	**8.0**	**6.4**	**5.2**	**7.1**	**5.0**	**5.2**	**6.5**	**4.4**	**8.4**	**3.1**	**4.7**	**3.0**	**4.2**	**2.4**	**3.5**	**4.0**	**3.8**
Iron		**5100**	**5100**	**6200**	**7900**	**15000**	**5300**	**5400**	**6500**	**6600**	**2600**	**4500**	**11000**	**6500**	**5900**	**7300**	**6100**	**11000**	**6300**	**5500**	**7300**	**4000**	**4900**	**4500**	**4200**	**2800**	**3600**	**4200**	**3800**
Lead	1000	**3.1**	**6.2**	**4.0**	**5.8**	**24**	**3.3**	**2.7**	**7.6**	**3.8**	**1.8**	**2.6**	**7.7**	**4.2**	**3.3**	**3.4**	**3.1**	**22**	**3.2**	**3.8**	**3.7**	**1.8**	**2.5**	**2.3**	**2.3**	**1.3**	**1.8**	**2.0**	**1.7**
Magnesium		**830**	**2100**	**1900**	**3900**	**9000**	**1600**	**5400**	**3400**	**1400**	**660**	**2700**	**2800**	**2100**	**2600**	**2200**	**1300**	**550**	**1000**	**2000**	**1900**	**570**	**650**	**610**	**860**	**300**	**570**	**830**	**590**
Manganese	10000	**170**	**110**	**140**	**210**	**210**	**110**	**120**	**130**	**120**	**180**	**88**	**100**	**110**	**180**	**230**	**180**	**450**	**230**	**240**	**220**	**82**	**130**	**140**	**140**	**71**	**110**	**110**	**110**
Mercury	2.8	< 0.026	< 0.024	< 0.026	**0.035**	**0.075**	< 0.026	< 0.025	< 0.025	< 0.024	< 0.023	< 0.025	< 0.029	< 0.024	< 0.025	< 0.024	**0.015 J**	< 0.026	< 0.025	< 0.025	< 0.026	< 0.027	< 0.028	< 0.026	< 0.028	< 0.024	< 0.026	< 0.024	< 0.026
Nickel	310	**4.0**	**4.8**	**4.9**	**7.1**	**23**	**4.1**	**3.9**	**5.0**	**5.3**	**2.1**	**3.4**	**7.3**	**4.4**	**4.8**	**5.8**	**6.5**	**6.4**	**5.4**	**4.0**	**6.0**	**2.7**	**3.9**	**3.7**	**4.1**	**2.2**	**2.8**	**3.9**	**2.8**
Potassium		**380**	**300**	**460**	**740**	**1200**	**380**	**530**	**510**	**530**	**140 J**	**290**	**500**	**370**	**500**	**550**	**450**	**180**	**550**	**330**	**620**	**140 J**	**240**	**200**	**380**	**150 J**	**310**	**370**	**350**
Selenium	1500	**1.6 J**	< 3.4	< 3.5	**1.5 J**	**2.2 J**	< 3.8	< 3.5	**1.1 J**	**1.2 J**	< 3.4	< 3.6	**2.1 J**	**1.2 J**	**1.1 J**	**1.3 J**	< 3.5	**2.2 J**	**1.8 J**	**0.90 J**	**1.9 J**	**1.1 J**	**1.3 J**	**1.1 J**	**1.0 J**	< 3.5	**0.98 J**	**1.0 J**	**0.89 J**
Silver	1500	< 0.35	< 0.34	< 0.35	< 0.36	< 0.37	< 0.38	< 0.35	< 0.34	< 0.34	< 0.34	< 0.36	< 0.37	< 0.34	< 0.35	< 0.34	< 0.35	< 0.35	< 0.35	< 0.34	< 0.35	< 0.36	< 0.42	< 0.34	< 0.36	< 0.35	< 0.35	< 0.33	< 0.35
Sodium		< 180	**58 J**	**48 J**	**84 J**	**300**	< 190	< 180	**45 J**	< 170	< 170	**40 J**	< 190	**43 J**	**46 J**	**42 J**	< 180	< 170	< 170	< 170	**44 J**	< 180	**51 J**	< 170	< 180	< 180	< 170	< 170	< 180
Thallium		< 1.8	< 1.7	< 1.8	< 1.8	< 1.8	< 1.9	< 1.8	< 1.7	< 1.7	< 1.7	< 1.8	< 1.9	< 1.7	< 1.7	< 1.7	< 1.8	< 1.7	< 1.7	< 1.7	< 1.7	< 1.8	< 2.1	< 1.7	< 1.8	< 1.8	< 1.7	< 1.7	< 1.8
Vanadium		**7.0**	**8.0**	**7.7**	**12**	**23**	**7.9**	**7.3**	**8.7**	**8.6**	**4.2**	**7.0**	**20**	**9.8**	**7.5**	**8.6**	**7.5**	**15**	**8.5**	**7.2**	**9.5**	**4.2**	**6.5**	**6.1**	**5.6**	**3.0**	**4.9**	**5.4**	**5.4**
Zinc	10000	**9.3**	**8.7**	**9.6**	**36**	**85**	**11**	**9.6**	**17**	**11**	**4.0**	**7.4**	**16**	**9.4**	**11**	**13**	**13**	**91**	**12**	**10**	**14**	**5.8**	**7.5**	**7.3**	**11**	**6.1**	**7.8**	**9.9**	**7.8**
Polychlorinated Biphenyls (PCB) (mg/kg)																													
PCB, Total	1	< 0.082	**0.12**	**0.06**	< 0.087	**0.611**	< 0.091	< 0.085	**0.354**	**0.072**	< 0.082	**0.037**	**0.064**	**0.093**	**0.11**	**0.062**	< 0.078	< 0.079	< 0.085	**0.035**	< 0.085	**0.043**	< 0.094	< 0.078	< 0.085	< 0.082	< 0.08	< 0.078	< 0.082
PCB-1016	1	< 0.082	< 0.078	< 0.081	< 0.087	< 0.091	< 0.091	< 0.085	< 0.082	< 0.081	< 0.082	< 0.078	< 0.087	< 0.08	< 0.078	< 0.085	< 0.078	< 0.079	< 0.085	< 0.079	< 0.085	< 0.084	< 0.094	< 0.078	< 0.085	< 0.082	< 0.08	< 0.078	< 0.082
PCB-1242	1	< 0.082	< 0.078	< 0.081	< 0.087	< 0.091	< 0.091	< 0.085	< 0.082	< 0.081	< 0.082	< 0.078	< 0.087	< 0.08	< 0.078	< 0.085	< 0.078	< 0.079	< 0.085	< 0.079	< 0.085	< 0.084	< 0.094	< 0.078	< 0.085	< 0.082	< 0.08	< 0.078	< 0.082
PCB-1248	1	< 0.082	< 0.078	< 0.081	< 0.087	**0.18 D**	< 0.091	< 0.085	< 0.082	< 0.081	< 0.082	< 0.078	< 0.087	< 0.08	< 0.078	< 0.085	< 0.078	< 0.079	< 0.085	< 0.079	< 0.085	< 0.084	< 0.094	< 0.078	< 0.085	< 0.082	< 0.08	< 0.078	< 0.082
PCB-1254	1	< 0.082	**0.12 D**	**0.060 JD**	< 0.087	**0.37 D**	< 0.091	< 0.085	**0.26 D**	**0.072 JD**	< 0.082	**0.037 JD**	**0.064 JD**	**0.093 D**	**0.11 D**	**0.062 JD**	< 0.078	< 0.079	< 0.085	**0.035 JD**	< 0.085	**0.043 JD**	< 0.094	< 0.078	< 0.085	< 0.082	< 0.08	< 0.078	< 0.082
PCB-1260	1	< 0.082	< 0.078	< 0.081	< 0.087	**0.061 JD**	< 0.091	< 0.085	**0.094 D**	< 0.081	< 0.082	< 0.078	< 0.087	< 0.08	< 0.078	< 0.085	< 0.078	< 0.079	< 0.085	< 0.079	< 0.085	< 0.084	< 0.094	< 0.078	< 0.085	< 0.082	< 0.08	< 0.078	< 0.082
PCB-1268	1	< 0.082	< 0.078	< 0.081	< 0.087	< 0.091	< 0.091	< 0.085	< 0.082	< 0.081	< 0.082	< 0.078	< 0.087	< 0.08	< 0.078	< 0.085	< 0.078	< 0.079	< 0.085	< 0.079	< 0.085	< 0.084	< 0.094	< 0.078	< 0.085	< 0.082	< 0.08	< 0.078	< 0.082
PFAS Compounds (µg/kg)																													
Perfluorodecanoic acid (PFDA)		NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA
Perfluorododecanoic acid (PFDoA)		NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA
Perfluoroheptanoic acid (PFHpA)		NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA
Perfluorohexanoic acid (PFHxA)		NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA
Perfluorononane sulfonic acid (PFNS)		NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA
Perfluorononanoic acid (PFNA)		NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA
Perfluorooctanesulfonic acid (PFOS)	440	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA
Perfluorooctanoic acid (PFOA)	500	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA
Perfluoropentanoic acid (PFPeA)		NA	NA	NA	NA	NA	< 0.39	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.39	NA	NA	NA	< 0.39	NA	NA	NA
Perfluorotetradecanoic acid (PFTeDA)		NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA
Perfluorotridecanoic acid (PFTrDA)		NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA
Perfluoroundecanoic acid (PFUnA)		NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA

Legend	
<1	Parameter not detected above the laboratory reporting limit
1	Parameter reported at a concentrations greater than Part 375 Commercial SCOs
1	Parameter reported above the laboratory reporting limit but below the applicable regulatory standard/criterion

Notes:
Only compounds detected above the laboratory reporting limits are presented

mg/L = milligrams per liter
µg/L = micrograms per liter
ng/L = nanograms per liter
NA = Not Analyzed
NE = No criteria established
NYSDEC = New York State Department of Environmental Conservation
SCO = Soil Cleanup Objectives
* Soil samples SB-100R and SB-100B were excavated on 6/26/2024

Table 4A
2024 Geoprobe Soil Analytical Results
Lawrence Aviation
Port Jefferson, New York

Location:		SB-135	SB-135	SB-136	SB-136	SB-137	SB-137	SB-138	SB-138	SB-138	SB-139	SB-139	SB-140	SB-140	SB-141	SB-141	SB-142	SB-142	SB-143	SB-143	SB-144	SB-144	SB-145	SB-145	SB-146	SB-146	SB-147	SB-147	SB-147
Date Collected:		03/14/2024	03/14/2024	03/14/2024	03/14/2024	03/14/2024	03/14/2024	03/14/2024	03/14/2024	03/14/2024	03/14/2024	03/14/2024	03/14/2024	03/14/2024	03/14/2024	03/14/2024	03/14/2024	03/14/2024	03/15/2024	03/15/2024	03/15/2024	03/15/2024	03/15/2024	03/15/2024	03/15/2024	03/15/2024	03/15/2024	03/15/2024	03/15/2024	03/15/2024
Sample ID:	Part 375 Commercial	SB-135 (3-5)	SB-135 (13-15)	SB-136 (3-5)	SB-136 (13-15)	SB-137 (3-5)	SB-137 (13-15)	DUP-04	SB-138 (3-5)	SB-138 (13-15)	SB-139 (3-5)	SB-139 (13-15)	SB-140 (2-4)	SB-140 (12-14)	SB-141 (2-4)	SB-141 (12-14)	SB-142 (2-4)	SB-142 (12-14)	SB-143 (2-4)	SB-143 (12-14)	SB-144 (2-4)	SB-144 (12-14)	SB-145 (5-7)	SB-145 (15-17)	SB-146 (5-7)	SB-146 (15-17)	DUP-05	SB-147 (5-7)	SB-147 (15-17)
Laboratory Sample ID:		24C1753-08	24C1753-09	24C1753-10	24C1753-11	24C1753-12	24C1753-13	24C1753-24	24C1753-14	24C1753-15	24C1753-16	24C1753-17	24C1753-18	24C1753-19	24C1753-20	24C1753-21	24C1753-22	24C1753-23	24C1967-01	24C1967-02	24C1967-03	24C1967-04	24C1967-05	24C1967-06	24C1967-07	24C1967-08	24C1967-13	24C1967-09	24C1967-10
Volatile Organic Compounds (VOCs) (mg/kg)																													
2-Butanone (MEK)	500	< 0.038	< 0.036	< 0.038	< 0.035	< 0.036	< 0.036	< 0.035	< 0.035	< 0.029	< 0.035	< 0.039	< 0.038	< 0.039	< 0.027	< 0.038	< 0.037	< 0.041	< 0.034	< 0.025	< 0.024	< 0.027	< 0.027	< 0.027	< 0.028	< 0.037	< 0.029	< 0.024	< 0.025
Acetone	500	< 0.095	< 0.089	< 0.094	< 0.089	< 0.091	< 0.091	< 0.087	**0.060 J**	< 0.072	< 0.088	< 0.097	< 0.094	< 0.098	< 0.066	< 0.096	< 0.092	< 0.1	< 0.085	< 0.062	< 0.061	< 0.066	< 0.069	< 0.066	< 0.07	< 0.091	< 0.072	< 0.061	< 0.062
Benzene	44	< 0.0019	< 0.0018	< 0.0019	< 0.0018	< 0.0018	< 0.0018	< 0.0017	< 0.0018	< 0.0014	< 0.0018	< 0.0019	< 0.0019	< 0.002	< 0.0013	< 0.0019	< 0.0018	< 0.002	< 0.0017	< 0.0012	< 0.0012	< 0.0013	< 0.0014	< 0.0013	< 0.0014	< 0.0018	< 0.0014	< 0.0012	< 0.0012
cis-1,2-Dichloroethene	500	< 0.0019	< 0.0018	< 0.0019	< 0.0018	< 0.0018	< 0.0018	< 0.0017	< 0.0018	< 0.0014	< 0.0018	< 0.0019	< 0.0019	< 0.002	< 0.0013	< 0.0019	< 0.0018	< 0.002	< 0.0017	< 0.0012	< 0.0012	< 0.0013	< 0.0014	< 0.0013	< 0.0014	< 0.0018	< 0.0014	< 0.0012	< 0.0012
Dichlorodifluoromethane		< 0.019	< 0.018	< 0.019	< 0.018	< 0.018	< 0.018	< 0.017	< 0.018	< 0.014	< 0.018	< 0.019	< 0.019	< 0.02	< 0.013	< 0.019	< 0.018	< 0.02	< 0.017	< 0.012	< 0.012	< 0.013	< 0.014	< 0.013	< 0.014	< 0.018	< 0.014	< 0.012	< 0.012
Isopropylbenzene		< 0.0019	< 0.0018	< 0.0019	< 0.0018	< 0.0018	< 0.0018	< 0.0017	< 0.0018	< 0.0014	< 0.0018	< 0.0019	< 0.0019	< 0.002	< 0.0013	< 0.0019	< 0.0018	< 0.002	< 0.0017	< 0.0012	< 0.0012	< 0.0013	< 0.0014	< 0.0013	< 0.0014	< 0.0018	< 0.0014	< 0.0012	< 0.0012
Methyl acetate		< 0.0019	< 0.0018	< 0.0019	< 0.0018	< 0.0018	< 0.0018	< 0.0017	< 0.0018	< 0.0014	< 0.0018	< 0.0019	< 0.0019	< 0.002	< 0.0013	< 0.0019	< 0.0018	< 0.002	< 0.0017	< 0.0012	< 0.0012	< 0.0013	< 0.0014	< 0.0013	< 0.0014	< 0.0018	< 0.0014	< 0.0012	< 0.0012
Methylcyclohexane		< 0.0019	< 0.0018	< 0.0019	< 0.0018	< 0.0018	< 0.0018	< 0.0017	< 0.0018	< 0.0014	< 0.0018	< 0.0019	< 0.0019	< 0.002	< 0.0013	< 0.0019	< 0.0018	< 0.002	< 0.0017	< 0.0012	< 0.0012	< 0.0013	< 0.0014	< 0.0013	< 0.0014	< 0.0018	< 0.0014	< 0.0012	< 0.0012
Methylene chloride	500	< 0.019	< 0.018	< 0.019	< 0.018	< 0.018	< 0.018	< 0.017	< 0.018	< 0.014	< 0.018	< 0.019	< 0.019	< 0.02	< 0.013	< 0.019	< 0.018	< 0.02	< 0.017	< 0.012	< 0.012	< 0.013	< 0.014	< 0.013	< 0.014	< 0.018	< 0.014	< 0.012	< 0.012
Tetrachloroethene	150	< 0.0019	< 0.0018	< 0.0019	< 0.0018	< 0.0018	< 0.0018	< 0.0017	< 0.0018	< 0.0014	< 0.0018	< 0.0019	< 0.0019	< 0.002	< 0.0013	< 0.0019	< 0.0018	< 0.002	< 0.0017	< 0.0012	< 0.0012	< 0.0013	< 0.0014	< 0.0013	< 0.0014	< 0.0018	< 0.0014	< 0.0012	< 0.0012
Toluene	500	< 0.0019	< 0.0018	< 0.0019	< 0.0018	< 0.0018	< 0.0018	< 0.0017	< 0.0018	< 0.0014	< 0.0018	< 0.0019	< 0.0019	< 0.002	< 0.0013	< 0.0019	< 0.0018	< 0.002	< 0.0017	< 0.0012	< 0.0012	< 0.0013	< 0.0014	< 0.0013	< 0.0014	< 0.0018	< 0.0014	< 0.0012	< 0.0012
Trichloroethene	200	< 0.0019	< 0.0018	< 0.0019	< 0.0018	< 0.0018	< 0.0018	< 0.0017	< 0.0018	< 0.0014	**0.0010 J**	< 0.0019	< 0.0019	< 0.002	< 0.0013	< 0.0019	< 0.0018	< 0.002	< 0.0017	< 0.0012	< 0.0012	< 0.0013	< 0.0014	< 0.0013	< 0.0014	< 0.0018	< 0.0014	< 0.0012	< 0.0012
Trichlorofluoromethane		< 0.0095	< 0.0089	< 0.0094	< 0.0089	< 0.0091	< 0.0091	< 0.0087	< 0.0088	< 0.0072	< 0.0088	< 0.0097	< 0.0094	< 0.0098	< 0.0066	< 0.0096	< 0.0092	< 0.01	< 0.0085	< 0.0062	< 0.0061	< 0.0066	< 0.0069	< 0.0066	< 0.007	< 0.0091	< 0.0072	< 0.0061	< 0.0062
Semivolatile Organic Compounds (SVOC) (mg/kg)																													
1,1'-Biphenyl		< 0.71	< 0.69	< 0.71	< 0.73	< 0.71	< 0.7	< 0.7	< 0.69	< 0.69	< 0.73	< 0.69	< 0.7	< 0.69	< 0.7	< 0.7	< 0.7	< 0.71	< 0.69	< 0.72	< 0.7	< 0.78	< 0.69	< 0.7	< 0.72	< 0.7	< 0.71	< 0.7	< 0.71
2-Methylnaphthalene		< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.19	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18
Acenaphthene	500	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.19	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18
Anthracene	500	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.19	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18
Benzo(a)anthracene	5.6	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.19	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18
Benzo(a)pyrene	1	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.19	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18
Benzo(b)fluoranthene	5.6	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.19	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18
Bis(2-ethylhexyl)phthalate		< 0.36	< 0.35	< 0.36	< 0.37	< 0.36	< 0.36	< 0.36	< 0.35	< 0.35	< 0.37	< 0.35	< 0.35	< 0.35	< 0.36	< 0.35	< 0.35	< 0.36	< 0.35	< 0.36	< 0.35	< 0.39	< 0.35	< 0.36	< 0.36	< 0.36	< 0.36	< 0.36	< 0.36
Butylbenzyl phthalate		< 0.36	< 0.35	< 0.36	< 0.37	< 0.36	< 0.36	< 0.36	< 0.35	< 0.35	< 0.37	< 0.35	< 0.35	< 0.35	< 0.36	< 0.35	< 0.35	< 0.36	< 0.35	< 0.36	< 0.35	< 0.39	< 0.35	< 0.36	< 0.36	< 0.36	< 0.36	< 0.36	< 0.36
Chrysene	56	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.19	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18
Dibenzofuran	350	< 0.36	< 0.35	< 0.36	< 0.37	< 0.36	< 0.36	< 0.36	< 0.35	< 0.35	< 0.37	< 0.35	< 0.35	< 0.35	< 0.36	< 0.35	< 0.35	< 0.36	< 0.35	< 0.36	< 0.35	< 0.39	< 0.35	< 0.36	< 0.36	< 0.36	< 0.36	< 0.36	< 0.36
Dimethyl phthalate		< 0.36	< 0.35	< 0.36	< 0.37	< 0.36	< 0.36	< 0.36	< 0.35	< 0.35	< 0.37	< 0.35	< 0.35	< 0.35	< 0.36	< 0.35	< 0.35	< 0.36	< 0.35	< 0.36	< 0.35	< 0.39	< 0.35	< 0.36	< 0.36	< 0.36	< 0.36	< 0.36	< 0.36
Fluoranthene	500	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.19	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18
Fluorene	500	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.19	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18
Hexachlorobenzene	6	< 0.36	< 0.35	< 0.36	< 0.37	< 0.36	< 0.36	< 0.36	< 0.35	< 0.35	< 0.37	< 0.35	< 0.35	< 0.35	< 0.36	< 0.35	< 0.35	< 0.36	< 0.35	< 0.36	< 0.35	< 0.39	< 0.35	< 0.36	< 0.36	< 0.36	< 0.36	< 0.36	< 0.36
Naphthalene	500	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.19	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18
Phenanthrene	500	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.19	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18
Phenol	500	< 0.36	< 0.35	< 0.36	< 0.37	< 0.36	< 0.36	< 0.36	< 0.35	< 0.35	< 0.37	< 0.35	< 0.35	< 0.35	< 0.36	< 0.35	< 0.35	< 0.36	< 0.35	< 0.36	< 0.35	< 0.39	< 0.35	< 0.36	< 0.36	< 0.36	< 0.36	< 0.36	< 0.36
Pyrene	500	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.19	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18
Metals (mg/kg)																													
Aluminum		**2300**	**2300**	**2800**	**2000**	**3000**	**4000**	**3600**	**3200**	**2300**	**4400**	**2100**	**2900**	**1300**	**2100**	**2100**	**2600**	**1600**	**1600**	**2000**	**1700**	**2700**	**2800**	**2500**	**1700**	**3900**	**2700**	**3100**	**2700**
Antimony		< 1.7	< 1.7	< 1.7	< 1.8	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.8	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 2	< 1.7	< 1.7	< 1.8	< 1.7	< 1.7	< 1.7	< 1.7
Arsenic	16	< 3.5	< 3.5	< 3.4	< 3.6	< 3.5	< 3.5	< 3.4	**0.74 J**	< 3.5	< 3.5	< 3.5	< 3.3	< 3.4	< 3.4	< 3.4	< 3.4	< 3.5	**1.2 J**	**1.6 J**	**1.5 J**	**3.4 J**	**1.6 J**	**1.4 J**	**1.9 J**	**2.1 J**	**1.4 J**	**2.5 J**	**1.4 J**
Barium	400	**7.8**	**12**	**9.6**	**9.2**	**9.6**	**20**	**19**	**6.8**	**12**	**10**	**3.7**	**8.8**	**8.3**	**6.3**	**8.7**	**7.6**	**7.1**	**5.8**	**12**	**7.5**	**18**	**11**	**11**	**6.0**	**14**	**12**	**21**	**11**
Beryllium	590	**0.10 J**	**0.13 J**	**0.15 J**	**0.095 J**	**0.14 J**	**0.22**	**0.22**	**0.12 J**	**0.12 J**	**0.15 J**	**0.13 J**	**0.16 J**	**0.089 J**	**0.13 J**	**0.13 J**	**0.15 J**	**0.10 J**	**0.092 J**	**0.11 J**	**0.11 J**	**0.24**	**0.17**	**0.14 J**	**0.17 J**	**0.20**	**0.14 J**	**0.18**	**0.14 J**
Cadmium	9.3	< 0.35	< 0.35	< 0.34	< 0.36	< 0.35	< 0.35	< 0.34	< 0.34	< 0.35	< 0.35	< 0.33	< 0.34	< 0.34	< 0.34	< 0.34	< 0.34	< 0.35	< 0.34	< 0.35	< 0.34	< 0.39	< 0.34	< 0.34	< 0.35	< 0.35	< 0.35	< 0.34	< 0.34
Calcium		**110**	**140**	**110**	**75**	**110**	**190**	**130**	**120**	**91**	**320**	**110**	**140**	**53**	**64**	**42**	**170**	**69**	**83**	**70**	**390**	**140**	**13000**	**8800**	**84**	**5500**	**330**	**360**	**5500**
Chromium	1500	**3.8**	**5.7**	**4.8**	**5.6**	**4.2**	**7.8**	**5.7**	**4.4**	**4.8**	**5.4**	**3.7**	**5.5**	**3.0**	**4.3**	**2.9**	**3.5**	**2.7**	**2.4**	**3.7**	**2.7**	**4.9**	**7.1**	**10**	**1.8**	**8.7**	**5.1**	**5.4**	**7.4**
Cobalt		**1.8**	**1.7 J**	**3.0**	**1.4 J**	**2.4**	**2.6**	**2.1**	**2.2**	**1.6 J**	**1.2 J**	**1.3 J**	**2.1**	**1.1 J**	**1.7 J**	**1.6 J**	**1.7**	**1.1 J**	**1.0 J**	**1.2 J**	**0.99 J**	**2.5**	**1.4 J**	**1.4 J**	**1.1 J**	**2.6**	**1.4 J**	**2.4**	**1.4 J**
Copper	270	**3.8**	**3.9**	**5.4**	**3.0**	**9.4**	**6.6**	**6.6**	**3.3**	**3.5**	**3.2**	**4.0**	**5.9**	**4.1**	**4.7**	**4.2**	**5.0**	**3.7**	**3.9**	**4.8**	**4.1**	**5.5**	**5.5**	**5.0**	**5.9**	**7.1**	**4.6**	**6.3**	**5.3**
Iron		**3600**	**4200**	**4500**	**3400**	**4200**	**6200**	**5100**	**4100**	**3900**	**4700**	**3200**	**4300**	**2600**	**3400**	**3100**	**3600**	**2600**	**2700**	**3300**	**2700**	**5800**	**3500**	**3400**	**3000**	**5400**	**4000**	**5200**	**3700**
Lead	1000	**1.7**	**1.7**	**3.9**	**1.8**	**2.4**	**2.3**	**2.5**	**2.3**	**1.8**	**6.2**	**1.6**	**2.8**	**1.6**	**1.8**	**1.6**	**2.3**	**1.4**	**1.7**	**1.7**	**1.8**	**2.6**	**1.7**	**1.6**	**3.4**	**2.6**	**1.7**	**2.8**	**1.9**
Magnesium		**650**	**610**	**630**	**500**	**800**	**1100**	**850**	**520**	**650**	**480**	**510**	**590**	**380**	**510**	**470**	**540**	**400**	**330**	**450**	**360**	**700**	**4900**	**2100**	**470**	**1800**	**610**	**880**	**1200**
Manganese	10000	**99**	**110**	**160**	**89**	**130**	**160**	**160**	**82**	**130**	**46**	**73**	**120**	**74**	**130**	**83**	**120**	**85**	**96**	**98**	**74**	**310**	**110**	**89**	**290**	**160**	**110**	**210**	**100**
Mercury	2.8	< 0.025	< 0.026	**0.012 J**	< 0.025	< 0.026	< 0.025	< 0.025	< 0.025	< 0.024	< 0.026	< 0.025	< 0.026	< 0.025	< 0.026	< 0.026	< 0.025	< 0.024	< 0.025	< 0.027	< 0.023	< 0.029	< 0.024	< 0.023	< 0.024	< 0.026	< 0.024	< 0.024	< 0.026
Nickel	310	**3.6**	**3.1**	**3.8**	**2.6**	**4.1**	**5.2**	**4.3 B**	**3.6**	**3.2**	**4.3**	**2.3 B**	**4.5 B**	**2.2 B**	**3.3 B**	**2.6 B**	**3.4 B**	**2.4 B**	**2.0**	**2.4**	**2.1**	**4.1**	**3.4**	**3.4**	**2.0**	**5.2**	**3.3**	**4.3**	**3.3**
Potassium		**310**	**380**	**360**	**230**	**410**	**660**	**510**	**170**	**360**	**170 J**	**170**	**290**	**180**	**210**	**260**	**270**	**200**	**190**	**260**	**260**	**400**	**330**	**360**	**280**	**400**	**340**	**380**	**360**
Selenium	1500	**0.90 J**	**1.1 J**	**1.1 J**	**0.93 J**	**1.0 J**	**1.4 J**	< 3.4	**1.0 J**	**0.85 J**	**1.3 J**	< 3.3	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.5	< 3.4	< 3.5	< 3.4	**1.1 J**	< 3.4	< 3.4	< 3.5	< 3.5	< 3.5	< 3.4	< 3.4
Silver	1500	< 0.35	< 0.35	< 0.34	< 0.36	< 0.35	< 0.35	< 0.34	< 0.34	< 0.35	< 0.35	< 0.33	< 0.34	< 0.34	< 0.34	< 0.34	< 0.34	< 0.35	< 0.34	< 0.35	< 0.34	< 0.39	< 0.34	< 0.34	< 0.35	< 0.35	< 0.35	< 0.34	< 0.34
Sodium		< 170	< 170	< 170	< 180	< 170	**73 J**	**71 J**	< 170	< 170	< 180	< 170	< 170	< 170	< 170	< 170	< 170	< 170	< 170	< 170	< 170	< 200	**53 J**	**58 J**	< 180	**72 J**	< 170	< 170	< 170
Thallium		< 1.7	< 1.7	< 1.7	< 1.8	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.8	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 2	< 1.7	< 1.7	< 1.8	< 1.7	< 1.7	< 1.7	< 1.7
Vanadium		**4.7**	**6.1**	**6.0**	**4.8**	**5.4**	**8.4**	**7.3**	**5.6**	**5.2**	**7.6**	**4.4**	**6.1**	**3.6**	**5.3**	**4.4**	**5.3**	**3.6**	**3.3**	**4.5**	**4.0**	**10**	**6.7**	**5.8**	**2.4**	**7.9**	**4.6**	**7.0**	**5.7**
Zinc	10000	**7.6**	**7.8**	**12**	**5.6**	**7.8**	**12**	**10**	**5.5**	**7.5**	**71**	**5.5**	**7.4**	**5.3**	**6.1**	**6.5**	**8.2**	**4.9**	**4.5**	**5.8**	**4.8**	**11**	**6.6**	**6.4**	**4.0**	**11**	**7.4**	**9.2**	**8.2**
Polychlorinated Biphenyls (PCB) (mg/kg)																													
PCB, Total	1	< 0.082	< 0.08	**0.28**	< 0.082	< 0.083	< 0.083	< 0.079	< 0.08	< 0.078	< 0.087	< 0.079	< 0.082	< 0.078	< 0.08	< 0.084	**0.021**	< 0.081	< 0.078	< 0.08	< 0.077	< 0.092	< 0.082	< 0.083	< 0.079	< 0.08	< 0.082	< 0.08	< 0.082
PCB-1016	1	< 0.082	< 0.08	< 0.08	< 0.082	< 0.083	< 0.083	< 0.079	< 0.08	< 0.078	< 0.087	< 0.079	< 0.082	< 0.078	< 0.08	< 0.084	< 0.082	< 0.081	< 0.078	< 0.08	< 0.077	< 0.092	< 0.082	< 0.083	< 0.079	< 0.08	< 0.082	< 0.08	< 0.082
PCB-1242	1	< 0.082	< 0.08	< 0.08	< 0.082	< 0.083	< 0.083	< 0.079	< 0.08	< 0.078	< 0.087	< 0.079	< 0.082	< 0.078	< 0.08	< 0.084	< 0.082	< 0.081	< 0.078	< 0.08	< 0.077	< 0.092	< 0.082	< 0.083	< 0.079	< 0.08	< 0.082	< 0.08	< 0.082
PCB-1248	1	< 0.082	< 0.08	< 0.08	< 0.082	< 0.083	< 0.083	< 0.079	< 0.08	< 0.078	< 0.087	< 0.079	< 0.082	< 0.078	< 0.08	< 0.084	< 0.082	< 0.081	< 0.078	< 0.08	< 0.077	< 0.092	< 0.082	< 0.083	< 0.079	< 0.08	< 0.082	< 0.08	< 0.082
PCB-1254	1	< 0.082	< 0.08	**0.23 D**	< 0.082	< 0.083	< 0.083	< 0.079	< 0.08	< 0.078	< 0.087	< 0.079	< 0.082	< 0.078	< 0.08	< 0.084	< 0.082	< 0.081	< 0.078	< 0.08	< 0.077	< 0.092	< 0.082	< 0.083	< 0.079	< 0.08	< 0.082	< 0.08	< 0.082
PCB-1260	1	< 0.082	< 0.08	**0.050 JD**	< 0.082	< 0.083	< 0.083	< 0.079	< 0.08	< 0.078	< 0.087	< 0.079	< 0.082	< 0.078	< 0.08	< 0.084	**0.021 JD**	< 0.081	< 0.078	< 0.08	< 0.077	< 0.092	< 0.082	< 0.083	< 0.079	< 0.08	< 0.082	< 0.08	< 0.082
PCB-1268	1	< 0.082	< 0.08	< 0.08	< 0.082	< 0.083	< 0.083	< 0.079	< 0.08	< 0.078	< 0.087	< 0.079	< 0.082	< 0.078	< 0.08	< 0.084	< 0.082	< 0.081	< 0.078	< 0.08	< 0.077	< 0.092	< 0.082	< 0.083	< 0.079	< 0.08	< 0.082	< 0.08	< 0.082
PFAS Compounds (µg/kg)																													
Perfluorodecanoic acid (PFDA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA
Perfluorododecanoic acid (PFDoA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA
Perfluoroheptanoic acid (PFHpA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA
Perfluorohexanoic acid (PFHxA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA
Perfluorononane sulfonic acid (PFNS)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA
Perfluorononanoic acid (PFNA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA
Perfluorooctanesulfonic acid (PFOS)	440	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA
Perfluorooctanoic acid (PFOA)	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA
Perfluoropentanoic acid (PFPeA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.39	NA	NA	NA	NA	NA	< 0.4	NA	NA	NA	NA	NA	NA	NA	NA	< 0.4	NA
Perfluorotetradecanoic acid (PFTeDA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA
Perfluorotridecanoic acid (PFTrDA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA
Perfluoroundecanoic acid (PFUnA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA

Legend	
<1	Parameter not detected above the laboratory reporting limit
1	Parameter reported at a concentrations greater than Part 375 Commercial SCOs
1	Parameter reported above the laboratory reporting limit but below the applicable regulatory standard/criterion

Notes:
Only compounds detected above the laboratory reporting limits are presented

mg/L = milligrams per liter
µg/L = micrograms per liter
ng/L = nanograms per liter
NA = Not Analyzed
NE = No criteria established
NYSDEC = New York State Department of Environmental Conservation
SCO = Soil Cleanup Objectives
* Soil samples SB-100R and SB-100B were excavated on 6/26/2024

Table 4A
2024 Geoprobe Soil Analytical Results
Lawrence Aviation
Port Jefferson, New York

Location:		SB-148	SB-149	SB-149	SB-150	SB-150	SB-151	SB-151	SB-152	SB-152	SB-153	SB-153	SB-154	SB-154	SB-155	SB-155	SB-156	SB-156	SB-157	SB-157	SB-158	SB-158	SB-158	SB-159	SB-159	SB-159	SB-160	SB-160	SB-161
Date Collected:		03/15/2024	03/18/2024	03/18/2024	03/18/2024	03/18/2024	03/18/2024	03/18/2024	03/18/2024	03/18/2024	03/18/2024	03/18/2024	03/18/2024	03/18/2024	03/18/2024	03/18/2024	03/18/2024	03/18/2024	03/18/2024	03/18/2024	03/18/2024	03/15/2024	03/18/2024	03/18/2024	03/18/2024	03/18/2024	03/19/2024	03/19/2024	03/19/2024
Sample ID:	Part 375 Commercial	SB-148 (2-4)	SB-149 (2-4)	SB-149 (12-14)	SB-150 (2-4)	SB-150 (12-14)	SB-151 (3-5)	SB-151 (13-15)	SB-152 (3-5)	SB-152 (13-15)	SB-153 (3-5)	SB-153 (13-15)	SB-154 (3-5)	SB-154 (13-15)	SB-155 (3-5)	SB-155 (13-15)	SB-156 (3-5)	SB-156 (13-15)	SB-157 (3-5)	SB-157 (13-15)	SB-158 (7-9)	SB-158 (12-14)	SB-158 (17-19)	DUP-06	SB-159 (7-9)	SB-159 (17-19)	SB-160 (7-9)	SB-160 (17-19)	SB-161 (7-9)
Laboratory Sample ID:		24C1967-11	24C2190-01	24C2190-02	24C2190-03	24C2190-04	24C2190-05	24C2190-06	24C2190-07	24C2190-08	24C2190-09	24C2190-10	24C2190-11	24C2190-12	24C2190-13	24C2190-14	24C2190-15	24C2190-16	24C2190-17	24C2190-18	24C2190-19	24C1967-12	24C2190-20	24C2193-03	24C2193-01	24C2193-02	24C2193-04	24C2193-05	24C2195-04
Volatile Organic Compounds (VOCs) (mg/kg)																													
2-Butanone (MEK)	500	< 0.03	< 0.021	< 0.018	< 0.024	< 0.018	< 0.023	< 0.024	< 0.022	< 0.02	< 0.024	< 0.024	< 0.019	< 0.019	< 0.018	< 0.018	< 0.021	< 0.02	< 0.019	< 0.017	< 0.021	< 0.039	< 0.02	< 0.02	< 0.021	< 0.019	< 0.026	< 0.027	< 0.024
Acetone	500	< 0.074	< 0.052	< 0.045	< 0.059	< 0.045	< 0.058	< 0.061	< 0.056	< 0.05	< 0.06	< 0.059	< 0.048	< 0.047	< 0.045	< 0.045	< 0.051	< 0.051	< 0.047	< 0.042	< 0.051	< 0.096	< 0.051	< 0.049	< 0.052	< 0.048	< 0.065	< 0.067	< 0.061
Benzene	44	< 0.0015	< 0.001	< 0.00091	< 0.0012	< 0.00089	< 0.0012	< 0.0012	< 0.0011	< 0.001	< 0.0012	< 0.0012	< 0.00097	< 0.00094	< 0.0009	< 0.0009	< 0.001	< 0.001	< 0.00093	< 0.00084	< 0.001	< 0.0019	< 0.001	< 0.00098	< 0.001	< 0.00095	< 0.0013	< 0.0013	< 0.0012
cis-1,2-Dichloroethene	500	< 0.0015	< 0.001	< 0.00091	< 0.0012	< 0.00089	< 0.0012	< 0.0012	< 0.0011	< 0.001	< 0.0012	< 0.0012	< 0.00097	< 0.00094	< 0.0009	< 0.0009	< 0.001	< 0.001	< 0.00093	< 0.00084	< 0.001	< 0.0019	< 0.001	< 0.00098	< 0.001	< 0.00095	**0.00055 J**	< 0.0013	< 0.0012
Dichlorodifluoromethane		< 0.015	< 0.01	< 0.0091	< 0.012	< 0.0089	< 0.012	< 0.012	< 0.011	< 0.01	< 0.012	< 0.012	< 0.0097	< 0.0094	< 0.009	< 0.009	< 0.01	< 0.01	< 0.0093	< 0.0084	< 0.01	< 0.019	< 0.01	< 0.0098	< 0.01	< 0.0095	< 0.013	< 0.013	< 0.012
Isopropylbenzene		< 0.0015	< 0.001	< 0.00091	< 0.0012	< 0.00089	< 0.0012	< 0.0012	< 0.0011	< 0.001	< 0.0012	< 0.0012	< 0.00097	< 0.00094	< 0.0009	< 0.0009	< 0.001	< 0.001	< 0.00093	< 0.00084	< 0.001	< 0.0019	< 0.001	< 0.00098	< 0.001	< 0.00095	< 0.0013	< 0.0013	< 0.0012
Methyl acetate		< 0.0015	< 0.001	< 0.00091	< 0.0012	< 0.00089	**0.0027**	< 0.0012	< 0.0011	< 0.001	< 0.0012	< 0.0012	< 0.00097	< 0.00094	< 0.0009	< 0.0009	< 0.001	< 0.001	< 0.00093	< 0.00084	< 0.001	< 0.0019	< 0.001	< 0.00098	< 0.001	< 0.00095	< 0.0013	< 0.0013	< 0.0012
Methylcyclohexane		< 0.0015	< 0.001	< 0.00091	< 0.0012	< 0.00089	< 0.0012	< 0.0012	< 0.0011	< 0.001	< 0.0012	< 0.0012	< 0.00097	< 0.00094	< 0.0009	< 0.0009	< 0.001	< 0.001	< 0.00093	< 0.00084	< 0.001	< 0.0019	< 0.001	< 0.00098	< 0.001	< 0.00095	< 0.0013	< 0.0013	< 0.0012
Methylene chloride	500	< 0.015	< 0.01	< 0.0091	< 0.012	< 0.0089	< 0.012	< 0.012	< 0.011	< 0.01	< 0.012	< 0.012	< 0.0097	< 0.0094	< 0.009	< 0.009	< 0.01	< 0.01	< 0.0093	< 0.0084	< 0.01	< 0.019	< 0.01	< 0.0098	< 0.01	< 0.0095	< 0.013	< 0.013	< 0.012
Tetrachloroethene	150	< 0.0015	< 0.001	< 0.00091	< 0.0012	< 0.00089	< 0.0012	**0.0060**	< 0.0011	< 0.001	< 0.0012	< 0.0012	< 0.00097	< 0.00094	< 0.0009	< 0.0009	< 0.001	< 0.001	< 0.00093	< 0.00084	< 0.001	< 0.0019	< 0.001	< 0.00098	< 0.001	< 0.00095	< 0.0013	< 0.0013	< 0.0012
Toluene	500	< 0.0015	< 0.001	< 0.00091	< 0.0012	< 0.00089	< 0.0012	< 0.0012	< 0.0011	< 0.001	< 0.0012	< 0.0012	< 0.00097	< 0.00094	< 0.0009	< 0.0009	< 0.001	< 0.001	< 0.00093	< 0.00084	< 0.001	< 0.0019	< 0.001	< 0.00098	< 0.001	< 0.00095	< 0.0013	< 0.0013	< 0.0012
Trichloroethene	200	< 0.0015	< 0.001	< 0.00091	< 0.0012	**0.00061 J**	**0.018**	**0.11**	< 0.0011	< 0.001	< 0.0012	< 0.0012	< 0.00097	< 0.00094	< 0.0009	< 0.0009	< 0.001	< 0.001	< 0.00093	< 0.00084	**0.0014**	< 0.0019	< 0.001	< 0.00098	< 0.001	< 0.00095	**0.015**	< 0.0013	< 0.0012
Trichlorofluoromethane		< 0.0074	< 0.0052	< 0.0045	< 0.0059	< 0.0045	< 0.0058	< 0.0061	< 0.0056	< 0.005	< 0.006	< 0.0059	< 0.0048	< 0.0047	< 0.0045	< 0.0045	< 0.0051	< 0.0051	< 0.0047	< 0.0042	< 0.0051	< 0.0096	< 0.0051	< 0.0049	< 0.0052	< 0.0048	< 0.0065	< 0.0067	< 0.0061
Semivolatile Organic Compounds (SVOC) (mg/kg)																													
1,1'-Biphenyl		< 0.71	< 0.72	< 0.7	< 0.71	< 0.7	< 0.72	< 0.7	< 0.69	< 0.69	< 0.7	< 0.7	< 0.71	< 0.71	< 0.69	< 0.71	< 0.69	< 0.69	< 0.69	< 0.68	< 0.7	< 0.71	< 0.71	< 0.69	< 0.7	< 0.69	< 0.72	< 0.72	< 0.73
2-Methylnaphthalene		< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18
Acenaphthene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18
Anthracene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18
Benzo(a)anthracene	5.6	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18
Benzo(a)pyrene	1	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18
Benzo(b)fluoranthene	5.6	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18
Bis(2-ethylhexyl)phthalate		< 0.36	< 0.37	< 0.35	< 0.36	< 0.36	< 0.37	**0.33 J**	< 0.35	< 0.35	< 0.36	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.35	< 0.35	< 0.35	< 0.34	< 0.35	< 0.36	< 0.36	< 0.35	< 0.36	< 0.35	< 0.36	< 0.36	< 0.37
Butylbenzyl phthalate		< 0.36	< 0.37	< 0.35	< 0.36	< 0.36	< 0.37	< 0.36	< 0.35	< 0.35	< 0.36	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.35	< 0.35	< 0.35	< 0.34	< 0.35	< 0.36	< 0.36	< 0.35	< 0.36	< 0.35	< 0.36	< 0.36	< 0.37
Chrysene	56	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18
Dibenzofuran	350	< 0.36	< 0.37	< 0.35	< 0.36	< 0.36	< 0.37	< 0.36	< 0.35	< 0.35	< 0.36	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.35	< 0.35	< 0.35	< 0.34	< 0.35	< 0.36	< 0.36	< 0.35	< 0.36	< 0.35	< 0.36	< 0.36	< 0.37
Dimethyl phthalate		< 0.36	< 0.37	< 0.35	< 0.36	< 0.36	< 0.37	< 0.36	< 0.35	< 0.35	< 0.36	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.35	< 0.35	< 0.35	< 0.34	< 0.35	< 0.36	< 0.36	< 0.35	< 0.36	< 0.35	< 0.36	< 0.36	< 0.37
Fluoranthene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18
Fluorene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18
Hexachlorobenzene	6	< 0.36	< 0.37	< 0.35	< 0.36	< 0.36	< 0.37	**0.15 J**	< 0.35	< 0.35	< 0.36	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.35	< 0.35	< 0.35	< 0.34	< 0.35	< 0.36	< 0.36	< 0.35	< 0.36	< 0.35	< 0.36	< 0.36	< 0.37
Naphthalene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18
Phenanthrene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18
Phenol	500	< 0.36	< 0.37	< 0.35	< 0.36	< 0.36	< 0.37	< 0.36	< 0.35	< 0.35	< 0.36	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.35	< 0.35	< 0.35	< 0.34	< 0.35	< 0.36	< 0.36	< 0.35	< 0.36	< 0.35	< 0.36	< 0.36	< 0.37
Pyrene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.17	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18
Metals (mg/kg)																													
Aluminum		**3400**	**7900**	**3200**	**4200**	**2200**	**2800**	**1400**	**2200**	**2200**	**3300**	**6500**	**5300**	**3000**	**3600**	**1500**	**3600**	**3000**	**1900**	**2200**	**3500**	**3600**	**1900**	**2100**	**2500**	**1900**	**4600**	**3400**	**6100**
Antimony		< 1.7	**0.45 J**	**0.39 J**	**0.78 J**	< 1.7	< 1.8	**1.3 J**	< 1.7	< 1.7	< 1.7	< 1.8	< 1.8	< 1.7	< 1.7	< 1.7	< 1.6	< 1.8	< 1.7	< 1.6	< 1.7	< 1.7	< 1.7	< 1.7	< 1.8	< 1.6	< 1.8	< 1.7	< 1.8
Arsenic	16	**1.0 J**	**1.5 J**	**3.0 J**	**0.79 J**	**0.83 J**	< 3.6	< 3.5	**0.99 J**	**1.1 J**	**0.97 J**	**0.93 J**	**1.3 J**	**1.1 J**	**1.1 J**	**0.66 J**	**1.2 J**	**1.1 J**	**1.0 J**	**1.2 J**	**1.4 J**	**1.5 J**	**0.79 J**	**1.2 J**	**1.3 J**	**1.2 J**	**1.2 J**	**1.9 J**	**1.5 J**
Barium	400	**12**	**14**	**11**	**11**	**7.5**	**23**	**22**	**6.4**	**12**	**10**	**14**	**23**	**16**	**15**	**8.3**	**20**	**19**	**5.8**	**14**	**12**	**14**	**5.6**	**6.2**	**17**	**11**	**23**	**24**	**13**
Beryllium	590	**0.15 J**	**0.18**	**0.16 J**	**0.11 J**	**0.088 J**	< 0.18	< 0.17	**0.10 J**	**0.10 J**	**0.13 J**	**0.28**	**0.25**	**0.13 J**	**0.15 J**	< 0.17	**0.15 J**	NA	**0.10 J**	**0.14 J**	**0.16 J**	**0.16 J**	**0.11 J**	**0.13 J**	**0.18**	**0.12 J**	**0.27**	**0.18**	**0.21**
Cadmium	9.3	**0.17 J**	< 0.35	**0.15 J**	< 0.33	< 0.35	**0.29 J**	**0.34 J**	< 0.35	< 0.34	< 0.34	**0.76**	< 0.36	< 0.34	< 0.34	< 0.34	< 0.33	< 0.35	< 0.33	< 0.33	**0.14 J**	**0.17 J**	< 0.35	< 0.34	< 0.36	< 0.33	**0.68**	< 0.35	< 0.36
Calcium		**570**	**220**	**1900**	**250**	**700**	**1500**	**1100**	**280**	**56**	**110**	**250**	**86**	**67**	**78**	**73**	**160**	**86**	**180**	**320**	**510**	**19000 D**	**190**	**180**	**210**	**190**	**22000 D**	**200**	**740**
Chromium	1500	**5.2**	**8.5**	**30**	**6.0**	**8.0**	**27**	**9.9**	**3.7**	**3.9**	**5.1**	**8.8**	**7.1**	**6.9**	**5.2**	**3.2**	**5.4**	**6.4**	**6.1**	**5.3**	**7.2**	**16**	**3.1**	**6.1**	**4.9**	**4.0**	**12**	**5.0**	**7.8**
Cobalt		**1.6 J**	**2.7**	**2.5**	**1.9**	**1.5 J**	< 1.8	< 1.7	**1.7 J**	**1.5 J**	**2.3**	**2.9**	**2.6**	**1.5 J**	**1.9**	**1.1 J**	**2.0**	**2.0**	**1.5 J**	**1.9**	**1.8**	**1.5 J**	**1.4 J**	**1.6 J**	**3.4**	**1.6 J**	**2.2**	**1.9**	**3.3**
Copper	270	**7.6**	**4.3**	**6.7**	**2.8**	**4.2**	**6.5**	**2.0**	**3.8**	**5.4**	**3.5**	**22**	**6.0**	**4.2**	**3.7**	**3.9**	**4.5**	**4.3**	**4.5**	**4.9**	**4.5**	**5.4**	**2.9 B**	**5.6**	**6.8**	**6.2**	**10**	**5.1**	**6.0**
Iron		**3700**	**7400**	**8800**	**5400**	**3600**	**3800**	**1800**	**4000**	**3200**	**4100**	**5100**	**6500**	**4300**	**4400**	**2400**	**5300**	**4700**	**5200**	**4500**	**5200**	**4200**	**3000**	**5500**	**4300**	**3800**	**7800**	**6100 D**	**7500**
Lead	1000	**81**	**4.1**	**4.3**	**2.7**	**2.4**	**130**	**95**	**2.2**	**2.2**	**2.3**	**2.4**	**3.0**	**2.1**	**2.3**	**1.6**	**2.5**	**1.9**	**6.9**	**1.9**	**4.4**	**15**	**1.8**	**11**	**2.2**	**2.0**	**17**	**2.4**	**3.4**
Magnesium		**670**	**890**	**1100**	**720**	**580**	**350**	**96**	**600**	**440**	**660**	**670**	**1300**	**520**	**820**	**300**	**920**	**1100**	**710**	**650**	**1200**	**4300**	**470**	**670**	**560**	**510**	**1800**	**900**	**1100**
Manganese	10000	**100**	**90**	**180**	**110**	**94**	**20**	**10**	**120**	**86**	**110**	**210**	**160**	**170**	**130**	**73**	**110**	**170**	**84**	**150**	**120**	**110**	**78**	**130**	**180**	**110**	**150**	**160**	**150**
Mercury	2.8	< 0.025	< 0.027	< 0.026	< 0.025	< 0.025	< 0.024	< 0.025	< 0.026	< 0.025	< 0.025	< 0.026	< 0.026	< 0.024	< 0.025	< 0.026	< 0.024	< 0.025	< 0.025	< 0.025	< 0.023	< 0.026	< 0.025	< 0.026	< 0.026	< 0.025	< 0.025	< 0.024	**0.017 J**
Nickel	310	**5.3**	**5.6**	**4.4**	**4.2**	**3.2**	**8.0**	**0.45 JB**	**3.6**	**4.2**	**3.6**	**35**	**5.8**	**3.4**	**4.0**	**2.4**	**4.3**	**4.0**	**2.9**	**3.3**	**3.6**	**6.0**	**2.4**	**3.0**	**6.4**	**2.8**	**8.1**	**3.9**	**5.0**
Potassium		**760**	**720**	**580**	**360**	**350**	**720**	**1200**	**260**	**360**	**510**	**880**	**1400**	**650**	**670**	**240**	**660**	**670**	**340**	**400**	**350**	**680**	**300**	**340**	**440**	**440**	**680**	**630**	**450**
Selenium	1500	< 3.5	< 3.5	< 3.5	< 3.3	< 3.5	< 3.6	< 3.5	< 3.5	< 3.4	< 3.4	< 3.5	< 3.6	< 3.4	< 3.4	< 3.4	< 3.3	< 3.5	< 3.3	< 3.3	< 3.5	< 3.4	< 3.5	< 3.4	< 3.6	< 3.3	< 3.5	< 3.5	< 3.6
Silver	1500	< 0.35	< 0.35	< 0.35	< 0.33	< 0.35	< 0.36	< 0.35	< 0.35	< 0.34	< 0.34	< 0.35	< 0.36	< 0.34	< 0.34	< 0.34	< 0.33	< 0.35	< 0.33	< 0.33	< 0.35	< 0.34	< 0.35	< 0.34	< 0.36	< 0.33	< 0.35	< 0.35	< 0.36
Sodium		**1700**	< 180	< 170	< 170	< 170	**900**	**110 J**	< 170	**45 J**	**86 J**	**510**	**60 J**	**45 J**	< 170	< 170	**38 J**	< 180	< 170	< 160	< 170	**1000**	< 170	< 170	< 180	< 160	**43 J**	< 170	< 180
Thallium		< 1.7	< 1.8	< 1.7	< 1.7	< 1.7	< 1.8	< 1.7	< 1.7	< 1.7	< 1.7	< 1.8	< 1.8	< 1.7	< 1.7	< 1.7	< 1.6	< 1.8	< 1.7	< 1.6	< 1.7	< 1.7	< 1.7	< 1.7	< 1.8	< 1.6	< 1.8	< 1.7	< 1.8
Vanadium		**7.6**	**16**	**14**	**15**	**7.5**	**100**	**170**	**5.6**	**4.4**	**6.9**	**27**	**9.9**	**6.4**	**6.9**	**3.6**	**7.9**	**6.5**	**5.8**	**6.1**	**7.1**	**8.8**	**4.2**	**5.7**	**15**	**4.9**	**12**	**7.4**	**11**
Zinc	10000	**19**	**11**	**12**	**8.6**	**9.0**	**2.7**	**0.87**	**8.3**	**9.1**	**7.3**	**29**	**17**	**12**	**9.0**	**5.2**	**10**	**9.9**	**11**	**7.8**	**13**	**15**	**5.1**	**10**	**6.1**	**6.7**	**37**	**10**	**11**
Polychlorinated Biphenyls (PCB) (mg/kg)																													
PCB, Total	1	< 0.085	< 0.08	< 0.082	< 0.08	< 0.079	**0.205**	**1.32**	< 0.084	< 0.081	< 0.084	< 0.083	< 0.081	< 0.08	< 0.081	< 0.084	< 0.083	< 0.082	< 0.079	< 0.079	**0.029**	< 0.083	< 0.079	< 0.078	< 0.082	< 0.078	**0.45**	< 0.083	< 0.086
PCB-1016	1	< 0.085	< 0.08	< 0.082	< 0.08	< 0.079	< 0.081	< 0.082	< 0.084	< 0.081	< 0.084	< 0.083	< 0.081	< 0.08	< 0.081	< 0.084	< 0.083	< 0.082	< 0.079	< 0.079	< 0.082	< 0.083	< 0.079	< 0.078	< 0.082	< 0.078	< 0.084	< 0.083	< 0.086
PCB-1242	1	< 0.085	< 0.08	< 0.082	< 0.08	< 0.079	< 0.081	< 0.082	< 0.084	< 0.081	< 0.084	< 0.083	< 0.081	< 0.08	< 0.081	< 0.084	< 0.083	< 0.082	< 0.079	< 0.079	< 0.082	< 0.083	< 0.079	< 0.078	< 0.082	< 0.078	< 0.084	< 0.083	< 0.086
PCB-1248	1	< 0.085	< 0.08	< 0.082	< 0.08	< 0.079	**0.025 JD**	**0.32 D**	< 0.084	< 0.081	< 0.084	< 0.083	< 0.081	< 0.08	< 0.081	< 0.084	< 0.083	< 0.082	< 0.079	< 0.079	< 0.082	< 0.083	< 0.079	< 0.078	< 0.082	< 0.078	< 0.084	< 0.083	< 0.086
PCB-1254	1	< 0.085	< 0.08	< 0.082	< 0.08	< 0.079	**0.052 JD**	**0.47 D**	< 0.084	< 0.081	< 0.084	< 0.083	< 0.081	< 0.08	< 0.081	< 0.084	< 0.083	< 0.082	< 0.079	< 0.079	< 0.082	< 0.083	< 0.079	< 0.078	< 0.082	< 0.078	**0.20 D**	< 0.083	< 0.086
PCB-1260	1	< 0.085	< 0.08	< 0.082	< 0.08	< 0.079	**0.086 D**	**0.35 D**	< 0.084	< 0.081	< 0.084	< 0.083	< 0.081	< 0.08	< 0.081	< 0.084	< 0.083	< 0.082	< 0.079	< 0.079	**0.029 JD**	< 0.083	< 0.079	< 0.078	< 0.082	< 0.078	**0.25 D**	< 0.083	< 0.086
PCB-1268	1	< 0.085	< 0.08	< 0.082	< 0.08	< 0.079	**0.042 JD**	**0.18 D**	< 0.084	< 0.081	< 0.084	< 0.083	< 0.081	< 0.08	< 0.081	< 0.084	< 0.083	< 0.082	< 0.079	< 0.079	< 0.082	< 0.083	< 0.079	< 0.078	< 0.082	< 0.078	< 0.084	< 0.083	< 0.086
PFAS Compounds (µg/kg)																													
Perfluorodecanoic acid (PFDA)		< 0.2	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2
Perfluorododecanoic acid (PFDoA)		< 0.2	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2
Perfluoroheptanoic acid (PFHpA)		< 0.2	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2
Perfluorohexanoic acid (PFHxA)		< 0.2	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2
Perfluorononane sulfonic acid (PFNS)		< 0.2	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2
Perfluorononanoic acid (PFNA)		< 0.2	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2
Perfluorooctanesulfonic acid (PFOS)	440	< 0.2	NA	NA	**0.047 J**	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2
Perfluorooctanoic acid (PFOA)	500	< 0.2	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.40**
Perfluoropentanoic acid (PFPeA)		< 0.39	NA	NA	< 0.39	NA	NA	NA	< 0.39	NA	NA	NA	NA	NA	NA	NA	< 0.39	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.4
Perfluorotetradecanoic acid (PFTeDA)		< 0.2	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2
Perfluorotridecanoic acid (PFTrDA)		< 0.2	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2
Perfluoroundecanoic acid (PFUnA)		< 0.2	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2

Legend	
<1	Parameter not detected above the laboratory reporting limit
1	Parameter reported at a concentrations greater than Part 375 Commercial SCOs
1	Parameter reported above the laboratory reporting limit but below the applicable regulatory standard/criterion

Notes:
Only compounds detected above the laboratory reporting limits are presented

mg/L = milligrams per liter
µg/L = micrograms per liter
ng/L = nanograms per liter
NA = Not Analyzed
NE = No criteria established
NYSDEC = New York State Department of Environmental Conservation
SCO = Soil Cleanup Objectives
* Soil samples SB-100R and SB-100B were excavated on 6/26/2024

Table 4A
2024 Geoprobe Soil Analytical Results
Lawrence Aviation
Port Jefferson, New York

Location:		SB-161	SB-162	SB-162	SB-163	SB-163	SB-164	SB-164	SB-165	SB-165	SB-165	SB-166	SB-166	SB-167	SB-167	SB-168	SB-168	SB-169	SB-169	SB-170	SB-170	SB-171	SB-171	SB-172	SB-172	SB-173	SB-173	SB-174
Date Collected:		03/19/2024	03/19/2024	03/19/2024	03/19/2024	03/19/2024	03/19/2024	03/19/2024	03/19/2024	03/19/2024	03/19/2024	03/19/2024	03/19/2024	03/20/2024	03/20/2024	03/20/2024	03/20/2024	03/20/2024	03/20/2024	03/20/2024	03/20/2024	03/20/2024	03/20/2024	03/20/2024	03/20/2024	03/20/2024	03/20/2024	03/20/2024	03/20/2024
Sample ID:	Part 375 Commercial	SB-161 (17-19)	SB-162 (7-9)	SB-162 (17-19)	SB-163 (7-9)	SB-163 (17-19)	SB-164 (20-22)	SB-164 (30-32)	DUP-7	SB-165 (20-22)	SB-165 (30-32)	SB-166 (20-22)	SB-166 (30-32)	SB-167 (20-22)	SB-167 (30-32)	SB-168 (20-22)	SB-168 (30-32)	SB-169 (3-5)	SB-169 (13-15)	SB-170 (3-5)	SB-170 (13-15)	SB-171 (5-7)	SB-171 (15-17)	SB-172 (5-7)	SB-172 (15-17)	SB-173 (5-7)	SB-173 (15-17)	DUP-08
Laboratory Sample ID:		24C2193-07	24C2193-08	24C2193-09	24C2193-10	24C2193-11	24C2193-12	24C2193-13	24C2193-18	24C2193-14	24C2193-15	24C2193-16	24C2193-17	24C2562-01	24C2562-02	24C2562-03	24C2562-04	24C2562-05	24C2562-06	24C2562-07	24C2562-08	24C2562-09	24C2562-10	24C2562-11	24C2562-12	24C2562-13	24C2562-14	24C2562-17
Volatile Organic Compounds (VOCs) (mg/kg)																												
2-Butanone (MEK)	500	< 0.023	< 0.026	< 0.017	< 0.02	< 0.017	< 0.014	< 0.023	< 0.029	< 0.025	< 0.026	< 0.021	< 0.021	< 0.022	< 0.02	< 0.022	< 0.022	< 0.019	< 0.025	< 0.017	< 0.019	< 0.026	< 0.021	< 0.025	< 0.026	< 0.022	< 0.031	< 0.019
Acetone	500	< 0.058	< 0.065	< 0.043	< 0.05	< 0.044	< 0.035	< 0.059	< 0.073	< 0.063	< 0.064	< 0.052	< 0.052	< 0.055	< 0.05	< 0.054	< 0.055	< 0.046	< 0.063	< 0.044	< 0.047	< 0.064	< 0.052	< 0.062	< 0.065	< 0.055	< 0.078	< 0.047
Benzene	44	< 0.0012	< 0.0013	< 0.00087	< 0.001	< 0.00087	< 0.0007	< 0.0012	< 0.0015	< 0.0013	< 0.0013	< 0.001	< 0.001	< 0.0011	< 0.00099	< 0.0011	< 0.0011	< 0.00093	< 0.0013	< 0.00087	< 0.00094	< 0.0013	< 0.001	< 0.0012	< 0.0013	< 0.0011	< 0.0016	< 0.00093
cis-1,2-Dichloroethene	500	< 0.0012	< 0.0013	< 0.00087	< 0.001	< 0.00087	< 0.0007	< 0.0012	< 0.0015	< 0.0013	< 0.0013	< 0.001	< 0.001	< 0.0011	< 0.00099	< 0.0011	< 0.0011	**0.00043 J**	< 0.0013	< 0.00087	< 0.00094	< 0.0013	< 0.001	< 0.0012	< 0.0013	< 0.0011	< 0.0016	< 0.00093
Dichlorodifluoromethane		< 0.012	< 0.013	< 0.0087	< 0.01	< 0.0087	< 0.007	< 0.012	< 0.015	< 0.013	< 0.013	< 0.01	< 0.01	< 0.011	< 0.0099	< 0.011	< 0.011	< 0.0093	< 0.013	< 0.0087	< 0.0094	< 0.013	< 0.01	< 0.012	< 0.013	< 0.011	< 0.016	< 0.0093
Isopropylbenzene		< 0.0012	< 0.0013	< 0.00087	< 0.001	< 0.00087	< 0.0007	< 0.0012	< 0.0015	< 0.0013	< 0.0013	< 0.001	< 0.001	< 0.0011	< 0.00099	< 0.0011	< 0.0011	< 0.00093	< 0.0013	< 0.00087	< 0.00094	< 0.0013	< 0.001	< 0.0012	< 0.0013	< 0.0011	< 0.0016	< 0.00093
Methyl acetate		< 0.0012	< 0.0013	< 0.00087	< 0.001	< 0.00087	< 0.0007	< 0.0012	< 0.0015	< 0.0013	< 0.0013	< 0.001	< 0.001	< 0.0011	< 0.00099	< 0.0011	< 0.0011	< 0.00093	< 0.0013	< 0.00087	< 0.00094	< 0.0013	< 0.001	< 0.0012	< 0.0013	< 0.0011	< 0.0016	< 0.00093
Methylcyclohexane		< 0.0012	< 0.0013	< 0.00087	< 0.001	< 0.00087	< 0.0007	< 0.0012	< 0.0015	< 0.0013	< 0.0013	< 0.001	< 0.001	< 0.0011	< 0.00099	< 0.0011	< 0.0011	< 0.00093	< 0.0013	< 0.00087	< 0.00094	< 0.0013	< 0.001	< 0.0012	< 0.0013	< 0.0011	< 0.0016	< 0.00093
Methylene chloride	500	< 0.012	< 0.013	< 0.0087	< 0.01	< 0.0087	< 0.007	< 0.012	< 0.015	< 0.013	< 0.013	< 0.01	< 0.01	< 0.011	< 0.0099	< 0.011	< 0.011	< 0.0093	< 0.013	< 0.0087	< 0.0094	< 0.013	< 0.01	< 0.012	< 0.013	< 0.011	< 0.016	< 0.0093
Tetrachloroethene	150	< 0.0012	< 0.0013	< 0.00087	< 0.001	< 0.00087	< 0.0007	< 0.0012	< 0.0015	< 0.0013	< 0.0013	< 0.001	< 0.001	< 0.0011	< 0.00099	< 0.0011	< 0.0011	< 0.00093	< 0.0013	< 0.00087	< 0.00094	< 0.0013	< 0.001	< 0.0012	< 0.0013	< 0.0011	< 0.0016	< 0.00093
Toluene	500	< 0.0012	< 0.0013	< 0.00087	< 0.001	< 0.00087	< 0.0007	< 0.0012	< 0.0015	< 0.0013	< 0.0013	< 0.001	< 0.001	< 0.0011	< 0.00099	< 0.0011	< 0.0011	< 0.00093	< 0.0013	< 0.00087	< 0.00094	< 0.0013	< 0.001	< 0.0012	< 0.0013	< 0.0011	< 0.0016	< 0.00093
Trichloroethene	200	< 0.0012	< 0.0013	< 0.00087	< 0.001	< 0.00087	< 0.0007	< 0.0012	< 0.0015	< 0.0013	< 0.0013	< 0.001	< 0.001	< 0.0011	< 0.00099	< 0.0011	< 0.0011	**0.0029**	< 0.0013	**0.00081 J**	< 0.00094	< 0.0013	< 0.001	< 0.0012	< 0.0013	< 0.0011	< 0.0016	< 0.00093
Trichlorofluoromethane		< 0.0058	< 0.0065	< 0.0043	< 0.005	< 0.0044	< 0.0035	< 0.0059	< 0.0073	< 0.0063	< 0.0064	< 0.0052	< 0.0052	< 0.0055	< 0.005	< 0.0054	< 0.0055	< 0.0046	< 0.0063	< 0.0044	< 0.0047	< 0.0064	< 0.0052	< 0.0062	< 0.0065	< 0.0055	< 0.0078	< 0.0047
Semivolatile Organic Compounds (SVOC) (mg/kg)																												
1,1'-Biphenyl		< 0.7	< 0.71	< 0.71	< 0.72	< 0.72	< 0.71	< 0.72	< 0.69	< 0.69	< 0.68	< 0.72	< 0.72	< 0.72	< 0.76	< 0.71	< 0.72	< 0.71	< 0.7	< 0.72	< 0.71	< 0.82	< 0.68	< 0.74	< 0.74	< 0.69	< 0.82	< 0.68
2-Methylnaphthalene		< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.17	< 0.19	< 0.19	< 0.17	< 0.21	< 0.17
Acenaphthene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.17	< 0.19	< 0.19	< 0.17	< 0.21	< 0.17
Anthracene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.17	< 0.19	< 0.19	< 0.17	< 0.21	< 0.17
Benzo(a)anthracene	5.6	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.17	< 0.19	< 0.19	< 0.17	< 0.21	< 0.17
Benzo(a)pyrene	1	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.17	< 0.19	< 0.19	< 0.17	< 0.21	< 0.17
Benzo(b)fluoranthene	5.6	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.17	< 0.19	< 0.19	< 0.17	< 0.21	< 0.17
Bis(2-ethylhexyl)phthalate		< 0.35	< 0.36	< 0.36	< 0.37	< 0.36	< 0.36	< 0.36	< 0.35	< 0.35	< 0.35	< 0.36	< 0.36	< 0.37	< 0.39	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.36	**0.26 J**	< 0.35	< 0.38	**0.25 J**	< 0.35	< 0.42	< 0.34
Butylbenzyl phthalate		< 0.35	< 0.36	< 0.36	< 0.37	< 0.36	< 0.36	< 0.36	< 0.35	< 0.35	< 0.35	< 0.36	< 0.36	< 0.37	< 0.39	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.36	< 0.42	< 0.35	< 0.38	**0.19 J**	< 0.35	< 0.42	< 0.34
Chrysene	56	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.17	< 0.19	< 0.19	< 0.17	< 0.21	< 0.17
Dibenzofuran	350	< 0.35	< 0.36	< 0.36	< 0.37	< 0.36	< 0.36	< 0.36	< 0.35	< 0.35	< 0.35	< 0.36	< 0.36	< 0.37	< 0.39	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.36	< 0.42	< 0.35	< 0.38	< 0.37	< 0.35	< 0.42	< 0.34
Dimethyl phthalate		< 0.35	< 0.36	< 0.36	< 0.37	< 0.36	< 0.36	< 0.36	< 0.35	< 0.35	< 0.35	< 0.36	< 0.36	< 0.37	< 0.39	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.36	< 0.42	< 0.35	< 0.38	< 0.37	< 0.35	< 0.42	< 0.34
Fluoranthene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.17	< 0.19	< 0.19	< 0.17	< 0.21	< 0.17
Fluorene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.17	< 0.19	< 0.19	< 0.17	< 0.21	< 0.17
Hexachlorobenzene	6	< 0.35	< 0.36	< 0.36	< 0.37	< 0.36	< 0.36	< 0.36	< 0.35	< 0.35	< 0.35	< 0.36	< 0.36	< 0.37	< 0.39	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.36	< 0.42	< 0.35	< 0.38	< 0.37	< 0.35	< 0.42	< 0.34
Naphthalene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.17	< 0.19	< 0.19	< 0.17	< 0.21	< 0.17
Phenanthrene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.17	< 0.19	< 0.19	< 0.17	< 0.21	< 0.17
Phenol	500	< 0.35	< 0.36	< 0.36	< 0.37	< 0.36	< 0.36	< 0.36	< 0.35	< 0.35	< 0.35	< 0.36	< 0.36	< 0.37	< 0.39	< 0.36	< 0.36	< 0.36	< 0.35	< 0.36	< 0.36	< 0.42	< 0.35	< 0.38	< 0.37	< 0.35	< 0.42	< 0.34
Pyrene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.19	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.17	< 0.19	< 0.19	< 0.17	< 0.21	< 0.17
Metals (mg/kg)																												
Aluminum		**990**	**2900**	**1700**	**4800**	**3100**	**1900**	**3000**	**1900**	**2500**	**1900**	**4800**	**3600**	**2000**	**5700**	**3100**	**4500**	**4200**	**2500**	**3500**	**3400**	**4600**	**3100**	**3100**	**4800**	**3100**	**4500**	**2000**
Antimony		< 1.7	< 1.7	< 1.7	< 1.7	< 1.8	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.8	< 1.8	< 1.7	< 1.9	< 1.8	< 1.8	< 1.8	< 1.7	< 1.8	< 1.7	< 1.9	< 1.7	< 1.8	< 1.8	< 1.7	< 2	< 1.7
Arsenic	16	**1.1 J**	< 3.4	< 3.4	**1.8 J**	**0.86 J**	**0.95 J**	**1.2 J**	**1.1 J**	**1.1 J**	**1.1 J**	**1.7 J**	**2.0 J**	< 3.5	< 3.8	< 3.6	< 3.6	< 3.5	< 3.4	< 3.5	< 3.4	**0.98 J**	< 3.3	< 3.6	< 3.6	< 3.3	< 4.1	**3.7**
Barium	400	**4.8**	**10**	**15**	**18**	**27**	**9.0**	**12**	**9.7**	**12**	**8.7**	**16**	**20**	**8.2**	**26**	**18**	**22**	**11**	**6.2**	**9.0**	**16**	**20**	**7.4**	**11**	**27**	**9.7**	**21**	**11**
Beryllium	590	< 0.17	**0.12 J**	**0.083 J**	**0.28**	**0.29**	**0.11 J**	**0.19**	**0.10 J**	**0.14 J**	**0.087 J**	**0.22**	**0.21**	**0.096 J**	**0.34**	**0.21**	**0.23**	**0.15 J**	**0.13 J**	**0.14 J**	**0.20**	**0.26**	**0.17**	**0.14 J**	**0.12 J**	**0.16 J**	**0.25**	**0.12 J**
Cadmium	9.3	**0.19 J**	< 0.34	< 0.34	**0.17 J**	< 0.35	< 0.34	< 0.34	< 0.34	< 0.34	< 0.33	**0.36 J**	< 0.36	< 0.35	< 0.38	< 0.36	< 0.36	**0.29 J**	< 0.34	**0.16 J**	< 0.34	**0.24 J**	< 0.33	< 0.36	**0.57**	< 0.33	< 0.41	< 0.34
Calcium		**1100**	**81**	**860**	**350**	**680**	**260**	**200**	**170**	**310**	**150**	**790**	**200**	**320**	**240**	**170**	**250**	**530**	**180**	**340**	**140**	**1000**	**320**	**90**	**7100**	**790**	**820**	**110**
Chromium	1500	**9.7**	**7.1**	**10**	**56**	**11**	**4.6**	**5.7**	**4.8**	**8.7**	**4.8**	**6.1**	**6.0**	**4.3**	**8.2**	**5.1**	**7.2**	**7.5**	**4.1**	**5.2**	**5.6**	**35**	**5.3**	**4.4**	**20**	**4.5**	**6.5**	**5.5**
Cobalt		**0.36 J**	**1.9**	< 1.7	**2.1**	**0.55 J**	**1.2 J**	**2.2**	**1.2 J**	**1.9**	**1.3 J**	**2.1**	**2.5**	**1.2 J**	**3.3**	**1.9**	**2.1**	**2.2**	**1.8**	**1.8**	**2.3**	**3.5**	**2.1**	**2.4**	**2.0**	**2.2**	**2.4**	**1.5 J**
Copper	270	**4.4**	**4.7 B**	**17**	**8.4**	**8.2**	**3.9**	**5.8**	**3.5**	**6.5**	**3.8**	**5.8**	**6.5**	**5.4**	**7.4**	**4.8**	**5.8**	**7.0**	**3.8**	**4.4**	**5.7**	**13**	**5.3**	**5.7**	**19**	**4.2**	**7.4**	**5.4**
Iron		**4500 D**	**4300 D**	**4100**	**9200**	**8700**	**3000**	**4800**	**3200**	**4500**	**4000 D**	**6600 D**	**7100 D**	**3700**	**7800**	**4900**	**5700**	**5300**	**3700**	**4300**	**5500**	**9700**	**4800**	**4300**	**12000**	**4200**	**5900**	**4000**
Lead	1000	**3.0**	**2.5**	**2.8**	**4.5**	**6.7**	**2.1**	**2.3**	**1.9**	**1.8**	**1.7**	**2.6**	**2.9**	**1.9**	**3.7**	**2.4**	**2.9**	**7.1**	**2.1**	**4.7**	**2.5**	**9.6**	**2.7**	**2.1**	**9.9**	**2.3**	**3.0**	**2.0**
Magnesium		**810**	**660**	**370**	**1200**	**490**	**480**	**760**	**490**	**940**	**580**	**950**	**1000**	**560**	**1500**	**760**	**920**	**840**	**650**	**590**	**910**	**1200**	**470**	**680**	**2000**	**890**	**1000**	**540**
Manganese	10000	**30**	**140**	**61**	**80**	**47**	**97**	**160**	**150**	**99**	**99**	**340**	**190**	**80**	**160**	**140**	**160**	**100**	**110**	**96**	**140**	**430**	**120**	**110**	**150**	**130**	**160**	**110**
Mercury	2.8	< 0.025	< 0.025	< 0.024	< 0.026	< 0.026	< 0.026	**0.027**	< 0.025	< 0.025	< 0.026	< 0.027	< 0.027	< 0.027	< 0.028	< 0.024	< 0.026	< 0.026	< 0.026	**0.012 J**	< 0.026	**0.036**	< 0.024	< 0.027	**0.032**	< 0.026	< 0.031	< 0.024
Nickel	310	**1.5**	**3.1**	**2.6**	**5.3**	**1.8**	**2.4**	**4.0**	**2.4**	**3.1**	**2.4**	**5.2**	**4.9**	**4.1**	**6.8**	**3.7**	**5.3**	**6.0**	**3.3**	**4.5**	**4.6**	**110**	**7.3**	**3.7**	**10**	**4.0**	**4.7**	**2.7**
Potassium		**620**	**760**	**3900**	**1600**	**3000**	**270**	**520**	**290**	**300**	**270**	**620**	**600**	**330**	**980**	**470**	**710**	**2200**	**280**	**250**	**540**	**470**	**170**	**290**	**1700**	**390**	**630**	**320**
Selenium	1500	< 3.5	< 3.4	< 3.4	< 3.4	< 3.5	< 3.4	< 3.4	< 3.4	< 3.4	< 3.3	< 3.6	< 3.6	< 3.5	< 3.8	< 3.6	< 3.6	< 3.5	< 3.4	< 3.5	< 3.4	< 3.9	< 3.3	< 3.6	< 3.6	< 3.3	< 4.1	< 3.4
Silver	1500	< 0.35	< 0.34	< 0.34	< 0.34	< 0.35	< 0.34	< 0.34	< 0.34	< 0.34	< 0.33	< 0.36	< 0.36	< 0.35	< 0.38	< 0.36	< 0.36	< 0.35	< 0.34	< 0.35	< 0.34	< 0.39	< 0.33	< 0.36	< 0.36	< 0.33	< 0.41	< 0.34
Sodium		< 170	< 170	< 170	**50 J**	**140 J**	< 170	< 170	< 170	< 170	< 170	< 180	< 180	< 170	< 190	< 180	< 180	**47 J**	< 170	< 180	< 170	**44 J**	< 170	< 180	**79 J**	< 170	< 200	< 170
Thallium		< 1.7	< 1.7	< 1.7	< 1.7	< 1.8	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.8	< 1.8	< 1.7	< 1.9	< 1.8	< 1.8	< 1.8	< 1.7	< 1.8	< 1.7	< 1.9	< 1.7	< 1.8	< 1.8	< 1.7	< 2	< 1.7
Vanadium		**150**	**5.8**	**15**	**43**	**340**	**4.8**	**7.1**	**5.1**	**7.7**	**5.2**	**7.6**	**9.0**	**6.6**	**11**	**6.8**	**8.2**	**22**	**5.1**	**11**	**8.0**	**14**	**6.6**	**5.9**	**33**	**5.9**	**9.0**	**5.5**
Zinc	10000	**3.6**	**7.4**	**8.5**	**16**	**5.6**	**5.8**	**9.4**	**6.3**	**7.3**	**8.6**	**11**	**12**	**14**	**17**	**9.6**	**15**	**18**	**7.2**	**19**	**15**	**34**	**6.9**	**9.5**	**73**	**11**	**12**	**6.9**
Polychlorinated Biphenyls (PCB) (mg/kg)																												
PCB, Total	1	< 0.083	< 0.083	NA	**0.076**	< 0.083	< 0.082	< 0.081	< 0.081	< 0.08	< 0.083	< 0.084	< 0.082	< 0.081	< 0.09	< 0.078	< 0.088	**0.139**	< 0.082	**0.059**	< 0.081	**0.26**	< 0.077	< 0.088	**0.444**	< 0.081	< 0.095	< 0.076
PCB-1016	1	< 0.083	< 0.083	NA	< 0.086	< 0.083	< 0.082	< 0.081	< 0.081	< 0.08	< 0.083	< 0.084	< 0.082	< 0.081	< 0.09	< 0.078	< 0.088	< 0.08	< 0.082	< 0.085	< 0.081	< 0.093	< 0.077	< 0.088	< 0.082	< 0.081	< 0.095	< 0.076
PCB-1242	1	< 0.083	< 0.083	NA	< 0.086	< 0.083	< 0.082	< 0.081	< 0.081	< 0.08	< 0.083	< 0.084	< 0.082	< 0.081	< 0.09	< 0.078	< 0.088	< 0.08	< 0.082	< 0.085	< 0.081	< 0.093	< 0.077	< 0.088	< 0.082	< 0.081	< 0.095	< 0.076
PCB-1248	1	< 0.083	< 0.083	NA	< 0.086	< 0.083	< 0.082	< 0.081	< 0.081	< 0.08	< 0.083	< 0.084	< 0.082	< 0.081	< 0.09	< 0.078	< 0.088	< 0.08	< 0.082	< 0.085	< 0.081	**0.080 JD**	< 0.077	< 0.088	**0.14 D**	< 0.081	< 0.095	< 0.076
PCB-1254	1	< 0.083	< 0.083	NA	**0.042 JD**	< 0.083	< 0.082	< 0.081	< 0.081	< 0.08	< 0.083	< 0.084	< 0.082	< 0.081	< 0.09	< 0.078	< 0.088	< 0.08	< 0.082	< 0.085	< 0.081	**0.18 D**	< 0.077	< 0.088	**0.26 D**	< 0.081	< 0.095	< 0.076
PCB-1260	1	< 0.083	< 0.083	NA	**0.034 JD**	< 0.083	< 0.082	< 0.081	< 0.081	< 0.08	< 0.083	< 0.084	< 0.082	< 0.081	< 0.09	< 0.078	< 0.088	**0.091 D**	< 0.082	**0.059 JD**	< 0.081	< 0.093	< 0.077	< 0.088	**0.044 JD**	< 0.081	< 0.095	< 0.076
PCB-1268	1	< 0.083	< 0.083	NA	< 0.086	< 0.083	< 0.082	< 0.081	< 0.081	< 0.08	< 0.083	< 0.084	< 0.082	< 0.081	< 0.09	< 0.078	< 0.088	**0.048 JD**	< 0.082	< 0.085	< 0.081	< 0.093	< 0.077	< 0.088	< 0.082	< 0.081	< 0.095	< 0.076
PFAS Compounds (µg/kg)																												
Perfluorodecanoic acid (PFDA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA
Perfluorododecanoic acid (PFDoA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA
Perfluoroheptanoic acid (PFHpA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA
Perfluorohexanoic acid (PFHxA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA
Perfluorononane sulfonic acid (PFNS)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA
Perfluorononanoic acid (PFNA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA
Perfluorooctanesulfonic acid (PFOS)	440	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.089 J**	NA	NA	NA	**0.044 J**	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA
Perfluorooctanoic acid (PFOA)	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	**0.062 J**	NA	NA
Perfluoropentanoic acid (PFPeA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.39	NA	NA	NA	< 0.4	NA	NA	NA	NA	NA	NA	NA	< 0.39	NA	NA
Perfluorotetradecanoic acid (PFTeDA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA
Perfluorotridecanoic acid (PFTrDA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA
Perfluoroundecanoic acid (PFUnA)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	NA

Legend	
<1	Parameter not detected above the laboratory reporting limit
1	Parameter reported at a concentrations greater than Part 375 Commercial SCOs
1	Parameter reported above the laboratory reporting limit but below the applicable regulatory standard/criterion

Notes:
Only compounds detected above the laboratory reporting limits are presented

mg/L = milligrams per liter
µg/L = micrograms per liter
ng/L = nanograms per liter
NA = Not Analyzed
NE = No criteria established
NYSDEC = New York State Department of Environmental Conservation
SCO = Soil Cleanup Objectives
* Soil samples SB-100R and SB-100B were excavated on 6/26/2024

Table 4A
2024 Geoprobe Soil Analytical Results
Lawrence Aviation
Port Jefferson, New York

Location:		SB-174	SB-174	SB-175	SB-175	SB-175	SB-176	SB-176	SB-177	SB-177	SB-178	SB-178	SB-178	SB-179	SB-179	SB-180	SB-180	SB-181	SB-181	SB-182	SB-182	SB-183	SB-183	SB-183	SB-184	SB-184	SB-185	SB-185	SB-186
Date Collected:		03/20/2024	03/20/2024	03/21/2024	03/21/2024	03/21/2024	03/21/2024	03/21/2024	03/21/2024	03/21/2024	03/21/2024	03/21/2024	03/21/2024	03/21/2024	03/21/2024	03/21/2024	03/21/2024	03/21/2024	03/21/2024	03/22/2024	03/22/2024	03/22/2024	03/22/2024	03/22/2024	03/22/2024	03/22/2024	03/22/2024	03/25/2024	03/25/2024
Sample ID:	Part 375 Commercial	SB-174 (5-7)	SB-174 (15-17)	SB-175 (0.5-2.5)	SB-175 (5-7)	SB-175 (15-17)	SB-176 (5-7)	SB-176 (15-17)	SB-177 (5-7)	SB-177 (15-17)	DUP-09	SB-178 (5-7)	SB-178 (15-17)	SB-179 (5-7)	SB-179 (15-17)	SB-180 (5-7)	SB-180 (15-17)	SB-181 (5-7)	SB-181 (15-17)	SB-182 (5-7)	SB-182 (15-17)	DUP-10	SB-183 (5-7)	SB-183 (15-17)	SB-184 (6-8)	SB-184 (13-15)	DUP-11	SB-185 (0.5-2.5)	SB-186 (1-3)
Laboratory Sample ID:		24C2562-15	24C2562-16	24C2562-18	24C2562-19	24C2562-20	24C2563-01	24C2563-02	24C2563-03	24C2563-04	24C2563-13	24C2563-05	24C2563-06	24C2563-07	24C2563-08	24C2563-09	24C2563-10	24C2563-11	24C2563-12	24C2771-01	24C2774-02	24C2774-07	24C2774-03	24C2774-04	24C2774-05	24C2774-06	24C3013-01	24C3013-02	24C3013-03
Volatile Organic Compounds (VOCs) (mg/kg)																													
2-Butanone (MEK)	500	< 0.017	< 0.022	< 1.6	< 0.03	< 0.033	< 0.03	< 0.046	< 0.025	< 0.041	< 0.027	< 0.022	< 0.038	< 0.021	< 0.039	< 0.018	< 0.024	< 0.021	< 0.029	< 0.025	< 0.034	< 0.04	< 0.029	< 0.035	< 0.53	< 0.025	< 0.66	< 0.036	< 0.019
Acetone	500	< 0.042	< 0.055	< 3.9	< 0.076	< 0.082	< 0.076	< 0.11	< 0.063	< 0.1	< 0.067	< 0.056	< 0.094	< 0.054	< 0.098	< 0.045	< 0.061	< 0.052	< 0.074	< 0.061	< 0.084	< 0.1	< 0.073	< 0.087	< 1.3	< 0.062	< 1.7	< 0.091	< 0.048
Benzene	44	< 0.00084	< 0.0011	< 0.079	< 0.0015	< 0.0016	< 0.0015	< 0.0023	< 0.0013	< 0.002	< 0.0013	< 0.0011	< 0.0019	< 0.0011	< 0.002	< 0.0009	< 0.0012	< 0.001	< 0.0015	< 0.0012	< 0.0017	< 0.002	< 0.0015	< 0.0017	< 0.026	< 0.0012	< 0.033	< 0.0018	< 0.00096
cis-1,2-Dichloroethene	500	< 0.00084	< 0.0011	< 0.079	< 0.0015	< 0.0016	< 0.0015	< 0.0023	< 0.0013	< 0.002	< 0.0013	**0.00039 J**	< 0.0019	< 0.0011	< 0.002	< 0.0009	< 0.0012	< 0.001	< 0.0015	< 0.0012	< 0.0017	< 0.002	< 0.0015	< 0.0017	< 0.026	< 0.0012	< 0.033	< 0.0018	< 0.00096
Dichlorodifluoromethane		< 0.0084	< 0.011	< 0.16	< 0.015	< 0.016	< 0.015	< 0.023	< 0.013	< 0.02	< 0.013	< 0.011	< 0.019	< 0.011	< 0.02	< 0.009	< 0.012	< 0.01	< 0.015	< 0.012	< 0.017	< 0.02	< 0.015	< 0.017	< 0.053	< 0.012	< 0.066	< 0.018	< 0.0096
Isopropylbenzene		< 0.00084	< 0.0011	**0.084 D**	< 0.0015	< 0.0016	< 0.0015	< 0.0023	< 0.0013	< 0.002	< 0.0013	< 0.0011	< 0.0019	< 0.0011	< 0.002	< 0.0009	< 0.0012	< 0.001	< 0.0015	< 0.0012	< 0.0017	< 0.002	< 0.0015	< 0.0017	< 0.026	< 0.0012	< 0.033	< 0.0018	< 0.00096
Methyl acetate		< 0.00084	< 0.0011	< 0.79	< 0.0015	< 0.0016	< 0.0015	< 0.0023	< 0.0013	< 0.002	< 0.0013	< 0.0011	< 0.0019	< 0.0011	< 0.002	< 0.0009	< 0.0012	< 0.001	< 0.0015	< 0.0012	< 0.0017	< 0.002	< 0.0015	< 0.0017	< 0.26	< 0.0012	< 0.33	< 0.0018	< 0.00096
Methylcyclohexane		< 0.00084	< 0.0011	**0.99 D**	**0.0021**	< 0.0016	< 0.0015	< 0.0023	< 0.0013	< 0.002	< 0.0013	< 0.0011	< 0.0019	< 0.0011	< 0.002	< 0.0009	< 0.0012	< 0.001	< 0.0015	< 0.0012	< 0.0017	< 0.002	< 0.0015	< 0.0017	< 0.026	< 0.0012	**0.022 J**	**0.0010 J**	< 0.00096
Methylene chloride	500	< 0.0084	< 0.011	< 0.39	< 0.015	< 0.016	< 0.015	< 0.023	< 0.013	< 0.02	< 0.013	< 0.011	< 0.019	< 0.011	< 0.02	< 0.009	< 0.012	< 0.01	< 0.015	< 0.012	< 0.017	< 0.02	< 0.015	< 0.017	< 0.13	< 0.012	< 0.17	< 0.018	< 0.0096
Tetrachloroethene	150	< 0.00084	< 0.0011	< 0.079	< 0.0015	< 0.0016	< 0.0015	< 0.0023	< 0.0013	< 0.002	< 0.0013	< 0.0011	< 0.0019	< 0.0011	< 0.002	< 0.0009	< 0.0012	< 0.001	< 0.0015	< 0.0012	< 0.0017	< 0.002	< 0.0015	< 0.0017	**0.025 J**	< 0.0012	< 0.033	< 0.0018	< 0.00096
Toluene	500	< 0.00084	< 0.0011	< 0.079	< 0.0015	< 0.0016	< 0.0015	< 0.0023	< 0.0013	< 0.002	< 0.0013	< 0.0011	< 0.0019	< 0.0011	< 0.002	< 0.0009	< 0.0012	< 0.001	< 0.0015	< 0.0012	< 0.0017	< 0.002	< 0.0015	< 0.0017	< 0.026	< 0.0012	< 0.033	< 0.0018	< 0.00096
Trichloroethene	200	< 0.00084	< 0.0011	< 0.079	< 0.0015	< 0.0016	< 0.0015	< 0.0023	< 0.0013	< 0.002	**0.0028**	**0.0026**	< 0.0019	< 0.0011	< 0.002	< 0.0009	< 0.0012	< 0.001	< 0.0015	< 0.0012	< 0.0017	< 0.002	**0.0013 J**	**0.0037**	< 0.026	< 0.0012	< 0.033	< 0.0018	< 0.00096
Trichlorofluoromethane		< 0.0042	< 0.0055	< 0.16	< 0.0076	< 0.0082	< 0.0076	< 0.011	< 0.0063	< 0.01	< 0.0067	< 0.0056	< 0.0094	< 0.0054	< 0.0098	< 0.0045	< 0.0061	< 0.0052	< 0.0074	< 0.0061	< 0.0084	< 0.01	< 0.0073	< 0.0087	< 0.053	< 0.0062	< 0.066	< 0.0091	< 0.0048
Semivolatile Organic Compounds (SVOC) (mg/kg)																													
1,1'-Biphenyl		< 0.7	< 0.69	**0.20 J**	< 0.74	**0.072 J**	< 0.7	< 0.81	**0.065 J**	**0.072 J**	< 0.71	< 0.69	< 0.7	< 0.7	< 0.69	< 0.73	< 0.71	< 0.71	< 0.7	< 0.69	< 0.69	< 0.71	< 0.7	< 0.71	< 0.72	< 0.71	< 0.75	< 0.8	**0.54 J**
2-Methylnaphthalene		< 0.18	< 0.18	**1.8**	< 0.19	**0.58**	< 0.18	< 0.2	**0.48**	**0.53**	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.2	**4.3**
Acenaphthene	500	< 0.18	< 0.18	**0.14 J**	< 0.19	**0.044 J**	< 0.18	< 0.2	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.2	< 0.19
Anthracene	500	< 0.18	< 0.18	< 0.19	< 0.19	< 0.18	< 0.18	< 0.2	< 0.17	**0.57**	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.2	< 0.19
Benzo(a)anthracene	5.6	< 0.18	< 0.18	< 0.19	< 0.19	< 0.18	< 0.18	< 0.2	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.2	< 0.19
Benzo(a)pyrene	1	< 0.18	< 0.18	< 0.19	< 0.19	< 0.18	< 0.18	< 0.2	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.2	< 0.19
Benzo(b)fluoranthene	5.6	< 0.18	< 0.18	< 0.19	< 0.19	< 0.18	< 0.18	< 0.2	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.2	< 0.19
Bis(2-ethylhexyl)phthalate		< 0.35	< 0.35	< 0.37	< 0.37	< 0.37	**0.057 J**	< 0.41	**0.13 J**	< 0.36	< 0.36	< 0.35	< 0.36	< 0.35	**0.17 J**	< 0.37	< 0.36	< 0.36	< 0.35	**0.080 J**	< 0.35	< 0.36	< 0.35	< 0.36	< 0.37	< 0.36	< 0.38	< 0.41	< 0.38
Butylbenzyl phthalate		< 0.35	< 0.35	< 0.37	< 0.37	< 0.37	< 0.36	< 0.41	< 0.35	< 0.36	< 0.36	< 0.35	< 0.36	< 0.35	< 0.35	< 0.37	< 0.36	< 0.36	< 0.35	< 0.35	< 0.35	< 0.36	< 0.35	< 0.36	< 0.37	< 0.36	< 0.38	< 0.41	< 0.38
Chrysene	56	< 0.18	< 0.18	< 0.19	< 0.19	< 0.18	< 0.18	< 0.2	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.2	< 0.19
Dibenzofuran	350	< 0.35	< 0.35	< 0.37	< 0.37	< 0.37	< 0.36	< 0.41	**0.039 J**	**0.044 J**	< 0.36	< 0.35	< 0.36	< 0.35	< 0.35	< 0.37	< 0.36	< 0.36	< 0.35	< 0.35	< 0.35	< 0.36	< 0.35	< 0.36	< 0.37	< 0.36	< 0.38	< 0.41	< 0.38
Dimethyl phthalate		< 0.35	< 0.35	< 0.37	< 0.37	< 0.37	< 0.36	< 0.41	< 0.35	< 0.36	< 0.36	< 0.35	< 0.36	< 0.35	< 0.35	< 0.37	< 0.36	< 0.36	< 0.35	< 0.35	< 0.35	< 0.36	< 0.35	< 0.36	< 0.37	< 0.36	< 0.38	< 0.41	< 0.38
Fluoranthene	500	< 0.18	< 0.18	< 0.19	< 0.19	< 0.18	< 0.18	< 0.2	**0.043 J**	**0.045 J**	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.2	< 0.19
Fluorene	50	< 0.18	< 0.18	**0.35**	< 0.19	**0.11 J**	< 0.18	< 0.2	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.2	< 0.19
Hexachlorobenzene	6	< 0.35	< 0.35	< 0.37	< 0.37	< 0.37	< 0.36	< 0.41	< 0.35	< 0.36	< 0.36	< 0.35	< 0.36	< 0.35	< 0.35	< 0.37	< 0.36	< 0.36	< 0.35	< 0.35	< 0.35	< 0.36	< 0.35	< 0.36	< 0.37	< 0.36	< 0.38	< 0.41	< 0.38
Naphthalene	500	< 0.18	< 0.18	**0.073 J**	< 0.19	< 0.18	< 0.18	< 0.2	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.2	< 0.19
Phenanthrene	500	< 0.18	< 0.18	**0.71**	< 0.19	**0.21**	< 0.18	< 0.2	**0.61**	**0.69**	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.2	**1.7**
Phenol	500	< 0.35	< 0.35	< 0.37	< 0.37	< 0.37	< 0.36	< 0.41	< 0.35	< 0.36	< 0.36	< 0.35	< 0.36	< 0.35	**3.1**	< 0.37	< 0.36	< 0.36	**1.8**	**23 D**	**1.1**	< 0.36	< 0.35	< 0.36	< 0.37	< 0.36	< 0.38	< 0.41	< 0.38
Pyrene	500	< 0.18	< 0.18	**0.12 J**	< 0.19	< 0.18	< 0.18	< 0.2	**0.10 J**	**0.11 J**	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.19	< 0.2	**0.31**
Metals (mg/kg)																													
Aluminum		**3700**	**2500**	**6400**	**7900**	**6500**	**2800**	**2700**	**2500**	**2800**	**3000**	**2700**	**2000**	**3000**	**3300**	**5100**	**3000**	**3200**	**2800**	**2800**	**2200**	**2500**	**3000**	**2400**	**3700**	**1900**	**1800**	**7500**	**6100**
Antimony		< 1.7	< 1.7	< 1.9	< 1.9	< 1.8	< 1.7	< 2	< 1.7	< 1.8	< 1.8	< 1.7	< 1.7	< 1.7	< 1.7	< 1.8	< 1.8	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.8	< 1.7	< 1.8	< 1.9	< 1.8
Arsenic	16	< 3.4	< 3.4	< 3.7	< 3.7	**1.9 J**	**0.87 J**	**1.0 J**	**0.80 J**	**1.6 J**	**1.1 J**	**1.6 J**	**0.90 J**	**1.0 J**	**1.4 J**	**1.1 J**	**1.4 J**	**1.2 J**	**1.0 J**	**0.93 J**	**0.95 J**	**1.1 J**	**0.60 J**	**1.1 J**	**0.55 J**	**0.61 J**	**1.8 J**	**1.2 J**
Barium	400	**17**	**12**	**14**	**20**	**17**	**10**	**7.4**	**9.9**	**9.4**	**10**	**7.2**	**8.7**	**10**	**13**	**15**	**16**	**12**	**11**	**9.4**	**12**	**16**	**13**	**12**	**12**	**8.2**	**4.7**	**14**	**13**
Beryllium	590	**0.25**	**0.14 J**	**0.23**	**0.27**	**0.20**	**0.11 J**	**0.087 J**	**0.11 J**	**0.14 J**	**0.097 J**	**0.12 J**	**0.081 J**	**0.11 J**	**0.13 J**	**0.20**	**0.12 J**	**0.13 J**	**0.11 J**	**0.12 J**	**0.14 J**	**0.14 J**	**0.17 J**	**0.13 J**	**0.18**	**0.11 J**	**0.098 J**	**0.29**	**0.24**
Cadmium	9.3	< 0.34	< 0.34	< 0.37	< 0.37	< 0.36	< 0.35	< 0.39	< 0.34	< 0.36	**0.16 J**	< 0.34	< 0.34	< 0.34	< 0.34	< 0.36	< 0.35	< 0.35	< 0.34	< 0.34	< 0.33	< 0.35	< 0.34	< 0.34	< 0.35	< 0.34	< 0.36	< 0.38	< 0.37
Calcium		**88**	**3600**	**420**	**1800**	**9400**	**5400**	**380**	**6700**	**4900**	**3800**	**280**	**190**	**290**	**9100**	**170**	**110**	**210**	**3500**	**5300**	**410**	**1600**	**620**	**4900**	**6000**	**660**	**360**	**390**	**280**
Chromium	1500	**5.9**	**9.1**	**6.9**	**8.8**	**12**	**16**	**4.5**	**7.7**	**8.1**	**6.0**	**4.8**	**3.4**	**4.1**	**21**	**6.6**	**6.4**	**5.2**	**8.5**	**6.7**	**4.3**	**5.8**	**5.5**	**14**	**5.8**	**3.9**	**4.0**	**9.2**	**7.2**
Cobalt		**2.2**	**1.4 J**	**1.8 J**	**2.1**	**2.0**	**1.5 J**	**1.4 J**	**1.2 J**	**1.4 J**	**1.7 J**	**1.5 J**	**1.5 J**	**1.9**	**1.7 J**	**3.1**	**1.9**	**2.5**	**1.4 J**	**1.5 J**	**1.7**	**1.6 J**	**2.0**	**1.5 J**	**1.9**	**1.3 J**	**0.94 J**	**3.2**	**2.3**
Copper	270	**5.5**	**4.0**	**3.9**	**5.3**	**5.8**	**6.1**	**3.2 B**	**3.6 B**	**4.6 B**	**4.6 B**	**5.3**	**3.2 B**	**3.7 B**	**8.2**	**5.9**	**4.4 B**	**4.2 B**	**5.3**	**3.4**	**4.8**	**4.1**	**6.7**	**4.4**	**5.3**	**3.5**	**4.3**	**4.9**	**4.3**
Iron		**5300**	**3700**	**6000**	**7600**	**6300**	**3600**	**3300**	**3300**	**4200**	**3700**	**3600**	**3100**	**3900**	**4600**	**5900**	**4000**	**4800**	**3900**	**3500**	**3600**	**4000**	**4400**	**3700**	**4300**	**3000**	**3100 D**	**8400 D**	**6300 D**
Lead	1000	**2.4**	**2.2**	**6.2**	**7.0**	**3.8**	**2.6**	**1.9**	**1.8**	**2.3**	**4.8**	**4.6**	**1.6**	**2.2**	**2.7**	**4.0**	**3.7**	**2.8**	**2.3**	**3.6**	**2.8**	**2.2**	**4.3**	**2.6**	**23**	**3.6**	**3.1**	**12**	**6.1**
Magnesium		**820**	**630**	**710**	**1000**	**2000**	**660**	**510**	**630**	**640**	**910**	**460**	**580**	**720**	**780**	**1100**	**770**	**940**	**610**	**650**	**660**	**760**	**740**	**1100**	**1500**	**570**	**400**	**1000**	**790**
Manganese	10000	**150**	**100**	**56**	**160**	**93**	**93**	**80**	**92**	**99**	**93**	**100**	**87**	**100**	**98**	**140**	**140**	**160**	**92**	**78**	**110**	**130**	**140**	**110**	**100**	**88**	**54**	**110**	**49**
Mercury	2.8	< 0.023	< 0.025	**0.019 J**	**0.019 J**	**0.014 J**	< 0.024	< 0.03	< 0.025	< 0.026	< 0.026	< 0.024	< 0.026	< 0.026	< 0.025	< 0.024	< 0.024	< 0.025	< 0.025	< 0.025	< 0.022	< 0.025	< 0.025	< 0.025	**0.093**	< 0.024	< 0.027	< 0.028	< 0.027
Nickel	310	**4.1**	**3.2**	**4.2**	**4.9**	**4.5**	**3.5**	**2.8**	**2.6**	**3.0**	**3.5**	**3.0**	**2.5**	**3.4**	**4.6**	**5.6**	**3.8**	**4.5**	**3.1**	**3.2**	**3.0**	**3.3**	**3.6**	**3.2**	**3.9**	**2.5**	**2.1**	**5.4**	**4.5**
Potassium		**490**	**330**	**230**	**310**	**290**	**280**	**200**	**390**	**310**	**320**	**270**	**360**	**320**	**420**	**470**	**440**	**470**	**320**	**240**	**320**	**410**	**430**	**340**	**330**	**300**	**180**	**320**	**260**
Selenium	1500	< 3.4	< 3.4	< 3.7	< 3.7	< 3.6	< 3.5	< 3.9	< 3.4	< 3.6	< 3.6	< 3.4	< 3.4	< 3.4	< 3.4	< 3.6	< 3.5	< 3.5	< 3.4	< 3.4	**1.2 J**	**1.3 J**	**1.3 J**	< 3.4	**1.1 J**	**0.99 J**	< 3.6	< 3.8	< 3.7
Silver	1500	< 0.34	< 0.34	< 0.37	< 0.37	< 0.36	< 0.35	< 0.39	< 0.34	< 0.36	< 0.36	< 0.34	< 0.34	< 0.34	< 0.34	< 0.36	< 0.35	< 0.35	< 0.34	< 0.34	< 0.33	< 0.35	< 0.34	< 0.34	< 0.35	< 0.34	< 0.36	< 0.38	< 0.37
Sodium		< 170	**54 J**	< 190	< 190	< 180	**44 J**	< 200	**92 J**	< 180	< 180	< 170	< 170	< 170	**97 J**	< 180	< 180	**68 J**	< 170	< 170	< 170	< 170	< 170	< 170	< 180	< 170	< 180	< 190	< 180
Thallium		< 1.7	< 1.7	< 1.9	< 1.9	< 1.8	< 1.7	< 2	< 1.7	< 1.8	< 1.8	< 1.7	< 1.7	< 1.7	< 1.7	< 1.8	< 1.8	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.8	< 1.7	< 1.8	< 1.9	< 1.8
Vanadium		**7.8**	**5.2**	**11**	**13**	**10**	**5.5**	**4.5**	**4.9**	**5.7**	**5.7**	**5.6**	**4.4**	**5.4**	**6.0**	**8.6**	**5.9**	**6.6**	**5.3**	**5.9**	**7.2**	**6.2**	**7.5**	**5.8**	**8.1**	**4.8**	**5.8**	**14**	**11**
Zinc	10000	**9.9**	**7.0**	**20**	**19**	**21**	**9.8**	**5.4**	**6.3**	**8.8**	**14**	**17**	**9.2**	**8.0**	**14**	**17**	**11**	**9.5**	**9.1**	**11**	**7.0**	**7.5**	**9.9**	**7.3**	**16**	**5.9**	**7.7**	**15**	**22**
Polychlorinated Biphenyls (PCB) (mg/kg)																													
PCB, Total	1	< 0.078	< 0.084	**0.051**	< 0.083	**0.02**	**0.068**	< 0.091	**0.127**	**0.127**	**0.26**	**0.065**	< 0.08	< 0.078	**0.296**	< 0.086	< 0.082	< 0.078	**0.024**	< 0.084	< 0.077	< 0.078	NA	< 0.082	**0.094**	< 0.08	**0.15**	**0.16**	**0.26**
PCB-1016	1	< 0.078	< 0.084	< 0.089	< 0.083	< 0.083	< 0.08	< 0.091	< 0.079	< 0.079	< 0.086	< 0.079	< 0.08	< 0.078	< 0.078	< 0.086	< 0.082	< 0.078	< 0.082	< 0.084	< 0.077	< 0.078	NA	< 0.082	< 0.086	< 0.08	< 0.086	< 0.094	< 0.089
PCB-1242	1	< 0.078	< 0.084	< 0.089	< 0.083	< 0.083	< 0.08	< 0.091	< 0.079	< 0.079	< 0.086	< 0.079	< 0.08	< 0.078	< 0.078	< 0.086	< 0.082	< 0.078	< 0.082	< 0.084	< 0.077	< 0.078	NA	< 0.082	< 0.086	< 0.08	< 0.086	< 0.094	< 0.089
PCB-1248	1	< 0.078	< 0.084	< 0.089	< 0.083	< 0.083	< 0.08	< 0.091	< 0.079	< 0.079	< 0.086	< 0.079	< 0.08	< 0.078	**0.047 JD**	< 0.086	< 0.082	< 0.078	< 0.082	< 0.084	< 0.077	< 0.078	NA	< 0.082	< 0.086	< 0.08	< 0.086	< 0.094	< 0.089
PCB-1254	1	< 0.078	< 0.084	< 0.089	< 0.083	< 0.083	< 0.08	< 0.091	**0.097 D**	**0.093 D**	< 0.086	< 0.079	< 0.08	< 0.078	**0.20 D**	< 0.086	< 0.082	< 0.078	**0.024 JD**	< 0.084	< 0.077	< 0.078	NA	< 0.082	< 0.086	< 0.08	< 0.086	< 0.094	< 0.089
PCB-1260	1	< 0.078	< 0.084	**0.051 JD**	< 0.083	**0.020 JD**	**0.068 JD**	< 0.091	**0.030 JD**	**0.034 JD**	**0.26 D**	**0.065 JD**	< 0.08	< 0.078	**0.049 JD**	< 0.086	< 0.082	< 0.078	< 0.082	< 0.084	< 0.077	< 0.078	NA	< 0.082	**0.063 JD**	< 0.08	**0.15 D**	**0.16 D**	**0.26 D**
PCB-1268	1	< 0.078	< 0.084	< 0.089	< 0.083	< 0.083	< 0.08	< 0.091	< 0.079	< 0.079	< 0.086	< 0.079	< 0.08	< 0.078	< 0.078	< 0.086	< 0.082	< 0.078	< 0.082	< 0.084	< 0.077	< 0.078	NA	< 0.082	**0.031 JD**	< 0.08	< 0.086	< 0.094	< 0.089
PFAS Compounds (µg/kg)																													
Perfluorodecanoic acid (PFDA)		NA	NA	NA	**0.026 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorododecanoic acid (PFDoA)		NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoroheptanoic acid (PFHpA)		NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorohexanoic acid (PFHxA)		NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorononane sulfonic acid (PFNS)		NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorononanoic acid (PFNA)		NA	NA	NA	**0.027 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorooctanesulfonic acid (PFOS)	440	NA	NA	NA	**0.075 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorooctanoic acid (PFOA)	500	NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoropentanoic acid (PFPeA)		NA	NA	NA	< 0.39	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.39	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorotetradecanoic acid (PFTeDA)		NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorotridecanoic acid (PFTrDA)		NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoroundecanoic acid (PFUnA)		NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA

Legend	
<1	Parameter not detected above the laboratory reporting limit
1	Parameter reported at a concentrations greater than Part 375 Commercial SCOs
1	Parameter reported above the laboratory reporting limit but below the applicable regulatory standard/criterion

Notes:
Only compounds detected above the laboratory reporting limits are presented

mg/L = milligrams per liter
µg/L = micrograms per liter
ng/L = nanograms per liter
NA = Not Analyzed
NE = No criteria established
NYSDEC = New York State Department of Environmental Conservation
SCO = Soil Cleanup Objectives
* Soil samples SB-100R and SB-100B were excavated on 6/26/2024

Table 4A
2024 Geoprobe Soil Analytical Results
Lawrence Aviation
Port Jefferson, New York

Location:		SB-187	SB-187	SB-188	SB-188	SB-189	SB-189	SB-190	SB-190	SB-191	SB-191	SB-192	SB-192	SB-193	SB-193	SB-194	SB-194	SB-194	SB-195	SB-195	SB-196	SB-196	SB-197	SB-197	SB-198	SB-198	SB-199	SB-199
Date Collected:		03/25/2024	03/25/2024	03/25/2024	03/25/2024	03/25/2024	03/25/2024	03/26/2024	03/26/2024	03/26/2024	03/26/2024	03/26/2024	03/26/2024	03/26/2024	03/26/2024	03/26/2024	03/26/2024	03/26/2024	03/26/2024	03/26/2024	03/27/2024	03/27/2024	03/27/2024	03/27/2024	03/27/2024	03/27/2024	03/27/2024	03/27/2024
Sample ID:	Part 375 Commercial	SB-187 (15-17)	SB-187 (25-27)	SB-188 (15-17)	SB-188 (25-27)	SB-189 (15-17)	SB-189 (25-27)	SB-190 (15-17)	SB-190 (25-27)	SB-191 (15-17)	SB-191 (25-27)	SB-192(15-17)	SB-192 (25-27)	SB-193 (1-3)	SB-193 (11-13)	DUP-12	SB-194 (9-11)	SB-194 (18-20)	SB-195 (9-11)	SB-195 (18-20)	SB-196 (9-11)	SB-196 (18-20)	SB-197 (0-2)	SB-197 (3-5)	SB-198 (0-2)	SB-198 (3-5)	SB-199 (0-2)	SB-199 (3-5)
Laboratory Sample ID:		24C3013-04	24C3013-05	24C3013-06	24C3013-07	24C3013-08	24C3013-09	24C3013-10	24C3013-11	24C3013-12	24C3013-13	24C3013-14	24C3013-15	24C3013-16	24C3013-17	24C3013-20	24C3013-18	24C3013-19	24C3013-21	24C3013-22	24C3443-01	24C3443-02	24C3443-03	24C3443-04	24C3443-05	24C3443-06	24C3443-07	24C3443-08
Volatile Organic Compounds (VOCs) (mg/kg)																												
2-Butanone (MEK)	500	< 0.021	< 0.025	< 0.022	< 0.023	< 0.025	< 0.024	< 0.017	< 0.022	< 0.023	< 0.019	< 0.019	< 0.019	< 0.0018	< 0.037	< 0.023	< 0.023	< 0.021	< 0.021	< 0.018	< 0.018	< 0.021	< 0.03	< 0.02	< 0.03	< 0.019	< 0.021	< 0.029
Acetone	500	< 0.053	< 0.062	< 0.055	< 0.058	< 0.062	< 0.059	< 0.044	< 0.055	< 0.057	< 0.047	< 0.047	< 0.048	< 0.0046	< 0.092	< 0.058	< 0.057	< 0.052	< 0.053	< 0.045	< 0.046	< 0.054	< 0.074	**0.043 J**	< 0.074	**0.029 J**	< 0.053	**0.050 J**
Benzene	44	< 0.0011	< 0.0012	< 0.0011	< 0.0012	< 0.0012	< 0.0012	< 0.00087	< 0.0011	< 0.0011	< 0.00095	< 0.00094	< 0.00096	< 0.000092	< 0.0018	< 0.0012	< 0.0011	< 0.001	< 0.0011	< 0.00091	< 0.00092	< 0.0011	< 0.0015	< 0.001	< 0.0015	< 0.00095	< 0.0011	< 0.0014
cis-1,2-Dichloroethene	500	< 0.0011	< 0.0012	< 0.0011	< 0.0012	< 0.0012	< 0.0012	< 0.00087	< 0.0011	< 0.0011	< 0.00095	< 0.00094	< 0.00096	< 0.000092	< 0.0018	< 0.0012	< 0.0011	< 0.001	< 0.0011	< 0.00091	< 0.00092	< 0.0011	< 0.0015	< 0.001	< 0.0015	< 0.00095	< 0.0011	< 0.0014
Dichlorodifluoromethane		< 0.011	< 0.012	< 0.011	< 0.012	< 0.012	< 0.012	< 0.0087	< 0.011	< 0.011	< 0.0095	< 0.0094	< 0.0096	**0.000092 J**	< 0.018	< 0.012	< 0.011	< 0.01	< 0.011	< 0.0091	< 0.0092	< 0.011	< 0.015	< 0.01	< 0.015	< 0.0095	< 0.011	< 0.014
Isopropylbenzene		< 0.0011	< 0.0012	< 0.0011	< 0.0012	< 0.0012	< 0.0012	< 0.00087	< 0.0011	< 0.0011	< 0.00095	< 0.00094	< 0.00096	< 0.000092	< 0.0018	< 0.0012	< 0.0011	< 0.001	< 0.0011	< 0.00091	< 0.00092	< 0.0011	< 0.0015	< 0.001	< 0.0015	< 0.00095	< 0.0011	< 0.0014
Methyl acetate		< 0.0011	< 0.0012	< 0.0011	< 0.0012	< 0.0012	< 0.0012	< 0.00087	< 0.0011	< 0.0011	< 0.00095	< 0.00094	< 0.00096	**0.00010**	< 0.0018	< 0.0012	< 0.0011	< 0.001	< 0.0011	< 0.00091	< 0.00092	< 0.0011	< 0.0015	< 0.001	< 0.0015	< 0.00095	< 0.0011	< 0.0014
Methylcyclohexane		< 0.0011	< 0.0012	< 0.0011	< 0.0012	< 0.0012	< 0.0012	< 0.00087	< 0.0011	< 0.0011	< 0.00095	< 0.00094	< 0.00096	< 0.000092	< 0.0018	< 0.0012	< 0.0011	< 0.001	< 0.0011	< 0.00091	< 0.00092	< 0.0011	< 0.0015	< 0.001	< 0.0015	< 0.00095	< 0.0011	< 0.0014
Methylene chloride	500	< 0.011	< 0.012	< 0.011	< 0.012	< 0.012	< 0.012	< 0.0087	< 0.011	< 0.011	< 0.0095	< 0.0094	< 0.0096	< 0.00092	< 0.018	< 0.012	< 0.011	< 0.01	< 0.011	< 0.0091	< 0.0092	< 0.011	< 0.015	< 0.01	< 0.015	< 0.0095	< 0.011	< 0.014
Tetrachloroethene	150	< 0.0011	< 0.0012	< 0.0011	< 0.0012	< 0.0012	< 0.0012	**0.00085 J**	< 0.0011	< 0.0011	< 0.00095	< 0.00094	< 0.00096	**0.000071 J**	< 0.0018	< 0.0012	< 0.0011	< 0.001	< 0.0011	< 0.00091	< 0.00092	< 0.0011	< 0.0015	< 0.001	< 0.0015	< 0.00095	< 0.0011	< 0.0014
Toluene	500	< 0.0011	< 0.0012	< 0.0011	< 0.0012	< 0.0012	< 0.0012	< 0.00087	< 0.0011	< 0.0011	< 0.00095	< 0.00094	< 0.00096	< 0.000092	< 0.0018	< 0.0012	< 0.0011	< 0.001	< 0.0011	< 0.00091	< 0.00092	< 0.0011	< 0.0015	< 0.001	< 0.0015	< 0.00095	< 0.0011	< 0.0014
Trichloroethene	200	< 0.0011	< 0.0012	< 0.0011	< 0.0012	< 0.0012	< 0.0012	< 0.00087	< 0.0011	< 0.0011	< 0.00095	< 0.00094	< 0.00096	< 0.000092	< 0.0018	< 0.0012	< 0.0011	< 0.001	< 0.0011	< 0.00091	< 0.00092	< 0.0011	< 0.0015	< 0.001	< 0.0015	< 0.00095	< 0.0011	< 0.0014
Trichlorofluoromethane		< 0.0053	< 0.0062	< 0.0055	< 0.0058	< 0.0062	< 0.0059	< 0.0044	< 0.0055	< 0.0057	< 0.0047	< 0.0047	< 0.0048	< 0.00046	< 0.0092	< 0.0058	< 0.0057	< 0.0052	< 0.0053	< 0.0045	< 0.0046	< 0.0054	< 0.0074	< 0.0051	< 0.0074	< 0.0048	< 0.0053	< 0.0072
Semivolatile Organic Compounds (SVOC) (mg/kg)																												
1,1'-Biphenyl		< 0.71	< 0.69	< 0.7	< 0.7	< 0.68	< 0.7	< 0.73	< 0.69	< 0.8	< 0.69	< 0.72	< 0.7	< 0.72	< 0.7	< 0.7	< 0.69	< 0.7	< 0.71	< 0.72	< 0.72	< 0.71	< 0.8	< 0.7	< 0.73	< 0.76	< 0.75	< 0.82
2-Methylnaphthalene		< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.17	< 0.2	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.19	< 0.19	< 0.21
Acenaphthene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.17	< 0.2	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.19	< 0.19	< 0.21
Anthracene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.17	< 0.2	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.19	< 0.19	< 0.21
Benzo(a)anthracene	5.6	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.17	< 0.2	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.19	< 0.19	< 0.21
Benzo(a)pyrene	1	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.17	< 0.2	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.19	< 0.19	< 0.21
Benzo(b)fluoranthene	5.6	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.17	< 0.2	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.19	< 0.19	< 0.21
Bis(2-ethylhexyl)phthalate		< 0.36	< 0.35	< 0.36	< 0.36	< 0.35	< 0.36	< 0.37	< 0.35	< 0.4	< 0.35	< 0.37	< 0.36	< 0.37	< 0.35	< 0.35	< 0.35	< 0.35	< 0.36	< 0.36	< 0.37	< 0.36	< 0.41	< 0.36	< 0.37	< 0.39	**0.064 J**	< 0.41
Butylbenzyl phthalate		< 0.36	< 0.35	< 0.36	< 0.36	< 0.35	< 0.36	< 0.37	< 0.35	< 0.4	< 0.35	< 0.37	< 0.36	< 0.37	< 0.35	< 0.35	< 0.35	< 0.35	< 0.36	< 0.36	< 0.37	< 0.36	< 0.41	< 0.36	< 0.37	< 0.39	< 0.38	< 0.41
Chrysene	56	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.17	< 0.2	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.19	< 0.19	< 0.21
Dibenzofuran	350	< 0.36	< 0.35	< 0.36	< 0.36	< 0.35	< 0.36	< 0.37	< 0.35	< 0.4	< 0.35	< 0.37	< 0.36	< 0.37	< 0.35	< 0.35	< 0.35	< 0.35	< 0.36	< 0.36	< 0.37	< 0.36	< 0.41	< 0.36	< 0.37	< 0.39	< 0.38	< 0.41
Dimethyl phthalate		< 0.36	< 0.35	< 0.36	< 0.36	< 0.35	< 0.36	< 0.37	< 0.35	< 0.4	< 0.35	< 0.37	< 0.36	< 0.37	< 0.35	< 0.35	< 0.35	< 0.35	< 0.36	< 0.36	< 0.37	< 0.36	< 0.41	< 0.36	< 0.37	< 0.39	**0.054 J**	**0.071 J**
Fluoranthene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.17	< 0.2	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.19	< 0.19	< 0.21
Fluorene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.17	< 0.2	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.19	< 0.19	< 0.21
Hexachlorobenzene	6	< 0.36	< 0.35	< 0.36	< 0.36	< 0.35	< 0.36	< 0.37	< 0.35	< 0.4	< 0.35	< 0.37	< 0.36	< 0.37	< 0.35	< 0.35	< 0.35	< 0.35	< 0.36	< 0.36	< 0.37	< 0.36	< 0.41	< 0.36	< 0.37	< 0.39	< 0.38	< 0.41
Naphthalene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.17	< 0.2	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.19	< 0.19	< 0.21
Phenanthrene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.17	< 0.2	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.19	< 0.19	< 0.21
Phenol	500	< 0.36	< 0.35	< 0.36	< 0.36	< 0.35	< 0.36	< 0.37	< 0.35	< 0.4	< 0.35	< 0.37	< 0.36	< 0.37	< 0.35	< 0.35	< 0.35	< 0.35	< 0.36	< 0.36	< 0.37	< 0.36	< 0.41	< 0.36	< 0.37	< 0.39	< 0.38	< 0.41
Pyrene	500	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.17	< 0.2	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.17	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	< 0.2	< 0.18	< 0.18	< 0.19	< 0.19	< 0.21
Metals (mg/kg)																												
Aluminum		**2600**	**3700**	**1600**	**3400**	**3600**	**3100**	**3600**	**3400**	**3300**	**1700**	**3200**	**3100**	**5600**	**2400**	**1500**	**2300**	**2000**	**2200**	**2700**	**2500**	**2300**	**4000**	**1800**	**3600**	**5100**	**4000**	**5600**
Antimony		< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.8	< 1.7	< 1.7	< 1.9	< 1.8	< 1.7	< 1.7	< 1.8	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 2	< 1.7	< 1.8	< 1.9	< 1.8	< 2
Arsenic	16	**0.98 J**	**1.0 J**	**0.61 J**	**1.0 J**	**2.9 J**	**1.3 J**	< 3.5	< 3.4	< 3.9	< 3.5	**6.2 D**	< 3.5	< 3.5	< 3.5	< 3.5	< 3.4	< 3.4	< 3.4	< 3.5	< 3.5	< 3.4	< 3.5	< 3.9	< 3.4	< 3.5	< 3.7	**6.2 D**	**8.4 D**
Barium	400	**13**	**13**	**10**	**15**	**15**	**11**	**14**	**14**	**16**	**10**	**16**	**16**	**15**	**13**	**5.6**	**7.1**	**13**	**14**	**15**	**9.1**	**12**	**13**	**6.5**	**9.4**	**17**	**22**	**18**
Beryllium	590	**0.17 J**	**0.18**	**0.15 J**	**0.21**	**0.20**	**0.17 J**	**0.15 J**	**0.15 J**	**0.16 J**	**0.085 J**	**0.17 J**	**0.18**	**0.22**	**0.13 J**	**0.065 J**	**0.089 J**	**0.12 J**	**0.095 J**	**0.14 J**	**0.10 J**	**0.11 J**	**0.15 J**	**0.074 J**	**0.14 J**	**0.19**	< 0.18	< 0.2
Cadmium	9.3	< 0.34	< 0.34	< 0.34	< 0.35	< 0.33	< 0.35	< 0.35	< 0.34	< 0.39	< 0.35	< 0.35	< 0.34	< 0.35	< 0.35	< 0.35	< 0.34	< 0.34	< 0.34	< 0.35	< 0.35	< 0.34	**0.28 J**	< 0.34	< 0.35	< 0.37	**1.5**	**2.1**
Calcium		**1000**	**470**	**140**	**110**	**140**	**210**	**8500**	**1400**	**100**	**250**	**130**	**77**	**190**	**64**	**74**	**130**	**150**	**120**	**130**	**530**	**130**	**1300**	**180**	**170**	**230**	**5500**	**7400**
Chromium	1500	**5.3**	**7.3**	**3.8**	**5.4**	**8.8**	**12**	**13**	**13**	**5.1**	**5.5**	**4.9**	**5.3**	**13**	**3.9**	**2.9**	**4.6**	**3.9**	**3.2**	**4.7**	**3.8**	**3.8**	**7.9**	**3.5**	**5.5**	**6.1**	**20**	**20**
Cobalt		**1.7**	**1.9**	**1.7**	**2.2**	**2.4**	**2.4**	**1.5 J**	**1.9**	**1.7 J**	**1.2 J**	**1.6 J**	**1.8**	**1.9**	**1.2 J**	**0.98 J**	**1.3 J**	**1.4 J**	**1.4 J**	**1.7 J**	**1.2 J**	**1.3 J**	**2.6**	**1.4 J**	**2.3**	**2.6**	**0.88 J**	**1.2 J**
Copper	270	**4.6**	**4.6**	**2.6**	**5.6**	**5.0**	**4.7**	**6.2**	**6.6**	**6.1**	**5.0**	**5.4**	**5.2**	**6.5**	**4.6**	**3.1**	**4.1**	**4.3**	**4.7**	**4.7**	**4.1**	**3.6**	**11**	**3.6**	**6.7**	**5.3**	**39**	**53**
Iron		**4100 D**	**4900 D**	**4300 D**	**5400 D**	**5700 D**	**5200 D**	**4700**	**5600**	**4800**	**3200**	**4300**	**5400**	**6400**	**3700**	**2600**	**3400**	**3900**	**3000**	**4600**	**3800 D**	**4300 D**	**7900 D**	**3300 D**	**6500 D**	**7800 D**	**10000 D**	**10000 D**
Lead	1000	**2.7**	**3.8**	**1.8**	**2.8**	**2.6**	**2.6**	**4.9**	**4.1**	**2.5**	**2.0**	**2.5**	**2.6**	**13**	**1.9**	**1.6**	**1.9**	**2.4**	**2.4**	**2.5**	**2.2**	**1.8**	**8.4**	**2.6**	**7.5**	**6.9**	**30**	**26**
Magnesium		**510**	**810**	**470**	**790**	**930**	**710**	**850**	**750**	**740**	**400**	**590**	**600**	**790**	**500**	**390**	**530**	**520**	**450**	**550**	**640**	**480**	**910**	**440**	**800**	**980**	**890**	**1300**
Manganese	10000	**490**	**140**	**220**	**330**	**150**	**140**	**130**	**220**	**250**	**140**	**290**	**200**	**94**	**94**	**80**	**99**	**130**	**140**	**150**	**80**	**100**	**180**	**100**	**160**	**160**	**140**	**130**
Mercury	2.8	< 0.025	< 0.025	< 0.025	< 0.024	< 0.025	< 0.023	**0.015 J**	< 0.025	< 0.029	< 0.026	< 0.026	< 0.023	**0.013 J**	< 0.025	< 0.025	< 0.024	< 0.024	< 0.026	< 0.027	< 0.025	< 0.026	**0.015 J**	< 0.024	**0.019 J**	**0.020 J**	< 0.026	**0.023 J**
Nickel	310	**6.5**	**4.2**	**2.9**	**4.2**	**4.5**	**4.0**	**5.9**	**7.3**	**3.6**	**5.9**	**4.1**	**9.7**	**17**	**2.5**	**1.9**	**2.9**	**2.8**	**2.3**	**3.0**	**2.4**	**2.5**	**8.0**	**2.9**	**5.3**	**5.0**	**11**	**13**
Potassium		**510**	**970**	**290**	**540**	**480**	**340**	**540**	**630**	**720**	**400**	**770**	**640**	**370**	**290**	**180**	**230**	**300**	**520**	**340**	**230**	**300**	**330**	**180**	**230**	**290**	**610**	**2600**
Selenium	1500	< 3.4	< 3.4	< 3.4	< 3.5	< 3.3	< 3.5	< 3.5	< 3.4	< 3.9	< 3.5	< 3.5	< 3.4	< 3.5	< 3.5	< 3.5	< 3.4	< 3.4	< 3.4	< 3.5	< 3.5	< 3.4	< 3.9	< 3.4	< 3.5	< 3.7	< 3.7	< 3.9
Silver	1500	< 0.34	< 0.34	< 0.34	< 0.35	< 0.33	< 0.35	< 0.35	< 0.34	< 0.39	< 0.35	< 0.35	< 0.34	< 0.35	< 0.35	< 0.35	< 0.34	< 0.34	< 0.34	< 0.35	< 0.35	< 0.34	< 0.39	< 0.34	< 0.35	< 0.37	< 0.37	**0.69**
Sodium		< 170	< 170	< 170	< 170	< 170	< 180	< 170	< 170	< 190	< 180	< 170	< 170	**61 J**	< 170	< 170	< 170	< 170	**95 J**	< 170	< 170	< 170	< 200	< 170	< 180	< 190	**150 J**	**800**
Thallium		< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.8	< 1.7	< 1.7	< 1.9	< 1.8	< 1.7	< 1.7	< 1.8	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 2	< 1.7	< 1.8	< 1.9	**1.1 J**	**3.0**
Vanadium		**5.7**	**8.2**	**4.7**	**6.8**	**7.6**	**7.1**	**7.6**	**7.2**	**6.8**	**4.4**	**5.9**	**8.0**	**10**	**6.4**	**3.8**	**4.8**	**5.8**	**4.6**	**6.8**	**5.5**	**5.6**	**33**	**9.6**	**12**	**11**	**360**	**810**
Zinc	10000	**10**	**10**	**6.3**	**8.7**	**9.1**	**8.7**	**13**	**12**	**10**	**7.4**	**8.9**	**12**	**14**	**6.5**	**4.8**	**6.7**	**7.1**	**6.6**	**7.8**	**7.4**	**5.8**	**27**	**9.0**	**12**	**12**	**51**	**200**
Polychlorinated Biphenyls (PCB) (mg/kg)																												
PCB, Total	1	< 0.082	**0.044**	< 0.081	< 0.081	< 0.078	< 0.078	< 0.082	**0.026**	**0.15**	**0.089**	< 0.082	< 0.08	**0.079**	< 0.081	< 0.081	< 0.082	< 0.082	**0.36**	< 0.084	< 0.086	< 0.086	< 0.098	< 0.086	< 0.087	< 0.091	**0.316**	**0.102**
PCB-1016	1	< 0.082	< 0.08	< 0.081	< 0.081	< 0.078	< 0.078	< 0.082	< 0.081	**0.15 D**	**0.089 D**	< 0.082	< 0.08	< 0.08	< 0.081	< 0.081	< 0.082	< 0.082	< 0.082	< 0.084	< 0.086	< 0.086	< 0.098	< 0.086	< 0.087	< 0.091	< 0.09	< 0.099
PCB-1242	1	< 0.082	< 0.08	< 0.081	< 0.081	< 0.078	< 0.078	< 0.082	< 0.081	< 0.092	< 0.081	< 0.082	< 0.08	< 0.08	< 0.081	< 0.081	< 0.082	< 0.082	**0.22 D**	< 0.084	< 0.086	< 0.086	< 0.098	< 0.086	< 0.087	< 0.091	< 0.09	< 0.099
PCB-1248	1	< 0.082	< 0.08	< 0.081	< 0.081	< 0.078	< 0.078	< 0.082	< 0.081	< 0.092	< 0.081	< 0.082	< 0.08	< 0.08	< 0.081	< 0.081	< 0.082	< 0.082	< 0.082	< 0.084	< 0.086	< 0.086	< 0.098	< 0.086	< 0.087	< 0.091	< 0.09	< 0.099
PCB-1254	1	< 0.082	**0.044 JD**	< 0.081	< 0.081	< 0.078	< 0.078	< 0.082	**0.026 JD**	< 0.092	< 0.081	< 0.082	< 0.08	**0.043 JD**	< 0.081	< 0.081	< 0.082	< 0.082	**0.11 D**	< 0.084	< 0.086	< 0.086	< 0.098	< 0.086	< 0.087	< 0.091	**0.23 D**	**0.063 JD**
PCB-1260	1	< 0.082	< 0.08	< 0.081	< 0.081	< 0.078	< 0.078	< 0.082	< 0.081	< 0.092	< 0.081	< 0.082	< 0.08	**0.036 JD**	< 0.081	< 0.081	< 0.082	< 0.082	**0.030 JD**	< 0.084	< 0.086	< 0.086	< 0.098	< 0.086	< 0.087	< 0.091	**0.086 JD**	**0.039 JD**
PCB-1268	1	< 0.082	< 0.08	< 0.081	< 0.081	< 0.078	< 0.078	< 0.082	< 0.081	< 0.092	< 0.081	< 0.082	< 0.08	< 0.08	< 0.081	< 0.081	< 0.082	< 0.082	< 0.082	< 0.084	< 0.086	< 0.086	< 0.098	< 0.086	< 0.087	< 0.091	< 0.09	< 0.099
PFAS Compounds (µg/kg)																												
Perfluorodecanoic acid (PFDA)		NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	< 0.2	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.079 J**	NA
Perfluorododecanoic acid (PFDoA)		NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	< 0.2	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.093 J**	NA
Perfluoroheptanoic acid (PFHpA)		NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	**0.019 J**	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.017 J**	NA
Perfluorohexanoic acid (PFHxA)		NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	**0.035 J**	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA
Perfluorononane sulfonic acid (PFNS)		NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	< 0.2	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.025 J**	NA
Perfluorononanoic acid (PFNA)		NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	< 0.2	**0.016 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.046 J**	NA
Perfluorooctanesulfonic acid (PFOS)	440	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	**0.034 J**	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.24**	NA
Perfluorooctanoic acid (PFOA)	500	NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	**0.037 J**	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.048 J**	NA
Perfluoropentanoic acid (PFPeA)		NA	NA	NA	< 0.4	NA	NA	NA	NA	NA	NA	NA	NA	< 0.4	NA	**0.051 J**	< 0.39	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.39	NA
Perfluorotetradecanoic acid (PFTeDA)		NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	< 0.2	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.054 J**	NA
Perfluorotridecanoic acid (PFTrDA)		NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	< 0.2	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.094 J**	NA
Perfluoroundecanoic acid (PFUnA)		NA	NA	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	< 0.2	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.17 J**	NA

Legend	
<1	Parameter not detected above the laboratory reporting limit
1	Parameter reported at a concentrations greater than Part 375 Commercial SCOs
1	Parameter reported above the laboratory reporting limit but below the applicable regulatory standard/criterion

Notes:
Only compounds detected above the laboratory reporting limits are presented

mg/L = milligrams per liter
µg/L = micrograms per liter
ng/L = nanograms per liter
NA = Not Analyzed
NE = No criteria established
NYSDEC = New York State Department of Environmental Conservation
SCO = Soil Cleanup Objectives
* Soil samples SB-100R and SB-100B were excavated on 6/26/2024

Table 4A
2024 Geoprobe Soil Analytical Results
Lawrence Aviation
Port Jefferson, New York

Location:		SB-200	SB-200	SB-201	SB-201	SB-202	SB-202	SB-202	SB-203	SB-203	SB-203	SB-204	SB-204	SB-205	SB-205	SB-206	SB-206	SB-207	SB-207	SB-208	SB-208	SB-209	SB-209	SB-210	SB-210	SB-211	SB-211
Date Collected:		03/27/2024	03/27/2024	03/27/2024	03/27/2024	03/27/2024	03/27/2024	03/27/2024	03/28/2024	03/28/2024	03/28/2024	03/28/2024	03/28/2024	03/28/2024	03/28/2024	03/28/2024	03/28/2024	03/29/2024	03/29/2024	03/29/2024	03/29/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
Sample ID:	Part 375 Commercial	SB-200 (0-2)	SB-200 (3-5)	SB-201 (0-2)	SB-201 (3-4.5)	SB-202 (15-17)	SB-202 (30-32)	SB-202 (40-42)	SB-203 (15-17)	SB-203 (30-32)	SB-203 (40-42)	SB-204 (15-17)	SB-204 (25-27)	SB-205 (15-17)	SB-205 (25-27)	SB-206 (0.5-2.5)	SB-206 (8-10)	SB-207 (19-21)	SB-207 (28-30)	SB-208 (21-23)	SB-208 (28-30)	SB-209 (20-22)	SB-209 (28-30)	SB-210 (21-23)	SB-210 (28-30)	SB-211 (20-22)	SB-211 (28-30)
Laboratory Sample ID:		24C3443-09	24C3443-10	24C3441-02	24C3443-12	24C3443-13	24C3443-14	24C3443-15	24C3443-17	24C3443-18	24C3443-19	24C3443-20	24C3443-21	24C3443-22	24C3443-23	24C3443-24	24C3443-25	24D0105-01	24D0107-02	24D0102-02	24D0107-04	24D0346-13	24D0348-02	24D0347-02	24D0348-04	24D0346-15	24D0348-06
Volatile Organic Compounds (VOCs) (mg/kg)																											
2-Butanone (MEK)	500	< 0.021	< 0.021	< 0.025	< 0.027	< 0.023	< 0.031	< 0.023	< 0.02	< 0.022	< 0.022	< 0.023	< 0.021	< 0.025	< 0.026	< 0.027	< 0.023	< 0.021	< 0.021	< 0.027	< 0.02	< 0.031	< 0.034	< 0.041	< 0.033	< 0.035	< 0.041
Acetone	500	< 0.052	**0.030 J**	< 0.063	**0.066 J**	< 0.059	< 0.076	< 0.059	< 0.05	< 0.055	< 0.055	< 0.057	< 0.053	< 0.062	< 0.065	< 0.068	< 0.057	< 0.053	< 0.053	< 0.067	< 0.05	< 0.077	< 0.084	< 0.1	< 0.081	< 0.088	< 0.1
Benzene	44	< 0.001	< 0.001	< 0.0013	< 0.0013	< 0.0012	< 0.0015	< 0.0012	< 0.001	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0012	< 0.0013	< 0.0014	< 0.0011	< 0.0011	< 0.0011	< 0.0013	< 0.00099	< 0.0015	< 0.0017	< 0.0021	< 0.0016	< 0.0018	< 0.002
cis-1,2-Dichloroethene	500	< 0.001	< 0.001	< 0.0013	< 0.0013	< 0.0012	< 0.0015	< 0.0012	< 0.001	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0012	< 0.0013	< 0.0014	< 0.0011	< 0.0011	< 0.0011	< 0.0013	< 0.00099	< 0.0015	< 0.0017	< 0.0021	< 0.0016	< 0.0018	< 0.002
Dichlorodifluoromethane		< 0.01	< 0.01	< 0.013	< 0.013	< 0.012	< 0.015	< 0.012	< 0.01	< 0.011	< 0.011	< 0.011	< 0.011	< 0.012	< 0.013	< 0.014	< 0.011	< 0.011	< 0.011	< 0.013	< 0.0099	< 0.015	< 0.017	< 0.021	< 0.016	< 0.018	< 0.02
Isopropylbenzene		< 0.001	< 0.001	< 0.0013	< 0.0013	< 0.0012	< 0.0015	< 0.0012	< 0.001	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0012	< 0.0013	< 0.0014	< 0.0011	< 0.0011	< 0.0011	< 0.0013	< 0.00099	< 0.0015	< 0.0017	< 0.0021	< 0.0016	< 0.0018	< 0.002
Methyl acetate		< 0.001	< 0.001	< 0.0013	< 0.0013	< 0.0012	< 0.0015	< 0.0012	< 0.001	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0012	< 0.0013	< 0.0014	< 0.0011	< 0.0011	< 0.0011	< 0.0013	< 0.00099	< 0.0015	< 0.0017	< 0.0021	< 0.0016	< 0.0018	< 0.002
Methylcyclohexane		< 0.001	< 0.001	< 0.0013	< 0.0013	< 0.0012	< 0.0015	< 0.0012	< 0.001	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0012	< 0.0013	< 0.0014	< 0.0011	< 0.0011	< 0.0011	< 0.0013	< 0.00099	< 0.0015	< 0.0017	< 0.0021	< 0.0016	< 0.0018	< 0.002
Methylene chloride	500	< 0.01	< 0.01	< 0.013	< 0.013	< 0.012	< 0.015	< 0.012	< 0.01	< 0.011	< 0.011	< 0.011	< 0.011	< 0.012	< 0.013	< 0.014	< 0.011	< 0.011	< 0.011	< 0.013	< 0.0099	< 0.015	< 0.017	< 0.021	< 0.016	< 0.018	< 0.02
Tetrachloroethene	150	< 0.001	< 0.001	**0.0013**	< 0.0013	< 0.0012	**0.00093 J**	< 0.0012	< 0.001	< 0.0011	< 0.0011	< 0.0011	**0.00066 J**	< 0.0012	< 0.0013	**0.00066 J**	< 0.0011	< 0.0011	< 0.0011	< 0.0013	< 0.00099	< 0.0015	< 0.0017	< 0.0021	< 0.0016	< 0.0018	< 0.002
Toluene	500	< 0.001	< 0.001	< 0.0013	< 0.0013	< 0.0012	< 0.0015	< 0.0012	< 0.001	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0012	< 0.0013	< 0.0014	< 0.0011	< 0.0011	< 0.0011	< 0.0013	< 0.00099	< 0.0015	< 0.0017	< 0.0021	< 0.0016	< 0.0018	< 0.002
Trichloroethene	200	< 0.001	< 0.001	< 0.0013	< 0.0013	< 0.0012	**0.00093 J**	< 0.0012	< 0.001	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0012	< 0.0013	< 0.0014	< 0.0011	< 0.0011	< 0.0011	< 0.0013	< 0.00099	< 0.0015	< 0.0017	< 0.0021	< 0.0016	< 0.0018	< 0.002
Trichlorofluoromethane		< 0.0052	< 0.0052	< 0.0063	< 0.0067	< 0.0059	< 0.0076	< 0.0059	< 0.005	< 0.0055	< 0.0055	< 0.0057	< 0.0053	< 0.0062	< 0.0065	< 0.0068	< 0.0057	< 0.0053	< 0.0053	< 0.0067	< 0.005	< 0.0077	< 0.0084	< 0.01	< 0.0081	< 0.0088	< 0.01
Semivolatile Organic Compounds (SVOC) (mg/kg)																											
1,1'-Biphenyl		< 0.72	< 0.73	< 0.81	< 0.79	< 0.7	< 0.7	< 0.71	< 0.72	< 0.82	< 0.82	< 0.78	< 0.72	< 0.73	< 0.69	< 0.73	< 0.71	NA	NA	NA	NA	< 0.72	NA	NA	NA	< 0.7	NA
2-Methylnaphthalene		< 0.18	< 0.18	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	NA	NA	NA	NA	< 0.18	NA	NA	NA	< 0.18	NA
Acenaphthene	500	< 0.18	< 0.18	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	NA	NA	NA	NA	< 0.18	NA	NA	NA	< 0.18	NA
Anthracene	500	< 0.18	< 0.18	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	NA	NA	NA	NA	< 0.18	NA	NA	NA	< 0.18	NA
Benzo(a)anthracene	5.6	< 0.18	< 0.18	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	NA	NA	NA	NA	< 0.18	NA	NA	NA	< 0.18	NA
Benzo(a)pyrene	1	< 0.18	< 0.18	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	NA	NA	NA	NA	< 0.18	NA	NA	NA	< 0.18	NA
Benzo(b)fluoranthene	5.6	< 0.18	< 0.18	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	NA	NA	NA	NA	< 0.18	NA	NA	NA	< 0.18	NA
Bis(2-ethylhexyl)phthalate		< 0.37	< 0.37	< 0.41	< 0.4	< 0.36	< 0.35	< 0.36	< 0.37	**0.072 J**	< 0.41	< 0.4	**0.055 J**	< 0.37	< 0.35	< 0.37	< 0.36	NA	NA	NA	NA	< 0.37	NA	NA	NA	< 0.35	NA
Butylbenzyl phthalate		< 0.37	< 0.37	< 0.41	< 0.4	< 0.36	< 0.35	< 0.36	< 0.37	< 0.41	< 0.41	< 0.4	< 0.36	< 0.37	< 0.35	< 0.37	< 0.36	NA	NA	NA	NA	< 0.37	NA	NA	NA	< 0.35	NA
Chrysene	56	< 0.18	< 0.18	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	NA	NA	NA	NA	< 0.18	NA	NA	NA	< 0.18	NA
Dibenzofuran	350	< 0.37	< 0.37	< 0.41	< 0.4	< 0.36	< 0.35	< 0.36	< 0.37	< 0.41	< 0.41	< 0.4	< 0.36	< 0.37	< 0.35	< 0.37	< 0.36	NA	NA	NA	NA	< 0.37	NA	NA	NA	< 0.35	NA
Dimethyl phthalate		< 0.37	< 0.37	< 0.41	< 0.4	< 0.36	< 0.35	< 0.36	< 0.37	< 0.41	< 0.41	< 0.4	< 0.36	< 0.37	< 0.35	< 0.37	< 0.36	NA	NA	NA	NA	< 0.37	NA	NA	NA	< 0.35	NA
Fluoranthene	500	< 0.18	< 0.18	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	NA	NA	NA	NA	< 0.18	NA	NA	NA	< 0.18	NA
Fluorene	500	< 0.18	< 0.18	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	NA	NA	NA	NA	< 0.18	NA	NA	NA	< 0.18	NA
Hexachlorobenzene	6	< 0.37	< 0.37	< 0.41	< 0.4	< 0.36	< 0.35	< 0.36	< 0.37	< 0.41	< 0.41	< 0.4	< 0.36	< 0.37	< 0.35	< 0.37	< 0.36	NA	NA	NA	NA	< 0.37	NA	NA	NA	< 0.35	NA
Naphthalene	500	< 0.18	< 0.18	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	NA	NA	NA	NA	< 0.18	NA	NA	NA	< 0.18	NA
Phenanthrene	500	< 0.18	< 0.18	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.18	NA	NA	NA	NA	< 0.18	NA	NA	NA	< 0.18	NA
Phenol	500	< 0.37	< 0.37	< 0.41	< 0.4	< 0.36	< 0.35	< 0.36	< 0.37	< 0.41	< 0.41	< 0.4	< 0.36	< 0.37	< 0.35	< 0.37	< 0.36	NA	NA	NA	NA	< 0.37	NA	NA	NA	< 0.35	NA
Pyrene	500	< 0.18	< 0.18	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	< 0.18	< 0.21	< 0.21	< 0.2	< 0.18	< 0.18	< 0.18	**0.040 J**	< 0.18	NA	NA	NA	NA	< 0.18	NA	NA	NA	< 0.18	NA
Metals (mg/kg)																											
Aluminum		**4500**	**9300**	**2500**	**3000**	**4100**	**2700**	**2100**	**3300**	**2700**	**1300**	**2700**	**1800**	**1200**	**1200**	**3200**	**3300**	**1900**	**660**	**3100**	**2100**	**2800**	**2800**	**4100**	**1900**	**2500**	**1000**
Antimony		< 1.8	< 1.8	< 2	< 1.9	< 1.7	< 1.7	< 1.8	< 1.7	< 2.1	< 2	< 1.9	< 1.8	< 1.7	< 1.7	**3.7**	< 1.7	< 1.8	< 1.7	< 1.8	< 2	< 1.8	< 1.8	< 1.7	< 1.8	< 1.7	< 1.7
Arsenic	16	< 3.5	< 3.5	< 4	< 3.9	< 3.5	< 3.4	< 3.6	< 3.5	< 4.1	< 4	< 3.8	< 3.6	< 3.5	**0.89 J**	< 3.5	< 3.4	< 3.6	**0.52 J**	< 3.6	**1.9 J**	**2.6 J**	**2.7 J**	**0.64 J**	**1.6 J**	**1.4 J**
Barium	400	**9.8**	**17**	**16**	**12**	**13**	**11**	**9.5**	**10**	**13**	**7.2**	**14**	**7.2**	**9.8**	**4.4**	**12**	**7.0**	**6.2**	**2.7**	**19**	**12**	**12**	**12**	**22**	**12**	**12**	**3.9**
Beryllium	590	**0.16 J**	**0.27**	**0.16 J**	**0.15 J**	**0.17 J**	**0.14 J**	**0.10 J**	**0.13 J**	**0.12 J**	**0.064 J**	**0.13 J**	**0.13 J**	**0.10 J**	**0.095 J**	**0.15 J**	**0.15 J**	**0.089 J**	< 0.17	**0.14 J**	**0.088 J**	**0.12 J**	**0.14 J**	**0.25**	**0.16 J**	**0.15 J**	< 0.17
Cadmium	9.3	< 0.35	< 0.35	**0.52**	< 0.39	**0.39**	< 0.34	< 0.36	**0.18 J**	< 0.41	< 0.4	< 0.38	< 0.36	< 0.35	< 0.34	**0.31 J**	< 0.34	< 0.36	< 0.35	< 0.36	< 0.4	< 0.35	< 0.35	< 0.34	< 0.36	< 0.34	< 0.34
Calcium		**280**	**220**	**320**	**110**	**310**	**620**	**410**	**410**	**910**	**380**	**840**	**620**	**62**	**51**	**1400**	**160**	**160**	**42**	**100**	**110**	**190**	**280**	**180**	**150**	**120**	**43**
Chromium	1500	**6.0**	**9.3**	**5.6**	**4.5**	**7.2**	**5.9**	**6.4**	**5.8**	**10**	**5.2**	**4.4**	**4.7**	**2.5**	**12**	**7.3**	**4.0**	**7.4**	**4.2**	**6.4**	**5.3**	**13**	**30**	**13**	**19**	**9.9**	**3.7**
Cobalt		**2.0**	**1.9**	**1.9 J**	**1.5 J**	**1.6 J**	**1.4 J**	**1.3 J**	**1.5 J**	**1.7 J**	**0.73 J**	**1.6 J**	**1.1 J**	**0.96 J**	**1.3 J**	**1.6 J**	**2.0**	**1.2 J**	**0.47 J**	**1.5 J**	**1.4 J**	**2.0**	**1.9**	**3.2**	**1.0 J**	**2.1**	**1.2 J**
Copper	270	**4.8**	**3.0**	**7.9**	**4.9**	**5.6**	**6.8**	**3.9**	**4.6**	**8.0**	**4.0**	**5.3**	**3.1**	**2.2**	**2.4**	**5.9**	**3.5**	**4.4**	**3.0**	**5.6**	**4.1**	**10**	**6.9**	**11**	**6.8**	**7.9**	**4.3**
Iron		**5800 D**	**10000 D**	**4900 D**	**4700 D**	**6100 D**	**4900 D**	**4000 D**	**4800 D**	**5800 D**	**3000 D**	**4800 D**	**3300**	**2300**	**4400 D**	**4800 D**	**4500 D**	**3900**	**1500**	**4600**	**3300**	**4900**	**6800 D**	**8500**	**7300 D**	**4900**	**2400**
Lead	1000	**5.1**	**6.0**	**220**	**2.8**	**14**	**4.5**	**2.6**	**7.3**	**4.2**	**2.6**	**2.4**	**3.8**	**1.7**	**1.5**	**29**	**2.6**	**2.9**	**0.78**	**2.4**	**2.0**	**5.7**	**3.6**	**4.5**	**2.9**	**2.2**	**1.4**
Magnesium		**680**	**970**	**660**	**620**	**670**	**580**	**580**	**580**	**720**	**310**	**640**	**360**	**360**	**300**	**610**	**660**	**540**	**170**	**730**	**480**	**730**	**720**	**1300**	**460**	**700**	**350**
Manganese	10000	**64**	**66**	**140**	**110**	**120**	**110**	**100**	**86**	**140**	**71**	**140**	**86**	**98**	**190**	**94**	**77**	**170**	**29**	**130**	**110**	**130**	**140**	**200**	**32**	**150**	**85**
Mercury	2.8	**0.017 J**	**0.025 J**	**0.012 J**	< 0.029	**0.015 J**	< 0.026	< 0.024	**0.020 J**	**0.015 J**	**0.016 J**	< 0.027	< 0.024	< 0.025	< 0.025	< 0.027	< 0.025	< 0.027	< 0.027	< 0.027	< 0.029	< 0.027	< 0.024	< 0.025	< 0.025	< 0.025	< 0.024
Nickel	310	**3.9**	**5.0**	**4.5**	**3.3**	**6.7**	**3.5**	**2.8**	**4.5**	**4.5**	**1.8**	**3.1**	**3.8**	**1.8**	**3.3**	**6.1**	**3.6**	**3.9**	**1.3**	**3.9**	**2.9**	**4.6**	**4.5**	**7.1**	**2.6**	**4.7**	**2.3**
Potassium		**200**	**220**	**290**	**380**	**910**	**670**	**460**	**370**	**480**	**220**	**450**	**320**	**210**	**130 J**	**380**	**230**	**200**	**81 J**	**460**	**290**	**400**	**430**	**600**	**250**	**300**	**110 J**
Selenium	1500	< 3.5	< 3.5	< 4	< 3.9	< 3.5	< 3.4	< 3.6	< 3.5	< 4.1	< 4	< 3.8	< 3.6	< 3.5	< 3.4	< 3.5	< 3.4	< 3.6	< 3.5	< 3.6	< 4	< 3.5	< 3.5	< 3.4	< 3.6	< 3.4	< 3.4
Silver	1500	< 0.35	< 0.35	< 0.4	< 0.39	< 0.35	< 0.34	< 0.36	< 0.35	< 0.41	< 0.4	< 0.38	< 0.36	< 0.35	< 0.34	< 0.35	< 0.34	< 0.36	< 0.35	< 0.36	< 0.4	< 0.35	< 0.35	< 0.34	< 0.36	< 0.34	< 0.34
Sodium		< 180	< 180	< 200	< 190	< 170	< 170	< 180	**59 J**	< 210	< 200	< 190	< 180	< 170	< 170	< 180	< 170	< 180	< 170	< 180	< 200	< 180	< 180	< 170	< 180	< 170	< 170
Thallium		< 1.8	< 1.8	< 2	< 1.9	< 1.7	< 1.7	< 1.8	< 1.7	< 2.1	< 2	< 1.9	< 1.8	< 1.7	< 1.7	< 1.8	< 1.7	< 1.8	< 1.7	< 1.8	< 2	< 1.8	< 1.8	< 1.7	< 1.8	< 1.7	< 1.7
Vanadium		**13**	**16**	**16**	**7.0**	**11**	**7.0**	**5.3**	**8.2**	**8.3**	**5.1**	**6.6**	**5.2**	**3.0**	**4.2**	**7.1**	**6.0**	**4.5**	**2.7**	**7.8**	**6.7**	**7.4**	**15**	**11**	**6.2**	**6.2**	**3.0**
Zinc	10000	**10**	**13**	**21**	**7.8**	**16**	**8.9**	**6.7**	**11**	**19**	**8.4**	**7.9**	**6.9**	**4.0**	**3.9**	**100**	**6.8**	**11**	**3.0**	**8.3**	**5.8**	**55**	**9.5**	**18**	**7.8**	**9.2**	**4.6**
Polychlorinated Biphenyls (PCB) (mg/kg)																											
PCB, Total	1	**0.17**	**0.58**	< 0.098	< 0.095	**0.167**	**0.04**	< 0.086	**0.566**	**0.92**	**0.57**	< 0.097	< 0.085	< 0.085	< 0.083	**0.201**	< 0.085	< 0.088	< 0.078	< 0.087	< 0.088	< 0.086	**0.048**	< 0.079	< 0.083	< 0.081	< 0.08
PCB-1016	1	< 0.087	< 0.088	< 0.098	< 0.095	< 0.085	< 0.084	< 0.086	< 0.088	< 0.099	< 0.1	< 0.097	< 0.085	< 0.085	< 0.083	< 0.085	< 0.085	< 0.088	< 0.078	< 0.087	< 0.088	< 0.086	< 0.078	< 0.079	< 0.083	< 0.081	< 0.08
PCB-1242	1	< 0.087	< 0.088	< 0.098	< 0.095	< 0.085	< 0.084	< 0.086	**0.49 D**	**0.87 D**	**0.57 D**	< 0.097	< 0.085	< 0.085	< 0.083	< 0.085	< 0.085	< 0.088	< 0.078	< 0.087	< 0.088	< 0.086	**0.048 JD**	< 0.079	< 0.083	< 0.081	< 0.08
PCB-1248	1	< 0.087	< 0.088	< 0.098	< 0.095	< 0.085	< 0.084	< 0.086	< 0.088	< 0.099	< 0.1	< 0.097	< 0.085	< 0.085	< 0.083	**0.11 D**	< 0.085	< 0.088	< 0.078	< 0.087	< 0.088	< 0.086	< 0.078	< 0.079	< 0.083	< 0.081	< 0.08
PCB-1254	1	**0.085 JD**	**0.58 D**	< 0.098	< 0.095	**0.12 D**	**0.040 JD**	< 0.086	**0.051 JD**	**0.050 JD**	< 0.1	< 0.097	< 0.085	< 0.085	< 0.083	**0.063 JD**	< 0.085	< 0.088	< 0.078	< 0.087	< 0.088	< 0.086	< 0.078	< 0.079	< 0.083	< 0.081	< 0.08
PCB-1260	1	**0.085 JD**	< 0.088	< 0.098	< 0.095	**0.047 JD**	< 0.084	< 0.086	**0.025 JD**	< 0.099	< 0.1	< 0.097	< 0.085	< 0.085	< 0.083	**0.028 JD**	< 0.085	< 0.088	< 0.078	< 0.087	< 0.088	< 0.086	< 0.078	< 0.079	< 0.083	< 0.081	< 0.08
PCB-1268	1	< 0.087	< 0.088	< 0.098	< 0.095	< 0.085	< 0.084	< 0.086	< 0.088	< 0.099	< 0.1	< 0.097	< 0.085	< 0.085	< 0.083	< 0.085	< 0.085	< 0.088	< 0.078	< 0.087	< 0.088	< 0.086	< 0.078	< 0.079	< 0.083	< 0.081	< 0.08
PFAS Compounds (µg/kg)																											
Perfluorodecanoic acid (PFDA)		NA	NA	**0.023 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.19	NA
Perfluorododecanoic acid (PFDoA)		NA	NA	**0.026 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.19	NA
Perfluoroheptanoic acid (PFHpA)		NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.19	NA
Perfluorohexanoic acid (PFHxA)		NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.19	NA
Perfluorononane sulfonic acid (PFNS)		NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.19	NA
Perfluorononanoic acid (PFNA)		NA	NA	**0.016 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	**0.034 J**	NA	< 0.2	NA	< 0.19	NA
Perfluorooctanesulfonic acid (PFOS)	440	NA	NA	**0.042 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	**0.098 J**	NA	**0.11 J**	NA	< 0.2	NA	**0.28**	NA	< 0.2	NA	< 0.19	NA
Perfluorooctanoic acid (PFOA)	500	NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.19	NA
Perfluoropentanoic acid (PFPeA)		NA	NA	< 0.39	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.4	NA	< 0.39	NA	< 0.4	NA	< 0.39	NA	< 0.4	NA	< 0.4	NA	< 0.39	NA
Perfluorotetradecanoic acid (PFTeDA)		NA	NA	< 0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.19	NA
Perfluorotridecanoic acid (PFTrDA)		NA	NA	**0.024 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.19	NA
Perfluoroundecanoic acid (PFUnA)		NA	NA	**0.035 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.2	NA	< 0.19	NA

Legend	
<1	Parameter not detected above the laboratory reporting limit
1	Parameter reported at a concentrations greater than Part 375 Commercial SCOs
1	Parameter reported above the laboratory reporting limit but below the applicable regulatory standard/criterion

Notes:
Only compounds detected above the laboratory reporting limits are presented

mg/L = milligrams per liter
µg/L = micrograms per liter
ng/L = nanograms per liter
NA = Not Analyzed
NE = No criteria established
NYSDEC = New York State Department of Environmental Conservation
SCO = Soil Cleanup Objectives
* Soil samples SB-100R and SB-100B were excavated on 6/26/2024

Table 4A
2024 Geoprobe Soil Analytical Results
Lawrence Aviation
Port Jefferson, New York

Location:		SB-212	SB-212	SB-213	SB-213	SB-214	SB-214	SB-215	SB-215	SB-216	SB-216	SB-216	SB-217	SB-217	SB-218	SB-218	SB-219	SB-219	SB-220	SB-220
Date Collected:		04/01/2024	04/01/2024	04/02/2024	04/02/2024	04/02/2024	04/02/2024	04/02/2024	04/02/2024	04/02/2024	04/02/2024	04/02/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Sample ID:	Part 375 Commercial	SB-212 (11-13)	SB-212 (16-18)	SB-213 (21-23)	SB-213 (28-30)	SB-214 (21-23)	SB-214 (28-30)	SB-215 (10-12)	SB-215 (16-18)	DUP-13	SB-216 (20-22)	SB-216 (28-30)	SB-217 (15-17)	SB-217 (23-25)	SB-218 (10-12)	SB-218 (16-18)	SB-219 (2-4)	SB-219 (6-8)	SB-220 (2-4)	SB-220 (6-8)
Laboratory Sample ID:		24D0347-04	24D0348-08	24D0347-05	24D0348-10	24D0346-18	24D0348-12	24D0346-19	24D0348-13	24D0346-21	24D0346-20	24D0348-15	24D0792-01	24D0792-02	24D0792-03	24D0802-01	24D0796-01	24D0792-05	24D0792-06	24D0792-07
Volatile Organic Compounds (VOCs) (mg/kg)																				
2-Butanone (MEK)	500	< 0.038	< 0.032	< 0.043	< 0.037	< 0.036	< 0.04	< 0.039	< 0.034	< 0.038	< 0.04	< 0.039	< 0.041	< 0.033	< 0.04	< 0.036	< 0.033	< 0.033	**0.017 J**	< 0.04
Acetone	500	< 0.094	< 0.08	< 0.11	< 0.092	< 0.091	< 0.1	< 0.097	< 0.086	< 0.094	< 0.099	< 0.098	< 0.1	< 0.083	< 0.099	< 0.09	< 0.083	< 0.083	**0.11**	< 0.099
Benzene	44	< 0.0019	< 0.0016	< 0.0021	< 0.0018	< 0.0018	< 0.002	< 0.0019	< 0.0017	< 0.0019	< 0.002	< 0.002	< 0.0021	< 0.0017	< 0.002	< 0.0018	< 0.0017	< 0.0017	< 0.0018	< 0.002
cis-1,2-Dichloroethene	500	< 0.0019	< 0.0016	< 0.0021	< 0.0018	< 0.0018	< 0.002	< 0.0019	< 0.0017	< 0.0019	< 0.002	< 0.002	< 0.0021	< 0.0017	< 0.002	< 0.0018	< 0.0017	< 0.0017	< 0.0018	< 0.002
Dichlorodifluoromethane		< 0.019	< 0.016	< 0.021	< 0.018	< 0.018	< 0.02	< 0.019	< 0.017	< 0.019	< 0.02	< 0.02	< 0.021	< 0.017	< 0.02	< 0.018	< 0.017	< 0.017	< 0.018	< 0.02
Isopropylbenzene		< 0.0019	< 0.0016	< 0.0021	< 0.0018	< 0.0018	< 0.002	< 0.0019	< 0.0017	< 0.0019	< 0.002	< 0.002	< 0.0021	< 0.0017	< 0.002	< 0.0018	< 0.0017	< 0.0017	< 0.0018	< 0.002
Methyl acetate		< 0.0019	< 0.0016	< 0.0021	< 0.0018	< 0.0018	< 0.002	< 0.0019	< 0.0017	< 0.0019	< 0.002	< 0.002	< 0.0021	< 0.0017	< 0.002	< 0.0018	< 0.0017	< 0.0017	< 0.0018	< 0.002
Methylcyclohexane		< 0.0019	< 0.0016	< 0.0021	< 0.0018	< 0.0018	< 0.002	< 0.0019	< 0.0017	< 0.0019	< 0.002	< 0.002	< 0.0021	< 0.0017	< 0.002	< 0.0018	< 0.0017	< 0.0017	< 0.0018	< 0.002
Methylene chloride	500	< 0.019	< 0.016	< 0.021	< 0.018	< 0.018	< 0.02	< 0.019	< 0.017	< 0.019	< 0.02	< 0.02	**0.0032 J**	< 0.017	< 0.02	< 0.018	**0.0020 J**	< 0.017	< 0.018	< 0.02
Tetrachloroethene	150	< 0.0019	< 0.0016	< 0.0021	< 0.0018	< 0.0018	< 0.002	< 0.0019	< 0.0017	< 0.0019	< 0.002	< 0.002	< 0.0021	< 0.0017	< 0.002	< 0.0018	< 0.0017	< 0.0017	**0.0021**	< 0.002
Toluene	500	< 0.0019	< 0.0016	< 0.0021	< 0.0018	< 0.0018	< 0.002	< 0.0019	< 0.0017	< 0.0019	< 0.002	< 0.002	< 0.0021	< 0.0017	< 0.002	< 0.0018	< 0.0017	< 0.0017	< 0.0018	< 0.002
Trichloroethene	200	< 0.0019	< 0.0016	< 0.0021	< 0.0018	< 0.0018	< 0.002	< 0.0019	< 0.0017	< 0.0019	< 0.002	< 0.002	< 0.0021	< 0.0017	< 0.002	< 0.0018	< 0.0017	< 0.0017	< 0.0018	< 0.002
Trichlorofluoromethane		< 0.0094	< 0.008	< 0.011	< 0.0092	< 0.0091	< 0.01	< 0.0097	< 0.0086	< 0.0094	< 0.0099	< 0.0098	< 0.01	< 0.0083	< 0.0099	< 0.009	< 0.0083	< 0.0083	< 0.0092	< 0.0099
Semivolatile Organic Compounds (SVOC) (mg/kg)																				
1,1'-Biphenyl		NA	NA	NA	NA	NA	NA	< 0.73	NA	< 0.7	< 0.7	NA	< 0.72	< 0.72	< 0.79	NA	< 0.72	< 0.75	< 1.4	< 0.68
2-Methylnaphthalene		NA	NA	NA	NA	NA	NA	< 0.18	NA	< 0.18	< 0.18	NA	< 0.18	< 0.18	< 0.2	NA	< 0.18	< 0.19	< 0.35	< 0.17
Acenaphthene	500	NA	NA	NA	NA	NA	NA	< 0.18	NA	< 0.18	< 0.18	NA	< 0.18	< 0.18	< 0.2	NA	< 0.18	< 0.19	< 0.35	< 0.17
Anthracene	500	NA	NA	NA	NA	NA	NA	< 0.18	NA	< 0.18	< 0.18	NA	< 0.18	< 0.18	< 0.2	NA	< 0.18	< 0.19	< 0.35	< 0.17
Benzo(a)anthracene	5.6	NA	NA	NA	NA	NA	NA	< 0.18	NA	< 0.18	< 0.18	NA	< 0.18	< 0.18	< 0.2	NA	< 0.18	< 0.19	< 0.35	< 0.17
Benzo(a)pyrene	1	NA	NA	NA	NA	NA	NA	< 0.18	NA	< 0.18	< 0.18	NA	< 0.18	< 0.18	< 0.2	NA	< 0.18	< 0.19	< 0.35	< 0.17
Benzo(b)fluoranthene	5.6	NA	NA	NA	NA	NA	NA	< 0.18	NA	< 0.18	< 0.18	NA	< 0.18	< 0.18	< 0.2	NA	< 0.18	< 0.19	< 0.35	< 0.17
Bis(2-ethylhexyl)phthalate		NA	NA	NA	NA	NA	NA	< 0.37	NA	**0.16 J**	**0.15 J**	NA	< 0.36	< 0.36	< 0.4	NA	< 0.37	< 0.38	< 0.69	< 0.35
Butylbenzyl phthalate		NA	NA	NA	NA	NA	NA	< 0.37	NA	< 0.36	< 0.35	NA	< 0.36	< 0.36	< 0.4	NA	< 0.37	< 0.38	< 0.69	< 0.35
Chrysene	56	NA	NA	NA	NA	NA	NA	< 0.18	NA	< 0.18	< 0.18	NA	< 0.18	< 0.18	< 0.2	NA	< 0.18	< 0.19	< 0.35	< 0.17
Dibenzofuran	350	NA	NA	NA	NA	NA	NA	< 0.37	NA	< 0.36	< 0.35	NA	< 0.36	< 0.36	< 0.4	NA	< 0.37	< 0.38	< 0.69	< 0.35
Dimethyl phthalate		NA	NA	NA	NA	NA	NA	< 0.37	NA	< 0.36	< 0.35	NA	< 0.36	< 0.36	< 0.4	NA	< 0.37	< 0.38	< 0.69	< 0.35
Fluoranthene	500	NA	NA	NA	NA	NA	NA	< 0.18	NA	< 0.18	< 0.18	NA	< 0.18	< 0.18	< 0.2	NA	< 0.18	< 0.19	< 0.35	< 0.17
Fluorene	500	NA	NA	NA	NA	NA	NA	< 0.18	NA	< 0.18	< 0.18	NA	< 0.18	< 0.18	< 0.2	NA	< 0.18	< 0.19	< 0.35	< 0.17
Hexachlorobenzene	6	NA	NA	NA	NA	NA	NA	< 0.37	NA	< 0.36	< 0.35	NA	< 0.36	< 0.36	< 0.4	NA	< 0.37	< 0.38	< 0.69	< 0.35
Naphthalene	500	NA	NA	NA	NA	NA	NA	< 0.18	NA	< 0.18	< 0.18	NA	< 0.18	< 0.18	< 0.2	NA	< 0.18	< 0.19	< 0.35	< 0.17
Phenanthrene	500	NA	NA	NA	NA	NA	NA	< 0.18	NA	< 0.18	< 0.18	NA	< 0.18	< 0.18	< 0.2	NA	< 0.18	< 0.19	< 0.35	< 0.17
Phenol	500	NA	NA	NA	NA	NA	NA	< 0.37	NA	< 0.36	< 0.35	NA	< 0.36	< 0.36	< 0.4	NA	< 0.37	< 0.38	< 0.69	< 0.35
Pyrene	500	NA	NA	NA	NA	NA	NA	< 0.18	NA	< 0.18	< 0.18	NA	< 0.18	< 0.18	< 0.2	NA	< 0.18	< 0.19	< 0.35	< 0.17
Metals (mg/kg)																				
Aluminum		**3700**	**5200**	**2200**	**1600**	**2700**	**2300**	**4700**	**5000**	**1200**	**1500**	**1400**	**1200**	**3400**	**3700**	**3300**	**5500**	**5500**	**2000**	**860**
Antimony		< 2	< 1.7	< 1.8	< 1.7	< 1.7	< 1.9	< 1.7	< 1.8	< 1.7	< 1.7	< 1.7	< 1.8	< 1.8	< 1.9	< 1.7	< 1.7	< 1.8	< 1.7	< 1.6
Arsenic	16	**2.3 J**	**1.6 J**	**1.9 J**	**0.66 J**	**1.4 J**	**0.67 J**	**2.0 J**	**1.3 J**	**1.4 J**	**1.0 J**	**0.59 J**	< 3.5	**2.2 J**	< 3.8	**4.8**	< 3.5	< 3.7	< 3.4	< 3.3
Barium	400	**16**	**16**	**8.8**	**7.1**	**8.0**	**8.3**	**19**	**21**	**5.2**	**4.7**	**9.2**	**4.9**	**15**	**18**	**13**	**13**	**14**	**4.8**	**2.8**
Beryllium	590	**0.18 J**	**0.27**	**0.12 J**	**0.084 J**	**0.10 J**	**0.072 J**	**0.25**	**0.17 J**	**0.058 J**	**0.082 J**	**0.096 J**	**0.098 J**	**0.18**	**0.26**	**0.16 J**	**0.21**	**0.17 J**	**0.076 J**	< 0.16
Cadmium	9.3	< 0.4	< 0.35	< 0.35	< 0.35	< 0.35	< 0.38	< 0.34	< 0.35	< 0.34	< 0.34	< 0.34	< 0.35	< 0.35	< 0.38	< 0.35	< 0.35	< 0.37	< 0.34	< 0.33
Calcium		**390**	**310**	**150**	**220**	**190**	**180**	**160**	**250**	**2700**	**3600**	**170**	**30**	**580**	**370**	**450**	**130**	**160**	**66**	**56**
Chromium	1500	**6.3**	**7.0**	**4.1**	**2.4**	**5.3**	**4.4**	**7.1**	**11**	**6.3**	**7.0**	**6.3**	**2.9**	**6.9**	**6.4**	**7.2**	**6.1**	**5.9**	**3.1**	**2.2**
Cobalt		**2.9**	**1.9**	**2.1**	**1.1 J**	**1.4 J**	**1.5 J**	**2.8**	**2.1**	**0.90 J**	**1.0 J**	**1.1 J**	**1.6 J**	**4.2**	**2.9**	**3.9**	**1.9**	**1.2 J**	**1.2 J**	**0.75 J**
Copper	270	**8.6**	**8.2**	**8.0**	**2.6**	**5.4**	**4.1**	**8.9**	**6.2**	**4.9**	**5.1**	**3.4**	**4.0**	**11**	**6.5**	**10**	**4.6**	**3.8**	**2.5**	**1.9**
Iron		**5900**	**8400 D**	**5200**	**3100**	**5500**	**5200 D**	**6700**	**8000 D**	**2700**	**3400**	**4100 D**	**3500**	**11000**	**8100**	**11000 D**	**6800**	**6700**	**3100**	**2000**
Lead	1000	**3.5**	**3.0**	**3.6**	**1.6**	**2.8**	**2.3**	**3.1**	**3.1**	**2.4**	**2.3**	**1.6**	**1.8**	**2.9**	**3.7**	**2.9**	**4.8**	**5.8**	**1.6**	**1.0**
Magnesium		**1100**	**1100**	**590**	**350**	**900**	**530**	**1100**	**1200**	**1600**	**2200**	**410**	**310**	**1200**	**1200**	**940**	**580**	**520**	**360**	**190**
Manganese	10000	**160**	**68**	**84**	**110**	**47**	**45**	**210**	**160**	**59**	**85**	**93**	**230**	**380**	**170**	**320**	**92**	**62**	**50**	**54**
Mercury	2.8	< 0.028	< 0.026	< 0.025	< 0.026	< 0.025	< 0.028	**0.012 J**	< 0.024	< 0.024	< 0.024	< 0.025	< 0.025	< 0.027	< 0.03	< 0.024	**0.013 J**	**0.036**	< 0.025	< 0.025
Nickel	310	**5.3**	**5.5**	**3.5**	**2.3**	**4.1**	**3.2**	**5.6**	**5.8**	**2.4**	**2.9**	**2.4**	**3.4**	**8.5**	**5.5**	**7.9**	**4.0**	**3.3**	**2.3**	**1.5**
Potassium		**550**	**750**	**310**	**180**	**340**	**340**	**610**	**530**	**140 J**	**170 J**	**180**	**130 J**	**470**	**560**	**400**	**210**	**150 J**	**160 J**	**93 J**
Selenium	1500	< 4	< 3.5	< 3.5	< 3.5	< 3.5	< 3.8	< 3.4	< 3.5	< 3.4	< 3.4	< 3.4	< 3.5	< 3.5	< 3.8	< 3.5	< 3.5	< 3.7	< 3.4	< 3.3
Silver	1500	< 0.4	< 0.35	< 0.35	< 0.35	< 0.35	< 0.38	< 0.34	< 0.35	< 0.34	< 0.34	< 0.34	< 0.35	< 0.35	< 0.38	< 0.35	< 0.35	< 0.37	< 0.34	< 0.33
Sodium		< 200	< 170	< 180	< 170	< 170	< 190	< 170	< 180	< 170	< 170	< 170	< 180	< 180	< 190	< 170	< 170	< 180	< 170	< 160
Thallium		< 2	< 1.7	< 1.8	< 1.7	< 1.7	< 1.9	< 1.7	< 1.8	< 1.7	< 1.7	< 1.7	< 1.8	< 1.8	< 1.9	< 1.7	< 1.7	< 1.8	< 1.7	< 1.6
Vanadium		**8.8**	**12**	**7.2**	**4.7**	**7.1**	**8.5**	**9.8**	**11**	**6.3**	**6.2**	**5.0**	**4.3**	**10**	**11**	**11**	**9.3**	**10**	**4.1**	**2.7**
Zinc	10000	**17**	**20**	**15**	**12**	**12**	**7.3**	**13**	**12**	**6.4**	**7.2**	**6.0**	**5.1**	**19**	**18**	**16**	**11**	**12**	**4.3**	**2.7**
Polychlorinated Biphenyls (PCB) (mg/kg)																				
PCB, Total	1	< 0.092	< 0.086	< 0.081	< 0.085	< 0.081	< 0.092	< 0.084	< 0.082	< 0.081	< 0.082	< 0.082	< 0.085	< 0.084	< 0.09	< 0.08	< 0.084	< 0.089	**0.62**	< 0.078
PCB-1016	1	< 0.092	< 0.086	< 0.081	< 0.085	< 0.081	< 0.092	< 0.084	< 0.082	< 0.081	< 0.082	< 0.082	< 0.085	< 0.084	< 0.09	< 0.08	< 0.084	< 0.089	< 0.078	< 0.078
PCB-1242	1	< 0.092	< 0.086	< 0.081	< 0.085	< 0.081	< 0.092	< 0.084	< 0.082	< 0.081	< 0.082	< 0.082	< 0.085	< 0.084	< 0.09	< 0.08	< 0.084	< 0.089	< 0.078	< 0.078
PCB-1248	1	< 0.092	< 0.086	< 0.081	< 0.085	< 0.081	< 0.092	< 0.084	< 0.082	< 0.081	< 0.082	< 0.082	< 0.085	< 0.084	< 0.09	< 0.08	< 0.084	< 0.089	< 0.078	< 0.078
PCB-1254	1	< 0.092	< 0.086	< 0.081	< 0.085	< 0.081	< 0.092	< 0.084	< 0.082	< 0.081	< 0.082	< 0.082	< 0.085	< 0.084	< 0.09	< 0.08	< 0.084	< 0.089	**0.54 D**	< 0.078
PCB-1260	1	< 0.092	< 0.086	< 0.081	< 0.085	< 0.081	< 0.092	< 0.084	< 0.082	< 0.081	< 0.082	< 0.082	< 0.085	< 0.084	< 0.09	< 0.08	< 0.084	< 0.089	**0.080 D**	< 0.078
PCB-1268	1	< 0.092	< 0.086	< 0.081	< 0.085	< 0.081	< 0.092	< 0.084	< 0.082	< 0.081	< 0.082	< 0.082	< 0.085	< 0.084	< 0.09	< 0.08	< 0.084	< 0.089	< 0.078	< 0.078
PFAS Compounds (µg/kg)																				
Perfluorodecanoic acid (PFDA)		**0.044 J**	NA	< 0.19	NA	< 0.2	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	**0.043 J**	NA	< 0.2	NA
Perfluorododecanoic acid (PFDoA)		< 0.2	NA	< 0.19	NA	< 0.2	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	< 0.2	NA
Perfluoroheptanoic acid (PFHpA)		< 0.2	NA	< 0.19	NA	< 0.2	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	< 0.2	NA
Perfluorohexanoic acid (PFHxA)		< 0.2	NA	< 0.19	NA	< 0.2	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	< 0.2	NA
Perfluorononane sulfonic acid (PFNS)		< 0.2	NA	< 0.19	NA	< 0.2	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	< 0.2	NA
Perfluorononanoic acid (PFNA)		**0.016 J**	NA	< 0.19	NA	< 0.2	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	< 0.2	NA
Perfluorooctanesulfonic acid (PFOS)	440	**0.049 J**	NA	< 0.19	NA	**0.065 J**	NA	**0.066 J**	NA	NA	NA	NA	NA	NA	NA	NA	**0.032 J**	NA	< 0.2	NA
Perfluorooctanoic acid (PFOA)	500	**0.038 J**	NA	< 0.19	NA	< 0.2	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	< 0.2	NA
Perfluoropentanoic acid (PFPeA)		< 0.39	NA	< 0.39	NA	< 0.4	NA	< 0.39	NA	NA	NA	NA	NA	NA	NA	NA	< 0.39	NA	**0.13 J**	NA
Perfluorotetradecanoic acid (PFTeDA)		< 0.2	NA	< 0.19	NA	< 0.2	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	< 0.2	NA
Perfluorotridecanoic acid (PFTrDA)		< 0.2	NA	< 0.19	NA	< 0.2	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	< 0.2	NA
Perfluoroundecanoic acid (PFUnA)		< 0.2	NA	< 0.19	NA	< 0.2	NA	< 0.2	NA	NA	NA	NA	NA	NA	NA	NA	< 0.19	NA	< 0.2	NA

Legend	
<1	Parameter not detected above the laboratory reporting limit
1	Parameter reported at a concentrations greater than Part 375 Commercial SCOs
1	Parameter reported above the laboratory reporting limit but below the applicable regulatory standard/criterion

Notes:
Only compounds detected above the laboratory reporting limits are presented
mg/L = milligrams per liter
µg/L = micrograms per liter
ng/L = nanograms per liter
NA = Not Analyzed
NE = No criteria established
NYSDEC = New York State Department of Environmental Conservation
SCO = Soil Cleanup Objectives
* Soil samples SB-100R and SB-100B were excavated on 6/26/2024

Table 4B - Soil Analytical Results
Concrete Coupon Investigation
Lawrence Aviation Industries, Port Jefferson, NY
HRP #DEC1027.OM

Location:		**10-1-1**	**10-1-2**	**10-1-3**	**10-2-1**	**10-3-1**	**10-3-2**	**10-4-1**	**10-4-2**	**10-4-3**	**10-4-4**	**10-4-4**	**30-1-1**	**30-1-3**	**30-1-4**	**30-2-1**	**30-2-1**	**30-3-1**	**30-3-2**
Date Collected:		**09/24/2024**	**09/25/2024**	**09/25/2024**	**09/25/2024**	**09/25/2024**	**09/25/2024**	**09/25/2024**	**09/25/2024**	**09/25/2024**	**09/25/2024**	**09/25/2024**	**09/23/2024**	**09/23/2024**	**09/23/2024**	**09/24/2024**	**09/24/2024**	**09/23/2024**	**09/23/2024**
Sample ID:		**10-1-1-S (0-1 ft bg)**	**10-1-2-S (0-1 ftbg)**	**10-1-3-S (0-1 ftbg)**	**10-2-1-S (0-1 ftbg)**	**10-3-1-S (0-1 ftbg)**	**10-3-2-S (0-1 ftbg)**	**10-4-1-S (0-1 ftbg)**	**10-4-2-S (0-1 ftbg)**	**10-4-3-S (0-1 ftbg)**	**10-4-4-S (0-1 ftbg)**	**DUP-6**	**30-1-1-S(0-1ftbg)**	**30-1-3-S(0-1ftbg)**	**30-1-4-S(0-1ftbg)**	**30-2-1-S (0-1 ft bg)**	**DUP-5**	**30-3-1-S(0-1ftbg)**	**30-3-2-S(0-1ftbg)**
Laboratory Sample ID:	**Part 375 Commercial**	**24I3534-25**	**24J0032-05**	**24J0032-06**	**24J0032-08**	**24J0032-09**	**24J0032-10**	**24J0032-11**	**24J0032-12**	**24J0032-13**	**24J0032-14**	**24J0032-15**	**24I3391-02**	**24I3391-03**	**24I3391-07RE1**	**24I3534-27**	**24I3534-32**	**24I3391-16**	**24I3391-04RE1**
General Chemistry Parameters																			
pH		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**7.90**	**7.00**	NA	NA
Solids, Percent		**94.4**	**90.4**	**90.9**	**93.4**	**87.3**	**96.0**	**92.3**	**92.0**	**91.5**	**91.5**	**91.5**	**86.2**	**88.3**	**94.7**	**89.0**	**88.6**	**83.5**	**95.1**
Volatile Organic Compounds (VOCs) (mg/kg)																			
2-Butanone (MEK)	500	< 0.0580 U	< 0.0190 U	< 0.0210 U	< 0.0220 U	< 0.0450 U	< 0.0210 U	< 0.0210 U	< 0.0190 U	< 0.0230 U	< 0.0230 U	< 0.0280 U	< 0.0460 U	< 0.0590 U	< 0.0380 U	< 0.0420 U	NA	< 0.0460 U	**0.0100 J**
2-Hexanone (Methyl butyl ketone/MBK)	NP	< 0.0290 U	< 0.00930 U	< 0.0100 U	< 0.0110 U	< 0.0230 U	< 0.0100 U	< 0.0100 U	< 0.00940 U	< 0.0120 U	< 0.0120 U	< 0.0140 U	< 0.0230 U	< 0.0290 U	< 0.0190 U	< 0.0210 U	NA	< 0.0230 U	< 0.0190 U
Acetone	500	< 0.140 U	< 0.0460 U	< 0.0520 U	< 0.0540 U	< 0.110 U	< 0.0520 U	< 0.0520 U	< 0.0470 U	< 0.0580 U	< 0.0580 U	< 0.0710 U	< 0.120 U	< 0.150 U	< 0.0950 U	< 0.110 U	NA	< 0.120 U	< 0.0960 U
m,p-Xylene	NP	< 0.00580 U	< 0.00190 U	< 0.00210 U	< 0.00220 U	< 0.00450 U	< 0.00210 U	< 0.00210 U	< 0.00190 U	< 0.00230 U	< 0.00230 U	< 0.00280 U	< 0.00460 U	< 0.00590 U	< 0.00380 U	< 0.00420 U	NA	< 0.00460 U	< 0.00390 U
Methylcyclohexane	NP	< 0.00290 U	< 0.000930 U	< 0.00100 U	< 0.00110 U	< 0.00230 U	< 0.00100 U	< 0.00100 U	< 0.000940 U	< 0.00120 U	< 0.00120 U	< 0.00140 U	< 0.00230 U	< 0.00290 U	< 0.00190 U	< 0.00210 U	NA	< 0.00230 U	< 0.00190 U
Naphthalene	500	< 0.00580 U	< 0.00190 U	< 0.00210 U	< 0.00220 U	< 0.00450 U	< 0.00210 U	< 0.00210 U	< 0.00190 U	< 0.00230 U	< 0.00230 U	< 0.00280 U	< 0.00460 U	< 0.00590 U	< 0.00380 U	< 0.00420 U	NA	< 0.00460 U	< 0.00390 U
Tetrachloroethene	150	< 0.00290 U	< 0.000930 U	< 0.00100 U	< 0.00110 U	< 0.00230 U	< 0.00100 U	< 0.00100 U	< 0.000940 U	< 0.00120 U	< 0.00120 U	< 0.00140 U	< 0.00230 U	< 0.00290 U	< 0.00190 U	< 0.00210 U	NA	< 0.00230 U	< 0.00190 U
Toluene	500	< 0.00290 U	< 0.000930 U	< 0.00100 U	< 0.00110 U	< 0.00230 U	< 0.00100 U	< 0.00100 U	< 0.000940 U	< 0.00120 U	< 0.00120 U	< 0.00140 U	< 0.00230 U	< 0.00290 U	< 0.00190 U	< 0.00210 U	NA	< 0.00230 U	< 0.00190 U
Trichloroethene	200	< 0.00290 U	< 0.000930 U	< 0.00100 U	< 0.00110 U	< 0.00230 U	< 0.00100 U	**0.00120**	< 0.000940 U	**0.00240**	**0.00850**	**0.0110**	< 0.00230 U	< 0.00290 U	**0.00250**	< 0.00210 U	NA	< 0.00230 U	< 0.00190 U
Semivolatile Organic Compounds (SVOC) (mg/kg)																			
2-Methylnaphthalene	NP	< 0.180 U	< 0.370 U	< 0.180 U	< 0.180 U	< 0.390 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.190 U	< 0.190 U	< 0.180 U	< 0.190 U	NA	< 0.200 U	< 0.350 U
3- And 4- Methylphenol (Total)	NP	< 0.360 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.370 U	NA	NA	NA
Benzo(a)pyrene	1	< 0.180 U	< 0.370 U	< 0.180 U	< 0.180 U	< 0.390 U	< 0.180 U	< 0.180 U	< 0.180 U	**0.0840 J**	**0.0400 J**	< 0.180 U	< 0.190 U	< 0.190 U	< 0.180 U	< 0.190 U	NA	< 0.200 U	< 0.350 U
Benzo(b)fluoranthene	5.6	< 0.180 U	< 0.370 U	< 0.180 U	< 0.180 U	< 0.390 U	< 0.180 U	**0.0670 J**	**0.0360 J**	**0.150 J**	**0.0770 J**	**0.0570 J**	< 0.190 U	< 0.190 U	< 0.180 U	< 0.190 U	NA	< 0.200 U	< 0.350 U
Benzo(ghi)perylene	500	< 0.180 U	< 0.370 U	< 0.180 U	< 0.180 U	< 0.390 U	< 0.180 U	< 0.180 U	< 0.180 U	**0.0640 J**	< 0.180 U	< 0.180 U	< 0.190 U	< 0.190 U	< 0.180 U	< 0.190 U	NA	< 0.200 U	< 0.350 U
Benzo(k)fluoranthene	56	< 0.180 U	< 0.370 U	< 0.180 U	< 0.180 U	< 0.390 U	< 0.180 U	< 0.180 U	< 0.180 U	**0.0610 J**	< 0.180 U	< 0.180 U	< 0.190 U	< 0.190 U	< 0.180 U	< 0.190 U	NA	< 0.200 U	< 0.350 U
Bis(2-ethylhexyl)phthalate	NP	< 0.360 U	< 0.740 U	< 0.370 U	< 0.360 U	< 0.770 U	< 0.350 U	< 0.370 U	< 0.370 U	**0.110 J**	< 0.370 U	< 0.370 U	< 0.390 U	< 0.370 U	< 0.350 U	< 0.370 U	NA	< 0.400 U	< 0.700 U
Fluoranthene	500	< 0.180 U	< 0.370 U	< 0.180 U	< 0.180 U	< 0.390 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.190 U	< 0.190 U	< 0.180 U	< 0.190 U	NA	< 0.200 U	< 0.350 U
Indeno(1,2,3-cd)pyrene	5.6	< 0.180 U	< 0.370 U	< 0.180 U	< 0.180 U	< 0.390 U	< 0.180 U	< 0.180 U	< 0.180 U	**0.0630 J**	< 0.180 U	< 0.180 U	< 0.190 U	< 0.190 U	< 0.180 U	< 0.190 U	NA	< 0.200 U	< 0.350 U
Isophorone	NP	< 0.360 U	< 0.740 U	< 0.370 U	< 0.360 U	< 0.770 U	**0.0610 J**	< 0.370 U	< 0.370 U	< 0.370 U	< 0.370 U	< 0.370 U	< 0.390 U	< 0.370 U	< 0.350 U	< 0.370 U	NA	< 0.400 U	< 0.700 U
Naphthalene	500	< 0.180 U	< 0.370 U	< 0.180 U	< 0.180 U	< 0.390 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.190 U	< 0.190 U	< 0.180 U	< 0.190 U	NA	< 0.200 U	< 0.350 U
Pyrene	500	< 0.180 U	< 0.370 U	< 0.180 U	< 0.180 U	< 0.390 U	< 0.180 U	< 0.180 U	< 0.180 U	**0.0600 J**	< 0.180 U	< 0.180 U	< 0.190 U	< 0.190 U	< 0.180 U	< 0.190 U	NA	< 0.200 U	< 0.350 U
Metals (mg/kg)																			
Aluminum	NP	**4000**	**3700**	**4000**	**4400**	**4000**	**3400**	**5700**	**4500**	**4000**	**4600**	**4600**	**1300**	**2300**	**2400**	**650**	NA	**2000**	**2500**
Antimony	NP	< 1.80 U	< 1.80 U	< 1.80 U	< 1.80 U	< 1.90 U	< 1.70 U	< 1.80 U	< 1.80 U	< 1.80 U	< 1.80 U	< 1.80 U	< 1.90 U	< 1.90 U	< 1.70 U	< 1.90 U	NA	< 1.90 U	< 1.70 U
Arsenic	16	**1.00 J**	**2.10 J**	**3.70**	**2.30 J**	**2.50 J**	**2.10 J**	**1.50 J**	**1.50 J**	**1.10 J**	**2.10 J**	**1.80 J**	**1.60 J**	**1.90 J**	**2.10 J**	NA	NA	**0.840 J**	**2.40 J**
Barium	400	**9.90**	**9.50**	**9.30**	**9.60**	**11.0**	**8.80**	**11.0**	**11.0**	**12.0**	**12.0**	**11.0**	**4.60**	**9.00**	**11.0**	**2.80**	NA	**8.90**	**13.0**
Beryllium	590	**0.160 J**	**0.150 J**	**0.150 J**	**0.140 J**	**0.140 J**	**0.130 J**	**0.140 J**	**0.140 J**	**0.120 J**	**0.140 J**	**0.140 J**	**0.0670 J**	**0.120 J**	**0.130 J**	< 0.190 U	NA	**0.0610 J**	**0.160 J**
Cadmium	9.3	< 0.350 U	< 0.370 U	< 0.370 U	< 0.350 U	< 0.380 U	< 0.350 U	< 0.360 U	< 0.360 U	< 0.360 U	< 0.360 U	< 0.360 U	< 0.370 U	< 0.360 U	< 0.340 U	< 0.370 U	NA	< 0.380 U	< 0.340 U
Calcium	NP	**2700**	**1100**	**1200**	**440**	**2900**	**2800**	**440**	**530**	**1800**	**680**	**550**	**610**	**1100**	**870**	**75.0**	NA	**1900**	**410**
Chromium	1500	**4.90**	**4.90**	**6.00**	**5.80**	**4.90**	**5.20**	**5.70**	**4.90**	**4.60**	**5.20**	**4.90**	**2.80**	**3.60**	**3.80**	**1.70**	**1.40**	**3.60**	**4.50**
Chromium, Hexavalent	400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**2.80 D**	< 0.350 U	NA	NA
Cobalt	NP	**1.60 J**	**2.20**	**3.10**	**2.10**	**2.30**	**2.00**	**0.960 J**	**1.60 J**	**1.50 J**	**1.50 J**	**1.60 J**	**0.970 J**	**1.50 J**	**1.60 J**	**0.540 J**	NA	**1.40 J**	**2.00**
Copper	270	**3.60**	**9.50**	**12.0**	**6.70**	**6.80**	**6.20**	**2.90**	**4.60**	**7.30**	**4.40**	**4.80**	**3.00**	**3.60**	**4.70**	**1.90**	NA	**4.70**	**5.80**
Iron	NP	**4500**	**5600**	**7100**	**6100**	**6300**	**5200**	**5600**	**5500**	**4600**	**5400**	**5100**	**2500**	**3800**	**3800**	**1600**	NA	**3500**	**4800**
Lead	1000	**6.30**	**4.10**	**6.20**	**6.30**	**3.30**	**3.10**	**4.50**	**22.0**	**6.90**	**37.0**	**29.0**	**1.90**	**2.20**	**2.30**	**0.910**	NA	**2.10**	**2.90**
Magnesium	NP	**1100**	**900**	**1200**	**780**	**1100**	**1100**	**460**	**780**	**530**	**550**	**580**	**320**	**560**	**580**	**170**	NA	**640**	**520**
Manganese	10000	**84.0**	**150**	**220**	**120**	**160**	**120**	**45.0**	**93.0**	**77.0**	**96.0**	**99.0**	**50.0**	**94.0**	**110**	**33.0**	NA	**110**	**200**
Mercury	2.8	**0.0100 J**	< 0.0270 U	**0.0150 J**	**0.0140 J**	< 0.0280 U	< 0.0260 U	**0.0190 J**	**0.0180 J**	**0.0140 J**	**0.0150 J**	**0.0160 J**	< 0.0290 U	< 0.0290 U	< 0.0260 U	< 0.0260 U	NA	< 0.0300 U	< 0.0270 U
Nickel	310	**3.50**	**5.90**	**7.40**	**4.90**	**4.30**	**3.90**	**2.70**	**3.70**	**4.30**	**3.20**	**3.60**	**1.80**	**2.70**	**2.80**	**0.950**	NA	**2.70**	**5.00**
Potassium	NP	**210**	**270**	**290**	**220**	**330**	**320**	**180**	**170 J**	**270**	**220**	**220**	**150 J**	**310**	**260**	**110 J**	NA	**320**	**270**
Sodium	NP	< 180 U	< 180 U	< 180 U	< 180 U	< 190 U	< 170 U	< 180 U	< 180 U	< 180 U	< 180 U	< 180 U	< 190 U	< 180 U	< 170 U	< 190 U	NA	< 190 U	< 170 U
Vanadium	NP	**7.20**	**6.30**	**8.30**	**8.20**	**7.40**	**7.40**	**8.60**	**7.20**	**6.60**	**8.10**	**7.60**	**3.30**	**5.20**	**5.50**	**2.20**	NA	**5.40**	**6.50**
Zinc	10000	**15.0**	**7.90**	**14.0**	**11.0**	**12.0**	**8.10**	**12.0**	**26.0**	**14.0**	**24.0**	**22.0**	**6.10**	**5.90**	**6.80**	**2.60**	NA	**6.40**	**8.90**
Polychlorinated Biphenyls (PCB) (mg/kg)																			
PCB-1016	1	< 0.0830 U	< 0.0860 U	< 0.0860 U	< 0.0830 U	< 0.0900 U	< 0.0820 U	< 0.0830 U	< 0.0860 U	< 0.0860 U	< 0.0850 U	< 0.0840 U	< 0.0870 U	< 0.0890 U	< 0.0830 U	< 0.0870 U	NA	< 0.0880 U	< 0.0830 U
PCB-1221	1	< 0.0830 U	< 0.0860 U	< 0.0860 U	< 0.0830 U	< 0.0900 U	< 0.0820 U	< 0.0830 U	< 0.0860 U	< 0.0860 U	< 0.0850 U	< 0.0840 U	< 0.0870 U	< 0.0890 U	< 0.0830 U	< 0.0870 U	NA	< 0.0880 U	< 0.0830 U
PCB-1232	1	< 0.0830 U	< 0.0860 U	< 0.0860 U	< 0.0830 U	< 0.0900 U	< 0.0820 U	< 0.0830 U	< 0.0860 U	< 0.0860 U	< 0.0850 U	< 0.0840 U	< 0.0870 U	< 0.0890 U	< 0.0830 U	< 0.0870 U	NA	< 0.0880 U	< 0.0830 U
PCB-1242	1	< 0.0830 U	< 0.0860 U	< 0.0860 U	< 0.0830 U	< 0.0900 U	< 0.0820 U	< 0.0830 U	< 0.0860 U	< 0.0860 U	< 0.0850 U	< 0.0840 U	< 0.0870 U	< 0.0890 U	< 0.0830 U	< 0.0870 U	NA	< 0.0880 U	< 0.0830 U
PCB-1248	1	< 0.0830 U	< 0.0860 U	< 0.0860 U	< 0.0830 U	< 0.0900 U	< 0.0820 U	< 0.0830 U	< 0.0860 U	< 0.0860 U	< 0.0850 U	< 0.0840 U	< 0.0870 U	< 0.0890 U	< 0.0830 U	< 0.0870 U	NA	< 0.0880 U	< 0.0830 U
PCB-1254	1	**0.140 D**	**0.440 D**	**0.220 D**	**0.150 D**	**0.660 D**	**0.0800 JD**	< 0.0830 U	< 0.0860 U	< 0.0860 U	< 0.0850 U	< 0.0840 U	< 0.0870 U	< 0.0890 U	< 0.0830 U	< 0.0870 U	NA	< 0.0880 U	< 0.0830 U
PCB-1260	1	**0.0640 JD**	< 0.0860 U	< 0.0860 U	**0.100 D**	< 0.0900 U	< 0.0820 U	**0.0940 D**	**0.0990 D**	**0.170 D**	**0.120 D**	**0.170 D**	**0.490 D**	< 0.0890 U	< 0.0830 U	< 0.0870 U	NA	< 0.0880 U	**0.0810 JD**
PCB-1262	1	< 0.0830 U	< 0.0860 U	< 0.0860 U	< 0.0830 U	< 0.0900 U	< 0.0820 U	< 0.0830 U	< 0.0860 U	< 0.0860 U	< 0.0850 U	< 0.0840 U	< 0.0870 U	< 0.0890 U	< 0.0830 U	< 0.0870 U	NA	< 0.0880 U	< 0.0830 U
PCB-1268	1	< 0.0830 U	< 0.0860 U	< 0.0860 U	< 0.0830 U	< 0.0900 U	< 0.0820 U	< 0.0830 U	< 0.0860 U	< 0.0860 U	< 0.0850 U	< 0.0840 U	< 0.0870 U	< 0.0890 U	< 0.0830 U	< 0.0870 U	NA	< 0.0880 U	< 0.0830 U
Total PCBs	1	**0.204**	**0.440**	**0.220 D**	**0.250**	**0.660 D**	**0.0800 JD**	**0.0940 D**	**0.0990 D**	**0.170 D**	**0.120 D**	**0.170 D**	**0.490 D**	BDL	BDL	BDL	NA	BDL	**0.0810 JD**
PFAS (ug/kg)																			
Perfluorodecanoic acid (PFDA)	NP	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.000200 U	< 0.000200 U	NA	NA	NA	NA	NA	NA	< 0.000200 U
Perfluorooctanesulfonic acid (PFOS)	0.44	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.0000570 J**	**0.0000420 J**	NA	NA	NA	NA	NA	NA	< 0.000200 U
Perfluorooctanoic acid (PFOA)	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.0000350 J**	**0.0000310 J**	NA	NA	NA	NA	NA	NA	< 0.000200 U

Legend

<1	Parameter not detcted above the laboratory reporting limit
1	Parameter reported at a concentrations greater than Part 375 Commercial SCOs
1	Parameter reported above the laboratory reporting limit but below the applicable regulatory standard/criterion

Notes:
Only detcted compounds are presented
ftbg = feet below grade
µg/kg = micrograms per kilogram
mg/kg = micrograms per kilogram
NA = Not Analyzed
NP = not promulgated/ no applicable soil criteria
R = Data are rejected and are not usable for any purpose
J = The reported result is an estimate.
D = Result ws obtained from the analysis of a dilution
U = The analyte was not detected in the sample at the estimated detection limit
PFAS = Per- and Polyfluoroalkyl Substances

4B - Soil Analytical Results
Concrete Coupon Investigation
Lawrence Aviation Industries, Port Jefferson, NY
HRP #DEC1027.OM

Location:		30-3-3	E-1-1	E-2-1	E-2-2	E-2-2	E-3-1	E-3-2	F-1-1	F-1-2	F-1-3	G-1-1	G-1-2	G-1-3	G-1-4	G-1-4	G-2-1	G-2-2	G-2-3
Date Collected:		09/23/2024	09/23/2024	09/23/2024	09/23/2024	09/23/2024	09/23/2024	09/23/2024	09/25/2024	09/25/2024	09/25/2024	09/25/2024	09/25/2024	09/25/2024	09/25/2024	09/25/2024	09/24/2024	09/24/2024	09/24/2024
Sample ID:		30-3-3-S(0-1ftbg)	E-1-1-S(0-1ftbg)	E-2-1-S(0-1ftbg)	E-2-2-S(0-1ftbg)	DUP-1	E-3-1-S(0-1ftbg)	E-3-2-S(0-1ftbg)	F-1-1-S (0-1 ftbg)	F-1-2-S (0-1 ftbg)	F-1-3-S (0-1 ftbg)	G-1-1-S (0-1 ftbg)	G-1-2-S (0-1 ftbg)	G-1-3-S (0-1 ftbg)	G-1-4-S (0-1 ftbg)	G-1-4-S(1-2 ftbg)	G-2-1-S (0-1 ft bg)	G-2-2-S (0-1 ft bg)	G-2-3-S (0-1 ft bg)
Laboratory Sample ID:	Part 375 Commercial	24I3391-14	24I3391-08	24I3391-09	24I3391-11	24I3391-12	24I3391-13	24I3391-10	2430032-17	2430032-18	2430032-19	2430032-01	2430032-02	2430032-03	2430032-07	24J4520-01	24I3534-19	24I3534-21	24I3534-23
General Chemistry Parameters																			
pH		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Solids, Percent		**78.8**	**89.5**	**87.1**	**94.2**	**93.1**	**86.7**	**91.0**	**94.6**	**88.0**	**87.6**	**92.4**	**93.3**	**94.3**	**84.6**	**81.6**	**86.9**	**95.0**	**96.3**
Volatile Organic Compounds (VOCs) (mg/kg)																			
2-Butanone (MEK)	500	**0.0420**	< 0.0360 U	< 0.0380 U	< 0.0360 U	< 0.0380 U	< 0.0480 U	< 0.0370 U	< 0.0190 U	< 0.0270 U	< 0.0620 U	< 0.0410 U	< 0.100 U	< 0.0400 U	< 0.0410 U	NA	< 0.0450 U	< 0.0410 U	**0.00950 J**
2-Hexanone (Methyl butyl ketone/MBK)	NP	**0.0100 J**	< 0.0180 U	< 0.0190 U	< 0.0180 U	< 0.0190 U	< 0.0240 U	< 0.0180 U	< 0.00950 U	< 0.0130 U	< 0.0310 U	< 0.0210 U	< 0.0510 U	< 0.0200 U	< 0.0200 U	NA	< 0.0230 U	< 0.0210 U	< 0.0210 U
Acetone	500	**0.150**	< 0.0910 U	< 0.0950 U	< 0.0910 U	< 0.0950 U	< 0.120 U	< 0.0920 U	< 0.0470 U	< 0.0660 U	< 0.160 U	< 0.100 U	< 0.260 U	< 0.0990 U	< 0.100 U	NA	< 0.110 U	< 0.100 U	< 0.110 U
m,p-Xylene	NP	< 0.00410 U	< 0.00360 U	< 0.00380 U	< 0.00360 U	< 0.00380 U	< 0.00480 U	< 0.00370 U	< 0.00190 U	< 0.00270 U	< 0.00620 U	< 0.00410 U	< 0.0100 U	< 0.00400 U	< 0.00410 U	NA	< 0.00450 U	< 0.00410 U	< 0.00430 U
Methylcyclohexane	NP	< 0.00210 U	< 0.00180 U	< 0.00190 U	< 0.00180 U	< 0.00190 U	< 0.00240 U	< 0.00180 U	< 0.000950 U	< 0.00130 U	< 0.00310 U	< 0.00210 U	< 0.00510 U	< 0.00200 U	< 0.00200 U	NA	< 0.00230 U	< 0.00210 U	< 0.00210 U
Naphthalene	500	< 0.00410 U	< 0.00360 U	< 0.00380 U	< 0.00360 U	< 0.00380 U	< 0.00480 U	< 0.00370 U	< 0.00190 U	< 0.00270 U	< 0.00620 U	< 0.00410 U	< 0.0100 U	< 0.00400 U	< 0.00410 U	NA	< 0.00450 U	< 0.00410 U	< 0.00430 U
Tetrachloroethene	150	< 0.00210 U	**0.00130 J**	< 0.00190 U	**0.00109 J**	**0.000980 J**	**0.00150 J**	**0.00100 J**	< 0.000950 U	< 0.00130 U	< 0.00310 U	< 0.00210 U	< 0.00510 U	< 0.00200 U	< 0.00200 U	NA	< 0.00230 U	< 0.00210 U	< 0.00210 U
Toluene	500	< 0.00210 U	< 0.00180 U	< 0.00190 U	< 0.00180 U	< 0.00190 U	< 0.00240 U	< 0.00180 U	< 0.000950 U	< 0.00130 U	< 0.00310 U	< 0.00210 U	< 0.00510 U	< 0.00200 U	< 0.00200 U	NA	< 0.00230 U	< 0.00210 U	< 0.00210 U
Trichloroethene	200	< 0.00210 U	**0.00110 J**	< 0.00190 U	< 0.00180 U	< 0.00190 U	< 0.00240 U	< 0.00180 U	< 0.000950 U	< 0.00130 U	< 0.00310 U	< 0.00210 U	**0.00460 J**	**0.000890 J**	< 0.00200 U	NA	**0.00100 J**	**0.00240**	< 0.00210 U
Semivolatile Organic Compounds (SVOC) (mg/kg)																			
2-Methylnaphthalene	NP	< 1.10 U	< 0.180 U	< 0.190 U	< 0.180 U	< 0.180 U	< 0.190 U	< 0.190 U	< 0.180 U	< 0.190 U	< 0.380 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.390 U	NA	< 0.390 U	< 0.180 U	< 0.180 U
3- And 4- Methylphenol (Total)	NP	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.780 U	< 0.360 U	< 0.350 U
Benzo(a)pyrene	1	< 1.10 U	< 0.180 U	< 0.190 U	< 0.180 U	< 0.180 U	< 0.190 U	< 0.190 U	< 0.180 U	< 0.190 U	< 0.380 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.390 U	NA	< 0.390 U	< 0.180 U	< 0.180 U
Benzo(b)fluoranthene	5.6	< 1.10 U	< 0.180 U	< 0.190 U	< 0.180 U	< 0.180 U	< 0.190 U	< 0.190 U	< 0.180 U	< 0.190 U	< 0.380 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.390 U	NA	< 0.390 U	< 0.180 U	< 0.180 U
Benzo(ghi)perylene	500	< 1.10 U	< 0.180 U	< 0.190 U	< 0.180 U	< 0.180 U	< 0.190 U	< 0.190 U	< 0.180 U	< 0.190 U	< 0.380 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.390 U	NA	< 0.390 U	< 0.180 U	< 0.180 U
Benzo(k)fluoranthene	56	< 1.10 U	< 0.180 U	< 0.190 U	< 0.180 U	< 0.180 U	< 0.190 U	< 0.190 U	< 0.180 U	< 0.190 U	< 0.380 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.390 U	NA	< 0.390 U	< 0.180 U	< 0.180 U
Bis(2-ethylhexyl)phthalate	NP	< 2.10 U	< 0.370 U	< 0.380 U	< 0.360 U	< 0.350 U	< 0.380 U	< 0.370 U	< 0.360 U	< 0.390 U	< 0.760 U	< 0.370 U	< 0.360 U	< 0.360 U	< 0.780 U	NA	< 0.780 U	**0.0490 J**	< 0.350 U
Fluoranthene	500	< 1.10 U	< 0.180 U	< 0.190 U	**0.0460 J**	< 0.180 U	< 0.190 U	< 0.190 U	< 0.180 U	< 0.190 U	< 0.380 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.390 U	NA	< 0.390 U	< 0.180 U	< 0.180 U
Indeno(1,2,3-cd)pyrene	5.6	< 1.10 U	< 0.180 U	< 0.190 U	< 0.180 U	< 0.180 U	< 0.190 U	< 0.190 U	< 0.180 U	< 0.190 U	< 0.380 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.390 U	NA	< 0.390 U	< 0.180 U	< 0.180 U
Isophorone	NP	< 2.10 U	< 0.370 U	< 0.380 U	< 0.360 U	< 0.350 U	< 0.380 U	< 0.370 U	< 0.360 U	< 0.390 U	< 0.760 U	< 0.370 U	< 0.360 U	< 0.360 U	< 0.780 U	NA	< 0.780 U	**0.140 J**	< 0.350 U
Naphthalene	500	< 1.10 U	< 0.180 U	< 0.190 U	< 0.180 U	< 0.180 U	< 0.190 U	< 0.190 U	< 0.180 U	< 0.190 U	< 0.380 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.390 U	NA	< 0.390 U	< 0.180 U	< 0.180 U
Pyrene	500	< 1.10 U	< 0.180 U	< 0.190 U	**0.0410 J**	< 0.180 U	< 0.190 U	< 0.190 U	< 0.180 U	< 0.190 U	< 0.380 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.390 U	NA	< 0.390 U	< 0.180 U	< 0.180 U
Metals (mg/kg)																			
Aluminum	NP	**1600**	**5300**	**3500**	**3900**	**3800**	**4100**	**3800**	**3900**	**2500**	**1900 B**	**3800**	**3800**	**4600**	**2900**	NA	**5400**	**3900**	**3600**
Antimony	NP	< 2.00 U	< 1.80 U	< 1.90 U	< 1.70 U	< 1.70 U	< 1.90 U	< 1.80 U	< 1.80 U	< 1.90 U	< 1.90 U	< 1.80 U	< 1.80 U	< 1.80 U	< 2.00 U	NA	< 1.80 U	**0.760 J**	< 1.70 U
Arsenic	16	**1.70 J**	**3.80**	**2.20 J**	**2.60 J**	**2.80 J**	**2.60 J**	**2.70 J**	**2.20 J**	**4.60**	**1.70 J**	**4.10**	**3.10 J**	**2.00 J**	**1.40 J**	NA	**0.740 J**	**1.20 J**	**1.60 J**
Barium	400	**5.40**	**20.0**	**11.0**	**13.0**	**12.0**	**13.0**	**13.0**	**12.0**	**8.70**	**8.40**	**14.0**	**10.0**	**14.0**	**8.40**	NA	**12.0**	**12.0**	**12.0**
Beryllium	590	**0.0710 J**	**0.220**	**0.160 J**	**0.180**	**0.160 J**	**0.170 J**	**0.190**	**0.150 J**	**0.110 J**	**0.110 J**	**0.170 J**	**0.130 J**	**0.150 J**	**0.0840 J**	NA	**0.190**	**0.150 J**	**0.170**
Cadmium	9.3	< 0.400 U	**0.270 J**	< 0.370 U	< 0.340 U	< 0.350 U	< 0.370 U	< 0.360 U	< 0.350 U	< 0.380 U	< 0.370 U	< 0.360 U	< 0.360 U	< 0.350 U	< 0.390 U	NA	< 0.360 U	< 0.340 U	< 0.340 U
Calcium	NP	**350**	**6800**	**710**	**730**	**1900**	**1200**	**3400**	**310**	**240**	**400**	**1500**	**2200**	**280**	**3900**	NA	**8100**	**15000**	**590**
Chromium	1500	**3.00**	**21.0**	**5.00**	**6.40**	**6.60**	**7.90**	**7.40**	**5.80**	**9.60**	**3.70**	**6.10**	**5.40**	**5.80**	**5.10**	NA	**5.50**	**6.70**	**5.00**
Chromium, Hexavalent	400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NP	**1.20 J**	**2.40**	**2.00**	**1.60 J**	**1.60 J**	**1.80 J**	**1.80**	**2.20**	**2.20**	**1.90**	**3.10**	**2.50**	**2.00**	**1.40 J**	NA	**0.930 J**	**1.30 J**	**1.90**
Copper	270	**5.30**	**15.0**	**5.10**	**5.60**	**6.90**	**4.90**	**7.40**	**5.60**	**6.00**	**8.00**	**16.0**	**10.0**	**6.20**	**8.10**	NA	**3.00**	**6.40**	**5.80**
Iron	NP	**2900**	**11000**	**4600**	**5000**	**5200**	**5100**	**5400**	**6100**	**5200**	**3900 B**	**7200**	**6200**	**5900**	**4700**	NA	**4900**	**4900**	**5000**
Lead	1000	**2.00**	**33.0**	**4.50**	**10.0**	**10.0**	**8.30**	**8.50**	**18.0**	**4.70**	**2.10**	**4.40**	**6.40**	**6.40**	**11.0**	NA	**6.40**	**19.0**	**3.20**
Magnesium	NP	**490**	**870**	**710**	**640**	**670**	**630**	**730**	**850**	**550**	**500**	**1200**	**1100**	**840**	**1300**	NA	**1700**	**2400**	**710**
Manganese	10000	**65.0**	**150**	**120**	**120**	**120**	**97.0**	**110**	**140**	**160**	**160 B**	**230**	**150**	**85.0**	**82.0**	NA	**40.0**	**68.0**	**120**
Mercury	2.8	< 0.0320 U	**0.0210 J**	< 0.0290 U	**0.0120 J**	< 0.0260 U	< 0.0290 U	< 0.0270 U	< 0.0270 U	< 0.0290 U	< 0.0280 U	< 0.0270 U	< 0.0270 U	< 0.0260 U	< 0.0290 U	NA	< 0.0280 U	**0.0170 J**	< 0.0240 U
Nickel	310	**2.30**	**39.0**	**3.90**	**5.90**	**5.70**	**7.30**	**5.50**	**4.80**	**8.10**	**3.30**	**9.20**	**6.10**	**4.40**	**4.80**	NA	**3.20**	**5.40**	**3.70**
Potassium	NP	**170 J**	**290**	**840**	**950**	**950**	**380**	**530**	**380**	**270**	**280**	**350**	**330**	**530**	**360**	NA	**170 J**	**240**	**470**
Sodium	NP	< 200 U	< 180 U	**120 J**	**87.0 J**	**97.0 J**	< 190 U	< 180 U	< 180 U	< 190 U	< 190 U	< 180 U	< 180 U	< 180 U	**200**	NA	< 180 U	< 170 U	< 170 U
Vanadium	NP	**3.90**	**12.0**	**7.50**	**9.20**	**8.80**	**8.50**	**8.80**	**8.80**	**5.70**	**5.70**	**7.60**	**7.50**	**8.50**	**5.90**	NA	**9.80**	**7.20**	**7.80**
Zinc	10000	**6.90**	**28.0**	**9.00**	**14.0**	**13.0**	**20.0**	**13.0**	**15.0**	**9.70**	**7.40**	**13.0**	**13.0**	**10.0**	**12.0**	NA	**7.90**	**15.0 B**	**10.0**
Polychlorinated Biphenyls (PCB) (mg/kg)																			
PCB-1016	1	< 0.0970 U	< 0.0830 U	< 0.0900 U	< 0.0830 U	< 0.0850 U	< 0.0920 U	< 0.0860 U	< 0.0830 U	< 0.0890 U	< 0.0890 U	< 0.0830 U	< 0.0830 U	< 0.0830 U	< 0.0920 U	< 0.0910 U	< 0.0880 U	< 0.0810 U	< 0.0810 U
PCB-1221	1	< 0.0970 U	< 0.0830 U	< 0.0900 U	< 0.0830 U	< 0.0850 U	< 0.0920 U	< 0.0860 U	< 0.0830 U	< 0.0890 U	< 0.0890 U	< 0.0830 U	< 0.0830 U	< 0.0830 U	< 0.0920 U	< 0.0910 U	< 0.0880 U	< 0.0810 U	< 0.0810 U
PCB-1232	1	< 0.0970 U	< 0.0830 U	< 0.0900 U	< 0.0830 U	< 0.0850 U	< 0.0920 U	< 0.0860 U	< 0.0830 U	< 0.0890 U	< 0.0890 U	< 0.0830 U	< 0.0830 U	< 0.0830 U	< 0.0920 U	< 0.0910 U	< 0.0880 U	< 0.0810 U	< 0.0810 U
PCB-1242	1	< 0.0970 U	< 0.0830 U	< 0.0900 U	< 0.0830 U	< 0.0850 U	< 0.0920 U	< 0.0860 U	< 0.0830 U	< 0.0890 U	< 0.0890 U	< 0.0830 U	< 0.0830 U	< 0.0830 U	< 0.0920 U	< 0.0910 U	< 0.0880 U	< 0.0810 U	< 0.0810 U
PCB-1248	1	< 0.0970 U	**0.0480 JD**	< 0.0900 U	< 0.0830 U	< 0.0850 U	< 0.0920 U	**0.0640 JD**	< 0.0830 U	< 0.0890 U	< 0.0890 U	< 0.0830 U	< 0.0830 U	< 0.0830 U	< 0.0920 U	< 0.0910 U	< 0.0880 U	< 0.0810 U	< 0.0810 U
PCB-1254	1	< 0.0970 U	**0.150 D**	< 0.0900 U	**0.0680 JD**	**0.0440 JD**	< 0.0920 U	**0.0710 JD**	< 0.0830 U	< 0.0890 U	< 0.0890 U	**0.330 D**	**0.380 D**	**0.130 D**	**1.20 D**	**0.150 D**	< 0.0880 U	< 0.0810 U	< 0.0810 U
PCB-1260	1	< 0.0970 U	**0.100 D**	< 0.0900 U	**0.0650 JD**	**0.0360 JD**	< 0.0920 U	**0.0470 JD**	< 0.0830 U	< 0.0890 U	< 0.0890 U	< 0.0830 U	< 0.0830 U	< 0.0830 U	**0.540 D**	< 0.0910 U	< 0.0880 U	**0.0290 JD**	< 0.0810 U
PCB-1262	1	< 0.0970 U	< 0.0830 U	< 0.0900 U	< 0.0830 U	< 0.0850 U	< 0.0920 U	< 0.0860 U	< 0.0830 U	< 0.0890 U	< 0.0890 U	< 0.0830 U	< 0.0830 U	< 0.0830 U	< 0.0920 U	< 0.0910 U	< 0.0880 U	< 0.0810 U	< 0.0810 U
PCB-1268	1	< 0.0970 U	< 0.0830 U	< 0.0900 U	< 0.0830 U	< 0.0850 U	< 0.0920 U	< 0.0860 U	< 0.0830 U	< 0.0890 U	< 0.0890 U	< 0.0830 U	< 0.0830 U	< 0.0830 U	< 0.0920 U	< 0.0910 U	< 0.0880 U	< 0.0810 U	< 0.0810 U
Total PCBs	1	BDL	**0.298**	BDL		0.080	BDL	**0.182**	BDL	BDL	BDL	**0.330 D**	**0.380 D**	**0.130 D**	**1.74 D**	**0.150 D**	BDL	**0.0290 JD**	BDL
PFAS (ug/kg)																			
Perfluorodecanoic acid (PFDA)	NP	NA	NA	NA	< 0.000200 U	< 0.000200 U	NA	NA	< 0.000200 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorooctanesulfonic acid (PFOS)	0.44	NA	NA	NA	**0.0000700 J**	< 0.000200 U	NA	NA	**0.0000680 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorooctanoic acid (PFOA)	0.5	NA	NA	NA	< 0.000200 U	< 0.000200 U	NA	NA	< 0.000200 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Legend

<1	Parameter not detected above the laboratory reporting limit
1	Parameter reported at a concentrations greater than Part 375 Commerical SCOs
1	Parameter reported above the laboratory reporting limit but below the applicable

Notes:
Only detcted compounds are presented
ftbg = feet below grade
µg/kg = micrograms per kilogram
mg/kg = micrograms per kilogram
NA = Not Analyzed
NP = not promulgated/ no applicable soil criteria
R = Data are rejected and are not usable for any purpose
J = The reported result is an estimate.
D = Result wx obtained from the analysis of a dilution
U = The analyte was not detected in the sample at the estimated detection limit
PFAS = Per- and Polyfluoroalkyl Substances

Table 4B - Soil Analytical Results
Concrete Coupon Investigation
Lawrence Aviation Industries, Port Jefferson, NY
HRP #DEC1027.OM

Location:		G-3-1	G-3-1	G-3-1	G-3-1	G-3-2	G-3-3	G-4-1	G-4-2	G-4-3	G-4-4	G-5-1	G-5-1	G-6-1	G-6-1	G-7-1	G-7-2
Date Collected:		09/24/2024	09/24/2024	09/24/2024	09/24/2024	09/24/2024	09/24/2024	09/24/2024	09/24/2024	09/24/2024	09/24/2024	09/23/2024	09/23/2024	09/23/2024	09/23/2024	09/24/2024	09/24/2024
Sample ID:		G-3-1-S (0-1 ft bg)	DUP-3	G-3-1-S (1-2 ft bg)	DUP-4	G-3-2-S (0-1 ft bg)	G-3-3-S (0-1 ft bg)	G-4-1-S (0-1 ft bg)	G-4-2-S (0-1 ft bg)	G-4-3-S (0-1 ft bg)	G-4-4-S (0-1 ft bg)	G-5-1-S(0-1ftbg)	DUP-2	G-6-1-S(0-1ftbg)	G-6-1-S(1-2ftbg)	G-7-1-S (0-1 ft bg)	G-7-2-S (0-1 ft bg)
Laboratory Sample ID:	Part 375 Commercial	24I3534-13	24I3534-30	24I3534-14	24I3534-31	24I3534-11	24I3534-09	24I3534-15	24I3534-17	24I3534-07	24I3534-05	24I3391-06RE1	24I3534-29	24I3391-01	24J4522-01	24I3534-03RE1	24I3534-01
General Chemistry Parameters																	
pH		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Solids, Percent		**95.7**	**95.2**	**95.4**	**95.4**	**94.5**	**94.5**	**97.6**	**94.4**	**96.0**	**94.6**	**93.8**	**93.0**	**94.1**	**81.2**	**87.5**	**96.0**
Volatile Organic Compounds (VOCs) (mg/kg)																	
2-Butanone (MEK)	500	< 0.0380 U	NA	< 0.0370 U	< 0.0370 U	< 0.0420 U	< 0.0400 U	< 0.0450 U	**0.0330 J**	< 0.0460 U	< 0.0400 U	< 0.0350 U	< 0.0370 U	< 1.00 U	**0.082**	< 0.0410 U	< 0.0370 U
2-Hexanone (Methyl butyl ketone/MBK)	NP	< 0.0190 U	NA	< 0.0190 U	< 0.0190 U	< 0.0210 U	< 0.0200 U	< 0.0230 U	< 0.0210 U	< 0.0230 U	< 0.0200 U	< 0.0180 U	< 0.0190 U	< 0.500 U	**0.033**	< 0.0210 U	< 0.0180 U
Acetone	500	< 0.0950 U	NA	< 0.0930 U	< 0.0930 U	< 0.100 U	< 0.100 U	< 0.110 U	**0.0740 J**	< 0.120 U	< 0.0990 U	< 0.0880 U	< 0.0930 U	< 2.50 U	**0.33**	< 0.100 U	< 0.0920 U
m,p-Xylene	NP	< 0.00380 U	NA	< 0.00370 U	< 0.00370 U	< 0.00420 U	< 0.00400 U	< 0.00450 U	**0.00180 J**	< 0.00460 U	< 0.00400 U	< 0.00350 U	< 0.00370 U	< 0.100 U	< 0.0054 U	< 0.00410 U	< 0.00370 U
Methylcyclohexane	NP	< 0.00190 U	NA	< 0.00190 U	< 0.00190 U	< 0.00210 U	< 0.00200 U	< 0.00230 U	**0.000760 J**	< 0.00230 U	< 0.00200 U	< 0.00180 U	< 0.00190 U	< 0.0500 U	< 0.0027 U	< 0.00210 U	< 0.00180 U
Naphthalene	500	< 0.00380 U	NA	< 0.00370 U	< 0.00370 U	< 0.00420 U	< 0.00400 U	< 0.00450 U	< 0.00420 U	< 0.00460 U	< 0.00400 U	< 0.00350 U	< 0.00370 U	**0.0150 J**	< 0.0054 U	< 0.00410 U	< 0.00370 U
Tetrachloroethene	150	< 0.00190 U	NA	< 0.00190 U	< 0.00190 U	< 0.00210 U	< 0.00200 U	< 0.00230 U	**0.00460**	**0.00120 J**	< 0.00200 U	**0.00170 J**	< 0.00190 U	**0.210**	< 0.0027 U	< 0.00210 U	< 0.00180 U
Toluene	500	< 0.00190 U	NA	< 0.00190 U	< 0.00190 U	< 0.00210 U	< 0.00200 U	< 0.00230 U	**0.000640 J**	< 0.00230 U	< 0.00200 U	< 0.00180 U	< 0.00190 U	< 0.0500 U	< 0.0027 U	< 0.00210 U	< 0.00180 U
Trichloroethene	200	< 0.00190 U	NA	< 0.00190 U	**0.0036**	**0.00130 J**	**0.00140 J**	**0.00280**	**0.0190**	**0.0140**	**0.00270**	**0.0140**	< 0.00190 U	**0.220**	< 0.0027 U	**0.00130 J**	< 0.00180 U
Semivolatile Organic Compounds (SVOC) (mg/kg)																	
2-Methylnaphthalene	NP	< 0.170 U	NA	< 0.170 U	< 0.170 U	< 0.180 U	< 0.180 U	< 0.170 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.890 U	NA	**0.0830 J**	< 0.180 U
3- And 4- Methylphenol (Total)	NP	< 0.350 U	NA	< 0.350 U	< 0.350 U	< 0.360 U	< 0.360 U	< 0.340 U	**0.0630 J**	< 0.350 U	< 0.360 U	NA	< 0.360 U	NA	NA	< 0.760 U	< 0.350 U
Benzo(a)pyrene	1	< 0.170 U	NA	< 0.170 U	< 0.170 U	< 0.180 U	< 0.180 U	< 0.170 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.890 U	NA	< 0.380 U	< 0.180 U
Benzo(b)fluoranthene	5.6	< 0.170 U	NA	< 0.170 U	< 0.170 U	< 0.180 U	< 0.180 U	< 0.170 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.890 U	NA	< 0.380 U	< 0.180 U
Benzo(ghi)perylene	500	< 0.170 U	NA	< 0.170 U	< 0.170 U	< 0.180 U	< 0.180 U	< 0.170 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.890 U	NA	< 0.380 U	< 0.180 U
Benzo(k)fluoranthene	56	< 0.170 U	NA	< 0.170 U	< 0.170 U	< 0.180 U	< 0.180 U	< 0.170 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.890 U	NA	< 0.380 U	< 0.180 U
Bis(2-ethylhexyl)phthalate	NP	< 0.350 U	NA	< 0.350 U	< 0.350 U	< 0.360 U	< 0.360 U	< 0.340 U	**0.200 J**	< 0.350 U	< 0.360 U	< 0.350 U	< 0.360 U	**1.20 JD**	NA	< 0.760 U	< 0.350 U
Fluoranthene	500	< 0.170 U	NA	< 0.170 U	< 0.170 U	< 0.180 U	< 0.180 U	< 0.170 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.890 U	NA	< 0.380 U	< 0.180 U
Indeno(1,2,3-cd)pyrene	5.6	< 0.170 U	NA	< 0.170 U	< 0.170 U	< 0.180 U	< 0.180 U	< 0.170 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.890 U	NA	< 0.380 U	< 0.180 U
Isophorone	NP	< 0.350 U	NA	< 0.350 U	< 0.350 U	< 0.360 U	< 0.360 U	< 0.340 U	< 0.360 U	< 0.350 U	< 0.360 U	< 0.350 U	< 0.360 U	< 1.80 U	NA	< 0.760 U	< 0.350 U
Naphthalene	500	< 0.170 U	NA	< 0.170 U	< 0.170 U	< 0.180 U	< 0.180 U	< 0.170 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.890 U	NA	**0.160 J**	< 0.180 U
Pyrene	500	< 0.170 U	NA	< 0.170 U	< 0.170 U	< 0.180 U	< 0.180 U	< 0.170 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.180 U	< 0.890 U	NA	< 0.380 U	< 0.180 U
Metals (mg/kg)																	
Aluminum	NP	**4200**	NA	**4100**	**3300**	**3800**	**3500**	**3400**	**3700**	**3400**	**3100**	**3000**	**3400**	**2900**	**2400**	**2800**	**3400**
Antimony	NP	< 1.70 U	NA	< 1.70 U	< 1.70 U	< 1.70 U	< 1.70 U	< 1.60 U	< 1.70 U	< 1.70 U	< 1.70 U	< 1.70 U	< 1.70 U	< 1.70 U	< 1.80 U	< 1.80 U	< 1.70 U
Arsenic	16	**2.40 J**	NA	**2.10 J**	**1.4 J**	**2.10 J**	**1.90 J**	**1.60 J**	**2.60 J**	**2.00 J**	**1.80 J**	**3.50**	**2.50 J**	**2.30 J**	< 3.70 U	**1.70 J**	**2.00 J**
Barium	400	**11.0**	NA	**11.0**	**8.4**	**11.0**	**9.00**	**10.0**	**15.0**	**15.0**	**10.0**	**23.0**	**21.0**	**15.0**	**8.0**	**9.40**	**11.0**
Beryllium	590	**0.200**	NA	**0.190**	**0.16**	**0.180**	**0.170 J**	**0.140 J**	**0.170**	**0.160 J**	**0.120 J**	**0.160 J**	**0.170 J**	**0.170**	< 0.18 U	**0.140 J**	**0.170 J**
Cadmium	9.3	< 0.350 U	NA	< 0.340 U	< 0.340 U	< 0.340 U	< 0.350 U	< 0.320 U	**0.650**	< 0.350 U	< 0.350 U	< 0.340 U	< 0.340 U	< 0.330 U	< 0.370 U	< 0.360 U	< 0.340 U
Calcium	NP	**440**	NA	**1500**	**610**	**1400**	**280**	**2900**	**4200**	**14000**	**240**	**360**	**530**	**7400**	**520**	**270**	**1600**
Chromium	1500	**6.80**	NA	**6.50**	**5.9**	**6.00**	**5.00**	**4.70**	**5.30**	**6.60**	**4.10**	**4.80**	**5.00**	**5.10**	**3.7**	**4.50**	**5.30**
Chromium, Hexavalent	400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NP	**2.40**	NA	**1.90**	**1.8**	**1.80**	**2.10**	**1.60 J**	**1.50 J**	**2.20**	**1.40 J**	**1.80**	**2.00**	**1.40 J**	< 1.800 U	**1.70 J**	**1.90**
Copper	270	**5.90**	NA	**4.60**	**4.6**	**5.60**	**4.20**	**4.50**	**12.0**	**5.20**	**4.20**	**5.00**	**4.90**	**4.70**	**4.7**	**4.60**	**5.60**
Iron	NP	**5500**	NA	**5300**	**4900**	**4900**	**4300**	**4100**	**5000**	**5600**	**3800**	**4400**	**4900**	**4000**	**3100**	**4200**	**4700**
Lead	1000	**10.0**	NA	**14.0**	**7.5**	**8.80**	**5.20**	**4.50**	**16.0**	**10.0**	**26.0**	**100**	**68.0**	**52.0**	**4.6**	**4.20**	**3.40**
Magnesium	NP	**840**	NA	**830**	**750**	**740**	**560**	**700**	**780**	**2000**	**530**	**600**	**710**	**740**	**460**	**560**	**630**
Manganese	10000	**120**	NA	**120**	**110**	**100**	**110**	**77.0**	**69.0**	**82.0**	**79.0**	**100**	**110**	**110**	**120**	**100**	**120**
Mercury	2.8	< 0.0260 U	NA	< 0.0260 U	< 0.0250 U	< 0.0260 U	< 0.0260 U	< 0.0250 U	< 0.0260 U	< 0.0260 U	< 0.0260 U	**0.0280**	< 0.0270 U	< 0.0270 U	< 0.030 U	< 0.0290 U	< 0.0270 U
Nickel	310	**3.50**	NA	**3.30**	**4.3**	**3.40**	**3.10**	**2.70**	**4.10**	**4.40**	**2.80**	**3.60**	**4.00**	**2.80**	**2.6**	**3.00**	**3.00**
Potassium	NP	**310**	NA	**310**	**290**	**510**	**400**	**320**	**280**	**290**	**240**	**330**	**360**	**450**	**190**	**300**	**270**
Sodium	NP	< 170 U	NA	< 170 U	< 170 U	**150 J**	< 170 U	< 160 U	< 170 U	< 170 U	< 170 U	< 170 U	< 170 U	**130 J**	< 180 U	< 180 U	< 170 U
Vanadium	NP	**8.10**	NA	**7.20**	**7.0**	**6.80**	**6.70**	**5.80**	**8.40**	**6.70**	**5.10**	**7.50**	**8.70**	**5.80**	**4.3**	**5.60**	**6.00**
Zinc	10000	**14.0**	NA	**11.0**	**8.3**	**19.0**	**11.0**	**8.70**	**96.0**	**13.0**	**30.0**	**26.0**	**26.0 B**	**15.0**	**5.1**	**9.00**	**11.0**
Polychlorinated Biphenyls (PCB) (mg/kg)																	
PCB-1016	1	< 0.0810 U	NA	< 0.0810 U	< 0.078 U	< 0.0830 U	< 0.0820 U	< 0.0790 U	< 0.0780 U	< 0.0780 U	< 0.0830 U	< 0.0810 U	< 0.0820 U	< 0.420 U	< 0.095 U	< 0.0840 U	< 0.0810 U
PCB-1221	1	< 0.0810 U	NA	< 0.0810 U	< 0.078 U	< 0.0830 U	< 0.0820 U	< 0.0790 U	< 0.0780 U	< 0.0780 U	< 0.0830 U	< 0.0810 U	< 0.0820 U	< 0.420 U	< 0.095 U	< 0.0840 U	< 0.0810 U
PCB-1232	1	< 0.0810 U	NA	< 0.0810 U	< 0.078 U	< 0.0830 U	< 0.0820 U	< 0.0790 U	< 0.0780 U	< 0.0780 U	< 0.0830 U	< 0.0810 U	< 0.0820 U	< 0.420 U	< 0.095 U	< 0.0840 U	< 0.0810 U
PCB-1242	1	< 0.0810 U	NA	< 0.0810 U	< 0.078 U	< 0.0830 U	< 0.0820 U	< 0.0790 U	< 0.0780 U	< 0.0780 U	< 0.0830 U	< 0.0810 U	< 0.0820 U	< 0.420 U	< 0.095 U	< 0.0840 U	< 0.0810 U
PCB-1248	1	< 0.0810 U	NA	< 0.0810 U	< 0.078 U	< 0.0830 U	< 0.0820 U	< 0.0790 U	< 0.0780 U	< 0.0780 U	< 0.0830 U	< 0.0810 U	< 0.0820 U	< 0.420 U	< 0.095 U	< 0.0840 U	< 0.0810 U
PCB-1254	1	< 0.0810 U	NA	< 0.0810 U	< 0.078 U	< 0.0830 U	< 0.0820 U	< 0.0790 U	< 0.0780 U	< 0.0780 U	< 0.0830 U	< 0.0810 U	< 0.0820 U	**0.280 JD**	< 0.095 U	< 0.0840 U	< 0.0810 U
PCB-1260	1	< 0.0810 U	NA	**0.0240 JD**	**0.023 J**	**0.0210 JD**	**0.200 D**	< 0.0790 U	< 0.0780 U	**0.0540 JD**	**0.0420 JD**	**0.150 D**	**0.0470 JD**	**2.80 D**	**0.20 D**	**0.0390 JD**	**0.0270 JD**
PCB-1262	1	< 0.0810 U	NA	< 0.0810 U	< 0.078 U	< 0.0830 U	< 0.0820 U	< 0.0790 U	< 0.0780 U	< 0.0780 U	< 0.0830 U	< 0.0810 U	< 0.0820 U	< 0.420 U	< 0.095 U	< 0.0840 U	< 0.0810 U
PCB-1268	1	< 0.0810 U	NA	< 0.0810 U	< 0.078 U	< 0.0830 U	**0.0840 D**	< 0.0790 U	< 0.0780 U	< 0.0780 U	< 0.0830 U	< 0.0810 U	< 0.0820 U	**0.720 D**	< 0.095 U	< 0.0840 U	< 0.0810 U
Total PCBs	1	BDL	NA	**0.0240 JD**	**0.023 J**	**0.0210 JD**	**0.0284 D**	BDL	BDL	**0.0540 JD**	**0.0420 JD**	**0.150 D**	**0.0470 JD**	**3.80 D**	**0.20 D**	**0.0390 JD**	**0.0270 JD**
PFAS (ug/kg)																	
Perfluorodecanoic acid (PFDA)	NP	< 0.000200 U	**0.0000220 J**	< 0.000190 U	< 0.000190 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorooctanesulfonic acid (PFOS)	0.44	**0.0000770 J**	**0.000180 J**	**0.000120 J**	**0.096 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorooctanoic acid (PFOA)	0.5	< 0.000200 U	< 0.000200 U	< 0.000190 U	< 0.000190 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Legend

<1	Parameter not detcted above the laboratory reporting limit
1	Parameter reported at a concentrations greater than Part 375 Commerical SCOs
1	Parameter reported above the laboratory reporting limit but below the applicable

Notes:
Only detcted compounds are presented
ftbg = feet below grade
µg/kg = micrograms per kilogram
mg/kg = micrograms per kilogram
NA = Not Analyzed
NP = not promulgated/ no applicable soil criteria
R = Data are rejected and are not usable for any purpose
J = The reported result is an estimate.
D = Result wx obtained from the analysis of a dilution
U = The analyte was not detected in the sample at the estimated detection limit
PFAS = Per- and Polyfluoroalkyl Substances

Table 4C - Oil/Product Analytical Results
Concrete Coupon Investigation
Lawrence Aviation Industries, Port Jefferson, NY
HRP #DEC1027.OM

Location:		10-4-0	10-4-0-2	30-1-0	30-1-0-2	E-2-0	E-2-0-2	G-2-0	G-2-0-2	G-4-0	G-4-0-2
Date Collected:		09/24/2024	10/31/2024	09/23/2024	10/31/2024	09/23/2024	10/31/2024	09/24/2024	10/31/2024	09/24/2024	10/31/2024
Sample ID:		10-4-0	10-4-0-2	30-1-0	30-1-0-2	E-2-0	E-2-0-2	G-2-0	G-2-0-2	G-4-0	G-4-0-2
Laboratory Sample ID:		24I3534-37	24J4509-10	24I3391-17	24J4509-07	24I3391-05	24J4509-06	24I3534-38	24J4509-09	24I3534-36	24J4509-08
	Part 375 Commercial										
General Chemistry Parameters (%)											
Solids, Percent	NP	**98.6**	NA	**95.4**	NA	**97.6**	NA	**98.2**	NA	**92**	NA
Volatile Organic Compounds (VOCs) (mg/kg)											
2-Butanone (MEK)	500	**0.65 J**	NA	**0.60 J**	NA	**0.65 J**	NA	**0.25 J**	NA	**0.43 J**	NA
2-Hexanone (Methyl butyl ketone/MBK)	NP	**0.16 J**	NA	< 0.57 U	NA	< 0.43 U	NA	< 0.5 U	NA	**0.12 J**	NA
Acetone	500	**1.3 J**	NA	**1.9 J**	NA	**2.2**	NA	**0.64 J**	NA	**0.84 J**	NA
Benzene	44	**0.0099 J**	NA	< 0.057 U	NA	< 0.043 U	NA	< 0.05 U	NA	< 0.062 U	NA
Ethylbenzene	390	**0.036 J**	NA	**0.0080 J**	NA	< 0.043 U	NA	< 0.05 U	NA	< 0.062 U	NA
Isopropylbenzene	NP	< 0.055 U	NA	< 0.057 U	NA	< 0.043 U	NA	< 0.05 U	NA	< 0.062 U	NA
m,p-Xylene	NP	**0.11**	NA	**0.025 J**	NA	**0.021 J**	NA	< 0.099 U	NA	< 0.12 U	NA
Methyl acetate	NP	**2.1**	NA	**2.3**	NA	**2.1**	NA	**1.2**	NA	**1.5**	NA
Methylcyclohexane	NP	< 0.055 U	NA	< 0.057 U	NA	< 0.043 U	NA	< 0.05 U	NA	< 0.062 U	NA
Naphthalene	500	**0.023 J**	NA	**0.10 J**	NA	**0.14**	NA	**0.012 J**	NA	**0.14**	NA
o-Xylene	500	**0.055**	NA	< 0.057 U	NA	**0.010 J**	NA	< 0.05 U	NA	< 0.062 U	NA
Styrene	NP	< 0.055 U	NA	< 0.057 U	NA	< 0.043 U	NA	< 0.05 U	NA	**0.0099 J**	NA
Tetrachloroethene	150	< 0.055 U	NA	< 0.057 U	NA	< 0.043 U	NA	**0.012 J**	NA	< 0.062 U	NA
Toluene	500	**0.043 J**	NA	**0.11**	NA	**0.11**	NA	**0.047 J**	NA	**0.030 J**	NA
Total Xylenes	NP	**0.17**	NA	< 0.057 U	NA	< 0.043 U	NA	< 0.05 U	NA	< 0.062 U	NA
Trichloroethene	200	**0.024 J**	NA	**0.046 J**	NA	< 0.043 U	NA	**0.0094 J**	NA	**0.022 J**	NA
Trichlorofluoromethane	NP	**0.24**	NA	**0.36**	NA	**0.015 J**	NA	**0.37**	NA	**0.17**	NA
Semivolalite Organic Compounds (SVOC) (mg/kg)											
1,4-Dioxane	130	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NP	< 8.2 U	NA	**2.2 JD**	NA	< 2.6 U	NA	< 8.1 U	NA	< 8.2 U	NA
3- And 4- Methylphenol (Total)	NP	< 17 U	NA	NA	NA	NA	NA	< 16 U	NA	< 17 U	NA
Benzo(a)pyrene	1	< 8.2 U	NA	< 8.9 U	NA	< 2.6 U	NA	< 8.1 U	NA	< 8.2 U	NA
Benzo(b)fluoranthene	5.6	< 8.2 U	NA	< 8.9 U	NA	< 2.6 U	NA	< 8.1 U	NA	< 8.2 U	NA
Benzo(ghi)perylene	500	< 8.2 U	NA	< 8.9 U	NA	< 2.6 U	NA	< 8.1 U	NA	< 8.2 U	NA
Benzo(k)fluoranthene	56	< 8.2 U	NA	< 8.9 U	NA	< 2.6 U	NA	< 8.1 U	NA	< 8.2 U	NA
Bis(2-ethylhexyl)phthalate	NP	**17 D**	NA	**24 D**	NA	**2.1 JD**	NA	**23 D**	NA	**17 D**	NA
Fluoranthene	500	< 8.2 U	NA	**2.2 JD**	NA	< 2.6 U	NA	**7.0 JD**	NA	< 8.2 U	NA
Indeno(1,2,3-cd)pyrene	5.6	< 8.2 U	NA	< 8.9 U	NA	< 2.6 U	NA	< 8.1 U	NA	< 8.2 U	NA
Isophorone	NP	< 8.2 U	NA	< 18 U	NA	< 5.2 U	NA	< 8.1 U	NA	< 8.2 U	NA
Naphthalene	500	< 8.2 U	NA	< 8.9 U	NA	< 2.6 U	NA	< 8.1 U	NA	< 8.2 U	NA
Phenanthrene	500	< 8.2 U	NA	**3.4 JD**	NA	< 2.6 U	NA	< 8.1 U	NA	< 8.2 U	NA
Phenol	500	< 17 U	NA	< 18 U	NA	< 5.2 U	NA	< 16 U	NA	< 17 U	NA
Pyrene	500	< 8.2 U	NA	< 8.9 U	NA	< 2.6 U	NA	< 8.1 U	NA	< 8.2 U	NA
Metals (mg/kg)											
Aluminum	NP	**6800**	NA	**5100**	NA	**6800**	NA	**5600**	NA	**7200**	NA
Antimony	NP	**24**	NA	< 1.7 U	NA	< 1.6 U	NA	**2.2**	NA	< 1.6 U	NA
Arsenic	16	**9.7**	NA	**8.7**	NA	**18**	NA	**6.3**	NA	**9.7**	NA
Barium	400	**140**	NA	**47**	NA	**64**	NA	**76**	NA	**61**	NA
Beryllium	590	< 0.16 U	NA	**0.13 J**	NA	**1.3**	NA	< 0.16 U	NA	< 0.16 U	NA
Cadmium	9.3	**11**	NA	**3.1**	NA	**15**	NA	**4.1**	NA	**11**	NA
Calcium	NP	**29000 D**	NA	**36000 D**	NA	**25000 D**	NA	**23000 D**	NA	**38000 D**	NA
Chromium	1500	**100**	**60**	**230**	**230**	**500**	**480**	**48**	**12**	**160**	**110**
Chromium, Hexavalent	400	NA	< 31	NA	< 4.0	NA	< 15	NA	< 1.6	NA	< 1.6
Cobalt	NP	**7.4**	NA	**6.7**	NA	**24**	NA	**7.9**	NA	**20**	NA
Copper	270	**950**	NA	**260**	NA	**2400**	NA	**450**	NA	**230**	NA
Iron	NP	**67000 D**	NA	**95000 D**	NA	**240000 D**	NA	**77000 D**	NA	**77000 D**	NA
Lead	1000	**1400 D**	NA	**130**	NA	**140**	NA	**140**	NA	**95**	NA
Magnesium	NP	**3600**	NA	**4300**	NA	**2300**	NA	**4700**	NA	**5300**	NA
Manganese	10000	**1100**	NA	**780**	NA	**2300**	NA	**380**	NA	**670**	NA
Mercury	2.8	**0.31**	NA	**0.14**	NA	**1.6 D**	NA	**0.43**	NA	**0.15**	NA
Nickel	310	**160**	NA	**120**	NA	**280**	NA	**51**	NA	**170**	NA
Potassium	NP	**1100**	NA	**1100**	NA	**1200**	NA	**620**	NA	**840**	NA
Selenium	1500	< 3.2 U	NA	< 3.3 U	NA	< 3.2 U	NA	< 3.1 U	NA	< 3.3 U	NA
Silver	1500	**1.8**	NA	< 0.33 U	NA	**12**	NA	**6.2**	NA	< 0.33 U	NA
Sodium	NP	**700**	NA	**390**	NA	**340**	NA	**370**	NA	**830**	NA
Thallium	NP	< 1.6 U	NA	< 1.7 U	NA	< 1.6 U	NA	< 1.6 U	NA	< 1.6 U	NA
Vanadium	NP	**110**	NA	**360**	NA	**990**	NA	**84**	NA	**200**	NA
Zinc	10000	**1500 BD**	NA	**610 D**	NA	**940**	NA	**590 BD**	NA	**590 BD**	NA
Polychlorinated Biphenyls (PCB) (mg/kg)											
PCB-1248	1	< 0.08 U	NA	**0.42 D**	NA	**7.0 D**	NA	< 69 U	NA	**1.6 D**	NA
PCB-1254	1	**1.3**	NA	**0.34 D**	NA	**1.7 D**	NA	< 69 U	NA	**0.76 D**	NA
PCB-1260	1	**0.26**	NA	**0.098 D**	NA	**0.27 JD**	NA	< 69 U	NA	< 0.32 U	NA
PCB-1262	1	< 0.08 U	NA	< 0.082 U	NA	< 0.8 U	NA	< 69 U	NA	< 0.32 U	NA
PCB-1268	1	< 0.08 U	NA	< 0.082 U	NA	< 0.8 U	NA	< 69 U	NA	< 0.32 U	NA
Total PCBs	1	**1.56**	NA	**0.86**	NA	**8.97**	NA	BDL	NA	**2.36**	NA

Legend

<1	Parameter not detcted above the laboratory reporting limit
1	Parameter reported at a concentrations greater than Part 375 Commerical SCOs
1	Parameter reported above the laboratory reporting limit but below the appilicable regulatory standard/criterion

Notes:

ft bg = feet below grade
µg/kg = micrograms per kilogram
mg/kg = micrograms per kilogram
NA = Not Analyzed
NP = not promulgated/ no applicable soil criteria

R = Data are rejected and are not usable for any purpose
J = The reported result is an estimate.
D = Result ws obtained from the analysis of a dilution
U = The analyte was not detected in the sample at the estimated detection limit
PFAS = Per- and Polyfluoroalkyl Substances

BDL = below detection level

Table 4D - 2024 Concrete Analytical Results
Concrete Coupon Investigation
Lawrence Aviation Industries, Port Jefferson, NY
HRP #DEC1027.OM

Location:		10-1-1	10-1-1-C-2	30-1-1	30-1-1-C-2	30-2-1	E-1-1	E-1-1-C-2	F-1-1	F-1-1-C-2	G-1-1	G-1-1-C-2
Date Collected:		09/25/2024	10/31/2024	09/24/2024	10/31/2024	09/24/2024	09/23/2024	10/30/2024	09/25/2024	10/31/2024	09/24/2024	10/31/2024
Sample ID:		10-1-1-C	10-1-1-C-2	30-1-1-C	30-1-1-C-2	30-2-1-C	E-1-1-C	E-1-1-C-2	F-1-1-C	F-1-1-C-2	G-1-1-C	G-1-1-C-2
Laboratory Sample ID:		24J0032-04	24J4509-03	24I3534-33	24J4509-02	24I3534-35	24I3391-15RE1	24J4509-01	24J0032-20	24J4509-05	24I3534-34	24J4509-04
	Part 375 Commercial											
General Chemistry Parameters (%)												
Solids, Percent	NP	**98.7**	NA	**98.4**	NA	**99.1**	**99.1**	NA	**98.5**	NA	**98.1**	NA
General Chemistry Parameters (pH Units)												
pH		NA	NA	NA	NA	**12**	NA	NA	NA	NA	NA	NA
Volatile Organic Compounds (VOCs) (mg/kg)												
2-Butanone (MEK)	500	**0.014 J**	NA	**0.41 J**	NA	**0.14 J**	**0.017 J**	NA	< 0.046 U	NA	**0.35 J**	NA
2-Hexanone (Methyl butyl ketone/MBK)	NP	< 0.021 U	NA	**0.17 J**	NA	< 0.59 U	< 0.022 U	NA	< 0.023 U	NA	**0.078 J**	NA
Acetone	500	< 0.11 U	NA	**0.59 J**	NA	< 2.9 U	**0.073 J**	NA	< 0.11 U	NA	**0.69 J**	NA
Benzene	44	< 0.0021 U	NA	< 0.054 U	NA	< 0.059 U	< 0.0022 U	NA	< 0.0023 U	NA	< 0.055 U	NA
Ethylbenzene	390	< 0.0021 U	NA	< 0.054 U	NA	< 0.059 U	< 0.0022 U	NA	< 0.0023 U	NA	< 0.055 U	NA
Isopropylbenzene	NP	< 0.0021 U	NA	< 0.054 U	NA	< 0.059 U	< 0.0022 U	NA	< 0.0023 U	NA	< 0.055 U	NA
m,p-Xylene	NP	< 0.0042 U	NA	< 0.11 U	NA	< 0.12 U	< 0.0044 U	NA	< 0.0046 U	NA	< 0.11 U	NA
Methyl acetate	NP	< 0.0021 U	NA	< 0.54 U	NA	< 0.59 U	< 0.0022 U	NA	< 0.0023 U	NA	< 0.55 U	NA
Methylcyclohexane	NP	< 0.0021 U	NA	< 0.054 U	NA	< 0.059 U	< 0.0022 U	NA	< 0.0023 U	NA	< 0.055 U	NA
Naphthalene	500	< 0.0042 U	NA	< 0.11 U	NA	< 0.12 U	< 0.0044 U	NA	< 0.0046 U	NA	**0.018 J**	NA
o-Xylene	500	< 0.0021 U	NA	< 0.054 U	NA	< 0.059 U	< 0.0022 U	NA	< 0.0023 U	NA	< 0.055 U	NA
Styrene	NP	< 0.0021 U	NA	< 0.054 U	NA	< 0.059 U	< 0.0022 U	NA	< 0.0023 U	NA	< 0.055 U	NA
Tetrachloroethene	150	< 0.0021 U	NA	< 0.054 U	NA	< 0.059 U	< 0.0022 U	NA	< 0.0023 U	NA	< 0.055 U	NA
Toluene	500	< 0.0021 U	NA	< 0.054 U	NA	< 0.059 U	< 0.0022 U	NA	< 0.0023 U	NA	**0.034 J**	NA
Total Xylenes	NP	< 0.0021 U	NA	< 0.054 U	NA	< 0.059 U	< 0.0022 U	NA	< 0.0023 U	NA	< 0.055 U	NA
Trichloroethene	200	< 0.0021 U	NA	< 0.054 U	NA	**0.029 J**	< 0.0022 U	NA	< 0.0023 U	NA	< 0.055 U	NA
Trichlorofluoromethane	NP	< 0.011 U	NA	< 0.11 U	NA	< 0.12 U	< 0.011 U	NA	< 0.011 U	NA	**0.018 J**	NA
Semivolatile Organic Compounds (SVOC) (mg/kg)												
1,4-Dioxane	130	**0.15**	NA	< 0.25 U	NA	< 0.25 U	< 0.23 U	NA	< 0.25 U	NA	< 0.25 U	NA
2-Methylnaphthalene	NP	< 0.82 U	NA	< 0.82 U	NA	< 0.82 U	**0.17 J**	NA	< 0.77 U	NA	< 0.82 U	NA
3- And 4- Methylphenol (Total)	NP	NA	NA	< 1.7 U	NA	< 1.7 U	NA	NA	NA	NA	< 1.6 U	NA
Benzo(a)pyrene	1	< 0.82 U	NA	< 0.82 U	NA	< 0.82 U	< 0.79 U	NA	< 0.77 U	NA	< 0.82 U	NA
Benzo(b)fluoranthene	5.6	< 0.82 U	NA	< 0.82 U	NA	< 0.82 U	< 0.79 U	NA	< 0.77 U	NA	< 0.82 U	NA
Benzo(ghi)perylene	500	< 0.82 U	NA	< 0.82 U	NA	< 0.82 U	< 0.79 U	NA	< 0.77 U	NA	< 0.82 U	NA
Benzo(k)fluoranthene	56	< 0.82 U	NA	< 0.82 U	NA	< 0.82 U	< 0.79 U	NA	< 0.77 U	NA	< 0.82 U	NA
Bis(2-ethylhexyl)phthalate	NP	**5**	NA	**1.1 J**	NA	**1.3 J**	**2.1**	NA	< 1.5 U	NA	**4.6**	NA
Fluoranthene	500	< 0.82 U	NA	< 0.82 U	NA	< 0.82 U	**0.19 J**	NA	< 0.77 U	NA	< 0.82 U	NA
Indeno(1,2,3-cd)pyrene	5.6	< 0.82 U	NA	< 0.82 U	NA	< 0.82 U	< 0.79 U	NA	< 0.77 U	NA	< 0.82 U	NA
Isophorone	NP	**0.40 J**	NA	**0.96**	NA	**1.7**	**1.3**	NA	**9.1**	NA	**0.51 J**	NA
Naphthalene	500	< 0.82 U	NA	< 0.82 U	NA	< 0.82 U	< 0.79 U	NA	< 0.77 U	NA	< 0.82 U	NA
Phenanthrene	500	< 0.82 U	NA	< 0.82 U	NA	< 0.82 U	**0.37 J**	NA	< 0.77 U	NA	< 0.82 U	NA
Phenol	500	< 1.7 U	NA	< 1.7 U	NA	< 1.7 U	< 1.6 U	NA	< 1.5 U	NA	**2.1**	NA
Pyrene	500	< 0.82 U	NA	< 0.82 U	NA	< 0.82 U	< 0.79 U	NA	< 0.77 U	NA	< 0.82 U	NA
Metals (mg/kg)												
Aluminum	NP	**4200**	NA	**4100**	NA	**6800**	**3900**	NA	**4700**	NA	**5500**	NA
Antimony	NP	< 1.7 U	NA	< 1.6 U	NA	< 1.6 U	< 1.6 U	NA	< 1.7 U	NA	< 1.6 U	NA
Arsenic	16	**4.9**	NA	**3.5**	NA	**6.6**	**2.2 J**	NA	**2.5 J**	NA	**3.5**	NA
Barium	400	**20**	NA	**31**	NA	**36**	**25**	NA	**26**	NA	**35**	NA
Beryllium	590	**0.17**	NA	< 0.16 U	NA	< 0.16 U	< 0.16 U	NA	**0.18**	NA	< 0.16 U	NA
Cadmium	9.3	< 0.33 U	NA	**0.30 J**	NA	**0.26 J**	**0.17 J**	NA	< 0.33 U	NA	**2.2**	NA
Calcium	NP	**130000 D**	NA	**87000 D**	NA	**110000 D**	**46000 D**	NA	**61000 D**	NA	**82000 D**	NA
Chromium	1500	**7.8**	**12**	**32**	**20**	**21**	**21**	**23**	**16**	**29**	**22**	**14**
Chromium, Hexavalent	400	NA	< 0.31	NA	< 0.32	< 0.32 U	NA	1.9	NA	< 0.78	NA	< 0.32
Cobalt	NP	**2.5**	NA	**2.4**	NA	< 1.6 U	**4.7**	NA	**4.2**	NA	**3.5**	NA
Copper	270	**10**	NA	**36**	NA	**26**	**39**	NA	**80**	NA	**47**	NA
Iron	NP	**5500**	NA	**12000 D**	NA	**12000 D**	**6900 D**	NA	**7100**	NA	**14000 D**	NA
Lead	1000	**8.8**	NA	**11**	NA	**19**	**6.7**	NA	**18**	NA	**24**	NA
Magnesium	NP	**38000 D**	NA	**20000 D**	NA	**32000 D**	**1900**	NA	**2200 D**	NA	**18000 D**	NA
Manganese	10000	**120**	NA	**140**	NA	**120**	**190**	NA	**180**	NA	**150**	NA
Mercury	2.8	< 0.023 U	NA	< 0.025 U	NA	**0.012 J**	**0.32**	NA	< 0.023 U	NA	**0.023 J**	NA
Nickel	310	**3.6**	NA	**16**	NA	**9.6**	**7.2**	NA	**6**	NA	**15**	NA
Potassium	NP	**1500**	NA	**1000**	NA	**7100**	**2100**	NA	**1000**	NA	**1500**	NA
Selenium	1500	< 3.3 U	NA	< 3.3 U	NA	< 3.1 U	< 3.1 U	NA	< 3.3 U	NA	< 3.1 U	NA
Silver	1500	< 0.33 U	NA	< 0.33 U	NA	< 0.31 U	< 0.31 U	NA	< 0.33 U	NA	< 0.31 U	NA
Sodium	NP	**470**	NA	**290**	NA	**1400**	**1100**	NA	**400**	NA	**500**	NA
Thallium	NP	< 1.7 U	NA	< 1.6 U	NA	**4.4**	< 1.6 U	NA	< 1.7 U	NA	< 1.6 U	NA
Vanadium	NP	**7.5**	NA	**29**	NA	**520**	**10**	NA	**10**	NA	**43**	NA
Zinc	10000	**18**	NA	**42 B**	NA	**20 B**	**22 B**	NA	**28**	NA	**170 B**	NA
Polychlorinated Biphenyls (PCB) (mg/kg)												
PCB-1248	1	< 0.8 U	NA	**0.17**	NA	**0.16**	**0.25**	NA	< 0.079 U	NA	**0.16**	NA
PCB-1254	1	**3.6 D**	NA	**0.21**	NA	**0.35**	**0.28**	NA	**0.20 D**	NA	**0.12**	NA
PCB-1260	1	**2.4 D**	NA	**0.11**	NA	**0.17**	**0.13**	NA	< 0.079 U	NA	**0.15**	NA
PCB-1268	1	< 0.8 U	NA	< 0.082 U	NA	< 0.085 U	< 0.081 U	NA	< 0.079 U	NA	**0.057 J**	NA
Total PCBs	1	**6**	NA	**0.49**	NA	**0.68**	**0.66**	NA	**0.2**	NA	**0.49**	NA
PFAS Compounds (µg/kg)												
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	NP	**0.25**	NA	**0.063 J**	NA	**0.078 J**	**0.061 J**	NA	**0.079 J**	NA	**0.064 J**	NA
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	NP	**0.074 J**	NA	< 0.2 U	NA	< 0.19 U	< 0.19 U	NA	< 0.2 U	NA	< 0.19 U	NA
Perfluorodecanoic acid (PFDA)	NP	< 0.2 U	NA	< 0.2 U	NA	< 0.19 U	< 0.19 U	NA	< 0.2 U	NA	< 0.19 U	NA
Perfluoroheptanoic acid (PFHpA)	NP	< 0.2 U	NA	< 0.2 U	NA	**0.020 J**	< 0.19 U	NA	< 0.2 U	NA	< 0.19 U	NA
Perfluorohexanesulfonic acid (PFHxS)	NP	**0.083 J**	NA	< 0.2 U	NA	< 0.19 U	< 0.19 U	NA	< 0.2 U	NA	< 0.19 U	NA
Perfluorohexanoic acid (PFHxA)	NP	< 0.2 U	NA	**0.089 J**	NA	< 0.19 U	< 0.19 U	NA	< 0.2 U	NA	< 0.19 U	NA
Perfluorononanoic acid (PFNA)	NP	< 0.2 U	NA	< 0.2 U	NA	**0.015 J**	< 0.19 U	NA	< 0.2 U	NA	< 0.19 U	NA
Perfluorooctanesulfonic acid (PFOS)	440	**0.29**	NA	**0.048 J**	NA	**0.076 J**	**0.079 J**	NA	**0.13 J**	NA	**0.13 J**	NA
Perfluorooctanoic acid (PFOA)	300	**0.12 J**	NA	< 0.2 U	NA	**0.065 J**	**0.24**	NA	**0.055 J**	NA	< 0.19 U	NA
Perfluoropentane sulfonate (PFPeS)	NP	< 0.2 U	NA	**0.048 J**	NA	< 0.19 U	< 0.19 U	NA	< 0.2 U	NA	< 0.19 U	NA
Perfluoropentanoic acid (PFPeA)	NP	**0.33 J**	NA	< 0.4 U	NA	< 0.39 U	< 0.39 U	NA	< 0.39 U	NA	< 0.39 U	NA

Legend

<1	Parameter not detcted above the laboratory reporting limit
1	Parameter reported at a concentrations greater than Part 375 Commerical SCOs
1	Parameter reported above the laboratory reporting limit but below the applicable regulatory standard/criterion

Notes:

ft bg = feet below grade
µg/kg = micrograms per kilogram
mg/kg = micrograms per kilogram
NA = Not Analyzed
NP = not promulgated/ no applicable soil criteria
R = Data are rejected and are not usable for any purpose
J = The reported result is an estimate.
D = Result ws obtained from the analysis of a dilution
U = The analyte was not detected in the sample at the estimated detection limit
PFAS = Per- and Polyfluoroalkyl Substances

Table 4E - Building 10 Concrete Analytical Results
Concrete Coupon Investigation Lawrence
Aviation Industries, Port Jefferson, NY
HRP #DEC1027.OM

Location:	Part 375 Commercial	Part 375 Industrial	A-1	A-2	A-3	B-1	B-2	B-3	C-1	C-2	C-3	D-1	D-3	E-1	E-2	E-3	E-4
Date Collected:			04/21/2025	04/21/2025	04/21/2025	04/21/2025	04/21/2025	04/21/2025	04/21/2025	04/21/2025	04/21/2025	04/21/2025	04/21/2025	04/21/2025	04/21/2025	04/21/2025	04/21/2025
Sample ID:			A-1	A-2	A-3	B-1	B-2	B-3	C-1	C-2	C-3	D-1	D-3	E-1	E-2	E-3	E-4
Laboratory Sample ID:			L2526403-01	L2526403-02	L2526403-03	L2526403-04	L2526403-05	L2526403-06	L2526403-07	L2526403-08	L2526403-09	L2526403-10	L2526403-11	L2526403-12	L2526403-13	L2526403-14	L2526403-15
General Chemistry Parameters																	
Solids, Percent			96.4	95.9	96	96.3	94.7	97	97	96.3	95.7	97.2	97.5	98	96.7	96.7	97.1
Metals (mg/kg)																	
Aluminum			3520	4960	4440	4270	4620	2490	3730	3360	3320	3630	2390	3850	5200	3310	2930
Antimony			< 19.2 U	< 19.8 U	< 19.7 U	< 18.8 U	< 19.0 U	< 19.3 U	< 19.7 U	< 19.5 U	< 19.7 U	< 19.1 U	< 19.6 U	< 19.6 U	< 19.2 U	< 19.8 U	< 19.8 U
Arsenic	16	16	2.88 J	3.67 J	< 3.95 U	2.58 J	1.70 J	2.66 J	3.56 J	3.21 J	5.05	3.83	4.88	< 3.92 U	1.80 J	2.70 J	1.93 J
Barium	400	10000	23.2	28.8	29.9	26.8	29.2	15	22.1	19.6	25.3	24	17	23.3	28.1	23.2	18.5
Beryllium	590	2700	< 1.92 U	0.235 J	0.226 J	< 1.88 U	0.223 J	< 1.93 U	< 1.97 U	< 1.95 U	< 1.97 U	< 1.91 U	< 1.96 U	< 1.96 U	< 1.92 U	< 1.98 U	< 1.98 U
Cadmium	9.3	60	< 3.84 U	< 3.96 U	< 3.95 U	< 3.77 U	< 3.80 U	< 3.86 U	< 3.95 U	< 3.90 U	< 3.94 U	< 3.83 U	< 3.91 U	< 3.92 U	< 3.84 U	< 3.96 U	< 3.96 U
Calcium			105000	126000	114000	131000	132000	96200	145000	111000	135000	149000	119000	46500	36700	124000	34700
Chromium	1500	6800	10.8	7.26	6.32	6.68	9.08	4.24	6.12	6.4	6.05	8.53	4.43	6.25	5.51	6.05	6.62
Cobalt			3.82 J	3.21 J	2.59 J	3.31 J	2.88 J	1.68 J	2.61 J	2.06 J	2.48 J	2.94 J	1.63 J	3.15 J	3.23 J	1.66 J	2.22 J
Copper	270	10000	11.4	9.36	6.89	9.92	8.44	4.89	6.74	5.79	5.96	7.37	7.15	14.1	20.4	8.18	15
Iron			4380	4920	4460	5500	4990	3420	5050	5480	5250	5890	4140	3310	6460	4050	3990
Lead	1000	3900	5.20 J	5.65 J	4.63 J	7.59 J	5.38 J	3.61 J	4.89 J	4.78 J	15.3 J	5.52 J	3.08 J	2.88 J	3.05 J	6.27 J	9.71 J
Magnesium			30600	44100	36600	44700	47200	33400	47900	33600	37800	44800	41700	1820	2730	41600	1910
Manganese	10000	10000	116	154	138	150	156	88.1	135	116	118	146	97.4	124	91	88	74.6
Mercury	2.8	5.7	< 0.0740 U	< 0.0770 U	< 0.0720 U	< 0.0750 U	< 0.0720 U	< 0.0700 U	< 0.0760 U	< 0.0630 U	0.0480 J	0.105	< 0.0750 U	< 0.0750 U	< 0.0760 U	< 0.0710 U	< 0.0690 U
Nickel	310	10000	4.78 J	4.97 J	3.54 J	3.66 J	4.42 J	< 9.64 U	< 9.86 U	< 9.76 U	< 9.84 U	3.35 J	< 9.78 U	3.31 J	3.10 J	3.51 J	< 9.90 U
Potassium			830 J	654 J	358 J	1070	881 J	468 J	868 J	488 J	616 J	1150	455 J	864 J	627 J	292 J	359 J
Selenium	1500	6800	< 7.69 U	< 7.92 U	< 7.89 U	< 7.54 U	< 7.59 U	< 7.72 U	< 7.89 U	< 7.81 U	< 7.87 U	< 7.66 U	< 7.82 U	< 7.84 U	< 7.67 U	< 7.92 U	< 7.92 U
Silver	1500	6800	< 1.92 U	< 1.98 U	< 1.97 U	< 1.88 U	< 1.90 U	< 1.93 U	< 1.97 U	< 1.95 U	< 1.97 U	< 1.91 U	< 1.96 U	< 1.96 U	< 1.92 U	< 1.98 U	< 1.98 U
Sodium			< 769 U	< 792 U	< 789 U	547 J	409 J	< 772 U	< 789 U	< 781 U	< 787 U	< 766 U	< 782 U	< 784 U	560 J	< 792 U	< 792 U
Thallium			< 7.69 U	< 7.92 U	< 7.89 U	< 7.54 U	< 7.59 U	< 7.72 U	< 7.89 U	< 7.81 U	< 7.87 U	< 7.66 U	< 7.82 U	< 7.84 U	< 7.67 U	< 7.92 U	< 7.92 U
Vanadium			7.62	7.49	6.93	7.51	8.3	4.77	7.73	6.86	9.62	7.99	7.91	5.01	11.3	6.69	6.66
Zinc	10000	10000	12.4 J	10.3 J	9.67 J	13.8 J	11.7 J	7.17 J	10.6 J	9.46 J	11.8 J	17.3 J	11.7 J	18.4 J	15.3 J	15.7 J	24.8
Polychlorinated Biphenyls (PCB) (mg/kg)																	
PCB-1016	1	25	< 0.880 U	< 0.0860 U	< 0.380 U	< 0.0830 U	< 0.0900 U	< 0.480 U	< 0.0800 U	< 0.0880 U	< 0.450 U	< 0.0710 U	< 0.0740 U	< 0.0760 U	< 0.0730 U	< 0.0840 U	< 0.0920 U
PCB-1221	1	25	< 0.880 U	< 0.0860 U	< 0.380 U	< 0.0830 U	< 0.0900 U	< 0.480 U	< 0.0800 U	< 0.0880 U	< 0.450 U	< 0.0710 U	< 0.0740 U	< 0.0760 U	< 0.0730 U	< 0.0840 U	< 0.0920 U
PCB-1232	1	25	< 0.880 U	< 0.0860 U	< 0.380 U	< 0.0830 U	< 0.0900 U	< 0.480 U	< 0.0800 U	< 0.0880 U	< 0.450 U	< 0.0710 U	< 0.0740 U	< 0.0760 U	< 0.0730 U	< 0.0840 U	< 0.0920 U
PCB-1242	1	25	< 0.880 U	< 0.0860 U	< 0.380 U	< 0.0830 U	< 0.0900 U	< 0.480 U	< 0.0800 U	< 0.0880 U	< 0.450 U	< 0.0710 U	< 0.0740 U	< 0.0760 U	< 0.0730 U	< 0.0840 U	< 0.0920 U
PCB-1248	1	25	< 0.880 U	< 0.0860 U	< 0.380 U	< 0.0830 U	< 0.0900 U	< 0.480 U	< 0.0800 U	< 0.0880 U	< 0.450 U	< 0.0710 U	< 0.0740 U	< 0.0760 U	< 0.0730 U	< 0.0840 U	< 0.0920 U
PCB-1254	1	25	5.9	0.71	2.5	0.51	0.97	2.7	0.32	0.62	1.2	0.65	0.54	0.46	0.28	0.12	1.1
PCB-1260	1	25	1.7	0.31	0.88	0.19	0.29	0.9	0.12	0.28	0.64	0.22	0.23	0.15	0.083	0.05	0.25
PCB-1262	1	25	< 0.880 U	< 0.0860 U	< 0.380 U	< 0.0830 U	< 0.0900 U	< 0.480 U	< 0.0800 U	< 0.0880 U	< 0.450 U	< 0.0710 U	< 0.0740 U	< 0.0760 U	< 0.0730 U	< 0.0840 U	< 0.0920 U
PCB-1268	1	25	< 0.880 U	< 0.0860 U	< 0.380 U	< 0.0830 U	< 0.0900 U	< 0.480 U	< 0.0800 U	< 0.0880 U	< 0.450 U	< 0.0710 U	< 0.0740 U	< 0.0760 U	< 0.0730 U	< 0.0840 U	< 0.0920 U
Total PCBs			7.6	1.02	3.38	0.7	1.26	3.6	0.44	0.9	1.84	0.87	0.77	0.61	0.363	0.17	1.35

Legend	
<1	Parameter not detcted above the laboratory reporting limit
1	Parameter reported at a concentrations greater than Part 375
1	Parameter reported at a concentrations greater than Part 375 Protection
1	Parameter reported at a concentrations greater than Part 375 Restricted
1	Parameter reported at a concentrations greater than Part 375
1	Parameter reported at a concentrations greater than Part 375 Industrial
1	Parameter reported above the laboratory reporting limit but below the

Notes:
ft bg = feet below grade
mg/kg = micrograms per kilogram
NA = Not Analyzed
NP = not promulgated/ no applicable SCO
R = Data are rejected and are not usable for any purpose
SCO Soil Cleanup Objective

Table 5a
Stream Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

Cas Number	Chemical Name	Analytic Method	Sample Code / Sample Name / Sample Date / Unit \\ Depth	SD-01-R1 10/14/2003 0 to 6 in bgs	SD-02-R1 10/14/2003 0 to 6 in bgs	SD-03-R1 10/14/2003 0 to 6 in bgs	SD-04-R1 10/15/2003 0 to 6 in bgs	SD-05-R1 10/17/2003 0 to 6 in bgs	SD-06-R1 10/20/2003 0 to 6 in bgs
	Volatile Organic Compounds - Page 1								
75-71-8	Dichlorodifluoromethane	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 UJ	14 UJ
74-87-3	Chloromethane	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
75-01-4	Vinyl Chloride	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	4 J
74-83-9	Bromomethane	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
75-00-3	Chloroethane	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
75-69-4	Trichlorofluoromethane	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
75-35-4	1,1-Dichloroethene	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
67-64-1	Acetone	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	5 J	14 UJ
75-15-0	Carbon Disulfide	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
79-20-9	Methyl Acetate	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
75-09-2	Methylene Chloride	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
156-60-5	trans-1,2-Dichloroethene	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
1634-04-4	Methyl tert-Butyl Ether	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
75-34-3	1,1-Dichloroethane	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
156-59-2	cis-1,2-Dichloroethene	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	8 J	150
78-93-3	2-Butanone	TCL-S-VOC	ug/Kg	15 U	12 U	10 UJ	14 U	14 U	14 U
67-66-3	Chloroform	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
71-55-6	1,1,1-Trichloroethane	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
110-82-7	Cyclohexane	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
56-23-5	Carbon Tetrachloride	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
71-43-2	Benzene	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
107-06-2	1,2-Dichloroethane	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
79-01-6	Trichloroethene	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	120	3000 J
108-87-2	Metylcyclohexane	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
78-87-5	1,2-Dichloropropane	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
75-27-4	Bromodichloromethane	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
10061-01-5	cis-1,3-Dichloropropene	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
108-10-1	4-Methyl-2-pentanone	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
108-88-3	Toluene	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
10061-02-6	trans-1,3-Dichloropropene	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
79-00-5	1,1,2-Trichloroethane	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
127-18-4	Tetrachloroethene	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	5 J	21
591-78-6	2-Hexanone	TCL-S-VOC	ug/Kg	15 U	12 U	10 UJ	14 U	14 U	14 U
124-48-1	Dibromochloromethane	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
106-93-4	1,2-Dibromoethane	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U
108-90-7	Chlorobenzene	TCL-S-VOC	ug/Kg	15 U	12 U	10 U	14 U	14 U	14 U

303189

Table 5a
Stream Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

Cas Number	Chemical Name	Analytic Method	Sample Code / Sample Name / Sample Date / Unit \\ Depth	SD-01-R1 10/14/2003 0 to 6 in bgs		SD-02-R1 10/14/2003 0 to 6 in bgs		SD-03-R1 10/14/2003 0 to 6 in bgs		SD-04-R1 10/15/2003 0 to 6 in bgs		SD-05-R1 10/17/2003 0 to 6 in bgs		SD-06-R1 10/20/2003 0 to 6 in bgs	
	Volatile Organic Compounds - Page 2														
100-41-4	Ethylbenzene	TCL-S-VOC	ug/Kg	15	U	12	U	10	U	14	U	14	U	14	U
1330-20-7	Xylenes (total)	TCL-S-VOC	ug/Kg	15	U	12	U	10	U	14	U	14	U	14	U
100-42-5	Styrene	TCL-S-VOC	ug/Kg	15	U	12	U	10	U	14	U	14	U	14	U
75-25-2	Bromoform	TCL-S-VOC	ug/Kg	15	U	12	U	10	U	14	U	14	U	14	U
98-82-8	Isopropylbenzene	TCL-S-VOC	ug/Kg	15	U	12	U	10	U	14	U	14	U	14	U
79-34-5	1,1,2,2-Tetrachloroethane	TCL-S-VOC	ug/Kg	15	U	12	U	10	U	14	U	14	U	14	U
541-73-1	1,3-Dichlorobenzene	TCL-S-VOC	ug/Kg	15	U	12	U	10	U	14	U	14	U	14	U
106-46-7	1,4-Dichlorobenzene	TCL-S-VOC	ug/Kg	15	U	12	U	10	U	14	U	14	U	14	U
95-50-1	1,2-Dichlorobenzene	TCL-S-VOC	ug/Kg	15	U	12	U	10	U	14	U	14	U	14	U
96-12-8	1,2-Dibromo-3-chloropropane	TCL-S-VOC	ug/Kg	15	U	12	U	10	U	14	U	14	U	14	U
120-82-1	1,2,4-Trichlorobenzene	TCL-S-VOC	ug/Kg	15	U	12	U	10	U	14	U	14	U	14	U

303190

Table 5a
Stream Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

Cas Number	Chemical Name	Analytic Method	Sample Code / Sample Name / Sample Date / Unit \\ Depth	SD-01-R1 10/14/2003 0 to 6 in bgs		SD-02-R1 10/14/2003 0 to 6 in bgs		SD-03-R1 10/14/2003 0 to 6 in bgs		SD-04-R1 10/15/2003 0 to 6 in bgs		SD-05-R1 10/17/2003 0 to 6 in bgs		SD-06-R1 10/20/2003 0 to 6 in bgs	
	Semi-Volatile Organic Compounds - Page 1														
100-52-7	Benzaldehyde	TCL-S-SVOC	ug/Kg	2400	R	450	R	420	UJ	500	R	450	R	460	R
108-95-2	Phenol	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
111-44-4	bis(2-Chloroethyl) ether	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
95-57-8	2-Chlorophenol	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
95-48-7	2-Methylphenol	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
108-60-1	2,2'-oxybis(1-Chloropropane)	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
98-86-2	Acetophenone	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
106-44-5	4-Methylphenol	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
621-64-7	n-Nitroso-di-n-propylamine	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
67-72-1	Hexachloroethane	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
98-95-3	Nitrobenzene	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
78-59-1	Isophorone	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
88-75-5	2-Nitrophenol	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
105-67-9	2,4-Dimethylphenol	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
111-91-1	bis(2-Chloroethoxy)methane	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
120-83-2	2,4-Dichlorophenol	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
91-20-3	Naphthalene	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
106-47-8	4-Chloroaniline	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
87-68-3	Hexachlorobutadiene	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
105-60-2	Caprolactam	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
59-50-7	4-Chloro-3-methylphenol	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
91-57-6	2-Methylnaphthalene	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
77-47-4	Hexachlorocyclopentadiene	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
88-06-2	2,4,6-Trichlorophenol	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
95-95-4	2,4,5-Trichlorophenol	TCL-S-SVOC	ug/Kg	6000	U	1100	U	1100	U	1300	U	1100	U	1200	UJ
92-52-4	1,1'-Biphenyl	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
91-58-7	2-Chloronaphthalene	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
88-74-4	2-Nitroaniline	TCL-S-SVOC	ug/Kg	6000	U	1100	U	1100	U	1300	U	1100	U	1200	UJ
131-11-3	Dimethylphthalate	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
606-20-2	2,6-Dinitrotoluene	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
208-96-8	Acenaphthylene	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
99-09-2	3-Nitroaniline	TCL-S-SVOC	ug/Kg	6000	R	1100	R	1100	UJ	1300	R	1100	UJ	1200	UJ
83-32-9	Acenaphthene	TCL-S-SVOC	ug/Kg	290	J	450	U	420	U	500	U	450	U	460	UJ

Table 5a
Stream Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

Cas Number	Chemical Name	Analytic Method	Sample Code / Sample Name / Sample Date / Unit \\ Depth	SD-01-R1 10/14/2003 0 to 6 in bgs		SD-02-R1 10/14/2003 0 to 6 in bgs		SD-03-R1 10/14/2003 0 to 6 in bgs		SD-04-R1 10/15/2003 0 to 6 in bgs		SD-05-R1 10/17/2003 0 to 6 in bgs		SD-06-R1 10/20/2003 0 to 6 in bgs	
	Semi-Volatile Organic Compounds - Page 2														
51-28-5	2,4-Dinitrophenol	TCL-S-SVOC	ug/Kg	6000	U	1100	U	1100	U	1300	U	1100	U	1200	R
100-02-7	4-Nitrophenol	TCL-S-SVOC	ug/Kg	6000	UJ	1100	UJ	1100	U	1300	UJ	1100	U	1200	UJ
132-64-9	Dibenzofuran	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
121-14-2	2,4-Dinitrotoluene	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
84-66-2	Diethylphthalate	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
86-73-7	Fluorene	TCL-S-SVOC	ug/Kg	350	J	450	U	420	U	500	U	450	U	460	UJ
7005-72-3	4-Chlorophenyl-phenylether	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
100-01-6	4-Nitroaniline	TCL-S-SVOC	ug/Kg	6000	U	1100	U	1100	U	1300	U	1100	U	1200	UJ
534-52-1	4,6-Dinitro-2-methylphenol	TCL-S-SVOC	ug/Kg	6000	U	1100	U	1100	U	1300	U	1100	U	1200	UJ
86-30-6	n-Nitrosodiphenylamine	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
101-55-3	4-Bromophenyl-phenylether	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
118-74-1	Hexachlorobenzene	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
1912-24-9	Atrazine	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
87-86-5	Pentachlorophenol	TCL-S-SVOC	ug/Kg	6000	U	1100	U	1100	U	1300	U	1100	U	1200	UJ
85-01-8	Phenanthrene	TCL-S-SVOC	ug/Kg	3100		78	J	140	J	230	J	310	J	460	UJ
120-12-7	Anthracene	TCL-S-SVOC	ug/Kg	610	J	450	U	420	U	500	U	52	J	460	UJ
86-74-8	Carbazole	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
84-74-2	Di-n-butylphthalate	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
206-44-0	Fluoranthene	TCL-S-SVOC	ug/Kg	3100		150	J	230	J	540		450		460	UJ
129-00-0	Pyrene	TCL-S-SVOC	ug/Kg	1400	J	170	J	200	J	460	J	340	J	460	UJ
85-68-7	Butylbenzylphthalate	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
91-94-1	3,3'-Dichlorobenzidine	TCL-S-SVOC	ug/Kg	2400	R	450	R	420	UJ	500	R	450	R	460	R
56-55-3	Benzo(a)anthracene	TCL-S-SVOC	ug/Kg	1300	J	64	J	100	J	230	J	190	J	460	UJ
218-01-9	Chrysene	TCL-S-SVOC	ug/Kg	1100	J	78	J	130	J	250	J	190	J	460	UJ
117-81-7	bis(2-Ethylhexyl) phthalate	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	47	J	460	UJ
117-84-0	Di-n-octylphthalate	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	UJ	500	U	450	UJ	460	UJ
205-99-2	Benzo(b)fluoranthene	TCL-S-SVOC	ug/Kg	940	J	77	J	130	J	270	J	170	J	460	UJ
207-08-9	Benzo(k)fluoranthene	TCL-S-SVOC	ug/Kg	810	J	64	J	80	J	220	J	160	J	460	UJ
50-32-8	Benzo(a)pyrene	TCL-S-SVOC	ug/Kg	380	J	76	J	99	J	220	J	120	J	460	UJ
193-39-5	Indeno(1,2,3-cd)pyrene	TCL-S-SVOC	ug/Kg	310	J	59	J	66	J	180	J	120	J	460	UJ
53-70-3	Dibenz(a,h)anthracene	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ
191-24-2	Benzo(g,h,i)perylene	TCL-S-SVOC	ug/Kg	2400	U	450	U	420	U	500	U	450	U	460	UJ

303192

Table 5a
Stream Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

Cas Number	Chemical Name	Analytic Method	Sample Code / Sample Name / Sample Date / Unit \\ Depth	SD-01-R1 10/14/2003 0 to 6 in bgs		SD-02-R1 10/14/2003 0 to 6 in bgs		SD-03-R1 10/14/2003 0 to 6 in bgs		SD-04-R1 10/15/2003 0 to 6 in bgs		SD-05-R1 10/17/2003 0 to 6 in bgs		SD-06-R1 10/20/2003 0 to 6 in bgs	
	Pesticides/PCBs														
319-84-6	alpha-BHC	TCL-S-P/P	ug/Kg	2.5	U	2.3	U	2.2	U	2.6	U	2.3	U	2.4	UJ
319-85-7	beta-BHC	TCL-S-P/P	ug/Kg	2.5	U	2.3	U	2.2	U	2.6	U	2.3	U	2.4	UJ
319-86-8	delta-BHC	TCL-S-P/P	ug/Kg	2.5	U	2.3	U	2.2	U	2.6	U	2.3	U	2.4	UJ
58-89-9	gamma-BHC (Lindane)	TCL-S-P/P	ug/Kg	2.5	U	2.3	U	2.2	U	2.6	U	2.3	UJ	2.4	UJ
76-44-8	Heptachlor	TCL-S-P/P	ug/Kg	2.5	U	2.3	U	2.2	U	2.6	U	2.3	UJ	2.4	UJ
309-00-2	Aldrin	TCL-S-P/P	ug/Kg	2.5	U	2.3	U	2.2	U	2.6	U	2.3	UJ	2.4	UJ
1024-57-3	Heptachlor epoxide	TCL-S-P/P	ug/Kg	2.5	U	2.3	U	2.2	U	2.6	U	2.3	U	2.4	UJ
959-98-8	Endosulfan I	TCL-S-P/P	ug/Kg	2.5	U	2.3	U	2.2	U	2.6	U	2.3	U	2.4	UJ
60-57-1	Dieldrin	TCL-S-P/P	ug/Kg	4.8	U	4.5	U	4.2	U	5	U	4.5	UJ	4.6	UJ
72-55-9	4,4'-DDE	TCL-S-P/P	ug/Kg	5.8	J	4.5	U	4.2	U	9.7	J	4.5	U	22	J
72-20-8	Endrin	TCL-S-P/P	ug/Kg	4.8	U	4.5	U	4.2	U	5	U	4.5	U	4.6	UJ
33213-65-9	Endosulfan II	TCL-S-P/P	ug/Kg	4.8	U	4.5	U	4.2	U	5	U	4.5	U	4.6	UJ
72-54-8	4,4'-DDD	TCL-S-P/P	ug/Kg	4.8	U	4.5	U	4.2	U	5	U	4.5	U	6.8	J
1031-07-8	Endosulfan sulfate	TCL-S-P/P	ug/Kg	4.8	U	4.5	U	4.2	U	5	U	4.5	U	4.6	UJ
50-29-3	4,4'-DDT	TCL-S-P/P	ug/Kg	19		4.5	U	4.2	U	28		5.3	J	17	J
72-43-5	Methoxychlor	TCL-S-P/P	ug/Kg	25	U	23	U	22	U	26	U	23	U	24	UJ
53494-70-5	Endrin ketone	TCL-S-P/P	ug/Kg	4.8	U	4.5	U	4.2	U	5	U	4.5	U	4.6	UJ
7421-93-4	Endrin aldehyde	TCL-S-P/P	ug/Kg	4.8	U	4.5	U	4.2	U	5	U	4.5	U	4.6	UJ
5103-71-9	alpha-Chlordane	TCL-S-P/P	ug/Kg	6.3	J	2.3	U	2.2	U	2.6	U	3.1	J	2.4	UJ
5103-74-2	gamma-Chlordane	TCL-S-P/P	ug/Kg	5.8		2.3	U	2.2	U	2.9	J	2.8	J	2.4	UJ
8001-35-2	Toxaphene	TCL-S-P/P	ug/Kg	250	U	230	U	220	U	260	U	230	U	240	UJ
12674-11-2	Aroclor-1016	TCL-S-P/P	ug/Kg	48	U	45	U	42	U	50	U	45	U	46	UJ
11104-28-2	Aroclor-1221	TCL-S-P/P	ug/Kg	97	U	92	U	85	U	100	U	91	U	93	UJ
11141-16-5	Aroclor-1232	TCL-S-P/P	ug/Kg	48	U	45	U	42	U	50	U	45	U	46	UJ
53469-21-9	Aroclor-1242	TCL-S-P/P	ug/Kg	48	U	45	U	42	U	50	U	45	U	46	UJ
12672-29-6	Aroclor-1248	TCL-S-P/P	ug/Kg	48	U	45	U	42	U	50	U	45	U	46	UJ
11097-69-1	Aroclor-1254	TCL-S-P/P	ug/Kg	48	U	45	U	42	U	50	U	45	U	46	UJ
11096-82-5	Aroclor-1260	TCL-S-P/P	ug/Kg	48	U	45	U	42	U	50	U	45	U	46	UJ

303193

Table 5a
Stream Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

Cas Number	Chemical Name	Analytic Method	Sample Code / Sample Name / Sample Date / Unit \\ Depth	SD-01-R1 10/14/2003 0 to 6 in bgs		SD-02-R1 10/14/2003 0 to 6 in bgs		SD-03-R1 10/14/2003 0 to 6 in bgs		SD-04-R1 10/15/2003 0 to 6 in bgs		SD-05-R1 10/17/2003 0 to 6 in bgs		SD-06-R1 10/20/2003 0 to 6 in bgs	
	Inorganic Analytes														
7439-97-6	Mercury	ILM05-2-S-AES	mg/kg	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
7440-22-4	Silver	ILM05-2-S-AES	mg/kg	1.5	U	1.3	U	1.3	U	1.5	U	1.3	U	1.6	U
7429-90-5	Aluminum	ILM05-2-S-AES	mg/kg	2300		340		1500		1000		580		2600	
7440-38-2	Arsenic	ILM05-2-S-AES	mg/kg	2.2	U	2	U	2	U	2.3	U	1.9	U	2.5	
7440-39-3	Barium	ILM05-2-S-AES	mg/kg	29	U	26	U	26	U	31	U	26	U	32	U
7440-41-7	Beryllium	ILM05-2-S-AES	mg/kg	0.7	U	0.7	U	0.7	U	0.8	U	0.6	U	0.8	U
7440-70-2	Calcium	ILM05-2-S-AES	mg/kg	2000		650	U	1700		1600		5600		880	
7440-43-9	Cadmium	ILM05-2-S-AES	mg/kg	0.7	U	0.7	U	0.7	U	0.8	U	0.6	U	0.8	U
7440-48-4	Cobalt	ILM05-2-S-AES	mg/kg	7.3	U	6.5	U	6.5	U	7.7	U	6.4	U	8.1	U
7440-47-3	Chromium	ILM05-2-S-AES	mg/kg	9.5		1.3	U	4.1		3.4		2.2		5.3	
7440-50-8	Copper	ILM05-2-S-AES	mg/kg	18		3.3	U	4.8		5		4.3		31	
7439-89-6	Iron	ILM05-2-S-AES	mg/kg	5200		1000		2500		2300		1900		4300	
7440-09-7	Potassium	ILM05-2-S-AES	mg/kg	730	U	650	U	650	U	770	U	640	U	810	U
7439-95-4	Magnesium	ILM05-2-S-AES	mg/kg	780		650	U	690		800		3000		810	U
7439-96-5	Manganese	ILM05-2-S-AES	mg/kg	180		6.6		43		61		25		57	
7440-23-5	Sodium	ILM05-2-S-AES	mg/kg	730	U	650	U	650	U	770	U	640	U	810	U
7440-02-0	Nickel	ILM05-2-S-AES	mg/kg	7.3		5.2	U	5.2	U	6.2	U	5.1	U	6.5	U
7439-92-1	Lead	ILM05-2-S-AES	mg/kg	23		7.8		7.9		20		4.8		29	
7440-36-0	Antimony	ILM05-2-S-AES	mg/kg	8.8	U	7.8	U	7.8	U	9.2	U	7.7	U	9.7	U
7782-49-2	Selenium	ILM05-2-S-AES	mg/kg	5.1	U	4.6	U	4.6	U	5.4	U	4.5	U	5.7	U
7440-28-0	Thallium	ILM05-2-S-AES	mg/kg	3.7	U	3.3	U	3.3	U	3.8	U	3.2	U	4	U
7440-62-2	Vanadium	ILM05-2-S-AES	mg/kg	22		6.5	U	6.5	U	7.7	U	6.4	U	11	
7440-66-6	Zinc	ILM05-2-S-AES	mg/kg	190		11		22		19		9.4		77	
57-12-5	Cyanide	Cyanide-S	mg/Kg	0.52		0.15	U	0.42		0.17	U	0.15	U	0.21	
7440-32-6	Titanium Metal Powder	SW6010B-TC	mg/kg	187	JN	71.9	JN	84.1	JN	127	JN			96.2	JN
	Wet Chemistry Analysis														
pH	pH	SW9045C	s.u.	6.2		6.4		6.5		7.1		6.7		7.6	J
TOC	Total Organic Carbon	Lloyd Kahn	mg/kg	42400		2330		255		19000		8520		12200	J

303194

Table 5a

Stream Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

Cas Number	Chemical Name	Analytic Method	Sample Code / Sample Name / Sample Date / Unit \\ Depth	SD-09-R1 10/16/2003 0 to 6 in bgs		SD-10-R1 10/16/2003 0 to 6 in bgs		SD-11-R1 10/16/2003 0 to 6 in bgs		SD-12-R1 10/16/2003 0 to 6 in bgs		SD-13-R1 10/16/2003 0 to 6 in bgs		SD-14-R1 10/14/2003 0 to 6 in bgs	
	Volatile Organic Compounds - Page 1														
75-71-8	Dichlorodifluoromethane	TCL-S-VOC	ug/Kg	13	UJ	12	U	11	UJ	12	UJ	11	UJ	14	U
74-87-3	Chloromethane	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
75-01-4	Vinyl Chloride	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
74-83-9	Bromomethane	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
75-00-3	Chloroethane	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
75-69-4	Trichlorofluoromethane	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
75-35-4	1,1-Dichloroethene	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
67-64-1	Acetone	TCL-S-VOC	ug/Kg	5	J	6	J	11	J	9	J	8	J	14	U
75-15-0	Carbon Disulfide	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
79-20-9	Methyl Acetate	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
75-09-2	Methylene Chloride	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
156-60-5	trans-1,2-Dichloroethene	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
1634-04-4	Methyl tert-Butyl Ether	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
75-34-3	1,1-Dichloroethane	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
156-59-2	cis-1,2-Dichloroethene	TCL-S-VOC	ug/Kg	33		12	U	11	U	12	U	11	U	14	U
78-93-3	2-Butanone	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
67-66-3	Chloroform	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
71-55-6	1,1,1-Trichloroethane	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
110-82-7	Cyclohexane	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
56-23-5	Carbon Tetrachloride	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
71-43-2	Benzene	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
107-06-2	1,2-Dichloroethane	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
79-01-6	Trichloroethene	TCL-S-VOC	ug/Kg	370	D	12	U	11	U	12	U	11	U	14	U
108-87-2	Metylcyclohexane	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
78-87-5	1,2-Dichloropropane	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
75-27-4	Bromodichloromethane	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
10061-01-5	cis-1,3-Dichloropropene	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
108-10-1	4-Methyl-2-pentanone	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
108-88-3	Toluene	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	2	J	14	U
10061-02-6	trans-1,3-Dichloropropene	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
79-00-5	1,1,2-Trichloroethane	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
127-18-4	Tetrachloroethene	TCL-S-VOC	ug/Kg	4	J	12	U	11	U	12	U	11	U	14	U
591-78-6	2-Hexanone	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
124-48-1	Dibromochloromethane	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
106-93-4	1,2-Dibromoethane	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
108-90-7	Chlorobenzene	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U

303195

Table 5a
Stream Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

Cas Number	Chemical Name	Analytic Method	Sample Code / Sample Name / Sample Date / Unit \\ Depth	SD-09-R1 10/16/2003 0 to 6 in bgs		SD-10-R1 10/16/2003 0 to 6 in bgs		SD-11-R1 10/16/2003 0 to 6 in bgs		SD-12-R1 10/16/2003 0 to 6 in bgs		SD-13-R1 10/16/2003 0 to 6 in bgs		SD-14-R1 10/14/2003 0 to 6 in bgs	
	Volatile Organic Compounds - Page 2														
100-41-4	Ethylbenzene	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
1330-20-7	Xylenes (total)	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
100-42-5	Styrene	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
75-25-2	Bromoform	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
98-82-8	Isopropylbenzene	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
79-34-5	1,1,2,2-Tetrachloroethane	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
541-73-1	1,3-Dichlorobenzene	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
106-46-7	1,4-Dichlorobenzene	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
95-50-1	1,2-Dichlorobenzene	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
96-12-8	1,2-Dibromo-3-chloropropane	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U
120-82-1	1,2,4-Trichlorobenzene	TCL-S-VOC	ug/Kg	13	U	12	U	11	U	12	U	11	U	14	U

Table 5a
Stream Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

Cas Number	Chemical Name	Analytic Method	Sample Code / Sample Name / Sample Date / Unit \\ Depth	SD-09-R1 10/16/2003 0 to 6 in bgs		SD-10-R1 10/16/2003 0 to 6 in bgs		SD-11-R1 10/16/2003 0 to 6 in bgs		SD-12-R1 10/16/2003 0 to 6 in bgs		SD-13-R1 10/16/2003 0 to 6 in bgs		SD-14-R1 10/14/2003 0 to 6 in bgs	
	Semi-Volatile Organic Compounds - Page 1														
100-52-7	Benzaldehyde	TCL-S-SVOC	ug/Kg	490	R	460	R	450	R	430	R	400	R	500	R
108-95-2	Phenol	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
111-44-4	bis(2-Chloroethyl) ether	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
95-57-8	2-Chlorophenol	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
95-48-7	2-Methylphenol	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
108-60-1	2,2'-oxybis(1-Chloropropane)	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
98-86-2	Acetophenone	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
106-44-5	4-Methylphenol	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
621-64-7	n-Nitroso-di-n-propylamine	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
67-72-1	Hexachloroethane	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
98-95-3	Nitrobenzene	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
78-59-1	Isophorone	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
88-75-5	2-Nitrophenol	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
105-67-9	2,4-Dimethylphenol	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
111-91-1	bis(2-Chloroethoxy)methane	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
120-83-2	2,4-Dichlorophenol	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
91-20-3	Naphthalene	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
106-47-8	4-Chloroaniline	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
87-68-3	Hexachlorobutadiene	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
105-60-2	Caprolactam	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
59-50-7	4-Chloro-3-methylphenol	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
91-57-6	2-Methylnaphthalene	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
77-47-4	Hexachlorocyclopentadiene	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
88-06-2	2,4,6-Trichlorophenol	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
95-95-4	2,4,5-Trichlorophenol	TCL-S-SVOC	ug/Kg	1200	U	1200	U	1100	U	1100	U	1000	U	1300	U
92-52-4	1,1'-Biphenyl	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
91-58-7	2-Chloronaphthalene	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
88-74-4	2-Nitroaniline	TCL-S-SVOC	ug/Kg	1200	U	1200	U	1100	U	1100	U	1000	U	1300	U
131-11-3	Dimethylphthalate	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
606-20-2	2,6-Dinitrotoluene	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
208-96-8	Acenaphthylene	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
99-09-2	3-Nitroaniline	TCL-S-SVOC	ug/Kg	1200	UJ	1200	UJ	1100	UJ	1100	UJ	1000	UJ	1300	R
83-32-9	Acenaphthene	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	190	J	400	U	94	J

Table 5a
Stream Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

Cas Number	Chemical Name	Analytic Method	Sample Code / Sample Name / Sample Date / Unit \\ Depth	SD-09-R1 10/16/2003 0 to 6 in bgs		SD-10-R1 10/16/2003 0 to 6 in bgs		SD-11-R1 10/16/2003 0 to 6 in bgs		SD-12-R1 10/16/2003 0 to 6 in bgs		SD-13-R1 10/16/2003 0 to 6 in bgs		SD-14-R1 10/14/2003 0 to 6 in bgs	
	Semi-Volatile Organic Compounds - Page 2														
51-28-5	2,4-Dinitrophenol	TCL-S-SVOC	ug/Kg	1200	U	1200	U	1100	U	1100	U	1000	U	1300	U
100-02-7	4-Nitrophenol	TCL-S-SVOC	ug/Kg	1200	U	1200	U	1100	U	1100	U	1000	U	1300	UJ
132-64-9	Dibenzofuran	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	82	J	400	U	53	J
121-14-2	2,4-Dinitrotoluene	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
84-66-2	Diethylphthalate	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
86-73-7	Fluorene	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	230	J	400	U	140	J
7005-72-3	4-Chlorophenyl-phenylether	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
100-01-6	4-Nitroaniline	TCL-S-SVOC	ug/Kg	1200	U	1200	U	1100	U	1100	U	1000	U	1300	U
534-52-1	4,6-Dinitro-2-methylphenol	TCL-S-SVOC	ug/Kg	1200	U	1200	U	1100	U	1100	U	1000	U	1300	U
86-30-6	n-Nitrosodiphenylamine	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
101-55-3	4-Bromophenyl-phenylether	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
118-74-1	Hexachlorobenzene	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
1912-24-9	Atrazine	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	500	U
87-86-5	Pentachlorophenol	TCL-S-SVOC	ug/Kg	1200	U	1200	U	1100	U	1100	U	1000	U	1300	U
85-01-8	Phenanthrene	TCL-S-SVOC	ug/Kg	490	U	460	U	85	J	2600		380	J	2100	
120-12-7	Anthracene	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	500		56	J	280	J
86-74-8	Carbazole	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	200	J	47	J	300	J
84-74-2	Di-n-butylphthalate	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	36	J	400	U	500	U
206-44-0	Fluoranthene	TCL-S-SVOC	ug/Kg	110	J	150	J	180	J	3100	D	670		3700	D
129-00-0	Pyrene	TCL-S-SVOC	ug/Kg	110	J	140	J	140	J	2200		500		2700	
85-68-7	Butylbenzylphthalate	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	160	J
91-94-1	3,3'-Dichlorobenzidine	TCL-S-SVOC	ug/Kg	490	R	460	R	450	R	430	R	400	R	500	R
56-55-3	Benzo(a)anthracene	TCL-S-SVOC	ug/Kg	67	J	80	J	67	J	1200		230	J	1400	
218-01-9	Chrysene	TCL-S-SVOC	ug/Kg	77	J	88	J	94	J	1200		270	J	1600	
117-81-7	bis(2-Ethylhexyl) phthalate	TCL-S-SVOC	ug/Kg	490	U	51	J	78	J	160	J	170	J	3000	
117-84-0	Di-n-octylphthalate	TCL-S-SVOC	ug/Kg	490	UJ	460	UJ	450	UJ	430	UJ	400	UJ	110	J
205-99-2	Benzo(b)fluoranthene	TCL-S-SVOC	ug/Kg	96	J	89	J	110	J	1100		270	J	1600	
207-08-9	Benzo(k)fluoranthene	TCL-S-SVOC	ug/Kg	65	J	73	J	76	J	840		220	J	1200	
50-32-8	Benzo(a)pyrene	TCL-S-SVOC	ug/Kg	54	J	64	J	49	J	590		170	J	1200	
193-39-5	Indeno(1,2,3-cd)pyrene	TCL-S-SVOC	ug/Kg	490	U	55	J	450	U	440		140	J	970	
53-70-3	Dibenz(a,h)anthracene	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	140	J	400	U	220	J
191-24-2	Benzo(g,h,i)perylene	TCL-S-SVOC	ug/Kg	490	U	460	U	450	U	430	U	400	U	89	J

303198

Table 5a
Stream Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

Cas Number	Chemical Name	Analytic Method	Sample Code / Sample Name / Sample Date / Unit \\ Depth	SD-09-R1 10/16/2003 0 to 6 in bgs		SD-10-R1 10/16/2003 0 to 6 in bgs		SD-11-R1 10/16/2003 0 to 6 in bgs		SD-12-R1 10/16/2003 0 to 6 in bgs		SD-13-R1 10/16/2003 0 to 6 in bgs		SD-14-R1 10/14/2003 0 to 6 in bgs	
	Pesticides/PCBs														
319-84-6	alpha-BHC	TCL-S-P/P	ug/Kg	2.5	UJ	2.4	UJ	2.3	UJ	2.2	UJ	2	UJ	2.6	U
319-85-7	beta-BHC	TCL-S-P/P	ug/Kg	2.5	UJ	2.4	UJ	2.3	UJ	2.2	UJ	2	UJ	2.6	U
319-86-8	delta-BHC	TCL-S-P/P	ug/Kg	2.5	UJ	2.4	UJ	2.3	UJ	2.2	UJ	2	UJ	2.6	U
58-89-9	gamma-BHC (Lindane)	TCL-S-P/P	ug/Kg	2.5	UJ	2.4	UJ	2.3	UJ	2.2	UJ	2	UJ	2.6	U
76-44-8	Heptachlor	TCL-S-P/P	ug/Kg	2.5	UJ	2.4	UJ	2.3	UJ	2.5	J	2	UJ	2.6	U
309-00-2	Aldrin	TCL-S-P/P	ug/Kg	2.5	UJ	2.4	UJ	2.3	UJ	2.2	UJ	2	UJ	2.6	U
1024-57-3	Heptachlor epoxide	TCL-S-P/P	ug/Kg	2.5	UJ	2.4	UJ	2.3	UJ	2.2	UJ	2	UJ	8.6	
959-98-8	Endosulfan I	TCL-S-P/P	ug/Kg	2.5	UJ	2.4	UJ	2.3	UJ	2.2	UJ	2	UJ	2.6	U
60-57-1	Dieldrin	TCL-S-P/P	ug/Kg	4.9	UJ	4.6	UJ	4.5	UJ	4.3	UJ	4	UJ	5	U
72-55-9	4,4'-DDE	TCL-S-P/P	ug/Kg	18	J	4.8	J	6.2	J	7.3	J	4	UJ	18	
72-20-8	Endrin	TCL-S-P/P	ug/Kg	4.9	UJ	4.6	UJ	4.5	UJ	4.3	UJ	4	UJ	5	U
33213-65-9	Endosulfan II	TCL-S-P/P	ug/Kg	4.9	UJ	4.6	UJ	4.5	UJ	4.3	UJ	4	UJ	5	U
72-54-8	4,4'-DDD	TCL-S-P/P	ug/Kg	23	J	13	J	7.6	J	21	J	4	UJ	12	J
1031-07-8	Endosulfan sulfate	TCL-S-P/P	ug/Kg	4.9	UJ	4.6	UJ	4.5	UJ	4.3	UJ	4	UJ	5	U
50-29-3	4,4'-DDT	TCL-S-P/P	ug/Kg	8.3	J	4.6	UJ	14	J	8.2	J	4.9	J	10	
72-43-5	Methoxychlor	TCL-S-P/P	ug/Kg	25	UJ	24	UJ	23	UJ	22	UJ	20	UJ	26	U
53494-70-5	Endrin ketone	TCL-S-P/P	ug/Kg	4.9	UJ	4.6	UJ	4.5	UJ	4.3	UJ	4	UJ	5	U
7421-93-4	Endrin aldehyde	TCL-S-P/P	ug/Kg	4.9	UJ	4.6	UJ	4.5	UJ	4.3	UJ	4	UJ	5	U
5103-71-9	alpha-Chlordane	TCL-S-P/P	ug/Kg	3.1	JN	2.4	UJ	2.3	UJ	18	J	3.4	J	13	J
5103-74-2	gamma-Chlordane	TCL-S-P/P	ug/Kg	2.5	UJ	2.4	UJ	2.3	UJ	19	J	3.2	J	15	
8001-35-2	Toxaphene	TCL-S-P/P	ug/Kg	250	UJ	240	UJ	230	UJ	220	UJ	200	UJ	260	U
12674-11-2	Aroclor-1016	TCL-S-P/P	ug/Kg	49	UJ	46	UJ	45	UJ	43	UJ	40	UJ	50	U
11104-28-2	Aroclor-1221	TCL-S-P/P	ug/Kg	100	UJ	93	UJ	92	UJ	87	UJ	81	UJ	100	U
11141-16-5	Aroclor-1232	TCL-S-P/P	ug/Kg	49	UJ	46	UJ	45	UJ	43	UJ	40	UJ	50	U
53469-21-9	Aroclor-1242	TCL-S-P/P	ug/Kg	49	UJ	46	UJ	45	UJ	43	UJ	40	UJ	50	U
12672-29-6	Aroclor-1248	TCL-S-P/P	ug/Kg	49	UJ	46	UJ	45	UJ	43	UJ	40	UJ	50	U
11097-69-1	Aroclor-1254	TCL-S-P/P	ug/Kg	49	UJ	46	UJ	45	UJ	43	UJ	40	UJ	50	U
11096-82-5	Aroclor-1260	TCL-S-P/P	ug/Kg	49	UJ	46	UJ	45	UJ	43	UJ	40	UJ	50	U

303199

Table 5a
Stream Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

Cas Number	Chemical Name	Analytic Method	Sample Code / Sample Name / Sample Date / Unit \\ Depth	SD-09-R1 10/16/2003 0 to 6 in bgs		SD-10-R1 10/16/2003 0 to 6 in bgs		SD-11-R1 10/16/2003 0 to 6 in bgs		SD-12-R1 10/16/2003 0 to 6 in bgs		SD-13-R1 10/16/2003 0 to 6 in bgs		SD-14-R1 10/14/2003 0 to 6 in bgs	
	Inorganic Analytes														
7439-97-6	Mercury	ILM05-2-S-AES	mg/kg	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
7440-22-4	Silver	ILM05-2-S-AES	mg/kg	1.4	U	1.5	U	1.4	U	1.3	U	1.3	U	1.5	U
7429-90-5	Aluminum	ILM05-2-S-AES	mg/kg	890		1600		1100		510		520		1100	
7440-38-2	Arsenic	ILM05-2-S-AES	mg/kg	15		3.2		2.5		1.9	U	1.9	U	2.2	U
7440-39-3	Barium	ILM05-2-S-AES	mg/kg	28	U	30	U	31		25	U	26	U	30	U
7440-41-7	Beryllium	ILM05-2-S-AES	mg/kg	0.7	U	0.7	U	0.7	U	0.6	U	0.7	U	0.8	U
7440-70-2	Calcium	ILM05-2-S-AES	mg/kg	690	U	740	U	720	U	2100		1000		890	
7440-43-9	Cadmium	ILM05-2-S-AES	mg/kg	0.7	U	0.7	U	0.7	U	0.6	U	0.7	U	0.8	U
7440-48-4	Cobalt	ILM05-2-S-AES	mg/kg	6.9	U	7.4	U	7.2	U	6.3	U	6.5	U	7.5	U
7440-47-3	Chromium	ILM05-2-S-AES	mg/kg	3.4		5		6.7		1.7		2.1		4.3	
7440-50-8	Copper	ILM05-2-S-AES	mg/kg	8.1		15		9		6.3		5.5		9.1	
7439-89-6	Iron	ILM05-2-S-AES	mg/kg	2200		3400		6100		2100		2800		8700	
7440-09-7	Potassium	ILM05-2-S-AES	mg/kg	690	U	740	U	720	U	630	U	650	U	750	U
7439-95-4	Magnesium	ILM05-2-S-AES	mg/kg	690	U	740	U	720	U	1200		650		750	U
7439-96-5	Manganese	ILM05-2-S-AES	mg/kg	27		29		25		19		26		39	
7440-23-5	Sodium	ILM05-2-S-AES	mg/kg	690	U	740	U	720	U	630	U	650	U	750	U
7440-02-0	Nickel	ILM05-2-S-AES	mg/kg	5.5	U	6	U	5.8	U	5	U	5.2	U	6	U
7439-92-1	Lead	ILM05-2-S-AES	mg/kg	11		38		10		7.6		5.7		19	
7440-36-0	Antimony	ILM05-2-S-AES	mg/kg	8.3	U	8.9	U	8.6	U	7.6	U	7.8	U	9	U
7782-49-2	Selenium	ILM05-2-S-AES	mg/kg	4.8	U	5.2	U	5	U	4.4	U	4.5	U	5.2	U
7440-28-0	Thallium	ILM05-2-S-AES	mg/kg	3.4	U	3.7	U	3.6	U	3.2	U	3.2	U	3.7	U
7440-62-2	Vanadium	ILM05-2-S-AES	mg/kg	6.9	U	11		7.2	U	6.3	U	9.3		7.7	
7440-66-6	Zinc	ILM05-2-S-AES	mg/kg	19		55		22		15		12		41	
57-12-5	Cyanide	Cyanide-S	mg/Kg	0.16	U	0.15	U	0.18		0.14	U	0.15	U	0.17	U
7440-32-6	Titanium Metal Powder	SW6010B-TC	mg/kg	77.4	JN	68.3	JN	88.7	JN	47.6	JN	57.3	JN	160	JN
	Wet Chemistry Analysis														
pH	pH	SW9045C	s.u.	6.9		6.5		6.4		6.5		6.7		6.7	
TOC	Total Organic Carbon	Lloyd Kahn	mg/kg	8360		4400		1580		144		3990		41000	

303200

Table 5b
Pond Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

CAS Number	Chemical Name	Analytic Method	Sample Code / Sample Name / Sample Date / Unit \\ Depth	SD-07-R1 10/20/2003 0 to 6 in bgs		SD-08-R1 10/20/2003 0 to 6 in bgs		SD-17-R1 10/20/2003 0 to 6 in bgs		SD-23-R1 10/15/2003 0 to 6 in bgs		SD-24-R1 10/15/2003 0 to 6 in bgs	
	Volatile Organic Compounds - Page 1												
75-71-8	Dichlorodifluoromethane	TCL-S-VOC	ug/Kg	17	UJ	69	UJ	13	UJ	14	U	20	U
74-87-3	Chloromethane	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
75-01-4	Vinyl Chloride	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
74-83-9	Bromomethane	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
75-00-3	Chloroethane	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
75-69-4	Trichlorofluoromethane	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
75-35-4	1,1-Dichloroethene	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
67-64-1	Acetone	TCL-S-VOC	ug/Kg	28	J	94	J	5	J	14	U	22	U
75-15-0	Carbon Disulfide	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
79-20-9	Methyl Acetate	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
75-09-2	Methylene Chloride	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
156-60-5	trans-1,2-Dichloroethene	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
1634-04-4	Methyl tert-Butyl Ether	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
75-34-3	1,1-Dichloroethane	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
156-59-2	cis-1,2-Dichloroethene	TCL-S-VOC	ug/Kg	13	J	69	UJ	13	U	14	U	20	U
78-93-3	2-Butanone	TCL-S-VOC	ug/Kg	8	J	69	UJ	13	U	14	U	4	J
67-66-3	Chloroform	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
71-55-6	1,1,1-Trichloroethane	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
110-82-7	Cyclohexane	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
56-23-5	Carbon Tetrachloride	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
71-43-2	Benzene	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
107-06-2	1,2-Dichloroethane	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
79-01-6	Trichloroethene	TCL-S-VOC	ug/Kg	4	J	69	UJ	17		70		20	U
108-87-2	Metylcyclohexane	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
78-87-5	1,2-Dichloropropane	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
75-27-4	Bromodichloromethane	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
10061-01-5	cis-1,3-Dichloropropene	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
108-10-1	4-Methyl-2-pentanone	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
108-88-3	Toluene	TCL-S-VOC	ug/Kg	130		69	UJ	13	U	14	U	6	J
10061-02-6	trans-1,3-Dichloropropene	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
79-00-5	1,1,2-Trichloroethane	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
127-18-4	Tetrachloroethene	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
591-78-6	2-Hexanone	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
124-48-1	Dibromochloromethane	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
106-93-4	1,2-Dibromoethane	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
108-90-7	Chlorobenzene	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U

303202

Table 5b
Pond Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

CAS Number	Chemical Name	Analytic Method	Sample Code / Sample Name / Sample Date / Unit \\ Depth	SD-07-R1 10/20/2003 0 to 6 in bgs		SD-08-R1 10/20/2003 0 to 6 in bgs		SD-17-R1 10/20/2003 0 to 6 in bgs		SD-23-R1 10/15/2003 0 to 6 in bgs		SD-24-R1 10/15/2003 0 to 6 in bgs	
	Volatile Organic Compounds - Page 2												
100-41-4	Ethylbenzene	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
1330-20-7	Xylenes (total)	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
100-42-5	Styrene	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
75-25-2	Bromoform	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
98-82-8	Isopropylbenzene	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
79-34-5	1,1,2,2-Tetrachloroethane	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
541-73-1	1,3-Dichlorobenzene	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
106-46-7	1,4-Dichlorobenzene	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
95-50-1	1,2-Dichlorobenzene	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
96-12-8	1,2-Dibromo-3-chloropropane	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U
120-82-1	1,2,4-Trichlorobenzene	TCL-S-VOC	ug/Kg	17	U	69	UJ	13	U	14	U	20	U

303203

Table 5b
Pond Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

CAS Number	Chemical Name	Analytic Method	Sample Code / Sample Name / Sample Date / Unit \\ Depth	SD-07-R1 10/20/2003 0 to 6 in bgs		SD-08-R1 10/20/2003 0 to 6 in bgs		SD-17-R1 10/20/2003 0 to 6 in bgs		SD-23-R1 10/15/2003 0 to 6 in bgs		SD-24-R1 10/15/2003 0 to 6 in bgs	
	Semi-Volatile Organic Compounds - Page 1												
100-52-7	Benzaldehyde	TCL-S-SVOC	ug/Kg	520	R	1200	R	500	R	520	R	570	R
108-95-2	Phenol	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
111-44-4	bis(2-Chloroethyl) ether	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
95-57-8	2-Chlorophenol	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
95-48-7	2-Methylphenol	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
108-60-1	2,2'-oxybis(1-Chloropropane)	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
98-86-2	Acetophenone	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
106-44-5	4-Methylphenol	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
621-64-7	n-Nitroso-di-n-propylamine	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
67-72-1	Hexachloroethane	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
98-95-3	Nitrobenzene	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
78-59-1	Isophorone	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
88-75-5	2-Nitrophenol	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
105-67-9	2,4-Dimethylphenol	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
111-91-1	bis(2-Chloroethoxy)methane	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
120-83-2	2,4-Dichlorophenol	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
91-20-3	Naphthalene	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
106-47-8	4-Chloroaniline	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
87-68-3	Hexachlorobutadiene	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
105-60-2	Caprolactam	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
59-50-7	4-Chloro-3-methylphenol	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
91-57-6	2-Methylnaphthalene	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
77-47-4	Hexachlorocyclopentadiene	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
88-06-2	2,4,6-Trichlorophenol	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
95-95-4	2,4,5-Trichlorophenol	TCL-S-SVOC	ug/Kg	1300	UJ	3100	UJ	1300	UJ	1300	U	1400	U
92-52-4	1,1'-Biphenyl	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
91-58-7	2-Chloronaphthalene	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
88-74-4	2-Nitroaniline	TCL-S-SVOC	ug/Kg	1300	UJ	3100	UJ	1300	UJ	1300	U	1400	U
131-11-3	Dimethylphthalate	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
606-20-2	2,6-Dinitrotoluene	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
208-96-8	Acenaphthylene	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
99-09-2	3-Nitroaniline	TCL-S-SVOC	ug/Kg	1300	UJ	3100	UJ	1300	UJ	1300	R	1400	R
83-32-9	Acenaphthene	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U

Table 5b
Pond Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

CAS Number	Chemical Name	Analytic Method	Sample Code / Sample Name / Sample Date / Unit \\ Depth	SD-07-R1 10/20/2003 0 to 6 in bgs		SD-08-R1 10/20/2003 0 to 6 in bgs		SD-17-R1 10/20/2003 0 to 6 in bgs		SD-23-R1 10/15/2003 0 to 6 in bgs		SD-24-R1 10/15/2003 0 to 6 in bgs	
	Semi-Volatile Organic Compounds - Page 2												
51-28-5	2,4-Dinitrophenol	TCL-S-SVOC	ug/Kg	1300	R	3100	R	1300	R	1300	U	1400	U
100-02-7	4-Nitrophenol	TCL-S-SVOC	ug/Kg	1300	UJ	3100	UJ	1300	UJ	1300	UJ	1400	UJ
132-64-9	Dibenzofuran	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
121-14-2	2,4-Dinitrotoluene	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
84-66-2	Diethylphthalate	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
86-73-7	Fluorene	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
7005-72-3	4-Chlorophenyl-phenylether	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
100-01-6	4-Nitroaniline	TCL-S-SVOC	ug/Kg	1300	UJ	3100	UJ	1300	UJ	1300	U	1400	U
534-52-1	4,6-Dinitro-2-methylphenol	TCL-S-SVOC	ug/Kg	1300	UJ	3100	UJ	1300	UJ	1300	U	1400	U
86-30-6	n-Nitrosodiphenylamine	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
101-55-3	4-Bromophenyl-phenylether	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
118-74-1	Hexachlorobenzene	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
1912-24-9	Atrazine	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
87-86-5	Pentachlorophenol	TCL-S-SVOC	ug/Kg	1300	UJ	3100	UJ	1300	UJ	1300	U	1400	U
85-01-8	Phenanthrene	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
120-12-7	Anthracene	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
86-74-8	Carbazole	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
84-74-2	Di-n-butylphthalate	TCL-S-SVOC	ug/Kg	520	UJ	260	J	500	UJ	520	U	570	U
206-44-0	Fluoranthene	TCL-S-SVOC	ug/Kg	520	UJ	960	J	500	UJ	520	U	570	U
129-00-0	Pyrene	TCL-S-SVOC	ug/Kg	520	UJ	990	J	500	UJ	520	U	570	U
85-68-7	Butylbenzylphthalate	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
91-94-1	3,3'-Dichlorobenzidine	TCL-S-SVOC	ug/Kg	520	R	1200	R	500	R	520	R	570	R
56-55-3	Benzo(a)anthracene	TCL-S-SVOC	ug/Kg	520	UJ	790	J	130	J	520	U	570	U
218-01-9	Chrysene	TCL-S-SVOC	ug/Kg	520	UJ	900	J	140	J	520	U	570	U
117-81-7	bis(2-Ethylhexyl) phthalate	TCL-S-SVOC	ug/Kg	65	J	360	J	500	UJ	520	U	570	U
117-84-0	Di-n-octylphthalate	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U
205-99-2	Benzo(b)fluoranthene	TCL-S-SVOC	ug/Kg	520	UJ	1200	J	160	J	520	U	570	U
207-08-9	Benzo(k)fluoranthene	TCL-S-SVOC	ug/Kg	520	UJ	810	J	130	J	520	U	570	U
50-32-8	Benzo(a)pyrene	TCL-S-SVOC	ug/Kg	520	UJ	730	J	100	J	520	U	570	U
193-39-5	Indeno(1,2,3-cd)pyrene	TCL-S-SVOC	ug/Kg	520	UJ	460	J	500	UJ	520	U	570	U
53-70-3	Dibenz(a,h)anthracene	TCL-S-SVOC	ug/Kg	520	UJ	130	J	500	UJ	520	U	570	U
191-24-2	Benzo(g,h,i)perylene	TCL-S-SVOC	ug/Kg	520	UJ	1200	UJ	500	UJ	520	U	570	U

303205

Table 5b
Pond Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

CAS Number	Chemical Name	Analytic Method	Sample Code / Sample Name / Sample Date / Unit \\ Depth	SD-07-R1 10/20/2003 0 to 6 in bgs		SD-08-R1 10/20/2003 0 to 6 in bgs		SD-17-R1 10/20/2003 0 to 6 in bgs		SD-23-R1 10/15/2003 0 to 6 in bgs		SD-24-R1 10/15/2003 0 to 6 in bgs	
	Pesticides/PCBs												
319-84-6	alpha-BHC	TCL-S-P/P	ug/Kg	2.7	UJ	6.1	UJ	2.6	UJ	2.7	U	2.9	U
319-85-7	beta-BHC	TCL-S-P/P	ug/Kg	2.7	UJ	6.1	UJ	2.6	UJ	2.7	U	2.9	U
319-86-8	delta-BHC	TCL-S-P/P	ug/Kg	2.7	UJ	6.1	UJ	2.6	UJ	2.7	U	2.9	U
58-89-9	gamma-BHC (Lindane)	TCL-S-P/P	ug/Kg	2.7	UJ	6.1	UJ	2.6	UJ	2.7	U	2.9	U
76-44-8	Heptachlor	TCL-S-P/P	ug/Kg	2.7	UJ	6.1	UJ	2.6	UJ	2.7	U	2.9	U
309-00-2	Aldrin	TCL-S-P/P	ug/Kg	2.7	UJ	6.1	UJ	2.6	UJ	2.7	U	2.9	U
1024-57-3	Heptachlor epoxide	TCL-S-P/P	ug/Kg	2.7	UJ	6.1	UJ	2.6	UJ	2.7	U	2.9	U
959-98-8	Endosulfan I	TCL-S-P/P	ug/Kg	2.7	UJ	6.1	UJ	2.6	UJ	2.7	U	2.9	U
60-57-1	Dieldrin	TCL-S-P/P	ug/Kg	5.2	UJ	12	UJ	5	UJ	5.2	U	5.7	U
72-55-9	4,4'-DDE	TCL-S-P/P	ug/Kg	22	J	12	UJ	7	J	5.2	U	5.7	U
72-20-8	Endrin	TCL-S-P/P	ug/Kg	5.2	UJ	12	UJ	5	UJ	5.2	U	5.7	U
33213-65-9	Endosulfan II	TCL-S-P/P	ug/Kg	5.2	UJ	12	UJ	5	UJ	5.2	U	5.7	U
72-54-8	4,4'-DDD	TCL-S-P/P	ug/Kg	16	J	12	UJ	9.8	J	8.1		5.7	U
1031-07-8	Endosulfan sulfate	TCL-S-P/P	ug/Kg	5.2	UJ	12	UJ	5	UJ	5.2	U	5.7	U
50-29-3	4,4'-DDT	TCL-S-P/P	ug/Kg	13	J	15	J	8.3	J	5.2	U	5.7	U
72-43-5	Methoxychlor	TCL-S-P/P	ug/Kg	27	UJ	61	UJ	26	UJ	27	U	29	U
53494-70-5	Endrin ketone	TCL-S-P/P	ug/Kg	5.2	UJ	12	UJ	5	UJ	5.2	U	5.7	U
7421-93-4	Endrin aldehyde	TCL-S-P/P	ug/Kg	5.2	UJ	12	UJ	5	UJ	5.2	U	5.7	U
5103-71-9	alpha-Chlordane	TCL-S-P/P	ug/Kg	4	JN	6.1	UJ	2.6	UJ	2.7	U	2.9	U
5103-74-2	gamma-Chlordane	TCL-S-P/P	ug/Kg	3.7	J	6.1	UJ	2.6	UJ	2.7	U	2.9	U
8001-35-2	Toxaphene	TCL-S-P/P	ug/Kg	270	UJ	610	UJ	260	UJ	270	U	290	U
12674-11-2	Aroclor-1016	TCL-S-P/P	ug/Kg	52	UJ	120	UJ	50	UJ	52	U	57	U
11104-28-2	Aroclor-1221	TCL-S-P/P	ug/Kg	100	UJ	240	UJ	100	UJ	100	U	120	U
11141-16-5	Aroclor-1232	TCL-S-P/P	ug/Kg	52	UJ	120	UJ	50	UJ	52	U	57	U
53469-21-9	Aroclor-1242	TCL-S-P/P	ug/Kg	52	UJ	120	UJ	50	UJ	52	U	57	U
12672-29-6	Aroclor-1248	TCL-S-P/P	ug/Kg	52	UJ	120	UJ	50	UJ	52	U	57	U
11097-69-1	Aroclor-1254	TCL-S-P/P	ug/Kg	52	UJ	120	UJ	50	UJ	52	U	57	U
11096-82-5	Aroclor-1260	TCL-S-P/P	ug/Kg	52	UJ	120	UJ	50	UJ	52	U	57	U

Table 5b
Pond Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

CAS Number	Chemical Name	Analytic Method	Sample Code / Sample Name / Sample Date / Unit \\ Depth	SD-07-R1 10/20/2003 0 to 6 in bgs		SD-08-R1 10/20/2003 0 to 6 in bgs		SD-17-R1 10/20/2003 0 to 6 in bgs		SD-23-R1 10/15/2003 0 to 6 in bgs		SD-24-R1 10/15/2003 0 to 6 in bgs	
	Inorganic Analytes												
7439-97-6	Mercury	ILM05-2-S-AES	mg/kg	0.1	U	0.2	UJ	0.1	U	0.1	U	0.1	U
7440-22-4	Silver	ILM05-2-S-AES	mg/kg	1.8	U	4.1	UJ	1.3	U	1.8	U	1.8	U
7429-90-5	Aluminum	ILM05-2-S-AES	mg/kg	2000		3200	J	1400		6500		7700	
7440-38-2	Arsenic	ILM05-2-S-AES	mg/kg	2.7	U	6.1	UJ	2	U	2.7	U	2.7	U
7440-39-3	Barium	ILM05-2-S-AES	mg/kg	35	U	81	UJ	27	U	36	U	36	U
7440-41-7	Beryllium	ILM05-2-S-AES	mg/kg	0.9	U	2	UJ	0.7	U	0.9	U	0.9	U
7440-70-2	Calcium	ILM05-2-S-AES	mg/kg	890	U	5900	J	670	U	890	U	900	U
7440-43-9	Cadmium	ILM05-2-S-AES	mg/kg	0.9	U	2	UJ	0.7	U	0.9	U	0.9	U
7440-48-4	Cobalt	ILM05-2-S-AES	mg/kg	8.9	U	20	UJ	6.7	U	8.9	U	9	U
7440-47-3	Chromium	ILM05-2-S-AES	mg/kg	5.5		9.2	J	3.5		6.4		8	
7440-50-8	Copper	ILM05-2-S-AES	mg/kg	14		35	J	17		4.9		4.5	U
7439-89-6	Iron	ILM05-2-S-AES	mg/kg	3200		4700	J	2400		2100		2400	
7440-09-7	Potassium	ILM05-2-S-AES	mg/kg	890	U	2000	UJ	670	U	890	U	900	U
7439-95-4	Magnesium	ILM05-2-S-AES	mg/kg	890	U	2000	UJ	670	U	890	U	900	U
7439-96-5	Manganese	ILM05-2-S-AES	mg/kg	35		140	J	28		54		40	
7440-23-5	Sodium	ILM05-2-S-AES	mg/kg	890	U	2000	UJ	670	U	890	U	900	U
7440-02-0	Nickel	ILM05-2-S-AES	mg/kg	7.1	U	18	J	5.3	U	7.1	U	7.2	U
7439-92-1	Lead	ILM05-2-S-AES	mg/kg	43		58	J	15		28		33	
7440-36-0	Antimony	ILM05-2-S-AES	mg/kg	11	U	24	UJ	8	U	11	U	11	U
7782-49-2	Selenium	ILM05-2-S-AES	mg/kg	6.2	U	14	UJ	4.7	U	6.2	U	6.3	U
7440-28-0	Thallium	ILM05-2-S-AES	mg/kg	4.4	U	10	UJ	3.3	U	4.4	U	4.5	U
7440-62-2	Vanadium	ILM05-2-S-AES	mg/kg	12		39	J	6.7	U	8.9	U	9.2	
7440-66-6	Zinc	ILM05-2-S-AES	mg/kg	38		110	J	41		14		14	
57-12-5	Cyanide	Cyanide-S	mg/Kg	0.2	U	0.44	UJ	0.13	U	0.18	U	0.19	U
7440-32-6	Titanium Metal Powder	SW6010B-TC	mg/kg	97.1	JN	153	JN	57.8	JN	188	JN	367	JN
	Wet chemistry analysis												
pH	pH	SW9045C	s.u.	6.7	J	6.7	J	6.8		6.4		6.4	
TOC	Total Organic Carbon	Lloyd Kahn	mg/kg	11900	J	194200	J	7620	J	50400		92200	

303207

Table 5c
Harbor Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

CAS Number	Chemical Name	Analytic Method	Sample Code / Sample Name / Sample Date / Unit \\ Depth	SD-15-R1 10/14/2003 0 to 6 in bgs		SD-16-R1 10/14/2003 0 to 6 in bgs	
	Volatile Organic Compounds - Page 1						
75-71-8	Dichlorodifluoromethane	TCL-S-VOC	ug/Kg	12	U	18	U
74-87-3	Chloromethane	TCL-S-VOC	ug/Kg	12	U	18	U
75-01-4	Vinyl Chloride	TCL-S-VOC	ug/Kg	12	U	18	U
74-83-9	Bromomethane	TCL-S-VOC	ug/Kg	12	U	18	U
75-00-3	Chloroethane	TCL-S-VOC	ug/Kg	12	U	18	U
75-69-4	Trichlorofluoromethane	TCL-S-VOC	ug/Kg	12	U	18	U
75-35-4	1,1-Dichloroethene	TCL-S-VOC	ug/Kg	12	U	18	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	TCL-S-VOC	ug/Kg	12	U	18	U
67-64-1	Acetone	TCL-S-VOC	ug/Kg	12	U	6	J
75-15-0	Carbon Disulfide	TCL-S-VOC	ug/Kg	12	U	18	U
79-20-9	Methyl Acetate	TCL-S-VOC	ug/Kg	12	U	18	U
75-09-2	Methylene Chloride	TCL-S-VOC	ug/Kg	12	U	18	U
156-60-5	trans-1,2-Dichloroethene	TCL-S-VOC	ug/Kg	12	U	18	U
1634-04-4	Methyl tert-Butyl Ether	TCL-S-VOC	ug/Kg	12	U	18	U
75-34-3	1,1-Dichloroethane	TCL-S-VOC	ug/Kg	12	U	18	U
156-59-2	cis-1,2-Dichloroethene	TCL-S-VOC	ug/Kg	12	U	18	U
78-93-3	2-Butanone	TCL-S-VOC	ug/Kg	12	UJ	18	UJ
67-66-3	Chloroform	TCL-S-VOC	ug/Kg	12	U	18	U
71-55-6	1,1,1-Trichloroethane	TCL-S-VOC	ug/Kg	12	U	18	U
110-82-7	Cyclohexane	TCL-S-VOC	ug/Kg	12	U	18	U
56-23-5	Carbon Tetrachloride	TCL-S-VOC	ug/Kg	12	U	18	U
71-43-2	Benzene	TCL-S-VOC	ug/Kg	12	U	18	U
107-06-2	1,2-Dichloroethane	TCL-S-VOC	ug/Kg	12	U	18	U
79-01-6	Trichloroethene	TCL-S-VOC	ug/Kg	12	U	18	U
108-87-2	Metylcyclohexane	TCL-S-VOC	ug/Kg	12	U	18	U
78-87-5	1,2-Dichloropropane	TCL-S-VOC	ug/Kg	12	U	18	U
75-27-4	Bromodichloromethane	TCL-S-VOC	ug/Kg	12	U	18	U
10061-01-5	cis-1,3-Dichloropropene	TCL-S-VOC	ug/Kg	12	U	18	U
108-10-1	4-Methyl-2-pentanone	TCL-S-VOC	ug/Kg	12	U	18	U
108-88-3	Toluene	TCL-S-VOC	ug/Kg	12	U	18	U
10061-02-6	trans-1,3-Dichloropropene	TCL-S-VOC	ug/Kg	12	U	18	U
79-00-5	1,1,2-Trichloroethane	TCL-S-VOC	ug/Kg	12	U	18	U
127-18-4	Tetrachloroethene	TCL-S-VOC	ug/Kg	12	U	18	U
591-78-6	2-Hexanone	TCL-S-VOC	ug/Kg	12	UJ	18	UJ
124-48-1	Dibromochloromethane	TCL-S-VOC	ug/Kg	12	U	18	U
106-93-4	1,2-Dibromoethane	TCL-S-VOC	ug/Kg	12	U	18	U
108-90-7	Chlorobenzene	TCL-S-VOC	ug/Kg	12	U	18	U

Table 5c
Harbor Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

CAS Number	Chemical Name	Analytic Method	Sample Code Sample Name Sample Date Unit \\ Depth	SD-15-R1 10/14/2003 0 to 6 in bgs		SD-16-R1 10/14/2003 0 to 6 in bgs	
	Volatile Organic Compounds - Page 2						
100-41-4	Ethylbenzene	TCL-S-VOC	ug/Kg	12	U	18	U
1330-20-7	Xylenes (total)	TCL-S-VOC	ug/Kg	12	U	18	U
100-42-5	Styrene	TCL-S-VOC	ug/Kg	12	U	18	U
75-25-2	Bromoform	TCL-S-VOC	ug/Kg	12	U	18	U
98-82-8	Isopropylbenzene	TCL-S-VOC	ug/Kg	12	U	18	U
79-34-5	1,1,2,2-Tetrachloroethane	TCL-S-VOC	ug/Kg	12	U	18	U
541-73-1	1,3-Dichlorobenzene	TCL-S-VOC	ug/Kg	12	U	18	U
106-46-7	1,4-Dichlorobenzene	TCL-S-VOC	ug/Kg	12	U	18	U
95-50-1	1,2-Dichlorobenzene	TCL-S-VOC	ug/Kg	12	U	18	U
96-12-8	1,2-Dibromo-3-chloropropane	TCL-S-VOC	ug/Kg	12	U	18	U
120-82-1	1,2,4-Trichlorobenzene	TCL-S-VOC	ug/Kg	12	U	18	U

303210

Table 5c
Harbor Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

CAS Number	Chemical Name	Analytic Method	Sample Code Sample Name Sample Date Unit \\ Depth	SD-15-R1 10/14/2003 0 to 6 in bgs		SD-16-R1 10/14/2003 0 to 6 in bgs	
	Semi-Volatile Organic Compounds - Page 1						
100-52-7	Benzaldehyde	TCL-S-SVOC	ug/Kg	410	UJ	570	UJ
108-95-2	Phenol	TCL-S-SVOC	ug/Kg	410	U	570	U
111-44-4	bis(2-Chloroethyl) ether	TCL-S-SVOC	ug/Kg	410	U	570	U
95-57-8	2-Chlorophenol	TCL-S-SVOC	ug/Kg	410	U	570	U
95-48-7	2-Methylphenol	TCL-S-SVOC	ug/Kg	410	U	570	U
108-60-1	2,2'-oxybis(1-Chloropropane)	TCL-S-SVOC	ug/Kg	410	U	570	U
98-86-2	Acetophenone	TCL-S-SVOC	ug/Kg	410	U	570	U
106-44-5	4-Methylphenol	TCL-S-SVOC	ug/Kg	410	U	570	U
621-64-7	n-Nitroso-di-n-propylamine	TCL-S-SVOC	ug/Kg	410	U	570	U
67-72-1	Hexachloroethane	TCL-S-SVOC	ug/Kg	410	U	570	U
98-95-3	Nitrobenzene	TCL-S-SVOC	ug/Kg	410	U	570	U
78-59-1	Isophorone	TCL-S-SVOC	ug/Kg	410	U	570	U
88-75-5	2-Nitrophenol	TCL-S-SVOC	ug/Kg	410	U	570	U
105-67-9	2,4-Dimethylphenol	TCL-S-SVOC	ug/Kg	410	U	570	U
111-91-1	bis(2-Chloroethoxy)methane	TCL-S-SVOC	ug/Kg	410	U	570	U
120-83-2	2,4-Dichlorophenol	TCL-S-SVOC	ug/Kg	410	U	570	U
91-20-3	Naphthalene	TCL-S-SVOC	ug/Kg	410	U	570	U
106-47-8	4-Chloroaniline	TCL-S-SVOC	ug/Kg	410	U	570	U
87-68-3	Hexachlorobutadiene	TCL-S-SVOC	ug/Kg	410	U	570	U
105-60-2	Caprolactam	TCL-S-SVOC	ug/Kg	410	U	570	U
59-50-7	4-Chloro-3-methylphenol	TCL-S-SVOC	ug/Kg	410	U	570	U
91-57-6	2-Methylnaphthalene	TCL-S-SVOC	ug/Kg	410	U	570	U
77-47-4	Hexachlorocyclopentadiene	TCL-S-SVOC	ug/Kg	410	U	570	U
88-06-2	2,4,6-Trichlorophenol	TCL-S-SVOC	ug/Kg	410	U	570	U
95-95-4	2,4,5-Trichlorophenol	TCL-S-SVOC	ug/Kg	1000	U	1400	U
92-52-4	1,1'-Biphenyl	TCL-S-SVOC	ug/Kg	410	U	570	U
91-58-7	2-Chloronaphthalene	TCL-S-SVOC	ug/Kg	410	U	570	U
88-74-4	2-Nitroaniline	TCL-S-SVOC	ug/Kg	1000	U	1400	U
131-11-3	Dimethylphthalate	TCL-S-SVOC	ug/Kg	410	U	570	U
606-20-2	2,6-Dinitrotoluene	TCL-S-SVOC	ug/Kg	410	U	570	U
208-96-8	Acenaphthylene	TCL-S-SVOC	ug/Kg	410	U	570	U
99-09-2	3-Nitroaniline	TCL-S-SVOC	ug/Kg	1000	UJ	1400	UJ
83-32-9	Acenaphthene	TCL-S-SVOC	ug/Kg	410	U	570	U

Table 5c
Harbor Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

CAS Number	Chemical Name	Analytic Method	Sample Code / Sample Name / Sample Date / Unit \\ Depth	SD-15-R1 10/14/2003 0 to 6 in bgs		SD-16-R1 10/14/2003 0 to 6 in bgs	
	Semi-Volatile Organic Compounds - Page 2						
51-28-5	2,4-Dinitrophenol	TCL-S-SVOC	ug/Kg	1000	U	1400	U
100-02-7	4-Nitrophenol	TCL-S-SVOC	ug/Kg	1000	U	1400	U
132-64-9	Dibenzofuran	TCL-S-SVOC	ug/Kg	410	U	570	U
121-14-2	2,4-Dinitrotoluene	TCL-S-SVOC	ug/Kg	410	U	570	U
84-66-2	Diethylphthalate	TCL-S-SVOC	ug/Kg	410	U	570	U
86-73-7	Fluorene	TCL-S-SVOC	ug/Kg	410	U	570	U
7005-72-3	4-Chlorophenyl-phenylether	TCL-S-SVOC	ug/Kg	410	U	570	U
100-01-6	4-Nitroaniline	TCL-S-SVOC	ug/Kg	1000	U	1400	U
534-52-1	4,6-Dinitro-2-methylphenol	TCL-S-SVOC	ug/Kg	1000	U	1400	U
86-30-6	n-Nitrosodiphenylamine	TCL-S-SVOC	ug/Kg	410	U	570	U
101-55-3	4-Bromophenyl-phenylether	TCL-S-SVOC	ug/Kg	410	U	570	U
118-74-1	Hexachlorobenzene	TCL-S-SVOC	ug/Kg	410	U	570	U
1912-24-9	Atrazine	TCL-S-SVOC	ug/Kg	410	U	570	U
87-86-5	Pentachlorophenol	TCL-S-SVOC	ug/Kg	1000	U	1400	U
85-01-8	Phenanthrene	TCL-S-SVOC	ug/Kg	240	J	120	J
120-12-7	Anthracene	TCL-S-SVOC	ug/Kg	410	U	570	U
86-74-8	Carbazole	TCL-S-SVOC	ug/Kg	410	U	570	U
84-74-2	Di-n-butylphthalate	TCL-S-SVOC	ug/Kg	410	U	570	U
206-44-0	Fluoranthene	TCL-S-SVOC	ug/Kg	450		480	J
129-00-0	Pyrene	TCL-S-SVOC	ug/Kg	310	J	320	J
85-68-7	Butylbenzylphthalate	TCL-S-SVOC	ug/Kg	410	U	570	U
91-94-1	3,3'-Dichlorobenzidine	TCL-S-SVOC	ug/Kg	410	UJ	570	UJ
56-55-3	Benzo(a)anthracene	TCL-S-SVOC	ug/Kg	170	J	190	J
218-01-9	Chrysene	TCL-S-SVOC	ug/Kg	220	J	240	J
117-81-7	bis(2-Ethylhexyl) phthalate	TCL-S-SVOC	ug/Kg	200	J	270	J
117-84-0	Di-n-octylphthalate	TCL-S-SVOC	ug/Kg	410	UJ	570	UJ
205-99-2	Benzo(b)fluoranthene	TCL-S-SVOC	ug/Kg	210	J	240	J
207-08-9	Benzo(k)fluoranthene	TCL-S-SVOC	ug/Kg	180	J	190	J
50-32-8	Benzo(a)pyrene	TCL-S-SVOC	ug/Kg	130	J	140	J
193-39-5	Indeno(1,2,3-cd)pyrene	TCL-S-SVOC	ug/Kg	110	J	150	J
53-70-3	Dibenz(a,h)anthracene	TCL-S-SVOC	ug/Kg	410	U	570	U
191-24-2	Benzo(g,h,i)perylene	TCL-S-SVOC	ug/Kg	410	U	570	U

Table 5c
Harbor Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

CAS Number	Chemical Name	Analytic Method	Sample Code Sample Name Sample Date Unit \\ Depth	SD-15-R1 10/14/2003 0 to 6 in bgs		SD-16-R1 10/14/2003 0 to 6 in bgs	
	Pesticides/PCBs						
319-84-6	alpha-BHC	TCL-S-P/P	ug/Kg	2.1	U	2.9	U
319-85-7	beta-BHC	TCL-S-P/P	ug/Kg	2.1	U	2.9	U
319-86-8	delta-BHC	TCL-S-P/P	ug/Kg	2.1	U	2.9	U
58-89-9	gamma-BHC (Lindane)	TCL-S-P/P	ug/Kg	2.1	U	2.9	U
76-44-8	Heptachlor	TCL-S-P/P	ug/Kg	2.1	U	2.9	U
309-00-2	Aldrin	TCL-S-P/P	ug/Kg	2.1	U	2.9	U
1024-57-3	Heptachlor epoxide	TCL-S-P/P	ug/Kg	2.1	U	2.9	U
959-98-8	Endosulfan I	TCL-S-P/P	ug/Kg	2.1	U	2.9	U
60-57-1	Dieldrin	TCL-S-P/P	ug/Kg	4.1	U	5.7	U
72-55-9	4,4'-DDE	TCL-S-P/P	ug/Kg	4.1	U	5.7	U
72-20-8	Endrin	TCL-S-P/P	ug/Kg	4.1	U	5.7	U
33213-65-9	Endosulfan II	TCL-S-P/P	ug/Kg	4.1	U	5.7	U
72-54-8	4,4'-DDD	TCL-S-P/P	ug/Kg	16		5.7	U
1031-07-8	Endosulfan sulfate	TCL-S-P/P	ug/Kg	4.1	U	5.7	U
50-29-3	4,4'-DDT	TCL-S-P/P	ug/Kg	8.9		5.7	U
72-43-5	Methoxychlor	TCL-S-P/P	ug/Kg	21	U	29	U
53494-70-5	Endrin ketone	TCL-S-P/P	ug/Kg	4.1	U	5.7	U
7421-93-4	Endrin aldehyde	TCL-S-P/P	ug/Kg	4.1	U	5.7	U
5103-71-9	alpha-Chlordane	TCL-S-P/P	ug/Kg	3.3		2.9	U
5103-74-2	gamma-Chlordane	TCL-S-P/P	ug/Kg	2.7	J	2.9	U
8001-35-2	Toxaphene	TCL-S-P/P	ug/Kg	210	U	290	U
12674-11-2	Aroclor-1016	TCL-S-P/P	ug/Kg	41	U	57	U
11104-28-2	Aroclor-1221	TCL-S-P/P	ug/Kg	83	U	120	U
11141-16-5	Aroclor-1232	TCL-S-P/P	ug/Kg	41	U	57	U
53469-21-9	Aroclor-1242	TCL-S-P/P	ug/Kg	41	U	57	U
12672-29-6	Aroclor-1248	TCL-S-P/P	ug/Kg	41	U	57	U
11097-69-1	Aroclor-1254	TCL-S-P/P	ug/Kg	41	U	57	U
11096-82-5	Aroclor-1260	TCL-S-P/P	ug/Kg	41	U	57	U

Table 5c
Harbor Sediment Results
Full Data Table
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

CAS Number	Chemical Name	Analytic Method	Sample Code / Sample Name / Sample Date / Unit \\ Depth	SD-15-R1 10/14/2003 0 to 5 in bgs		SD-15-R1 10/14/2003 0 to 5 in bgs	
	Inorganic Analytes						
7439-97-6	Mercury	ILM05-2-S-AES	mg/kg	0.1	U	0.1	U
7440-22-4	Silver	ILM05-2-S-AES	mg/kg	1.3	U	1.5	U
7429-90-5	Aluminum	ILM05-2-S-AES	mg/kg	500		2200	
7440-33-2	Arsenic	ILM05-2-S-AES	mg/kg	1.9	U	2.5	
7440-39-3	Barium	ILM05-2-S-AES	mg/kg	25	U	32	U
7440-41-7	Beryllium	ILM05-2-S-AES	mg/kg	0.5	U	0.8	U
7440-70-2	Calcium	ILM05-2-S-AES	mg/kg	630	U	1200	
7440-43-9	Cadmium	ILM05-2-S-AES	mg/kg	0.6	U	0.8	U
7440-48-4	Cobalt	ILM05-2-S-AES	mg/kg	5.3	U	7.9	U
7440-47-3	Chromium	ILM05-2-S-AES	mg/kg	1.8		8.3	
7440-50-8	Copper	ILM05-2-S-AES	mg/kg	8.3		25	
7439-89-5	Iron	ILM05-2-S-AES	mg/kg	2800		5100	
7440-09-7	Potassium	ILM05-2-S-AES	mg/kg	530	U	790	U
7439-95-4	Magnesium	ILM05-2-S-AES	mg/kg	530	U	1800	
7439-96-5	Manganese	ILM05-2-S-AES	mg/kg	20		58	
7440-28-5	Sodium	ILM05-2-S-AES	mg/kg	1700		4100	
7440-02-0	Nickel	ILM05-2-S-AES	mg/kg	5	U	6.3	U
7439-92-1	Lead	ILM05-2-S-AES	mg/kg	3.6		12	
7440-36-0	Antimony	ILM05-2-S-AES	mg/kg	7.5	U	9.5	U
7782-49-2	Selenium	ILM05-2-S-AES	mg/kg	4.4	U	5.5	U
7440-28-0	Thallium	ILM05-2-S-AES	mg/kg	3.1	U	4	U
7440-62-2	Vanadium	ILM05-2-S-AES	mg/kg	5.3		8.9	
7440-66-6	Zinc	ILM05-2-S-AES	mg/kg	9.4		35	
57-12-5	Cyanide	Cyanide-S	mg/Kg	0.15	U	0.17	U
7440-32-6	Titanium Metal Powder	SW6010B-TC	mg/kg	43.1	JN	293	JN
	Wet chemistry analysis						
pH	pH	SW9045C	s.u.	6.3		7.5	
TOC	Total Organic Carbon	Lloyd Kahn	mg/kg	856		12700	

303214

Table 6A

Comprehensive Groundwater Sampling Results
March-April 2024
Lawrence Aviation Industries
Port Jefferson Station, New York

ID:		ERT-EW01	ERT-EW02	ERT-EW03	ERT-EW04	ERT-EW05	ERT-EW05	ERT-EW06	ERT-MW-1A	ERT-MW-1B	ERT-MW-1B	ERT-MW-2A	ERT-MW-2B	ERT-MW-2C	ERT-MW-2D	ERT-MW-3	ERT-MW-4A	ERT-MW-4B	ERT-MW-5A	ERT-MW-5B	ERT-MW-6A
Sample ID:		ERT-EW-1	ERT-EW-2	ERT-EW-3	ERT-EW-4	ERT-EW-5	ERT-EW-5DUP	ERT-EW-6	ERT-MW-1A	ERT-MW-1B	ERT-MW-1B-DUP	ERT-MW-2A	ERT-MW-2B	ERT-MW-2C	ERT-MW-2D	ERT-MW-3	ERT-MW-4A	ERT-MW-4B	ERT-MW-5A	ERT-MW-5B	ERT-MW-6A
Date Collected:		03/28/2024	03/28/2024	03/27/2024	03/27/2024	03/26/2024	03/26/2024	03/28/2024	04/02/2024	04/02/2024	04/02/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/02/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024	03/27/2024
Lab Report Number:		24C3437	24C3437	24C3451	24C3451	24C3451	24C3451	24C3437	24D0344	24D0344	24D0344	24D0341	24D0341	24D0341	24D0341	24D0341	24D0341	24D0341	24D0341	24D0341	24C3451
Sample Type:		N	N	N	N	N	FD	N	N	N	FD	N	N	N	N	N	N	N	N	N	N
Parameter	NYDEC Class GA Criteria																				
Anions (µg/l)																					
Chloride	250000	**20000**	**28000**	**18000 U**	**51000 U**	**61000 U**	**62000 D**	**31000**	**16000**	**16000**	**16000**	**37000**	**22000**	**7900**	**15000**	**36000**	**14000**	**16000**	**18000**	**20000**	**15000 U**
Fluorides	1500	**140**	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	**71.0 J**	**71.0 J**	< 100 U	< 100 U	**67.0 J**	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
Sulfate	250000	**12000**	**26000**	**19000 U**	**25000 U**	**25000 U**	**25000**	**31000**	**9000**	**8400**	**8400**	**23000**	**15000**	**2000**	**5400**	**40000**	**14000**	**9000**	**7300**	**11000**	**8700 U**
GenChem (µg/l)																					
Alkalinity, Bicarbonate (As CaCO3)		**38000**	**56000**	**26000 U**	**29000 U**	NA	NA	**45000**	**40000**	**42000**	**42000**	**24000 J-**	**71000 J-**	**33000**	**53000**	**100000**	**23000**	**22000**	**24000**	**30000**	**49000 U**
Alkalinity, Carbonate (As CaCO3)		NA	NA	NA	NA	**10000 U**	**9500**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia	2000	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	**1100**	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U
Nitrogen, Kjeldahl, Total		< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	**2200**	< 1000 U	< 1000 U	< 1000 U	< 1000 U	**1100 U**
pH		**6.50**	**6.20**	NA	NA	NA	NA	**6.00**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids		**130000**	**160000**	**120000 U**	**120000 U**	**210000 U**	**190000**	**190000**	**58000**	**44000 J**	**100000 J**	**120000**	**140000**	**50000**	**94000**	**250000**	**58000**	**70000**	**110000**	**110000**	**82000 U**
Total Suspended Solids		< 2500 U	< 2500 U	< 2500 U	< 2500 U	< 2500 U	< 2500 U	< 2500 U	< 2500 U	< 2500 U	< 2500 U	< 2500 U	**38000**	< 2500 U	< 2500 U	< 2500 U	**2800**	< 2500 U	**2800**	< 2500 U	< 2500 U
Total Metals (mg/l)																					
Aluminum		**35.0 J**	< 50.0 U	**51.0 U**	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	**24.0 J**	< 50.0 U	< 50.0 U	**34.0 J**	**57.0**	< 50.0 U	**62.0**	< 50.0 U	< 50.0 U
Antimony	3	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U
Arsenic	25	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U
Barium	1000	**120**	**130**	**58.0 U**	**100 U**	**58.0 U**	**58.0**	**130**	**21.0 J**	**15.0 J**	**15.0 J**	**55.0**	**73.0**	**45.0 J**	**95.0**	**170**	**26.0 J**	**30.0 J**	**10.0 J**	**8.60 J**	**18.0 U**
Beryllium	3	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U
Cadmium	5	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U
Calcium		**17000**	**18000**	**13000 U**	**19000 U**	**11000 U**	**11000**	**17000**	**15000**	**15000**	**15000**	**14000**	**23000**	**8800**	**19000**	**32000**	**11000**	**11000**	**12000**	**15000**	**18000 U**
Chromium	50	< 10.0 U	**12.0**	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	**11.0**	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U
Cobalt		< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U
Copper	200	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	**5.70 J**	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U
Iron	300	< 50.0 U	< 50.0 U	**77.0 U**	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	**24.0 J**	**48.0 J**	**65.0**	< 50.0 U	< 50.0 U	**63.0**	**100**	< 50.0 U	**110**	**38.0 J**	< 50.0 U
Lead	25	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U
Magnesium	35000	**6400**	**8100**	**6000 U**	**9200 U**	**9100 U**	**9800**	**8200**	**5600**	**5600**	**5700**	**8200**	**9500**	**3200**	**6600**	**17000**	**4400**	**4600**	**4900**	**5800**	**6400 U**
Manganese	300	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	**3.60 J**	< 10.0 U	< 10.0 U	< 10.0 U	**4.40 J**	< 10.0 U	< 10.0 U	< 10.0 U	**5.50 J**	**3.80 J**	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U
Mercury	0.7	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U
Nickel	100	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	**2.80 U**	**2.80 J**	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	**4.00 J**	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U
Potassium		**1600 J**	**15000**	**1200 U**	**1700 U**	**2100 U**	**2300**	**11000**	**1100 J**	**950 J**	**960 J**	**2800**	**1500 J**	**730 J**	**1100 J**	**2100**	**900 J**	**960 J**	**910 J**	**1000 J**	**1400 U**
Selenium	10	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U
Silver	50	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U
Sodium	20000	**15000**	**19000**	**14000 U**	**30000 U**	**36000 U**	**38000**	**21000**	**10000**	**9700**	**9700**	**23000**	**17000**	**7000**	**13000**	**25000**	**10000**	**12000**	**12000**	**14000**	**11000 U**
Thallium	0.5	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U
Vanadium		< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U
Zinc	2000	< 10.0 U	**5.90 J**	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	**15.0 J+**	< 10.0 U	< 10.0 U	< 10.0 U	**19.0**	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U
PFAS Compounds (mg/l)																					
Total Suspended Solids		< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	**30000**	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U
PFAS Compounds (ng/l)																					
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F53B		< 4.00 U	< 4.20 U	< 3.90 U	< 3.50 U	< 3.90 U	< 4.00 U	< 3.60 U	< 3.90 U	< 3.80 U	< 3.90 U	< 3.90 U	< 3.90 U	< 3.90 U	< 3.90 U	< 3.80 U	< 3.80 U	< 3.60 U	< 3.60 U	< 3.90 U	< 3.80 U
1H,1H, 2H, 2H-Perfluorohexane sulfonic acid (4:2 FTS)		< 4.00 U	< 4.20 U	< 3.90 U	< 3.50 U	< 3.90 U	< 4.00 U	< 3.60 U	< 3.90 U	< 3.80 U	< 3.90 U	< 3.90 U	< 3.90 U	< 3.90 U	< 3.90 U	< 3.80 U	< 3.80 U	< 3.60 U	< 3.60 U	< 3.90 U	< 3.80 U
1H,1H, 2H, 2H-Perfluorooctane sulfonic acid (6:2 FTS)		< 4.00 U	< 4.20 U	< 3.90 U	< 3.50 U	< 3.90 U	< 4.00 U	< 3.60 U	< 3.90 U	< 3.80 U	< 3.90 U	< 3.90 U	< 3.90 U	< 3.90 U	< 3.90 U	< 3.80 U	< 3.80 U	< 3.60 U	< 3.60 U	< 3.90 U	< 3.80 U
1H,1H,2H,2H-Perfluorodecanessulfonic acid (8:2 FTS)		< 4.00 U	< 4.20 U	< 3.90 U	< 3.50 U	< 3.90 U	< 4.00 U	< 3.60 U	< 3.90 U	< 3.80 U	< 3.90 U	< 3.90 U	< 3.90 U	< 3.90 U	< 3.90 U	< 3.80 U	< 3.80 U	< 3.60 U	< 3.60 U	< 3.90 U	< 3.80 U
3:3FTCA		< 10.0 U	< 10.0 U	< 9.70 U	< 8.80 U	< 9.80 U	< 10.0 U	< 9.10 U	< 9.90 U	< 9.60 U	< 9.70 U	< 9.60 U	< 9.60 U	< 9.70 U	< 9.70 U	< 9.50 U	< 9.60 U	< 8.90 U	< 8.90 U	< 9.70 U	< 9.50 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)		< 4.00 U	< 4.20 U	< 3.90 U	< 3.50 U	< 3.90 U	< 4.00 U	< 3.60 U	< 3.90 U	< 3.80 U	< 3.90 U	< 3.90 U	< 3.90 U	< 3.90 U	< 3.90 U	< 3.80 U	< 3.80 U	< 3.60 U	< 3.60 U	< 3.90 U	< 3.80 U
5:3FTCA		< 51.0 U	< 52.0 U	< 49.0 U	< 44.0 U	< 49.0 U	< 50.0 U	< 46.0 U	< 49.0 U	< 48.0 U	< 49.0 U	< 48.0 U	< 48.0 U	< 48.0 U	< 48.0 U	< 48.0 U	< 48.0 U	< 44.0 U	< 44.0 U	< 48.0 U	< 48.0 U
7:3FTCA		< 51.0 U	< 52.0 U	< 49.0 U	< 44.0 U	< 49.0 U	< 50.0 U	< 46.0 U	< 49.0 U	< 48.0 U	< 49.0 U	< 48.0 U	< 48.0 U	< 48.0 U	< 48.0 U	< 48.0 U	< 48.0 U	< 44.0 U	< 44.0 U	< 48.0 U	< 48.0 U
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (F53B		< 4.00 U	< 4.20 U	< 3.90 U	< 3.50 U	< 3.90 U	< 4.00 U	< 3.60 U	< 3.90 U	< 3.80 U	< 3.90 U	< 3.90 U	< 3.90 U	< 3.90 U	< 3.90 U	< 3.80 U	< 3.80 U	< 3.60 U	< 3.60 U	< 3.90 U	< 3.80 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)		< 4.00 U	< 4.20 U	< 3.90 U	< 3.50 U	< 3.90 U	< 4.00 U	< 3.60 U	< 3.90 U	< 3.80 U	< 3.90 U	< 3.90 U	< 3.90 U	< 3.90 U	< 3.90 U	< 3.80 U	< 3.80 U	< 3.60 U	< 3.60 U	< 3.90 U	< 3.80 U
N-ethyl perfluorooctanesulfonamide (NEtFOSA)		< 1.00 U	< 1.00 U	< 0.970 U	< 0.880 U	< 0.980 U	< 1.00 U	< 0.910 U	< 0.990 U	< 0.960 U	< 0.970 U	< 0.960 U	< 0.960 U	< 0.970 U	< 0.970 U	< 0.950 U	< 0.960 U	< 0.890 U	< 0.890 U	< 0.970 U	< 0.950 U
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)		< 1.00 U	< 1.00 U	< 0.970 U	< 0.880 U	< 0.980 U	< 1.00 U	< 0.910 U	< 0.990 U	< 0.960 U	< 0.970 U	< 0.960 U	< 0.960 U	< 0.970 U	< 0.970 U	< 0.950 U	< 0.960 U	< 0.890 U	< 0.890 U	< 0.970 U	< 0.950 U
N-ethyl perfluorooctanesulfonamidoethanol (NEtFOSE)		< 10.0 U	< 10.0 U	< 9.70 U	< 8.80 U	< 9.80 U	< 10.0 U	< 9.10 U	< 9.90 U	< 9.60 U	< 9.70 U	< 9.60 U	< 9.60 U	< 9.70 U	< 9.70 U	< 9.50 U	< 9.60 U	< 8.90 U	< 8.90 U	< 9.70 U	< 9.50 U
N-methyl perfluorooctanesulfonamide (NMeFOSA)		< 1.00 U	< 1.00 U	< 0.970 U	< 0.880 U	< 0.980 U	< 1.00 U	< 0.910 U	< 0.990 U	< 0.960 U	< 0.970 U	< 0.960 U	< 0.960 U	< 0.970 U	< 0.970 U	< 0.950 U	< 0.960 U	< 0.890 U	< 0.890 U	< 0.970 U	< 0.950 U
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)		< 1.00 U	< 1.00 U	< 0.970 U	< 0.880 U	< 0.980 U	< 1.00 U	< 0.910 U	< 0.990 U	< 0.960 U	< 0.970 U	< 0.960 U	< 0.960 U	< 0.970 U	< 0.970 U	< 0.950 U	< 0.960 U	< 0.890 U	< 0.890 U	< 0.970 U	< 0.950 U
N-methyl perfluorooctanesulfonamidoethanol (NMeFOSE)		< 10.0 U	< 10.0 U	< 9.70 U	< 8.80 U	< 9.80 U	< 10.0 U	< 9.10 U	< 9.90 U	< 9.60 U	< 9.70 U	< 9.60 U	< 9.60 U	< 9.70 U	< 9.70 U	< 9.50 U	< 9.60 U	< 8.90 U	< 8.90 U	< 9.70 U	< 9.50 U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)		< 2.00 U	< 2.10 U	< 1.90 U	< 1.80 U	< 2.00 U	< 2.00 U	< 1.80 U	< 2.00 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.80 U	< 1.80 U	< 1.90 U	< 1.90 U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)		< 2.00 U	< 2.10 U	< 1.90 U	< 1.80 U	< 2.00 U	< 2.00 U	< 1.80 U	< 2.00 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.80 U	< 1.80 U	< 1.90 U	< 1.90 U
Perfluoro-3-methoxypropanoic acid (PFMPA)		< 2.00 U	< 2.10 U	< 1.90 U	< 1.80 U	< 2.00 U	< 2.00 U	< 1.80 U	< 2.00 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.80 U	< 1.80 U	< 1.90 U	< 1.90 U
Perfluoro-4-methoxybutanoic acid (PFMBA)		< 2.00 U	< 2.10 U	< 1.90 U	< 1.80 U	< 2.00 U	< 2.00 U	< 1.80 U	< 2.00 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.80 U	< 1.80 U	< 1.90 U	< 1.90 U
Perfluorobutanesulfonic acid (PFBS)		**0.700 J**	**0.990 J**	**1.20**	**4.20**	**3.40**	**3.00**	**1.30**	**0.300 J**	**0.230 J**	**0.230 J**	**2.40**	**1.00**	< 0.970 U	**0.560 J**	**1.20**	**0.330 J**	**0.370 J**	**0.400 J**	**0.380 J**	**0.230 J**
Perfluorobutanoic acid (PFBA)		< 4.00 U	**3.90 J**	< 3.90 U	**2.30 J**	**3.10 J**	**3.10 J**	**3.00 J**	< 3.90 U	< 3.80 U	< 3.90 U	**4.80**	**3.40 J**	< 3.90 U	< 3.90 U	**7.40**	< 3.80 U	< 3.60 U	< 3.60 U	< 3.90 U	< 3.80 U
Perfluorodecanesulfonic acid (PFDS)		< 1.00 U	< 1.00 U	< 0.970 U	< 0.880 U	< 0.980 U	< 1.00 U	< 0.910 U	< 0.990 U	< 0.960 U	< 0.970 U	< 0.960 U	< 0.960 U	< 0.970 U	< 0.970 U	< 0.950 U	< 0.960 U	< 0.890 U	< 0.890 U	< 0.970 U	< 0.950 U
Perfluorodecanoic acid (PFDA)		< 1.00 U	< 1.00 U	< 0.970 U	< 0.880 U	< 0.980 U	< 1.00 U	< 0.910 U	< 0.990 U	**0.210 J**	**0.230 J**	< 0.960 U	< 0.960 U	**0.340 J**	< 0.970 U	< 0.950 U	< 0.960 U	< 0.890 U	**0.310 J**	< 0.970 U	< 0.950 U
Perfluorododecane sulfonate (PFDoDS)		< 1.00 U	< 1.00 U	< 0.970 U	< 0.880 U	< 0.980 U	< 1.00 U	< 0.910 U	< 0.990 U	< 0.960 U	< 0.970 U	< 0.960 U	< 0.960 U	< 0.970 U	< 0.970 U	< 0.950 U	< 0.960 U	< 0.890 U	< 0.890 U	< 0.970 U	< 0.950 U
Perfluorododecanoic acid (PFDoA)		< 1.00 U	< 1.00 U	< 0.970 U	< 0.880 U	< 0.980 U	< 1.00 U	< 0.910 U	< 0.990 U	< 0.960 U	< 0.970 U	< 0.960 U	< 0.960 U	< 0.970 U	< 0.970 U	< 0.950 U	< 0.960 U	< 0.890 U	< 0.890 U	< 0.970 U	< 0.950 U
Perfluoroheptanesulfonic acid (PFHpS)		< 1.00 U	< 1.00 U	< 0.970 U	< 0.880 U	< 0.980 U	< 1.00 U	< 0.910 U	< 0.990 U	< 0.960 U	< 0.970 U	< 0.960 U	< 0.960 U	< 0.970 U	< 0.970 U	< 0.950 U	< 0.960 U	< 0.890 U	< 0.890 U	< 0.970 U	< 0.950 U
Perfluoroheptanoic acid (PFHpA)		**0.850 J**	**1.00 J**	**0.940 J**	**1.10**	**1.90**	**1.90**	**2.10**	< 0.990 U	< 0.960 U	< 0.970 U	**3.00**	**1.30**	< 0.970 U	**0.340 J**	**4.70**	< 0.960 U	< 0.890 U	**0.270 J**	< 0.970 U	< 0.950 U
Perfluorohexanesulfonic acid (PFHxS)		**5.10**	**2.90**	**2.10 J+**	**5.40 J+**	**16.0 J+**	**16.0 J+**	**7.00**	**0.500 J**	**0.440 J**	**0.390 J**	**3.10**	**1.50**	< 0.970 U	**0.640 J**	**3.70**	**1.20**	**1.60**	**1.30**	**1.30**	< 0.950 U
Perfluorohexanoic acid (PFHxA)		**2.10**	**2.60**	**2.30**	**2.00**	**4.70**	**4.60**	**5.60**	< 0.990 U	< 0.960 U	< 0.970 U	**12.0**	**4.60**	< 0.970 U	**1.40**	**8.70**	< 0.960 U	< 0.890 U	**0.570 J**	**0.740 J**	< 0.950 U
Perfluorononane sulfonic acid (PFNS)		< 1.00 U	< 1.00 U	< 0.970 U	< 0.880 U	< 0.980 U	< 1.00 U	< 0.910 U	< 0.990 U	< 0.960 U	< 0.970 U	< 0.960 U	< 0.960 U	< 0.970 U	< 0.970 U	< 0.950 U	< 0.960 U	< 0.890 U	< 0.890 U	< 0.970 U	< 0.950 U
Perfluorononanoic acid (PFNA)		< 1.00 U	< 1.00 U	< 0.970 U	< 0.880 U	**0.440 J**	**0.450 J**	< 0.910 U	**0.810 J**	< 0.960 U	< 0.970 U	**0.640 J**	< 0.960 U	**3.90 J+**	**4.40**	< 0.950 U	< 0.960 U	< 0.890 U	**2.30 J+**	< 0.970 U	**1.10**
Perfluorooctane Sulfonamide (PFOSA)		**0.540 J**	**0.270 J**	< 0.970 U	< 0.880 U	< 0.980 U	< 1.00 U	< 0.910 U	< 0.990 U	< 0.960 U	< 0.970 U	< 0.960 U	< 0.960 U	< 0.970 U	< 0.970 U	< 0.950 U	< 0.960 U	< 0.890 U	< 0.890 U	< 0.970 U	< 0.950 U
Perfluorooctanesulfonic acid (PFOS)	2.7	**1.30**	**1.90**	**0.940 J**	**0.680 J**	**3.10**	**3.20**	**1.30**	< 0.990 U	< 0.960 U	< 0.970 U	**3.30**	**0.650 J**	< 0.970 U	< 0.970 U	**3.40**	< 0.960 UJ	< 0.890 U	< 0.890 U	**0.710 J**	< 0.950 U
Perfluorooctanoic acid (PFOA)	6.7	**2.20**	**2.80**	**2.50**	**3.00**	**6.00**	**6.30**	**3.60**	**0.420 J**	< 0.960 U	**0.480 J**	**6.80**	**2.00**	**1.40**	**2.90**	**12.0**	< 0.960 U	< 0.890 U	**0.890**	**1.30**	**1.60**
Perfluoropentane sulfonate (PFPeS)		**0.440 J**	< 1.00 U	**0.480 J**	**0.610 J**	**1.20**	**1.10**	**1.00**	< 0.990 U	< 0.960 U	< 0.970 U	**0.560 J**	**0.580 J**	< 0.970 U	**0.260 J**	**0.840 J**	**0.260 J**	**0.330 J**	**0.280 J**	**0.390 J**	**0.250 J**
Perfluoropentanoic acid (PFPeA)		**2.10**	**2.90**	**1.80 J**	**1.60 J**	**4.70**	**4.60**	**5.30**	< 2.00 U	< 1.90 U	< 1.90 U	**12.0**	**5.30**	< 1.90 U	**1.60 J**	**9.70**	< 1.90 U	< 1.80 U	**1.10 J**	**0.430 J**	< 1.90 U
Perfluorotetradecanoic acid (PFTeDA)		< 1.00 U	< 1.00 U	< 0.970 U	< 0.880 U	< 0.980 U	< 1.00 U	< 0.910 U	< 0.990 U	< 0.960 U	< 0.970 U	< 0.960 U	< 0.960 U	< 0.970 U	< 0.970 U	< 0.950 U	< 0.960 U	< 0.890 U	< 0.890 U	< 0.970 U	< 0.950 U
Perfluorotridecanoic acid (PFTrDA)		< 1.00 U	< 1.00 U	< 0.970 U	< 0.880 U	< 0.980 U	< 1.00 U	< 0.910 U	< 0.990 U	< 0.960 U	< 0.970 U	< 0.960 U	< 0.960 U	< 0.970 U	< 0.970 U	< 0.950 U	< 0.960 U	< 0.890 U	< 0.890 U	< 0.970 U	< 0.950 U
Perfluoroundecanoic acid (PFUnA)		< 1.00 U	< 1.00 U	< 0.970 U	< 0.880 U	< 0.980 U	< 1.00 U	< 0.910 U	< 0.990 U	< 0.960 U	< 0.970 U	< 0.960 U	< 0.960 U	< 0.970 U	< 0.970 U	< 0.950 U	< 0.960 U	< 0.890 U	< 0.890 U	< 0.970 U	< 0.950 U
Semivolatile Organic Compounds (SVOCs) (µg/l)																					
1,4-Dioxane	0.35	**0.650**	**0.310**	**0.100 U**	**0.0980 U**	**0.0780 U**	**0.0730 J**	**0.250**	**0.450**	**0.450**	**0.420**	**0.0850 J**	**0.370**	**0.220**	**0.600**	**0.270**	**0.350**	**0.710**	**0.640**	**0.700**	**0.490 U**
TOC (ug/l)																					
Total Organic Carbon		**660 J**	**810 J**	**660 U**	**700 U**	**800 U**	**780 J**	**980 J**	< 1000 U	< 1000 U	< 1000 U	**770 J**	**890 J**	< 1000 U	< 1000 U	**2000**	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U

Table 6A
Comprehensive Groundwater Sampling Results
March-April 2024
Lawrence Aviation Industries
Port Jefferson Station, New York

ID:		ERT-EW01	ERT-EW02	ERT-EW03	ERT-EW04	ERT-EW05	ERT-EW05	ERT-EW06	ERT-MW-1A	ERT-MW-1B	ERT-MW-1B	ERT-MW-2A	ERT-MW-2B	ERT-MW-2C	ERT-MW-2D	ERT-MW-3	ERT-MW-4A	ERT-MW-4B	ERT-MW-5A	ERT-MW-5B	ERT-MW-6A
Sample ID:		ERT-EW-1	ERT-EW-2	ERT-EW-3	ERT-EW-4	ERT-EW-5	ERT-EW-5DUP	ERT-EW-6	ERT-MW-1A	ERT-MW-1B	ERT-MW-1B-DUP	ERT-MW-2A	ERT-MW-2B	ERT-MW-2C	ERT-MW-2D	ERT-MW-3	ERT-MW-4A	ERT-MW-4B	ERT-MW-5A	ERT-MW-5B	ERT-MW-6A
Date Collected:		03/28/2024	03/28/2024	03/27/2024	03/27/2024	03/26/2024	03/26/2024	03/28/2024	04/02/2024	04/02/2024	04/02/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/02/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024	03/27/2024
Lab Report Number:		24C3437	24C3437	24C3451	24C3451	24C3451	24C3451	24C3437	24D0344	24D0344	24D0344	24D0341	24D0341	24D0341	24D0341	24D0341	24D0341	24D0341	24D0341	24D0341	24C3451
Sample Type:		N	N	N	N	N	FD	N	N	N	FD	N	N	N	N	N	N	N	N	N	N
Parameter	NYDEC Class GA Criteria																				
Volatile Organic Compounds (VOCs) (µg/l)																					
1,1,1,2-Tetrachloroethane	5	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,1,1-Trichloroethane	5	**0.470 J**	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	**0.430 J**	**0.600**	**0.560**	< 0.500 U	**0.280 J**	**0.200 J**	**0.470 J**	< 0.500 U	**0.420 J**	**0.750**	**0.810**	**1.00**	**0.400 U**
1,1,2,2-Tetrachloroethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,1,2-Trichloroethane	1	< 1.00 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,1,2-Trichlorotrifluoroethane (Freon 113)	5	< 1.00 U	< 1.00 U	NA	NA	NA	NA	< 2.00 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	5	**1.10**	**0.390 J**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	**0.780**	**1.00**	**0.980**	< 0.500 U	**0.670**	**0.420 J**	**1.10**	**0.180 J**	**0.600**	**1.20**	**1.20**	**1.30**	**0.760 U**
1,1-Dichloroethene	5	**0.420 J**	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	**0.250 J**	**0.350 J**	**0.330 J**	< 0.500 U	**0.220 J**	< 0.500 U	**0.350 J**	< 0.500 U	**0.210 J**	**0.430 J**	**0.490 J**	**0.560**	**0.240 U**
1,1-Dichloropropylene	5	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2,3-Trichlorobenzene	5	< 5.00 U	< 5.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 10.0 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2,3-Trichloropropane	0.04	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	**0.150 J**	< 0.500 U	**0.230 J**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2,4-Trichlorobenzene	5	< 1.00 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2,4-Trimethylbenzene	5	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2-Dibromo-3-chloropropane	0.04	< 5.00 U	< 5.00 U	NA	NA	NA	NA	< 10.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (EDB) (ethylene dibromide)	0.0006	< 0.500 U	< 0.500 U	NA	NA	NA	NA	< 1.00 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	3	< 1.00 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2-Dichloroethane	0.6	< 1.00 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2-Dichloropropane	1	< 1.00 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,3,5-Trichlorobenzene	5	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,3,5-trimethyl-benzene	5	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,3-Dichlorobenzene	3	< 1.00 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,3-Dichloropropane	5	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,3-Dichloropropene	0.4	NA	NA	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	NA	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U
1,4-Dichlorobenzene	3	< 1.00 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,4-Dioxane	0.35	< 50.0 U	< 50.0 U	NA	NA	NA	NA	< 100 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2-Dichloropropane	5	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
2-Butanone (MEK)	50	< 20.0 U	< 20.0 U	NA	NA	NA	NA	< 40.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorotoluene	5	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
2-Hexanone (Methyl butyl ketone/MBK)	50	< 10.0 U	< 10.0 U	NA	NA	NA	NA	< 20.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorotoluene	5	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
4-Isopropyltoluene	5	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Acetone	50	< 50.0 U	< 50.0 U	NA	NA	NA	NA	< 100 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	1	< 1.00 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Bromobenzene	5	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Bromochloromethane	5	< 1.00 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Bromodichloromethane	50	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Bromoform	50	< 1.00 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Bromomethane	5	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 4.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Carbon disulfide	60	< 5.00 U	< 5.00 U	NA	NA	NA	NA	< 10.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	5	< 5.00 U	< 5.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 10.0 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Chlorobenzene	5	< 1.00 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Chloroethane	5	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 4.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Chloroform	7	**0.610 J**	**0.390 J**	**0.250 U**	< 0.500 U	**0.870 U**	**0.830**	< 4.00 U	**0.360 J**	**0.340 J**	**0.350 J**	**1.40 J+**	< 0.500 U	< 0.500 U	< 0.500 U	**0.590**	< 0.500 U	< 0.500 U	**0.510 J+**	**0.530 J+**	**0.380 U**
Chloromethane	5	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 4.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
cis-1,2-Dichloroethene	5	**0.550 J**	**0.480 J**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	**0.820 JD**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	**0.850**	< 0.500 U	**1.30**	< 0.500 U	< 0.500 U	**0.210 J**	**0.470 J**	**0.280 J**	**0.180 U**
cis-1,3-Dichloropropene	0.4	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Cyclohexane		< 5.00 U	< 5.00 U	NA	NA	NA	NA	< 10.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	50	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Dibromomethane	5	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Dichlorodifluoromethane	5	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 4.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Ethylbenzene	5	< 1.00 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Hexachloro-1,3-butadiene	0.5	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Isopropylbenzene		< 1.00 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
m,p-Xylene		NA	NA	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	NA	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U
Methyl acetate		< 1.00 U	< 1.00 U	NA	NA	NA	NA	< 2.00 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl isobutyl ketone (MIBK)		< 10.0 U	< 10.0 U	NA	NA	NA	NA	< 20.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane		< 1.00 UJ	**0.470 J**	NA	NA	NA	NA	< 2.00 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	5	< 5.00 U	< 5.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 10.0 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Methyltertbutyl ether	10	**0.320 J**	**0.490 J**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	**0.660 JD**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	**0.320 J**	< 0.500 U	< 0.500 U	**0.460 J**	< 0.500 U	< 0.500 U	**0.150 J**	**0.200 J**	< 0.500 U
Naphthalene	10	NA	NA	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	NA	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U
n-Butylbenzene	5	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
n-Propylbenzene	5	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
o-Xylene	5	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
sec-Butylbenzene	5	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Styrene	5	< 1.00 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
tert-Butylbenzene	5	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Tetrachloroethene	5	**1.90**	**3.70**	**0.530 U**	**1.30 U**	< 0.500 U	< 0.500 U	**5.90 D**	< 0.500 U	< 0.500 U	< 0.500 U	**0.420 J**	**5.20**	**0.200 J**	**2.50**	**0.230 J**	**0.260 J**	**0.410 J**	**0.480 J**	**0.430 J**	**0.300 U**
Tetrahydrofuran	50	NA	NA	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	NA	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U
Toluene	5	< 1.00 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Total Xylenes		< 1.00 U	< 1.00 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 2.00 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U
trans-1,2-Dichloroethene	5	< 1.00 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
trans-1,3-Dichloropropene	0.4	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Trichloroethene	5	**49.0**	**47.0**	**7.60 U**	**19.0 U**	< 0.500 U	< 0.500 U	**200 D**	**5.20**	**2.10**	**2.20**	**0.360 J**	**75.0**	**7.90**	**110 D**	< 0.500 U	**1.50**	**0.840**	**0.880**	**0.650**	**12.0 U**
Trichlorofluoromethane	5	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 4.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Vinyl chloride	2	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 4.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U

Legend	
<1	Parameter not detected above the laboratory reporting limit
1	Parameter reported at a concentrations greater than NYSDEC Class GA Criteria
1	Parameter reported above the laboratory reporting limit but below the applicable regulatory standard/criterion

Notes:
µg/l = micrograms per liter
NA = Not Analyzed
NP = not promulgated/ no applicable cleanup criteria
NYSDEC = New York State Department of Environmental Conservation
R = Data are rejected and not usable of any purpose

Table 6A
Comprehensive Groundwater Sampling Results
March-April 2024
Lawrence Aviation Industries
Port Jefferson Station, New York

ID:		ERT-MW-6B	IW-ISCO-10	LAI-EW01	LAI-EW02	LAI-EW03	MPW-01A	MPW-01B	MPW-01C	MPW-02B	MPW-02C	MPW-02D	MPW-03B	MPW-03C	MPW-03D	MPW-04A	MPW-04B	MPW-04C	MPW-04D	MPW-04E	MPW-05A
Sample ID:		ERT-MW-6B	IW-ISCO-10	LAI-EW-1	LAI-EW-2	LAI-EW-3	MPW-01A	MPW-01B	MPW-01C	MPW-02B	MPW-02C	MPW-02D	MPW-03B	MPW-03C	MPW-03D	MPW-04A	MPW-04B	MPW-04C	MPW-04D	MPW-04E	MPW-05A
Date Collected:		03/27/2024	04/08/2024	03/28/2024	03/28/2024	03/28/2024	04/01/2024	04/01/2024	04/01/2024	04/05/2024	04/05/2024	04/05/2024	04/04/2024	04/04/2024	04/04/2024	04/02/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/08/2024
Lab Report Number:		24C3451	24D1463	24C3437	24C3437	24C3437	24D0341	24D0341	24D0341	24D0932	24D0932	24D0932	24D0681	24D0681	24D0932	24D0341	24D0681	24D0681	24D0681	24D0681	24D1463
Sample Type:		N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Parameter	NYDEC Class GA Criteria																				
Anions (µg/l)																					
Chloride	250000	**14000 U**	**18000**	**15000**	**22000**	**16000**	**53000 D**	**70000 D**	**23000**	**32000 U**	**34000 U**	**48000 U**	**22000**	**32000**	**26000 U**	**64000 D**	**22000**	**37000**	**45000**	**52000 D**	**32000**
Fluorides	1500	< 100 U	**3700**	**9200 D**	**2200**	**9700 D**	< 100 U	< 100 U	< 100 U	**1800 U**	**600 U**	**130 U**	**120**	**510**	< 100 U	< 100 U	**1300**	**1300**	**450**	< 100 U	< 100 U
Sulfate	250000	**10000 U**	**26000**	**25000**	**24000**	**27000**	**29000 J-**	**24000**	**25000**	**27000 U**	**23000 U**	**27000 U**	**19000**	**21000**	**27000 U**	**40000**	**28000**	**31000**	**29000**	**27000**	**27000**
GenChem (µg/l)																					
Alkalinity, Bicarbonate (As CaCO3)		**51000 U**	**30000**	**64000**	**37000**	**29000**	**30000 J-**	NA	**84000**	**27000 U**	**35000 U**	**34000 U**	**34000**	**43000**	**35000 U**	**130000**	**70000**	**23000**	**20000**	**30000**	**25000**
Alkalinity, Carbonate (As CaCO3)		NA	NA	NA	NA	NA	NA	**11000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia	2000	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	**1700**	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U
Nitrogen, Kjeldahl, Total		**1100 U**	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	**2200**	**3400**	**2200**	**3400**	**2200**	< 1000 U
pH		NA	NA	**6.50**	**6.30**	**6.40**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids		**120000 U**	**120000**	**160000**	**160000**	**150000**	**180000**	**180000**	**170000**	**190000 U**	**190000 U**	**260000 U**	**130000**	**170000**	**200000 U**	**240000**	**180000**	**190000**	**180000**	**230000**	**30000**
Total Suspended Solids		< 5000 U	**5500**	< 2500 U	< 2500 U	< 2500 U	< 2700 U	< 2600 U	**5300**	< 2500 U	< 2500 U	< 2500 U	**49000**	< 2500 U	< 2500 U	**8500**	< 2500 U	< 2500 U	< 2500 U	< 2500 U	< 2500 U
Total Metals (mg/l)																					
Aluminum		< 50.0 U	**350**	**1900**	**210**	**2400**	< 50.0 U	< 50.0 U	**170**	< 50.0 U	< 50.0 U	< 50.0 U	**450**	< 50.0 U	< 50.0 U	< 50.0 U	**38.0 J**	**79.0**	**23.0 J**	< 50.0 U	**98.0**
Antimony	3	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U
Arsenic	25	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U
Barium	1000	**20.0 U**	**75.0**	**28.0 J**	**78.0**	**28.0 J**	**88.0**	**150**	**150**	**51.0 U**	**100 U**	**160 U**	**30.0 J**	**110**	**76.0 U**	**7.10 J**	**80.0**	**54.0**	**110**	**240**	**29.0 J**
Beryllium	3	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U
Cadmium	5	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U
Calcium		**18000 U**	**12000**	**15000**	**15000**	**13000**	**22000**	**17000**	**26000**	**15000 U**	**19000 U**	**21000 U**	**13000**	**19000**	**21000 U**	**15000**	**17000**	**16000**	**17000**	**19000**	**13000**
Chromium	50	< 10.0 U	**31.0**	**17.0**	**11.0**	**19.0**	**15.0**	< 10.0 U	< 10.0 U	**15.0 U**	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	**1000**	< 10.0 U	< 10.0 U	**20.0**	< 10.0 U	< 10.0 U
Cobalt		< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	**4.40 J**	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	**2.60 U**	**67.0**	< 10.0 U	< 10.0 U	**2.30 J**	< 10.0 U	**5.10 J**
Copper	200	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	**4.70 J**	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	**4.80 J**	< 10.0 U	< 10.0 U	**9.60 JB**	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U
Iron	300	< 50.0 U	**310**	< 50.0 U	< 50.0 U	< 50.0 U	**220**	< 50.0 U	**250**	< 50.0 U	< 50.0 U	< 50.0 U	**640 J-**	< 50.0 U	**25.0 U**	**63000**	< 50.0 U	**72.0**	**340 J-**	< 50.0 UJ-	**58.0**
Lead	25	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U
Magnesium	35000	**6700 U**	**6700**	**8100**	**7700**	**6700**	**5900**	**8300**	**14000**	**9200 U**	**8400 U**	**12000 U**	**5900**	**7200**	**5300 U**	**7700**	**9200**	**8400**	**8400**	**8600**	**8800**
Manganese	300	< 10.0 U	**55.0**	< 10.0 U	< 10.0 U	< 10.0 U	**520**	**19.0**	**8.00 J**	**3.00 U**	< 10.0 U	< 10.0 U	**11.0**	< 10.0 U	**230 U**	**2200**	< 10.0 U	**3.70 J**	**32.0**	< 10.0 U	**22.0**
Mercury	0.7	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U
Nickel	100	< 10.0 U	**17.0**	**13.0**	**3.10 J**	**7.60 J**	**510**	**3.90 J**	< 10.0 U	< 10.0 U	**5.60 U**	< 10.0 U	**10.0**	**150**	**20.0 U**	**7100**	< 10.0 U	< 10.0 U	**310**	< 10.0 U	**15.0**
Potassium		**1500 U**	**7100**	**19000**	**5400**	**9600**	**5500**	**3100**	**2000 J**	**1800 U**	**2900 U**	**2700 U**	**2400**	**2000**	**1900 U**	**12000**	**14000**	**7000**	**4600**	**6800**	**2700**
Selenium	10	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U
Silver	50	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	**2.70 U**	**2.80 U**	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U
Sodium	20000	**11000 U**	**19000**	**18000**	**18000**	**17000**	**37000**	**40000**	**21000**	**23000 U**	**20000 U**	**27000 U**	**15000**	**22000**	**20000 U**	**17000**	**19000 J-**	**27000**	**27000**	**32000**	**23000**
Thallium	0.5	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U
Vanadium		< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U
Zinc	2000	< 10.0 U	< 10.0 U	**87.0**	**83.0**	**16.0**	**25.0 J+**	< 10.0 U	< 10.0 U	< 10.0 U	**4.00 U**	< 10.0 U	**7.90 J**	< 10.0 U	**18.0 U**	**4.10 J**	< 10.0 U	**47.0**	< 10.0 U	< 10.0 U	**89.0**
PFAS Compounds (mg/l)																					
Total Suspended Solids		< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	**56000**	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	**10000**	< 10000 U	< 10000 U
PFAS Compounds (ng/l)																					
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F53B		< 3.60 U	< 3.70 U	< 3.80 U	< 4.00 U	< 4.00 U	< 4.20 U	< 4.20 U	< 4.50 U	< 4.10 U	< 3.90 U	< 4.30 U	< 3.80 U	< 4.30 U	< 4.10 U	< 4.40 U	< 4.30 U	< 4.10 U	< 4.20 U	< 3.90 U	< 3.80 U
1H,1H, 2H, 2H-Perfluorohexane sulfonic acid (4:2 FTS)		< 3.60 U	< 3.70 U	< 3.80 U	< 4.00 U	< 4.00 U	< 4.20 U	< 4.20 U	< 4.50 U	< 4.10 U	< 3.90 U	< 4.30 U	< 3.80 U	< 4.30 U	< 4.10 U	< 4.40 U	< 4.30 U	< 4.10 U	< 4.20 U	< 3.90 U	< 3.80 U
1H,1H, 2H, 2H-Perfluorooctane sulfonic acid (6:2 FTS)		< 3.60 U	< 3.70 U	< 3.80 U	< 4.00 U	< 4.00 U	< 4.20 U	< 4.20 U	< 4.50 U	< 4.10 U	< 3.90 U	< 4.30 U	< 3.80 U	< 4.30 U	< 4.10 U	< 4.40 U	< 4.30 U	< 4.10 U	< 4.20 U	< 3.90 U	< 3.80 U
1H,1H,2H,2H-Perfluorodecanessulfonic acid (8:2 FTS)		< 3.60 U	< 3.70 U	< 3.80 U	< 4.00 U	< 4.00 U	< 4.20 U	< 4.20 U	< 4.50 U	< 4.10 U	< 3.90 U	< 4.30 U	< 3.80 U	< 4.30 U	< 4.10 U	< 4.40 U	< 4.30 U	< 4.10 U	< 4.20 U	< 3.90 U	< 3.80 U
3:3FTCA		< 8.90 U	< 9.20 U	< 9.60 U	< 10.0 U	< 10.0 U	< 11.0 U	< 11.0 U	< 11.0 U	< 10.0 U	< 9.70 U	< 11.0 U	< 9.60 U	< 11.0 U	< 10.0 U	< 11.0 U	< 11.0 U	< 10.0 U	< 10.0 U	< 9.90 U	< 9.40 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)		< 3.60 U	< 3.70 U	< 3.80 U	< 4.00 U	< 4.00 U	< 4.20 U	< 4.20 U	< 4.50 U	< 4.10 U	< 3.90 U	< 4.30 U	< 3.80 U	< 4.30 U	< 4.10 U	< 4.40 U	< 4.30 U	< 4.10 U	< 4.20 U	< 3.90 U	< 3.80 U
5:3FTCA		< 44.0 U	< 46.0 U	< 48.0 U	< 50.0 U	< 50.0 U	< 53.0 U	< 53.0 U	< 56.0 U	< 51.0 U	< 49.0 U	< 54.0 U	< 48.0 U	< 53.0 U	< 51.0 U	< 55.0 U	< 53.0 U	< 52.0 U	< 52.0 U	< 49.0 U	< 47.0 U
7:3FTCA		< 44.0 U	< 46.0 U	< 48.0 U	< 50.0 U	< 50.0 U	< 53.0 U	< 53.0 U	< 56.0 U	< 51.0 U	< 49.0 U	< 54.0 U	< 48.0 U	< 53.0 U	< 51.0 U	< 55.0 U	< 53.0 U	< 52.0 U	< 52.0 U	< 49.0 U	< 47.0 U
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (F53B		< 3.60 U	< 3.70 U	< 3.80 U	< 4.00 U	< 4.00 U	< 4.20 U	< 4.20 U	< 4.50 U	< 4.10 U	< 3.90 U	< 4.30 U	< 3.80 U	< 4.30 U	< 4.10 U	< 4.40 U	< 4.30 U	< 4.10 U	< 4.20 U	< 3.90 U	< 3.80 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)		< 3.60 U	< 3.70 U	< 3.80 U	< 4.00 U	< 4.00 U	< 4.20 U	< 4.20 U	< 4.50 U	< 4.10 U	< 3.90 U	< 4.30 U	< 3.80 U	< 4.30 U	< 4.10 U	< 4.40 U	< 4.30 U	< 4.10 U	< 4.20 U	< 3.90 U	< 3.80 U
N-ethyl perfluorooctanesulfonamide (NEtFOSA)		< 0.890 U	< 0.920 U	< 0.960 U	< 1.00 U	< 1.00 U	< 1.10 U	< 1.10 U	< 1.10 U	< 1.00 U	< 0.970 U	< 1.10 U	< 0.960 U	< 1.10 U	< 1.00 U	< 1.10 U	< 1.10 U	< 1.00 U	< 1.00 U	< 0.990 U	< 0.940 U
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)		< 0.890 U	< 0.920 U	< 0.960 U	< 1.00 U	< 1.00 U	< 1.10 U	< 1.10 U	< 1.10 U	< 1.00 U	< 0.970 U	< 1.10 U	< 0.960 U	< 1.10 U	< 1.00 U	< 1.10 U	< 1.10 U	< 1.00 U	< 1.00 U	< 0.990 U	< 0.940 U
N-ethyl perfluorooctanesulfonamidoethanol (NEtFOSE)		< 8.90 U	< 9.20 U	< 9.60 U	< 10.0 U	< 10.0 U	< 11.0 U	< 11.0 U	< 11.0 U	< 10.0 U	< 9.70 U	< 11.0 U	< 9.60 U	< 11.0 U	< 10.0 U	< 11.0 U	< 11.0 U	< 10.0 U	< 10.0 U	< 9.90 U	< 9.40 U
N-methyl perfluorooctanesulfonamide (NMeFOSA)		< 0.890 U	< 0.920 U	< 0.960 U	< 1.00 U	< 1.00 U	< 1.10 U	< 1.10 U	< 1.10 U	< 1.00 U	< 0.970 U	< 1.10 U	< 0.960 U	< 1.10 U	< 1.00 U	< 1.10 U	< 1.10 U	< 1.00 U	< 1.00 U	< 0.990 U	< 0.940 U
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)		< 0.890 U	< 0.920 U	< 0.960 U	< 1.00 U	< 1.00 U	< 1.10 U	< 1.10 U	< 1.10 U	< 1.00 U	< 0.970 U	< 1.10 U	< 0.960 U	< 1.10 U	< 1.00 U	< 1.10 UJ	< 1.10 U	< 1.00 U	< 1.00 U	< 0.990 U	< 0.940 U
N-methyl perfluorooctanesulfonamidoethanol (NMeFOSE)		< 8.90 U	< 9.20 U	< 9.60 U	< 10.0 U	< 10.0 U	< 11.0 U	< 11.0 U	< 11.0 U	< 10.0 U	< 9.70 U	< 11.0 U	< 9.60 U	< 11.0 U	< 10.0 U	< 11.0 U	< 11.0 U	< 10.0 U	< 10.0 U	< 9.90 U	< 9.40 U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)		< 1.80 U	< 1.80 U	< 1.90 U	< 2.00 U	< 2.00 U	< 2.10 U	< 2.10 U	< 2.30 U	< 2.00 U	< 1.90 U	< 2.20 U	< 1.90 U	< 2.10 U	< 2.10 U	< 2.20 U	< 2.10 U	< 2.10 U	< 2.10 U	< 2.00 U	< 1.90 U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)		< 1.80 U	< 1.80 U	< 1.90 U	< 2.00 U	< 2.00 U	< 2.10 U	< 2.10 U	< 2.30 U	< 2.00 U	< 1.90 U	< 2.20 U	< 1.90 U	< 2.10 U	< 2.10 U	< 2.20 U	< 2.10 U	< 2.10 U	< 2.10 U	< 2.00 U	< 1.90 U
Perfluoro-3-methoxypropanoic acid (PFMPA)		< 1.80 U	< 1.80 U	< 1.90 U	< 2.00 U	< 2.00 U	< 2.10 U	< 2.10 U	< 2.30 U	< 2.00 U	< 1.90 U	< 2.20 U	< 1.90 U	< 2.10 U	< 2.10 U	< 2.20 U	< 2.10 U	**1.20 J**	< 2.10 U	**1.80 J**	< 1.90 U
Perfluoro-4-methoxybutanoic acid (PFMBA)		< 1.80 U	< 1.80 U	< 1.90 U	< 2.00 U	< 2.00 U	< 2.10 U	< 2.10 U	< 2.30 U	< 2.00 U	< 1.90 U	< 2.20 U	< 1.90 U	< 2.10 U	< 2.10 U	< 2.20 U	< 2.10 U	< 2.10 U	< 2.10 U	< 2.00 U	< 1.90 U
Perfluorobutanesulfonic acid (PFBS)		**0.240 J**	**1.40**	**1.40**	**3.10**	**1.60**	**6.10**	**5.50**	**1.20**	**2.20**	**2.00**	**2.00**	**2.00**	**1.90**	**0.810 J**	**5.60**	**2.20**	**2.10**	**2.70**	**3.50**	**3.40**
Perfluorobutanoic acid (PFBA)		< 3.60 U	**3.50 J**	**3.30 J**	**3.50 J**	**3.30 J**	**6.40**	**5.60**	< 4.50 U	**3.80 J**	**2.70 J**	**4.00 J**	< 3.80 U	**2.80 J**	**3.00 J**	**16.0**	**6.00**	**7.10**	**3.60 J**	**7.90**	**7.30**
Perfluorodecanesulfonic acid (PFDS)		< 0.890 U	< 0.920 U	< 0.960 U	< 1.00 U	< 1.00 U	< 1.10 U	< 1.10 U	< 1.10 U	< 1.00 U	< 0.970 U	< 1.10 U	< 0.960 U	< 1.10 U	< 1.00 U	< 1.10 U	< 1.10 U	< 1.00 U	< 1.00 U	< 0.990 U	< 0.940 U
Perfluorodecanoic acid (PFDA)		< 0.890 U	< 0.920 U	< 0.960 U	< 1.00 U	< 1.00 U	**0.260 J**	**0.410 J**	**0.280 J**	**0.780 J**	**0.960 J**	**1.10 J**	**1.00**	**0.670 J**	**2.40**	**0.530 J**	**0.380 J**	**0.650 J**	**0.240 J**	**1.00**	**0.970**
Perfluorododecane sulfonate (PFDoDS)		< 0.890 U	< 0.920 U	< 0.960 U	< 1.00 U	< 1.00 U	< 1.10 U	< 1.10 U	< 1.10 U	< 1.00 U	< 0.970 U	< 1.10 U	< 0.960 U	< 1.10 U	< 1.00 U	< 1.10 U	< 1.10 U	< 1.00 U	< 1.00 U	< 0.990 U	< 0.940 U
Perfluorododecanoic acid (PFDoA)		< 0.890 U	< 0.920 U	< 0.960 U	< 1.00 U	< 1.00 U	< 1.10 U	**0.690 J**	< 1.10 U	**0.220 J**	< 0.970 U	< 1.10 U	< 0.960 U	< 1.10 U	< 1.00 U	**0.240 J**	< 1.10 U	< 1.00 U	< 1.00 U	< 0.990 U	< 0.940 U
Perfluoroheptanesulfonic acid (PFHpS)		< 0.890 U	< 0.920 U	< 0.960 U	< 1.00 U	< 1.00 U	< 1.10 U	< 1.10 U	< 1.10 U	< 1.00 U	< 0.970 U	< 1.10 U	< 0.960 U	< 1.10 U	< 1.00 U	< 1.10 U	< 1.10 U	< 1.00 U	< 1.00 U	< 0.990 U	< 0.940 U
Perfluoroheptanoic acid (PFHpA)		< 0.890 U	**2.00**	**1.80**	**2.30**	**2.10**	**5.10**	**4.60**	**1.90**	**2.60**	**1.60**	**2.50**	**2.20**	**3.00**	**5.40**	**5.80**	**2.40**	**3.10**	**3.30**	**3.90**	**3.00**
Perfluorohexanesulfonic acid (PFHxS)		**1.10 J+**	**11.0**	**7.10**	**12.0**	**11.0**	**5.90**	**7.60**	**3.00**	**10.0**	**3.00**	**4.80**	**4.30 J+**	**6.20 J+**	**14.0**	**12.0**	**14.0 J+**	**7.20 J+**	**7.00 J+**	**5.00 J+**	**2.50**
Perfluorohexanoic acid (PFHxA)		< 0.890 U	**3.90**	**3.30**	**5.60**	**4.00**	**13.0**	**9.90**	**3.80**	**4.40**	**4.50**	**6.50**	**3.80**	**6.40**	**6.80**	**14.0**	**6.90**	**7.60**	**8.10**	**8.90**	**27.0**
Perfluorononane sulfonic acid (PFNS)		< 0.890 U	< 0.920 U	< 0.960 U	< 1.00 U	< 1.00 U	< 1.10 U	< 1.10 U	< 1.10 U	< 1.00 U	< 0.970 U	< 1.10 U	< 0.960 U	< 1.10 U	< 1.00 U	< 1.10 U	< 1.10 U	< 1.00 U	< 1.00 U	< 0.990 U	< 0.940 U
Perfluorononanoic acid (PFNA)		**1.00**	**0.200 J**	< 0.960 U	< 1.00 U	< 1.00 U	< 1.10 U	< 1.10 U	< 1.10 U	**1.10**	**0.440 J**	**2.80**	**0.340 J**	**0.400 J**	**1.00**	< 1.10 U	**0.380 J**	**0.550 J**	**0.220 J**	**1.50**	**0.550 J**
Perfluorooctane Sulfonamide (PFOSA)		< 0.890 U	< 0.920 U	< 0.960 U	< 1.00 U	**0.380 J**	< 1.10 U	< 1.10 U	< 1.10 U	< 1.00 U	< 0.970 U	< 1.10 U	< 0.960 U	< 1.10 U	< 1.00 U	< 1.10 U	< 1.10 U	< 1.00 U	< 1.00 U	< 0.990 U	< 0.940 U
Perfluorooctanesulfonic acid (PFOS)	2.7	< 0.890 U	**2.20**	**2.20**	**2.80**	**3.10**	**2.20**	**4.40**	**2.10 J**	**2.10**	**1.10**	**1.20 J**	**1.40**	**2.90**	**1.90**	**1.00 J**	**2.40**	**1.90**	**2.00**	**2.00**	**3.00**
Perfluorooctanoic acid (PFOA)	6.7	**0.800 J**	**4.70**	**10.0**	**5.00**	**5.00**	**13.0**	**10.0**	**5.40**	**6.30**	**3.80**	**5.80**	**4.50**	**7.90**	**20.0**	**6.30**	**4.40**	**6.50**	**6.60**	**7.50**	**8.00**
Perfluoropentane sulfonate (PFPeS)		< 0.890 U	**0.920 J**	**0.780 J**	**0.890 J**	**1.10**	**0.730 J**	**0.820 J**	**0.660 J**	**0.950 J**	**0.650 J**	**0.830 J**	**0.480 J**	**0.900 J**	**0.690 J**	**2.10**	**0.930 J**	**1.00 J**	**1.00 J**	**0.920 J**	**0.570 J**
Perfluoropentanoic acid (PFPeA)		< 1.80 U	**3.00**	**2.50**	**5.00 J+**	**3.10**	**12.0**	**11.0**	**4.00**	**3.80**	**4.40**	**6.90**	**3.90**	**6.60**	**6.40**	**17.0**	**10.0**	**9.60**	**6.90**	**11.0**	**19.0**
Perfluorotetradecanoic acid (PFTeDA)		< 0.890 U	< 0.920 U	< 0.960 U	< 1.00 U	< 1.00 U	< 1.10 U	< 1.10 U	< 1.10 U	< 1.00 U	< 0.970 U	< 1.10 U	< 0.960 U	< 1.10 U	< 1.00 U	< 1.10 U	< 1.10 U	< 1.00 U	< 1.00 U	< 0.990 U	< 0.940 U
Perfluorotridecanoic acid (PFTrDA)		< 0.890 U	< 0.920 U	< 0.960 U	< 1.00 U	< 1.00 U	< 1.10 U	**0.400 J**	< 1.10 U	< 1.00 U	< 0.970 U	< 1.10 U	< 0.960 U	< 1.10 U	< 1.00 U	< 1.10 U	< 1.10 U	< 1.00 U	< 1.00 U	< 0.990 U	< 0.940 U
Perfluoroundecanoic acid (PFUnA)		< 0.890 U	< 0.920 U	< 0.960 U	< 1.00 U	< 1.00 U	< 1.10 U	**0.980 J**	**0.300 J**	**0.890 J**	**0.850 J**	**0.520 J**	**0.270 J**	**0.600 J**	**0.400 J**	**0.260 J**	**0.420 J**	**0.410 J**	**0.410 J**	**0.470 J**	< 0.940 U
Semivolatile Organic Compounds (SVOCs) (µg/l)																					
1,4-Dioxane	0.35	**0.460 U**	**0.110 J**	**0.100 J**	**0.0690 J**	**0.0950 J**	**0.160 J**	**0.170 J**	**0.830**	**0.190 U**	**0.580 U**	**0.530 U**	< 0.200 U	**0.380**	**0.720 U**	**0.110 J**	**0.0730 J**	**0.330**	**0.290**	**0.240**	< 0.190 U
TOC (ug/l)																					
Total Organic Carbon		< 1000 U	**870 J**	**1100**	**960 J**	**1100**	**4000**	**730 J**	**610 J**	**760 U**	< 1000 U	< 1000 U	**620 J-**	**630 J-**	**880 U**	< 1000 U	**1700 J-**	**890 J-**	**1100 J-**	**730 J-**	**740 J**

Table 6A
Comprehensive Groundwater Sampling Results
March-April 2024
Lawrence Aviation Industries
Port Jefferson Station, New York

ID:		ERT-MW-6B	IW-ISCO-10	LAI-EW01	LAI-EW02	LAI-EW03	MPW-01A	MPW-01B	MPW-01C	MPW-02B	MPW-02C	MPW-02D	MPW-03B	MPW-03C	MPW-03D	MPW-04A	MPW-04B	MPW-04C	MPW-04D	MPW-04E	MPW-05A
Sample ID:		ERT-MW-6B	IW-ISCO-10	LAI-EW-1	LAI-EW-2	LAI-EW-3	MPW-01A	MPW-01B	MPW-01C	MPW-02B	MPW-02C	MPW-02D	MPW-03B	MPW-03C	MPW-03D	MPW-04A	MPW-04B	MPW-04C	MPW-04D	MPW-04E	MPW-05A
Date Collected:		03/27/2024	04/08/2024	03/28/2024	03/28/2024	03/28/2024	04/01/2024	04/01/2024	04/01/2024	04/05/2024	04/05/2024	04/05/2024	04/04/2024	04/04/2024	04/04/2024	04/02/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/08/2024
Lab Report Number:		24C3451	24D1463	24C3437	24C3437	24C3437	24D0341	24D0341	24D0341	24D0932	24D0932	24D0932	24D0681	24D0681	24D0932	24D0341	24D0681	24D0681	24D0681	24D0681	24D1463
Sample Type:		N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Parameter	NYDEC Class GA Criteria																				
Volatile Organic Compounds (VOCs) (µg/l)																					
1,1,1,2-Tetrachloroethane	5	< 0.500 U	< 0.500 U	NA	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,1,1-Trichloroethane	5	**0.410 U**	< 0.500 U	< 1.00 U	< 1.00 U	< 2.00 U	< 0.500 U	< 0.500 U	**0.410 J**	< 0.500 U	**0.270 U**	**0.220 U**	< 0.500 U	< 0.500 U	**0.260 U**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,1,2,2-Tetrachloroethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,1,2-Trichloroethane	1	< 0.500 U	< 0.500 U	< 1.00 U	< 1.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,1,2-Trichlorotrifluoroethane (Freon 113)	5	NA	NA	< 1.00 U	< 1.00 U	< 2.00 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	5	**0.660 U**	< 0.500 U	< 1.00 U	< 1.00 U	< 2.00 U	< 0.500 U	< 0.500 U	**1.00**	< 0.500 U	**0.710 U**	**0.540 U**	< 0.500 U	**0.220 J**	**0.600 U**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,1-Dichloroethene	5	**0.240 U**	< 0.500 U	< 1.00 U	< 1.00 U	< 2.00 U	< 0.500 U	< 0.500 U	**0.280 J**	< 0.500 U	**0.220 U**	**0.130 U**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,1-Dichloropropylene	5	< 0.500 U	< 0.500 U	NA	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2,3-Trichlorobenzene	5	< 0.500 U	< 0.500 U	< 5.00 U	< 5.00 U	< 10.0 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2,3-Trichloropropane	0.04	< 0.500 U	< 0.500 U	NA	NA	NA	< 0.500 U	< 0.500 U	**0.360 J**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2,4-Trichlorobenzene	5	< 0.500 U	< 0.500 U	< 1.00 U	< 1.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2,4-Trimethylbenzene	5	< 0.500 U	< 0.500 U	NA	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2-Dibromo-3-chloropropane	0.04	NA	NA	< 5.00 U	< 5.00 U	< 10.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (EDB) (ethylene dibromide)	0.0006	NA	NA	< 0.500 U	< 0.500 U	< 1.00 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	3	< 0.500 U	< 0.500 U	< 1.00 U	< 1.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2-Dichloroethane	0.6	< 0.500 U	< 0.500 U	< 1.00 U	< 1.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2-Dichloropropane	1	< 0.500 U	< 0.500 U	< 1.00 U	< 1.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,3,5-Trichlorobenzene	5	< 0.500 U	< 0.500 U	NA	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,3,5-trimethyl-benzene	5	< 0.500 U	< 0.500 U	NA	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,3-Dichlorobenzene	3	< 0.500 U	< 0.500 U	< 1.00 U	< 1.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,3-Dichloropropane	5	< 0.500 U	< 0.500 U	NA	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,3-Dichloropropene	0.4	< 1.00 U	< 1.00 U	NA	NA	NA	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U
1,4-Dichlorobenzene	3	< 0.500 U	< 0.500 U	< 1.00 U	< 1.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,4-Dioxane	0.35	NA	NA	< 50.0 U	< 50.0 U	< 100 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2-Dichloropropane	5	< 0.500 U	< 0.500 U	NA	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
2-Butanone (MEK)	50	NA	NA	< 20.0 U	< 20.0 U	< 40.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorotoluene	5	< 0.500 U	< 0.500 U	NA	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
2-Hexanone (Methyl butyl ketone/MBK)	50	NA	NA	< 10.0 U	< 10.0 U	< 20.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorotoluene	5	< 0.500 U	< 0.500 U	NA	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
4-Isopropyltoluene	5	< 0.500 U	< 0.500 U	NA	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Acetone	50	NA	NA	< 50.0 U	< 50.0 U	< 100 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	1	< 0.500 U	< 0.500 U	< 1.00 U	< 1.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Bromobenzene	5	< 0.500 U	< 0.500 U	NA	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Bromochloromethane	5	< 0.500 U	< 0.500 U	< 1.00 U	< 1.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Bromodichloromethane	50	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Bromoform	50	< 0.500 U	< 0.500 U	< 1.00 U	< 1.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Bromomethane	5	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 4.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Carbon disulfide	60	NA	NA	< 5.00 U	< 5.00 U	< 10.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	5	< 0.500 U	< 0.500 U	< 5.00 U	< 5.00 U	< 10.0 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Chlorobenzene	5	< 0.500 U	< 0.500 U	< 1.00 U	< 1.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Chloroethane	5	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 4.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Chloroform	7	**0.350 U**	< 0.500 U	< 2.00 U	**0.350 J**	< 4.00 U	< 0.500 U	< 0.500 U	**0.650 J+**	< 0.500 U	**0.710 U**	**0.790 U**	**0.190 J**	**0.430 J**	**0.330 U**	< 0.500 U	**0.220 J**	< 0.500 U	**0.560**	**0.520**	**1.30**
Chloromethane	5	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 4.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
cis-1,2-Dichloroethene	5	< 0.500 U	< 0.500 U	< 1.00 U	< 1.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	**0.180 J**	**0.600**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
cis-1,3-Dichloropropene	0.4	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Cyclohexane		NA	NA	< 5.00 U	< 5.00 U	< 10.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	50	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Dibromomethane	5	< 0.500 U	< 0.500 U	NA	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Dichlorodifluoromethane	5	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 4.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Ethylbenzene	5	< 0.500 U	< 0.500 U	< 1.00 U	< 1.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Hexachloro-1,3-butadiene	0.5	< 0.500 U	< 0.500 U	NA	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Isopropylbenzene		< 0.500 U	< 0.500 U	< 1.00 U	< 1.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
m,p-Xylene		< 1.00 U	< 1.00 U	NA	NA	NA	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U
Methyl acetate		NA	NA	< 1.00 U	< 1.00 U	< 2.00 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl isobutyl ketone (MIBK)		NA	NA	< 10.0 U	< 10.0 U	< 20.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane		NA	NA	< 1.00 UJ	< 1.00 UJ	< 2.00 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	5	< 0.500 U	< 0.500 U	< 5.00 U	< 5.00 U	< 10.0 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Methyltertbutyl ether	10	< 0.500 U	< 0.500 U	< 1.00 U	< 1.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	**0.150 U**	**0.190 U**	< 0.500 U	**0.210 J**	**0.380 U**	< 0.500 U	< 0.500 U	< 0.500 U	**0.230 J**	**0.160 J**	< 0.500 U
Naphthalene	10	< 1.00 U	< 1.00 U	NA	NA	NA	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U
n-Butylbenzene	5	< 0.500 U	< 0.500 U	NA	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
n-Propylbenzene	5	< 0.500 U	< 0.500 U	NA	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
o-Xylene	5	< 0.500 U	< 0.500 U	NA	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
sec-Butylbenzene	5	< 0.500 U	< 0.500 U	NA	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Styrene	5	< 0.500 U	< 0.500 U	< 1.00 U	< 1.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
tert-Butylbenzene	5	< 0.500 U	< 0.500 U	NA	NA	NA	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Tetrachloroethene	5	**0.180 U**	**0.520**	**3.10**	**3.20**	**4.10 D**	< 0.500 U	< 0.500 U	**0.280 J**	< 0.500 U	**0.180 U**	**0.330 U**	**0.360 J**	**0.160 J**	**0.410 U**	**2.00**	**2.80**	< 0.500 U	**0.200 J**	**0.530**	< 0.500 U
Tetrahydrofuran	50	< 2.00 U	< 2.00 U	NA	NA	NA	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U
Toluene	5	< 0.500 U	< 0.500 U	< 1.00 U	< 1.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Total Xylenes		< 1.50 U	< 1.50 U	< 1.00 U	< 1.00 U	< 2.00 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U
trans-1,2-Dichloroethene	5	< 0.500 U	< 0.500 U	< 1.00 U	< 1.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
trans-1,3-Dichloropropene	0.4	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 1.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Trichloroethene	5	**4.00 U**	**13.0**	**97.0**	**41.0**	**170 D**	< 0.500 U	< 0.500 U	**0.450 J**	**0.160 U**	**1.40 U**	**0.190 U**	**2.60**	**0.600**	**1.40 U**	**3.00**	**5.40**	< 0.500 U	**0.180 J**	**0.540**	< 0.500 U
Trichlorofluoromethane	5	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 4.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Vinyl chloride	2	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 4.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U

Legend	
<1	Parameter not detected above the laboratory reporting limit
1	Parameter reported at a concentrations greater than NYSDEC Class GA Criteria
1	Parameter reported above the laboratory reporting limit but below the applicable regulatory standard/criterion

Notes:
µg/l = micrograms per liter
NA = Not Analyzed
NP = not promulgated/ no applicable cleanup criteria
NYSDEC = New York State Department of Environmental Conservation
R = Data are rejected and not usable of any purpose

Table 6A
Comprehensive Groundwater Sampling Results
March-April 2024
Lawrence Aviation Industries
Port Jefferson Station, New York

ID:		MPW-05B	MPW-05C	MPW-05D	MPW-06A	MPW-06B	MPW-06D	MPW-08A	MPW-08A	MPW-08B	MPW-08C	MPW-08D	MPW-08E	MPW-09A	MPW-09B	MPW-09C	MPW-09D	MPW-09E	MPW-10A	MPW-10B	MPW-10C
Sample ID:		MPW-05B	MPW-05C	MPW-05D	MPW-06A	MPW-06B	MPW-06D	MPW-08A	MPW-08ADUP	MPW-08B	MPW-08C	MPW-08D	MPW-08E	MPW-09A	MPW-09B	MPW-09C	MPW-09D	MPW-09E	MPW-10A	MPW-10B	MPW-10C
Date Collected:		04/09/2024	04/08/2024	04/08/2024	04/02/2024	04/02/2024	04/02/2024	03/26/2024	03/26/2024	03/26/2024	03/27/2024	03/27/2024	03/27/2024	03/27/2024	03/27/2024	03/27/2024	03/27/2024	03/27/2024	04/09/2024	04/09/2024	04/09/2024
Lab Report Number:		24D1463	24D1463	24D1463	24D0341	24D0341	24D0341	24C3451	24C3451	24C3451	24C3451	24C3451	24C3451	24C3451	24C3451	24C3451	24C3451	24C3451	24D1463	24D1463	24D1463
Sample Type:		N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N
Parameter	NYDEC Class GA Criteria																				
Anions (µg/l)																					
Chloride	250000	**60000 D**	**37000**	**28000**	**100000 D**	**22000**	**15000**	**61000 U**	**62000 U**	**61000 U**	**38000 U**	**21000 U**	**16000 U**	**19000 U**	**25000 U**	**29000 U**	**24000 U**	**7900 U**	**34000**	**35000**	**43000**
Fluorides	1500	**200**	< 100 U	< 100 U	< 100 U	< 100 U	**66.0 J**	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	**960**	**1000**
Sulfate	250000	**20000**	**27000**	**25000**	**28000**	**34000**	**7800**	**23000 U**	**23000 U**	**22000 U**	**17000 U**	**13000 U**	**9200 U**	**17000 U**	**31000 U**	**20000 U**	**7400 U**	**4200 U**	**34000**	**28000**	**26000**
GenChem (µg/l)																					
Alkalinity, Bicarbonate (As CaCO3)		**110000**	**64000**	**49000**	**72000**	NA	**73000**	NA	NA	NA	**27000 U**	**38000 U**	**44000 U**	**26000 U**	**74000 U**	**220000 U**	**110000 U**	**32000 U**	**100000**	**43000**	**33000**
Alkalinity, Carbonate (As CaCO3)		NA	NA	NA	NA	**16000**	NA	**14000 U**	**14000 U**	**16000 U**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia	2000	**2400**	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U
Nitrogen, Kjeldahl, Total		**2800**	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	**1100 U**	< 1000 U	**1100 U**	**1100 U**	< 1000 U	< 1000 U	**22000**	< 1000 U	< 1000 U
pH		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids		**170000**	**130000**	**110000**	**260000**	**70000**	**120000**	**170000 U**	**190000 U**	**150000 U**	**140000 U**	**120000 U**	**100000 U**	**88000 U**	**160000 U**	**330000 U**	**200000 U**	**80000 U**	**150000**	**130000**	**150000**
Total Suspended Solids		< 2500 U	< 2500 U	**52000**	**2900**	< 2500 U	< 2500 U	< 2500 U	< 2500 U	< 2500 U	< 2500 U	< 2500 U	< 2500 U	< 2500 U	< 2500 U	< 2500 U	< 2500 U	< 2500 U	< 2500 U	< 2500 U	< 2500 U
Total Metals (mg/l)																					
Aluminum		< 50.0 U	**26.0 J**	**1300**	**23.0 J**	< 50.0 U	**21.0 J**	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	**36.0 U**	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U
Antimony	3	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U
Arsenic	25	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U
Barium	1000	**72.0**	**87.0**	**92.0**	**68.0**	**31.0 J**	< 50.0 U	**89.0 U**	**89.0 U**	**100 U**	**50.0 U**	**28.0 U**	**14.0 U**	**64.0 U**	**150 U**	**370 U**	**120 U**	**22.0 U**	**81.0**	**67.0**	**130**
Beryllium	3	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U
Cadmium	5	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U
Calcium		**27000**	**25000**	**22000**	**59000**	**11000**	**23000**	**13000 U**	**13000 U**	**14000 U**	**15000 U**	**16000 U**	**16000 U**	**12000 U**	**24000 U**	**32000 U**	**20000 U**	**10000 U**	**23000**	**17000**	**19000**
Chromium	50	**9.30 J**	< 10.0 U	**19.0**	**35.0**	**17.0**	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U
Cobalt		**3.70 J**	< 10.0 U	< 10.0 U	**35.0**	**3.80 J**	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	**4.20 U**	< 10.0 U	< 10.0 U	**6.10 J**	< 10.0 U	< 10.0 U
Copper	200	< 10.0 U	< 10.0 U	< 10.0 U	**8.30 JB**	**5.80 JB**	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U
Iron	300	**620**	**65.0**	**5200**	**7400**	**1600**	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	**140 U**	< 50.0 U	< 50.0 U	**64.0**	< 50.0 U	< 50.0 U
Lead	25	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U
Magnesium	35000	**13000**	**12000**	**10000**	**6100**	**5000**	**7000**	**8300 U**	**8300 U**	**8600 U**	**7000 U**	**5600 U**	**6300 U**	**5500 U**	**13000 U**	**13000 U**	**8100 U**	**3800 U**	**12000**	**8600**	**9800**
Manganese	300	**220**	**4.70 J**	**24.0**	**700**	**250**	< 10.0 U	**3.30 U**	**3.50 U**	**3.50 U**	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	**5.90 U**	**80.0 U**	< 10.0 U	< 10.0 U	**98.0**	< 10.0 U	< 10.0 U
Mercury	0.7	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U
Nickel	100	**3.10 J**	< 10.0 U	**5.50 J**	**3800**	**140**	< 10.0 U	**4.80 U**	**5.20 U**	**5.30 U**	< 10.0 U	< 10.0 U	< 10.0 U	**4.90 U**	< 10.0 U	**17.0 U**	< 10.0 U	< 10.0 U	**35.0**	< 10.0 U	< 10.0 U
Potassium		**9600**	**1500 J**	**1400 J**	**1400 J**	**1000 J**	**1500 J**	**2100 U**	**2100 U**	**1900 U**	**1600 U**	**1400 U**	**1200 U**	**1100 U**	**7300 U**	**47000 U**	**43000 U**	**1000 U**	**26000**	**21000**	**14000**
Selenium	10	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U
Silver	50	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U
Sodium	20000	**29000**	**21000**	**20000**	**30000**	**14000**	**11000**	**34000 U**	**35000 U**	**36000 U**	**22000 U**	**14000 U**	**11000 U**	**13000 U**	**18000 U**	**42000 U**	**18000 U**	**7000 U**	**23000**	**25000**	**26000**
Thallium	0.5	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U
Vanadium		< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U
Zinc	2000	< 10.0 U	< 10.0 U	**12.0**	**6.20 J**	**45.0**	< 10.0 U	< 10.0 U	< 10.0 U	**4.10 U**	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	**17.0 U**	**5.30 U**	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U
PFAS Compounds (mg/l)																					
Total Suspended Solids		< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U	< 10000 U
PFAS Compounds (ng/l)																					
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F53B		< 3.70 U	< 3.70 U	< 4.00 U	< 4.10 U	< 4.10 U	< 4.00 U	< 4.40 U	< 4.60 U	< 4.20 U	< 4.30 U	< 3.80 U	< 3.70 U	< 4.20 U	< 4.20 U	< 4.20 U	< 4.20 U	< 3.80 U	< 3.60 U	< 3.80 U	< 3.90 U
1H,1H, 2H, 2H-Perfluorohexane sulfonic acid (4:2 FTS)		< 3.70 U	< 3.70 U	< 4.00 U	< 4.10 U	< 4.10 U	< 4.00 U	< 4.40 U	< 4.60 U	< 4.20 U	< 4.30 U	< 3.80 U	< 3.70 U	< 4.20 U	< 4.20 U	< 4.20 U	< 4.20 U	< 3.80 U	< 3.60 U	< 3.80 U	< 3.90 U
1H,1H, 2H, 2H-Perfluorooctane sulfonic acid (6:2 FTS)		< 3.70 U	< 3.70 U	< 4.00 U	< 4.10 U	< 4.10 U	< 4.00 U	< 4.40 U	< 4.60 U	< 4.20 U	< 4.30 U	< 3.80 U	< 3.70 U	< 4.20 U	< 4.20 U	< 4.20 U	< 4.20 U	< 3.80 U	< 3.60 U	< 3.80 U	< 3.90 U
1H,1H,2H,2H-Perfluorodecanessulfonic acid (8:2 FTS)		< 3.70 U	< 3.70 U	< 4.00 U	< 4.10 U	< 4.10 U	< 4.00 U	< 4.40 U	< 4.60 U	< 4.20 U	< 4.30 U	< 3.80 U	< 3.70 U	< 4.20 U	< 4.20 U	< 4.20 U	< 4.20 U	< 3.80 U	< 3.60 U	< 3.80 U	< 3.90 U
3:3FTCA		< 9.30 U	< 9.20 U	< 10.0 U	< 10.0 U	< 10.0 U	< 9.90 U	< 11.0 U	< 11.0 U	< 11.0 U	< 11.0 U	< 9.60 U	< 9.10 U	< 11.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 9.50 U	< 9.10 U	< 9.50 U	< 9.60 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)		< 3.70 U	< 3.70 U	< 4.00 U	< 4.10 U	< 4.10 U	< 4.00 U	< 4.40 U	< 4.60 U	< 4.20 U	< 4.30 U	< 3.80 U	< 3.70 U	< 4.20 U	< 4.20 U	< 4.20 U	< 4.20 U	< 3.80 U	< 3.60 U	< 3.80 U	< 3.90 U
5:3FTCA		< 47.0 U	< 46.0 U	< 50.0 U	< 51.0 U	< 51.0 U	< 49.0 U	< 56.0 U	< 57.0 U	< 53.0 U	< 53.0 U	< 48.0 U	< 46.0 U	< 53.0 U	< 52.0 U	< 52.0 U	< 52.0 U	< 48.0 U	< 46.0 U	< 47.0 U	< 48.0 U
7:3FTCA		< 47.0 U	< 46.0 U	< 50.0 U	< 51.0 U	< 51.0 U	< 49.0 U	< 56.0 U	< 57.0 U	< 53.0 U	< 53.0 U	< 48.0 U	< 46.0 U	< 53.0 U	< 52.0 U	< 52.0 U	< 52.0 U	< 48.0 U	< 46.0 U	< 47.0 U	< 48.0 U
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (F53B		< 3.70 U	< 3.70 U	< 4.00 U	< 4.10 U	< 4.10 U	< 4.00 U	< 4.40 U	< 4.60 U	< 4.20 U	< 4.30 U	< 3.80 U	< 3.70 U	< 4.20 U	< 4.20 U	< 4.20 U	< 4.20 U	< 3.80 U	< 3.60 U	< 3.80 U	< 3.90 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)		< 3.70 U	< 3.70 U	< 4.00 U	< 4.10 U	< 4.10 U	< 4.00 U	< 4.40 U	< 4.60 U	< 4.20 U	< 4.30 U	< 3.80 U	< 3.70 U	< 4.20 U	< 4.20 U	< 4.20 U	< 4.20 U	< 3.80 U	< 3.60 U	< 3.80 U	< 3.90 U
N-ethyl perfluorooctanesulfonamide (NEtFOSA)		< 0.930 U	< 0.920 U	< 1.00 U	< 1.00 U	< 1.00 U	< 0.990 U	< 1.10 U	< 1.10 U	< 1.10 U	< 1.10 U	< 0.960 U	< 0.910 U	< 1.10 U	< 1.00 U	< 1.00 U	< 1.00 U	< 0.950 U	< 0.910 U	< 0.950 U	< 0.960 U
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)		< 0.930 U	< 0.920 U	< 1.00 U	< 1.00 U	< 1.00 U	< 0.990 U	< 1.10 U	< 1.10 U	< 1.10 U	< 1.10 U	< 0.960 U	< 0.910 U	< 1.10 U	< 1.00 U	< 1.00 U	< 1.00 U	< 0.950 U	< 0.910 U	< 0.950 U	< 0.960 U
N-ethyl perfluorooctanesulfonamidoethanol (NEtFOSE)		< 9.30 U	< 9.20 U	< 10.0 U	< 10.0 U	< 10.0 U	< 9.90 U	< 11.0 U	< 11.0 U	< 11.0 U	< 11.0 U	< 9.60 U	< 9.10 U	< 11.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 9.50 U	< 9.10 U	< 9.50 U	< 9.60 U
N-methyl perfluorooctanesulfonamide (NMeFOSA)		< 0.930 U	< 0.920 U	< 1.00 U	< 1.00 U	< 1.00 U	< 0.990 U	< 1.10 U	< 1.10 U	< 1.10 U	< 1.10 U	< 0.960 U	< 0.910 U	< 1.10 U	< 1.00 U	< 1.00 U	< 1.00 U	< 0.950 U	< 0.910 U	< 0.950 U	< 0.960 U
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)		< 0.930 U	< 0.920 U	< 1.00 U	< 1.00 U	< 1.00 U	< 0.990 U	< 1.10 U	< 1.10 U	< 1.10 U	< 1.10 U	< 0.960 U	< 0.910 U	< 1.10 U	< 1.00 U	< 1.00 U	< 1.00 U	< 0.950 U	< 0.910 U	< 0.950 U	< 0.960 U
N-methyl perfluorooctanesulfonamidoethanol (NMeFOSE)		< 9.30 U	< 9.20 U	< 10.0 U	< 10.0 U	< 10.0 U	< 9.90 U	< 11.0 U	< 11.0 U	< 11.0 U	< 11.0 U	< 9.60 U	< 9.10 U	< 11.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 9.50 U	< 9.10 U	< 9.50 U	< 9.60 U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)		< 1.90 U	< 1.80 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.20 U	< 2.30 U	< 2.10 U	< 2.10 U	< 1.90 U	< 1.80 U	< 2.10 U	< 2.10 U	< 2.10 U	< 2.10 U	< 1.90 U	< 1.80 U	< 1.90 U	< 1.90 U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)		< 1.90 U	< 1.80 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.20 U	< 2.30 U	< 2.10 U	< 2.10 U	< 1.90 U	< 1.80 U	< 2.10 U	< 2.10 U	< 2.10 U	< 2.10 U	< 1.90 U	< 1.80 U	< 1.90 U	< 1.90 U
Perfluoro-3-methoxypropanoic acid (PFMPA)		< 1.90 U	< 1.80 U	**2.80**	< 2.00 U	< 2.00 U	< 2.00 U	< 2.20 U	< 2.30 U	< 2.10 U	< 2.10 U	< 1.90 U	< 1.80 U	< 2.10 U	< 2.10 U	< 2.10 U	< 2.10 U	< 1.90 U	< 1.80 U	< 1.90 U	< 1.90 U
Perfluoro-4-methoxybutanoic acid (PFMBA)		< 1.90 U	< 1.80 U	**0.720 J**	< 2.00 U	< 2.00 U	< 2.00 U	< 2.20 U	< 2.30 U	< 2.10 U	< 2.10 U	< 1.90 U	< 1.80 U	< 2.10 U	< 2.10 U	< 2.10 U	< 2.10 U	< 1.90 U	< 1.80 U	< 1.90 U	< 1.90 U
Perfluorobutanesulfonic acid (PFBS)		**5.70**	**1.00**	**0.950 J**	**5.00**	**2.50**	**0.430 J**	**3.00**	**3.10**	**2.70**	**2.70**	**1.10**	< 0.910 U	**0.650 J**	**1.10**	**2.40**	**1.40**	< 0.950 U	**3.50**	**2.50**	**3.40**
Perfluorobutanoic acid (PFBA)		**7.40**	**6.80**	**13.0**	**3.40 J**	< 4.10 U	< 4.00 U	**4.90**	**5.20**	**4.30**	**3.40 J**	< 3.80 U	< 3.70 U	< 4.20 U	**4.20 J**	**7.20**	**2.50 J**	< 3.80 U	**9.10**	**4.00**	**3.70 J**
Perfluorodecanesulfonic acid (PFDS)		< 0.930 U	< 0.920 U	< 1.00 U	< 1.00 U	< 1.00 U	< 0.990 U	< 1.10 U	< 1.10 U	< 1.10 U	< 1.10 U	< 0.960 U	< 0.910 U	< 1.10 U	< 1.00 U	< 1.00 U	< 1.00 U	< 0.950 U	< 0.910 U	< 0.950 U	< 0.960 U
Perfluorodecanoic acid (PFDA)		**1.10**	**0.530 J**	**1.60**	**2.50**	**4.00**	**0.430 J**	< 1.10 U	< 1.10 U	**0.230 J**	< 1.10 U	**0.260 J**	**0.510 J**	< 1.10 U	< 1.00 U	**0.420 J**	< 1.00 U	< 0.950 U	**0.870 J**	**0.600 J**	**0.540 J**
Perfluorododecane sulfonate (PFDoDS)		< 0.930 U	< 0.920 U	< 1.00 U	< 1.00 U	< 1.00 U	< 0.990 U	< 1.10 U	< 1.10 U	< 1.10 U	< 1.10 U	< 0.960 U	< 0.910 U	< 1.10 U	< 1.00 U	< 1.00 U	< 1.00 U	< 0.950 U	< 0.910 U	< 0.950 U	< 0.960 U
Perfluorododecanoic acid (PFDoA)		**0.210 J**	**1.20**	**4.60**	< 1.00 U	< 1.00 U	< 0.990 U	< 1.10 U	< 1.10 U	< 1.10 U	< 1.10 U	< 0.960 U	< 0.910 U	< 1.10 U	< 1.00 U	< 1.00 U	< 1.00 U	< 0.950 U	< 0.910 U	< 0.950 U	< 0.960 U
Perfluoroheptanesulfonic acid (PFHpS)		< 0.930 U	< 0.920 U	< 1.00 U	< 1.00 U	< 1.00 U	< 0.990 U	**0.400 J**	**0.400 J**	< 1.10 U	< 1.10 U	< 0.960 U	< 0.910 U	< 1.10 U	< 1.00 U	< 1.00 U	< 1.00 U	< 0.950 U	< 0.910 U	< 0.950 U	< 0.960 U
Perfluoroheptanoic acid (PFHpA)		**7.70**	**3.20**	**3.80**	**3.10**	**3.30**	< 0.990 U	**2.90**	**3.10**	**2.80**	**1.20**	**0.300 J**	< 0.910 U	< 1.10 U	**2.10**	**2.70**	**0.730 J**	< 0.950 U	**3.40**	**3.10**	**3.20**
Perfluorohexanesulfonic acid (PFHxS)		**2.50**	**2.10**	**2.80**	**2.00**	**1.10**	**1.30**	**7.20 J+**	**7.70 J+**	**5.50 J+**	**2.40 J+**	**1.10 J+**	< 0.910 U	**1.60 J+**	**4.00 J+**	**4.30 J+**	**1.10 J+**	**0.270 J+**	**12.0**	**8.40**	**6.10**
Perfluorohexanoic acid (PFHxA)		**33.0**	**8.30**	**9.10**	**3.50**	**4.20**	**0.480 J**	**8.40**	**9.10**	**8.50**	**3.40**	**0.680 J**	< 0.910 U	**0.810 J**	**5.30**	**9.00**	**3.70**	< 0.950 U	**10.0**	**7.80**	**8.50**
Perfluorononane sulfonic acid (PFNS)		< 0.930 U	< 0.920 U	< 1.00 U	< 1.00 U	< 1.00 U	< 0.990 U	< 1.10 U	< 1.10 U	< 1.10 U	< 1.10 U	< 0.960 U	< 0.910 U	< 1.10 U	< 1.00 U	< 1.00 U	< 1.00 U	< 0.950 U	< 0.910 U	< 0.950 U	< 0.960 U
Perfluorononanoic acid (PFNA)		**0.830 J**	**0.300 J**	**3.00**	< 1.00 U	< 1.00 U	< 0.990 U	**0.380 J**	**0.370 J**	**0.350 J**	**0.280 J**	**0.240 J**	**0.290 J**	< 1.10 U	< 1.00 U	**0.230 J**	< 1.00 U	< 0.950 U	**0.260 J**	**0.250 J**	**0.470 J**
Perfluorooctane Sulfonamide (PFOSA)		< 0.930 U	< 0.920 U	**0.280 J**	< 1.00 U	< 1.00 U	< 0.990 U	< 1.10 U	< 1.10 U	< 1.10 U	< 1.10 U	< 0.960 U	< 0.910 U	**0.310 J**	< 1.00 U	< 1.00 U	< 1.00 U	< 0.950 U	< 0.910 U	< 0.950 U	< 0.960 U
Perfluorooctanesulfonic acid (PFOS)	2.7	**0.660 J**	**0.480 J**	< 1.00 U	**1.90**	< 1.00 U	< 0.990 U	**7.80**	**7.90**	**8.30**	**3.00**	**0.650 J**	< 0.910 U	< 1.10 U	**0.680 J**	**4.10**	**0.640 J**	< 0.950 U	**1.20**	**1.60**	**1.30 J**
Perfluorooctanoic acid (PFOA)	6.7	**12.0**	**11.0**	**11.0**	**6.30**	**17.0**	**0.860 J**	**8.60**	**9.00**	**7.70**	**4.00**	**1.40**	**0.530 J**	**1.10**	**3.10**	**5.90**	**1.20**	**0.330 J**	**4.40**	**5.90**	**6.80**
Perfluoropentane sulfonate (PFPeS)		< 0.930 U	**0.510 J**	**0.660 J**	**0.350 J**	**0.390 J**	**0.380 J**	**0.720 J**	**0.760 J**	**0.640 J**	**0.360 J**	**0.330 J**	< 0.910 U	**0.620 J**	**0.690 J**	**0.980 J**	**0.870 J**	< 0.950 U	**1.50**	**1.00**	**1.10**
Perfluoropentanoic acid (PFPeA)		**17.0**	**11.0**	**16.0**	**4.20**	**5.40**	< 2.00 U	**8.40**	**9.00**	**8.60**	**3.40**	**0.820 J**	< 1.80 U	**0.580 J**	**5.40**	**9.10**	**4.10**	< 1.90 U	**11.0**	**7.20**	**7.30**
Perfluorotetradecanoic acid (PFTeDA)		< 0.930 U	< 0.920 U	**2.00**	< 1.00 U	< 1.00 U	< 0.990 U	< 1.10 U	< 1.10 U	< 1.10 U	< 1.10 U	< 0.960 U	< 0.910 U	< 1.10 U	< 1.00 U	< 1.00 U	< 1.00 U	< 0.950 U	< 0.910 U	< 0.950 U	< 0.960 U
Perfluorotridecanoic acid (PFTrDA)		< 0.930 U	< 0.920 U	**4.00**	< 1.00 U	< 1.00 U	< 0.990 U	< 1.10 U	< 1.10 U	< 1.10 U	< 1.10 U	< 0.960 U	< 0.910 U	< 1.10 U	< 1.00 U	< 1.00 U	< 1.00 U	< 0.950 U	< 0.910 U	< 0.950 U	< 0.960 U
Perfluoroundecanoic acid (PFUnA)		**1.30**	**3.20**	**7.50**	**0.240 J**	**0.360 J**	**0.720 J**	< 1.10 U	< 1.10 U	< 1.10 U	< 1.10 U	**0.260 J**	**0.620 J**	< 1.10 U	< 1.00 U	< 1.00 U	< 1.00 U	< 0.950 U	**0.460 J**	**0.470 J**	**0.520 J**
Semivolatile Organic Compounds (SVOCs) (µg/l)																					
1,4-Dioxane	0.35	< 0.190 U	< 0.190 U	**0.210**	**0.0680 J**	**0.110 J**	**0.450**	**0.0930 U**	**0.0860 U**	**0.0820 U**	**0.0950 U**	**0.180 U**	**0.560 U**	**0.100 U**	**0.120 U**	**0.220 U**	**0.730 U**	**0.260 U**	**0.210**	**0.190 J**	**0.280**
TOC (ug/l)																					
Total Organic Carbon		**6700**	< 1000 U	**660 J**	**760 J**	**740 J**	< 1000 U	**780 U**	**670 U**	**690 U**	**540 U**	< 1000 U	< 1000 U	**540 U**	**1400 U**	**2000 U**	**720 U**	< 1000 U	**2300**	**890 J**	**780 J**

Table 6A
Comprehensive Groundwater Sampling Results
March-April 2024
Lawrence Aviation Industries
Port Jefferson Station, New York

ID:		MPW-05B	MPW-05C	MPW-05D	MPW-06A	MPW-06B	MPW-06D	MPW-08A	MPW-08A	MPW-08B	MPW-08C	MPW-08D	MPW-08E	MPW-09A	MPW-09B	MPW-09C	MPW-09D	MPW-09E	MPW-10A	MPW-10B	MPW-10C
Sample ID:		MPW-05B	MPW-05C	MPW-05D	MPW-06A	MPW-06B	MPW-06D	MPW-08A	MPW-08ADUP	MPW-08B	MPW-08C	MPW-08D	MPW-08E	MPW-09A	MPW-09B	MPW-09C	MPW-09D	MPW-09E	MPW-10A	MPW-10B	MPW-10C
Date Collected:		04/09/2024	04/08/2024	04/08/2024	04/02/2024	04/02/2024	04/02/2024	03/26/2024	03/26/2024	03/26/2024	03/27/2024	03/27/2024	03/27/2024	03/27/2024	03/27/2024	03/27/2024	03/27/2024	03/27/2024	04/09/2024	04/09/2024	04/09/2024
Lab Report Number:		24D1463	24D1463	24D1463	24D0341	24D0341	24D0341	24C3451	24C3451	24C3451	24C3451	24C3451	24C3451	24C3451	24C3451	24C3451	24C3451	24C3451	24D1463	24D1463	24D1463
Sample Type:		N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N
Parameter	NYDEC Class GA Criteria																				
Volatile Organic Compounds (VOCs) (µg/l)																					
1,1,1,2-Tetrachloroethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,1,1-Trichloroethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	**0.460 J**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	**0.590 U**	< 0.500 U	< 0.500 U	< 0.500 U	**0.500 U**	**0.210 U**	< 0.500 U	< 0.500 U	< 0.500 U
1,1,2,2-Tetrachloroethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,1,2-Trichloroethane	1	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,1,2-Trichlorotrifluoroethane (Freon 113)	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	**0.910**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	**0.190 U**	**0.940 U**	< 0.500 U	< 0.500 U	**0.190 U**	**1.10 U**	**0.400 U**	< 0.500 U	< 0.500 U	< 0.500 U
1,1-Dichloroethene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	**0.310 J**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	**0.310 U**	< 0.500 U	< 0.500 U	< 0.500 U	**0.310 U**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,1-Dichloropropylene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2,3-Trichlorobenzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2,3-Trichloropropane	0.04	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	**0.130 U**	**0.120 U**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2,4-Trichlorobenzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2,4-Trimethylbenzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2-Dibromo-3-chloropropane	0.04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (EDB) (ethylene dibromide)	0.0006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	3	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2-Dichloroethane	0.6	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2-Dichloropropane	1	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,3,5-Trichlorobenzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,3,5-trimethyl-benzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,3-Dichlorobenzene	3	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,3-Dichloropropane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,3-Dichloropropene	0.4	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U
1,4-Dichlorobenzene	3	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,4-Dioxane	0.35	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2-Dichloropropane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
2-Butanone (MEK)	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorotoluene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
2-Hexanone (Methyl butyl ketone/MBK)	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorotoluene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
4-Isopropyltoluene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Acetone	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	1	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Bromobenzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Bromochloromethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Bromodichloromethane	50	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Bromoform	50	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Bromomethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Carbon disulfide	60	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Chlorobenzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Chloroethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Chloroform	7	< 0.500 U	< 0.500 U	**0.260 J**	< 0.500 U	< 0.500 U	**0.470 J**	**0.640 U**	**0.610 U**	**0.500 U**	**0.410 U**	**0.410 U**	**0.360 U**	**0.270 U**	< 0.500 U	**0.270 U**	**0.480 U**	**0.280 U**	< 0.500 U	**0.450 J**	**0.600**
Chloromethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
cis-1,2-Dichloroethene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	**0.720 U**	**1.00 U**	< 0.500 U	**0.160 J**	< 0.500 U	< 0.500 U
cis-1,3-Dichloropropene	0.4	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Cyclohexane		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	50	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Dibromomethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Dichlorodifluoromethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Ethylbenzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Hexachloro-1,3-butadiene	0.5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Isopropylbenzene		< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
m,p-Xylene		< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U
Methyl acetate		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl isobutyl ketone (MIBK)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Methyltertbutyl ether	10	< 0.500 U	**0.270 J**	**0.680**	**0.150 J**	**0.220 J**	**0.130 J**	< 0.500 U	**0.160 U**	**0.270 U**	**0.210 U**	**0.240 U**	< 0.500 U	**0.140 U**	**0.830 U**	**0.430 U**	**0.220 U**	< 0.500 U	< 0.500 U	**0.180 J**	**0.170 J**
Naphthalene	10	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U
n-Butylbenzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
n-Propylbenzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
o-Xylene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
sec-Butylbenzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Styrene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
tert-Butylbenzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Tetrachloroethene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	**0.350 J**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	**0.210 U**	**2.70 U**	**12.0 U**	**4.20 U**	< 0.500 U	**1.50**	**1.20**	**0.840**
Tetrahydrofuran	50	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U
Toluene	5	< 0.500 U	< 0.500 U	**0.180 J**	< 0.500 U	**2.00**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Total Xylenes		< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U
trans-1,2-Dichloroethene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
trans-1,3-Dichloropropene	0.4	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Trichloroethene	5	< 0.500 U	< 0.500 U	**0.230 J**	< 0.500 U	**1.40**	**7.20**	< 0.500 U	**0.180 U**	**0.430 U**	**1.90 U**	**4.90 U**	**2.00 U**	**7.30 U**	**27.0 U**	**42.0 U**	**70.0 U**	**0.600 U**	**2.70**	**1.90**	**0.760**
Trichlorofluoromethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Vinyl chloride	2	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U

Legend	
<1	Parameter not detected above the laboratory reporting limit
1	Parameter reported at a concentrations greater than NYSDEC Class GA Criteria
1	Parameter reported above the laboratory reporting limit but below the applicable regulatory standard/criterion

Notes:
µg/l = micrograms per liter
NA = Not Analyzed
NP = not promulgated/ no applicable cleanup criteria
NYSDEC = New York State Department of Environmental Conservation
R = Data are rejected and not usable of any purpose

Table 6A
Comprehensive Groundwater Sampling Results
March-April 2024
Lawrence Aviation Industries
Port Jefferson Station, New York

ID:		MPW-10D	MW-05	MW-ISCO-5	MW-PD-11	MW-PD-12	MW-PD-13	MW-PD-14	MW-PD-15	MW-PD-16	MW-PD-16	MW-PD-17	PZ-01	PZ-04	PZ-05	PZ-07	SDW-1
Sample ID:		MPW-10D	MW-05	MW-ISCO-5	MW-PD-11	MW-PD-12	MW-PD-13	MW-PD-14	MW-PD-15	MW-PD-16	MW-PD-16-DUP	MW-PD-17	PZ-01	PZ-04	PZ-05	PZ-07	SDW-1
Date Collected:		04/09/2024	04/09/2024	04/08/2024	04/05/2024	04/03/2024	04/02/2024	04/03/2024	04/02/2024	04/03/2024	04/04/2024	04/02/2024	04/04/2024	04/04/2024	04/03/2024	04/04/2024	03/27/2024
Lab Report Number:		24D1463	24D1463	24D1463	24D0932	24D0681	24D0341	24D0681	24D0341	24D0681	24D0681	24D0341	24D0681	24D0681	24D0681	24D0681	24C3451
Sample Type:		N	N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N
Parameter	NYDEC Class GA Criteria																
Anions (µg/l)																	
Chloride	250000	**49000**	**8600**	**18000**	**49000 U**	**21000**	**35000**	**73000 D**	**26000**	**27000 D**	**26000 D**	**46000**	**54000 D**	**19000**	**37000**	**12000**	**31000 U**
Fluorides	1500	**150**	< 100 U	**5000**	< 100 U	**9300 D**	< 100 U	< 100 U	< 100 U	**1200 D**	**1200 D**	< 100 U	< 100 U	**1700**	**900**	**68.0 J**	**150 U**
Sulfate	250000	**26000**	**15000**	**26000**	**21000 U**	**21000**	**19000**	**16000**	**18000**	**30000 D**	**29000 D**	**18000**	**13000**	**28000**	**19000**	**18000**	**13000 U**
GenChem (ug/l)																	
Alkalinity, Bicarbonate (As CaCO3)		NA	**31000**	**54000**	**22000 U**	**61000**	**41000**	**21000**	**51000**	NA	NA	**44000**	NA	**44000**	NA	**29000**	**200000 U**
Alkalinity, Carbonate (As CaCO3)		**18000**	NA	NA	NA	NA	NA	NA	NA	**14000**	**13000**	NA	**9500**	NA	**16000**	NA	NA
Ammonia	2000	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	**840**	**980**	< 300 U	< 300 U	< 300 U	< 300 U	< 300 U	**840 U**
Nitrogen, Kjeldahl, Total		< 1000 U	**1100**	< 1000 U	< 1000 U	**1700**	< 1000 U	**2200**	< 1000 U	**1100**	**1100**	< 1000 U	< 1000 U	< 1000 U	< 1000 U	< 1000 U	**1100 U**
pH		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids		**100000**	**32000**	**100000**	**190000 U**	**180000**	**68000**	**180000**	**150000**	**150000**	**160000**	**160000**	**170000**	**170000**	**150000**	**88000**	**270000 U**
Total Suspended Solids		< 2500 U	**7600**	< 2500 U	**4200 U**	**11000**	**10000**	< 2500 U	**17000**	**22000**	**24000**	< 2500 U	**8300**	**2500**	**87000**	**44000**	**8200 U**
Total Metals (mg/l)																	
Aluminum		< 50.0 U	**96.0**	**330**	**45.0 U**	**2600**	< 50.0 U	**62.0**	**190**	**810**	**830**	< 50.0 U	**200**	**40.0 J**	**4400**	**430**	**30.0 U**
Antimony	3	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U
Arsenic	25	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	**220 U**
Barium	1000	**70.0**	**21.0 J**	**29.0 J**	**91.0 U**	**46.0 J**	**92.0**	**70.0**	**120**	**140**	**140**	**140**	**71.0**	**53.0**	**88.0**	**23.0 J**	**30.0 U**
Beryllium	3	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	**1.60 J**	< 4.00 U	< 4.00 U	< 4.00 U	**3.60 J**	**3.60 J**	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U
Cadmium	5	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U	< 4.00 U
Calcium		**18000**	**9700**	**20000**	**17000 U**	**11000**	**15000**	**15000**	**21000**	**14000**	**14000**	**23000**	**11000**	**14000**	**14000**	**9400**	**63000 U**
Chromium	50	< 10.0 U	< 10.0 U	**14.0**	**80.0 U**	**200**	**880**	**590**	**130**	**110**	**120**	**100**	**15.0**	**19.0**	**140**	**32.0**	< 10.0 U
Cobalt		< 10.0 U	< 10.0 U	< 10.0 U	**3.10 U**	**3.30 J**	**2.50 J**	**42.0**	**1.80 J**	< 10.0 U	< 10.0 U	**1.80 J**	< 10.0 U	< 10.0 U	**6.40 J**	< 10.0 U	< 10.0 U
Copper	200	< 10.0 U	< 10.0 U	< 10.0 U	**23.0 U**	**6.80 J**	**16.0**	**63.0**	**9.60 J**	< 10.0 U	< 10.0 U	**10.0 J**	< 10.0 U	< 10.0 U	**21.0**	**18.0**	< 10.0 U
Iron	300	< 50.0 U	**210**	**150**	**480 U**	**870 J-**	**3600**	**640 J-**	**940**	**550 J-**	**570 J-**	**460**	**410 J-**	**68.0 J-**	**5000**	**800 J-**	**4800 U**
Lead	25	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U
Magnesium	35000	**9400**	**4200**	**9400**	**8800 U**	**5800**	**7300**	**3300**	**9900**	**6100**	**6200**	**8300**	**4000**	**7000**	**6400**	**4100**	**8500 U**
Manganese	300	**3.70 J**	**5.50 J**	**35.0**	**76.0 U**	**61.0**	**28.0**	**520**	**19.0**	**24.0**	**23.0**	**22.0**	**11.0**	< 10.0 U	**170**	**12.0**	**430 U**
Mercury	0.7	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.200 U
Nickel	100	< 10.0 U	**4.70 J**	**6.40 J**	**160 U**	**210**	**64.0**	**2800**	**13.0**	**5.80 J**	**5.50 J**	**100**	**9.90 J**	**3.80 J**	**63.0**	**23.0**	< 10.0 U
Potassium		**8800**	**1000 J**	**8700**	**3500 U**	**36000**	**1400 J**	**8100**	**4800**	**8700**	**8800**	**1600 J**	**3600**	**9800**	**4800**	**2100**	**10000 U**
Selenium	10	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U
Silver	50	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	**2.80 J**	< 10.0 U	< 10.0 U	< 10.0 U
Sodium	20000	**29000**	**5700**	**19000**	**26000 U**	**19000**	**25000**	**32000**	**22000**	**24000**	**24000**	**25000**	**32000 J-**	**19000**	**20000**	**10000**	**26000 U**
Thallium	0.5	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U	< 50.0 U
Vanadium		< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	< 10.0 U	**10.0**	< 10.0 U	< 10.0 U
Zinc	2000	< 10.0 U	< 10.0 U	**18.0**	**14.0 U**	**22.0**	**43.0 B**	**130**	**31.0 B**	**55.0**	**57.0**	< 10.0 U	**4.60 J**	< 10.0 U	**78.0**	**17.0**	< 10.0 U
PFAS Compounds (mg/l)																	
Total Suspended Solids		< 10000 U	**26000**	< 10000 U	< 10000 U	**24000**	< 10000 U	< 10000 U	< 10000 U	**16000**	**24000**	< 10000 U	< 10000 U	< 10000 U	**230000**	**48000**	< 10000 U
PFAS Compounds (ng/l)																	
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F53B		< 3.50 U	< 3.80 U	< 3.80 U	< 3.60 U	< 3.80 U	< 3.90 U	< 3.80 U	< 3.80 U	< 3.80 U	< 3.90 U	< 3.60 U	< 3.90 U	< 3.80 U	< 20.0 U	< 3.50 U	< 3.90 U
1H,1H, 2H, 2H-Perfluorohexane sulfonic acid (4:2 FTS)		< 3.50 U	< 3.80 U	< 3.80 U	< 3.60 U	< 3.80 U	< 3.90 U	< 3.80 U	< 3.80 U	< 3.80 U	< 3.90 U	< 3.60 U	< 3.90 U	< 3.80 U	< 20.0 U	< 3.50 U	< 3.90 U
1H,1H, 2H, 2H-Perfluorooctane sulfonic acid (6:2 FTS)		< 3.50 U	< 3.80 U	< 3.80 U	< 3.60 U	< 3.80 U	< 3.90 U	< 3.80 U	< 3.80 U	< 3.80 U	< 3.90 U	< 3.60 U	**9.20**	< 3.80 U	**20.0 J**	**25.0**	**12.0**
1H,1H,2H,2H-Perfluorodecanessulfonic acid (8:2 FTS)		< 3.50 U	< 3.80 U	< 3.80 U	< 3.60 U	< 3.80 U	< 3.90 U	< 3.80 U	< 3.80 U	< 3.80 U	< 3.90 U	< 3.60 U	< 3.90 U	< 3.80 U	< 20.0 U	< 3.50 U	< 3.90 U
3:3FTCA		< 8.80 U	< 9.40 U	< 9.40 U	< 9.00 U	< 9.50 U	< 9.60 U	< 9.50 U	< 9.60 U	< 9.60 U	< 9.70 U	< 8.90 U	< 9.70 U	< 9.50 U	< 51.0 U	< 8.90 U	< 9.70 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)		< 3.50 U	< 3.80 U	< 3.80 U	< 3.60 U	< 3.80 U	< 3.90 U	< 3.80 U	< 3.80 U	< 3.80 U	< 3.90 U	< 3.60 U	< 3.90 U	< 3.80 U	< 20.0 U	< 3.50 U	< 3.90 U
5:3FTCA		< 44.0 U	< 47.0 U	< 47.0 U	< 45.0 U	< 47.0 U	< 48.0 U	< 48.0 U	< 48.0 U	< 48.0 U	< 49.0 U	< 44.0 U	< 49.0 U	< 48.0 U	< 250 U	< 44.0 U	< 49.0 U
7:3FTCA		< 44.0 U	< 47.0 U	< 47.0 U	< 45.0 U	< 47.0 U	< 48.0 U	< 48.0 U	< 48.0 U	< 48.0 U	< 49.0 U	< 44.0 U	< 49.0 U	< 48.0 U	< 250 U	< 44.0 U	< 49.0 U
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acd (F53B		< 3.50 U	< 3.80 U	< 3.80 U	< 3.60 U	< 3.80 U	< 3.90 U	< 3.80 U	< 3.80 U	< 3.80 U	< 3.90 U	< 3.60 U	< 3.90 U	< 3.80 U	< 20.0 U	< 3.50 U	< 3.90 U
Hexafluoropropylene oxide dimer acid (HFPO-DA)		< 3.50 U	< 3.80 U	< 3.80 U	< 3.60 U	< 3.80 U	< 3.90 U	< 3.80 U	< 3.80 U	< 3.80 U	< 3.90 U	< 3.60 U	< 3.90 U	< 3.80 U	< 20.0 U	< 3.50 U	< 3.90 U
N-ethyl perfluorooctanesulfonamide (NEtFOSA)		< 0.880 U	< 0.940 U	< 0.940 U	< 0.900 U	< 0.950 U	< 0.960 U	< 0.950 U	< 0.960 U	< 0.960 U	< 0.970 U	< 0.890 U	< 0.970 U	< 0.950 U	< 5.10 U	< 0.890 U	< 0.970 U
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)		< 0.880 U	< 0.940 U	< 0.940 U	< 0.900 U	< 0.950 U	< 0.960 U	< 0.950 U	< 0.960 U	< 0.960 U	< 0.970 U	< 0.890 U	< 0.970 U	< 0.950 U	< 5.10 U	< 0.890 U	< 0.970 U
N-ethyl perfluorooctanesulfonamidoethanol (NEtFOSE)		< 8.80 U	< 9.40 U	< 9.40 U	< 9.00 U	< 9.50 U	< 9.60 U	< 9.50 U	< 9.60 U	< 9.60 U	< 9.70 U	< 8.90 U	< 9.70 U	< 9.50 U	< 51.0 U	< 8.90 U	< 9.70 U
N-methyl perfluorooctanesulfonamide (NMeFOSA)		< 0.880 U	< 0.940 U	< 0.940 U	< 0.900 U	< 0.950 U	< 0.960 U	< 0.950 U	< 0.960 U	< 0.960 U	< 0.970 U	< 0.890 U	< 0.970 U	< 0.950 U	< 5.10 U	< 0.890 U	< 0.970 U
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)		< 0.880 U	< 0.940 U	< 0.940 U	< 0.900 U	< 0.950 U	< 0.960 U	< 0.950 U	< 0.960 U	< 0.960 U	< 0.970 U	< 0.890 U	< 0.970 U	< 0.950 U	< 5.10 U	< 0.890 U	< 0.970 U
N-methyl perfluorooctanesulfonamidoethanol (NMeFOSE)		< 8.80 U	< 9.40 U	< 9.40 U	< 9.00 U	< 9.50 U	< 9.60 U	< 9.50 U	< 9.60 U	< 9.60 U	< 9.70 U	< 8.90 U	< 9.70 U	< 9.50 U	< 51.0 U	< 8.90 U	< 9.70 U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)		< 1.80 U	< 1.90 U	< 1.90 U	< 1.80 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.80 U	< 1.90 U	< 1.90 U	< 10.0 U	< 1.80 U	< 1.90 U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)		< 1.80 U	< 1.90 U	< 1.90 U	< 1.80 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.80 U	< 1.90 U	< 1.90 U	< 10.0 U	< 1.80 U	< 1.90 U
Perfluoro-3-methoxypropanoic acid (PFMPA)		< 1.80 U	< 1.90 U	< 1.90 U	< 1.80 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.80 U	< 1.90 U	< 1.90 U	< 10.0 U	< 1.80 U	< 1.90 U
Perfluoro-4-methoxybutanoic acid (PFMBA)		< 1.80 U	< 1.90 U	< 1.90 U	< 1.80 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.90 U	< 1.80 U	< 1.90 U	< 1.90 U	< 10.0 U	< 1.80 U	< 1.90 U
Perfluorobutanesulfonic acid (PFBS)		**3.10**	**1.60**	**0.640 J**	**3.30**	**1.30**	**6.50**	**1.10**	**0.840 J**	**1.10**	**0.870 J**	**1.50**	**1.70**	**1.30**	**5.50**	**2.10**	**5.20**
Perfluorobutanoic acid (PFBA)		**4.10**	< 3.80 U	**2.90 J**	**4.60**	**3.70 J**	**3.60 J**	**9.50**	**3.40 J**	**2.40 J**	**2.80 J**	**3.10 J**	**2.20 J**	**3.60 J**	< 20.0 U	**3.70**	**8.40**
Perfluorodecanesulfonic acid (PFDS)		< 0.880 U	< 0.940 U	< 0.940 U	< 0.900 U	< 0.950 U	< 0.960 U	< 0.950 U	< 0.960 U	< 0.960 U	< 0.970 U	< 0.890 U	< 0.970 U	< 0.950 U	< 5.10 U	< 0.890 U	< 0.970 U
Perfluorodecanoic acid (PFDA)		**0.520 J**	< 0.940 U	< 0.940 U	**0.260 J**	< 0.950 U	< 0.960 U	**1.30**	< 0.960 U	< 0.960 U	< 0.970 U	< 0.890 U	< 0.970 U	< 0.950 U	< 5.10 U	< 0.890 U	**4.00**
Perfluorododecane sulfonate (PFDoDS)		< 0.880 U	< 0.940 U	< 0.940 U	< 0.900 U	< 0.950 U	< 0.960 U	< 0.950 U	< 0.960 U	< 0.960 U	< 0.970 U	< 0.890 U	< 0.970 U	< 0.950 U	< 5.10 U	< 0.890 U	< 0.970 U
Perfluorododecanoic acid (PFDoA)		< 0.880 U	< 0.940 U	< 0.940 U	< 0.900 U	< 0.950 U	< 0.960 U	**0.930 J**	< 0.960 U	< 0.960 U	< 0.970 U	< 0.890 U	< 0.970 U	< 0.950 U	< 5.10 U	< 0.890 U	< 0.970 U
Perfluoroheptanesulfonic acid (PFHpS)		< 0.880 U	< 0.940 U	< 0.940 U	< 0.900 U	< 0.950 U	< 0.960 U	< 0.950 U	< 0.960 U	< 0.960 U	< 0.970 U	< 0.890 U	< 0.970 U	< 0.950 U	< 5.10 U	< 0.890 U	< 0.970 U
Perfluoroheptanoic acid (PFHpA)		**3.60**	**0.790 J**	**0.740 J**	**3.60**	**1.30**	**1.10**	**2.70**	**1.50**	**2.30**	**2.30**	**1.40**	**1.40**	**1.90**	**6.00**	**1.70**	**4.50**
Perfluorohexanesulfonic acid (PFHxS)		**4.00**	**1.30**	**3.20**	**4.20**	**6.00 J+**	**1.00**	**5.50 J+**	**1.80**	**5.20 J+**	**5.20 J+**	**4.90**	**14.0 J+**	**7.00 J+**	< 5.10 U	**0.950 J+**	**3.10 J+**
Perfluorohexanoic acid (PFHxA)		**8.70**	**1.10**	**1.80**	**8.30**	**3.80**	**11.0**	**20.0**	**7.00**	**5.40**	**5.70**	**5.50**	**2.70**	**3.90**	**14.0**	**5.20**	**7.20**
Perfluorononane sulfonic acid (PFNS)		< 0.880 U	< 0.940 U	< 0.940 U	< 0.900 U	< 0.950 U	< 0.960 U	< 0.950 U	< 0.960 U	< 0.960 U	< 0.970 U	< 0.890 U	< 0.970 U	< 0.950 U	< 5.10 U	< 0.890 U	< 0.970 U
Perfluorononanoic acid (PFNA)		**0.380 J**	< 0.940 U	< 0.940 U	**0.450 J**	< 0.950 U	< 0.960 U	**1.30**	< 0.960 U	< 0.960 U	< 0.970 U	< 0.890 U	< 0.970 U	< 0.950 U	< 5.10 U	**0.250 J**	**4.60**
Perfluorooctane Sulfonamide (PFOSA)		< 0.880 U	< 0.940 U	< 0.940 U	< 0.900 U	< 0.950 U	< 0.960 U	< 0.950 U	< 0.960 U	< 0.960 U	< 0.970 U	< 0.890 U	< 0.970 U	< 0.950 U	< 5.10 U	**0.420 J**	< 0.970 U
Perfluorooctanesulfonic acid (PFOS)	2.7	**1.30**	**0.850 J**	**0.690 J**	**2.50**	**0.860 J**	< 0.960 U	**1.30**	**0.500 J**	**0.800 J**	**0.930 J**	**3.70**	**1.40**	**1.30 J**	< 5.10 U	**2.40**	**39.0**
Perfluorooctanoic acid (PFOA)	6.7	**7.10**	**2.20**	**1.20**	**6.90**	**2.60**	**2.40**	**3.10**	**2.50**	**3.80**	**3.60**	**2.00**	**5.80**	**3.80**	**6.70**	**3.20**	**12.0**
Perfluoropentane sulfonate (PFPeS)		**0.860 J**	**0.300 J**	**0.430 J**	**0.990**	**0.650 J**	**0.270 J**	**0.490 J**	**0.660 J**	**0.990**	**0.830 J**	**0.430 J**	< 0.970 U	**0.670 J**	< 5.10 U	< 0.890 U	**0.440 J**
Perfluoropentanoic acid (PFPeA)		**7.80**	**1.00 J**	**1.70 J**	**7.70**	**4.30**	**5.80**	**14.0**	**7.10**	**5.30**	**5.30**	**4.20**	**2.40**	**3.60**	**17.0**	**5.30**	**8.70**
Perfluorotetradecanoic acid (PFTeDA)		< 0.880 U	< 0.940 U	< 0.940 U	< 0.900 U	< 0.950 U	< 0.960 U	< 0.950 U	< 0.960 U	< 0.960 U	< 0.970 U	< 0.890 U	< 0.970 U	< 0.950 U	< 5.10 U	< 0.890 U	< 0.970 U
Perfluorotridecanoic acid (PFTrDA)		< 0.880 U	< 0.940 U	< 0.940 U	< 0.900 U	< 0.950 U	< 0.960 U	**0.600 J**	< 0.960 U	< 0.960 U	< 0.970 U	< 0.890 U	< 0.970 U	< 0.950 U	< 5.10 U	< 0.890 U	< 0.970 U
Perfluoroundecanoic acid (PFUnA)		**0.490 J**	< 0.940 U	< 0.940 U	< 0.900 U	< 0.950 U	< 0.960 U	**2.20**	< 0.960 U	< 0.960 U	< 0.970 U	< 0.890 U	< 0.970 U	< 0.950 U	< 5.10 U	< 0.890 U	< 0.970 U
Semivolatile Organic Compounds (SVOCs) (µg/l)																	
1,4-Dioxane	0.35	**0.220**	< 0.200 U	< 0.200 U	**0.270 U**	**0.0920 J**	**0.0570 J**	**0.100 J**	**0.610**	**0.610**	**0.540**	**0.220**	< 0.190 U	**0.150 J**	< 0.190 U	< 0.190 U	< 0.190 U
TOC (ug/l)																	
Total Organic Carbon		**700 J**	**580 J**	**790 J**	**1200 U**	**1000 J-**	**640 J**	**1300 J-**	**610 J**	**920 J-**	**830 J-**	< 1000 U	**590 J-**	**880 J-**	**1300 J-**	**630 J-**	**5900 U**

Table 6A
Comprehensive Groundwater Sampling Results
March-April 2024
Lawrence Aviation Industries
Port Jefferson Station, New York

ID:		MPW-10D	MW-05	MW-ISCO-5	MW-PD-11	MW-PD-12	MW-PD-13	MW-PD-14	MW-PD-15	MW-PD-16	MW-PD-16	MW-PD-17	PZ-01	PZ-04	PZ-05	PZ-07	SDW-1
Sample ID:		MPW-10D	MW-05	MW-ISCO-5	MW-PD-11	MW-PD-12	MW-PD-13	MW-PD-14	MW-PD-15	MW-PD-16	MW-PD-16-DUP	MW-PD-17	PZ-01	PZ-04	PZ-05	PZ-07	SDW-1
Date Collected:		04/09/2024	04/09/2024	04/08/2024	04/05/2024	04/03/2024	04/02/2024	04/03/2024	04/02/2024	04/03/2024	04/04/2024	04/02/2024	04/04/2024	04/04/2024	04/03/2024	04/04/2024	03/27/2024
Lab Report Number:		24D1463	24D1463	24D1463	24D0932	24D0681	24D0341	24D0681	24D0341	24D0681	24D0681	24D0341	24D0681	24D0681	24D0681	24D0681	24C3451
Sample Type:		N	N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N
Parameter	NYDEC Class GA Criteria																
Volatile Organic Compounds (VOCs) (µg/l)																	
1,1,1,2-Tetrachloroethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,1,1-Trichloroethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	**0.580**	< 2.00 U	< 2.00 U	**0.420 J**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,1,2,2-Tetrachloroethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,1,2-Trichloroethane	1	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,1,2-Trichlorotrifluoroethane (Freon 113)	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	**0.830**	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,1-Dichloroethene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	**0.300 J**	< 2.00 U	< 2.00 U	**0.140 J**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,1-Dichloropropylene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2,3-Trichlorobenzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2,3-Trichloropropane	0.04	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2,4-Trichlorobenzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2,4-Trimethylbenzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2-Dibromo-3-chloropropane	0.04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (EDB) (ethylene dibromide)	0.0006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	3	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2-Dichloroethane	0.6	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,2-Dichloropropane	1	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,3,5-Trichlorobenzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,3,5-trimethyl-benzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,3-Dichlorobenzene	3	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,3-Dichloropropane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,3-Dichloropropene	0.4	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 4.00 U	< 4.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U
1,4-Dichlorobenzene	3	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
1,4-Dioxane	0.35	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2-Dichloropropane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
2-Butanone (MEK)	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorotoluene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
2-Hexanone (Methyl butyl ketone/MBK)	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorotoluene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
4-Isopropyltoluene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Acetone	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	1	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Bromobenzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Bromochloromethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Bromodichloromethane	50	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Bromoform	50	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Bromomethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Carbon disulfide	60	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Chlorobenzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Chloroethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Chloroform	7	**0.640**	< 0.500 U	< 0.500 U	**1.20 U**	< 0.500 U	**0.350 J**	**1.10**	**0.590**	< 2.00 U	< 2.00 U	**0.330 J**	**0.310 J**	< 0.500 U	**2.50**	< 0.500 U	< 0.500 U
Chloromethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
cis-1,2-Dichloroethene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	**0.170 J**	< 0.500 U	< 2.00 U	**0.640 JD**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
cis-1,3-Dichloropropene	0.4	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Cyclohexane		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	50	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Dibromomethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Dichlorodifluoromethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Ethylbenzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Hexachloro-1,3-butadiene	0.5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Isopropylbenzene		< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
m,p-Xylene		< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 4.00 U	< 4.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U
Methyl acetate		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl isobutyl ketone (MIBK)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Methyltertbutyl ether	10	**0.170 J**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	**0.210 J**	**0.250 J**	**0.600 JD**	**0.640 JD**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	**0.250 U**
Naphthalene	10	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 4.00 U	< 4.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U	< 1.00 U
n-Butylbenzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
n-Propylbenzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
o-Xylene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
sec-Butylbenzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Styrene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
tert-Butylbenzene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Tetrachloroethene	5	**0.280 J**	< 0.500 U	**0.450 J**	< 0.500 U	**3.60**	< 0.500 U	**1.50**	**2.90**	**4.40 D**	**4.60 D**	< 0.500 U	< 0.500 U	< 0.500 U	**0.900**	**2.00**	< 0.500 U
Tetrahydrofuran	50	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 8.00 U	< 8.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U	< 2.00 U
Toluene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Total Xylenes		< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 6.00 U	< 6.00 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U	< 1.50 U
trans-1,2-Dichloroethene	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
trans-1,3-Dichloropropene	0.4	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Trichloroethene	5	**0.300 J**	**0.190 J**	**16.0**	< 0.500 U	**96.0 D**	< 0.500 U	**75.0**	**2.80**	**250 D**	**260 D**	**0.180 J**	**0.220 J**	**0.180 J**	**4.30**	**16.0**	< 0.500 U
Trichlorofluoromethane	5	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Vinyl chloride	2	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 2.00 U	< 2.00 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U

Legend	
<1	Parameter not detected above the laboratory reporting limit
1	Parameter reported at a concentrations greater than NYSDEC Class GA Criteria
1	Parameter reported above the laboratory reporting limit but below the applicable regulatory standard/criterion

Notes:
µg/l = micrograms per liter
NA = Not Analyzed
NP = not promulgated/ no applicable cleanup criteria
NYSDEC = New York State Department of Environmental Conservation
R = Data are rejected and not usable of any purpose

Table 6B
Groundwater Sampling Results - Site-related VOCs March - April 2024
Lawrence Aviation Industries Site
Port Jefferson Station, NY

		VOC Analyte	1,1,1-TCA	1,1-DCA	1,1-DCE	1,2,3-TCP	Chloroform	cis-1,2-DCE	Methylcyclo-hexane	MTBE	PCE	Toluene	TCE
		NYSDEC Class GA Criteria	5	5	5	0.04	7	5	NE	10	5	5	5
		Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Well ID:	Date Collected:	Lab Report Number:											
ERT-EW-01	03/28/2024	24C3437	**0.470 J**	**1.10**	**0.420 J**	NA	**0.610 J**	**0.550 J**	< 1.00	**0.320 J**	**1.90**	< 1.00	**49.0**
ERT-EW-02	03/28/2024	24C3437	< 1.00	**0.390 J**	< 1.00	NA	**0.390 J**	**0.480 J**	**0.470 J**	**0.490 J**	**3.70**	< 1.00	**47.0**
ERT-EW-03	03/27/2024	24C3449	< 0.500	< 0.500	< 0.500	< 0.500	**0.250 J**	< 0.500	NA	< 0.500	**0.530**	< 0.500	**7.60**
ERT-EW-04	03/27/2024	24C3451	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	NA	< 0.500	**1.30**	< 0.500	**19.0**
ERT-EW-05	03/26/2024	24C3451	< 0.500	< 0.500	< 0.500	< 0.500	**0.870**	< 0.500	NA	< 0.500	< 0.500	< 0.500	< 0.500
ERT-EW-06	03/28/2024	24C3437	< 2.00	< 2.00	< 2.00	NA	< 4.00	**0.820 JD**	< 2.00	**0.660 JD**	**5.90 D**	< 2.00	**200 D**
ERT-MW-1A	04/02/2024	24D0341	**0.430 J**	**0.780**	**0.250 J**	< 0.500	**0.360 J**	< 0.500	NA	< 0.500	< 0.500	< 0.500	**5.20**
ERT-MW-1B	04/02/2024	24D0344	**0.600**	**1.00**	**0.350 J**	< 0.500	**0.340 J**	< 0.500	NA	< 0.500	< 0.500	< 0.500	**2.10**
ERT-MW-2A	04/01/2024	24D0341	< 0.500	< 0.500	< 0.500	< 0.500	**1.40**	< 0.500	NA	< 0.500	**0.420 J**	< 0.500	**0.360 J**
ERT-MW-2B	04/01/2024	24D0344	**0.280 J**	**0.670**	**0.220 J**	**0.150 J**	**0.390 J**	**0.850**	NA	**0.320 J**	**5.20**	< 0.500	**75.0**
ERT-MW-2C	04/01/2024	24D0344	**0.200 J**	**0.420 J**	< 0.500	< 0.500	**0.310 J**	< 0.500	NA	< 0.500	**0.200 J**	< 0.500	**7.90**
ERT-MW-2D	04/01/2024	24D0341	**0.470 J**	**1.10**	**0.350 J**	**0.230 J**	**0.440 J**	**1.30**	NA	< 0.500	**2.50**	< 0.500	**110 D**
ERT-MW-3	04/02/2024	24D0341	< 0.500	**0.180 J**	< 0.500	< 0.500	**0.590**	< 0.500	NA	**0.460 J**	**0.230 J**	< 0.500	< 0.500
ERT-MW-4A	04/01/2024	24D0341	**0.420 J**	**0.600**	**0.210 J**	< 0.500	**0.270 J**	< 0.500	NA	< 0.500	**0.260 J**	< 0.500	**1.50**
ERT-MW-4B	04/01/2024	24D0344	**0.750**	**1.20**	**0.430 J**	< 0.500	**0.450 J**	**0.210 J**	NA	< 0.500	**0.410 J**	< 0.500	**0.840**
ERT-MW-5A	04/01/2024	24D0344	**0.810**	**1.20**	**0.490 J**	< 0.500	**0.510**	**0.470 J**	NA	**0.150 J**	**0.480 J**	< 0.500	**0.880**
ERT-MW-5B	04/01/2024	24D0341	**1.00**	**1.30**	**0.560**	< 0.500	**0.530**	**0.280 J**	NA	**0.200 J**	**0.430 J**	< 0.500	**0.650**
ERT-MW-6A	03/27/2024	24C3451	**0.400 J**	**0.760**	**0.240 J**	< 0.500	**0.380 J**	**0.180 J**	NA	< 0.500	**0.300 J**	< 0.500	**12.0**
ERT-MW-6B	03/27/2024	24C3451	**0.410 J**	**0.660**	**0.240 J**	< 0.500	**0.350 J**	< 0.500	NA	< 0.500	**0.180 J**	< 0.500	**4.00**
IW-ISCO-10	04/08/2024	24D1463	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	NA	< 0.500	**0.520**	< 0.500	**13.0**
LAI-EW-01	03/28/2024	24C3437	< 1.00	< 1.00	< 1.00	NA	< 2.00	< 1.00	< 1.00	< 1.00	**3.10**	< 1.00	**97.0**
LAI-EW-02	03/28/2024	24C3437	< 1.00	< 1.00	< 1.00	NA	**0.350 J**	< 1.00	< 1.00	< 1.00	**3.20**	< 1.00	**41.0**
LAI-EW-03	03/28/2024	24C3437	< 2.00	< 2.00	< 2.00	NA	< 4.00	< 2.00	< 2.00	< 2.00	**4.10 D**	< 2.00	**170 D**
LAI-FAC-EFF	03/28/2024	24C3436	< 1.00	< 1.00	< 1.00	NA	< 2.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00
MPW-01A	04/01/2024	24D0341	< 0.500	< 0.500	< 0.500	< 0.500	**0.270 J**	< 0.500	NA	< 0.500	< 0.500	< 0.500	< 0.500
MPW-01B	04/01/2024	24D0341	< 0.500	< 0.500	< 0.500	< 0.500	**0.330 J**	< 0.500	NA	< 0.500	< 0.500	< 0.500	< 0.500
MPW-01C	04/01/2024	24D0341	**0.410 J**	**1.00**	**0.280 J**	**0.360 J**	**0.650**	< 0.500	NA	< 0.500	**0.280 J**	< 0.500	**0.450 J**
MPW-02B	04/05/2024	24D0932	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	NA	< 0.500	< 0.500	< 0.500	**0.160 J**
MPW-02C	04/05/2024	24D0932	**0.270 J**	**0.710**	**0.220 J**	< 0.500	**0.710**	< 0.500	NA	**0.150 J**	**0.180 J**	< 0.500	**1.40**
MPW-02D	04/05/2024	24D0932	**0.220 J**	**0.540**	**0.130 J**	< 0.500	**0.790**	< 0.500	NA	**0.190 J**	**0.330 J**	< 0.500	**0.190 J**
MPW-03B	04/04/2024	24D0681	< 0.500	< 0.500	< 0.500	< 0.500	**0.190 J**	< 0.500	NA	< 0.500	**0.360 J**	< 0.500	**2.60**
MPW-03C	04/04/2024	24D0681	< 0.500	**0.220 J**	< 0.500	< 0.500	**0.430 J**	< 0.500	NA	**0.210 J**	**0.160 J**	< 0.500	**0.600**
MPW-03D	04/04/2024	24D0932	**0.260 J**	**0.600**	< 0.500	< 0.500	**0.330 J**	< 0.500	NA	**0.380 J**	**0.410 J**	< 0.500	**1.40**
MPW-04A	04/02/2024	24D0341	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	**0.180 J**	NA	< 0.500	**2.00**	< 0.500	**3.00**
MPW-04B	04/03/2024	24D0681	< 0.500	< 0.500	< 0.500	< 0.500	**0.220 J**	**0.600**	NA	< 0.500	**2.80**	< 0.500	**5.40**
MPW-04C	04/03/2024	24D0681	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	NA	< 0.500	< 0.500	< 0.500	< 0.500
MPW-04D	04/03/2024	24D0681	< 0.500	< 0.500	< 0.500	< 0.500	**0.560**	< 0.500	NA	**0.230 J**	**0.200 J**	< 0.500	**0.180 J**
MPW-04E	04/03/2024	24D0680	< 0.500	< 0.500	< 0.500	< 0.500	**0.520**	< 0.500	NA	**0.160 J**	**0.530**	< 0.500	**0.540**
MPW-05A	04/08/2024	24D1463	< 0.500	< 0.500	< 0.500	< 0.500	**1.30**	< 0.500	NA	< 0.500	< 0.500	< 0.500	< 0.500
MPW-05B	04/09/2024	24D1470	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	NA	< 0.500	< 0.500	< 0.500	< 0.500
MPW-05C	04/08/2024	24D1470	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	NA	**0.270 J**	< 0.500	< 0.500	< 0.500
MPW-05D	04/08/2024	24D1463	< 0.500	< 0.500	< 0.500	< 0.500	**0.260 J**	< 0.500	NA	**0.680**	< 0.500	**0.180 J**	**0.230 J**
MPW-06A	04/02/2024	24D0341	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	NA	**0.150 J**	< 0.500	< 0.500	< 0.500
MPW-06B	04/02/2024	24D0341	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	NA	**0.220 J**	< 0.500	**2.00**	**1.40**
MPW-06D	04/02/2024	24D0341	**0.460 J**	**0.910**	**0.310 J**	< 0.500	**0.470 J**	< 0.500	NA	**0.130 J**	**0.350 J**	< 0.500	**7.20**
MPW-08A	03/26/2024	24C3451	< 0.500	< 0.500	< 0.500	< 0.500	**0.640**	< 0.500	NA	< 0.500	< 0.500	< 0.500	< 0.500
MPW-08B	03/26/2024	24C3451	< 0.500	< 0.500	< 0.500	< 0.500	**0.500**	< 0.500	NA	**0.270 J**	< 0.500	< 0.500	**0.430 J**
MPW-08C	03/27/2024	24C3451	< 0.500	< 0.500	< 0.500	< 0.500	**0.410 J**	< 0.500	NA	**0.210 J**	< 0.500	< 0.500	**1.90**
MPW-08D	03/27/2024	24C3451	< 0.500	**0.190 J**	< 0.500	< 0.500	**0.410 J**	< 0.500	NA	**0.240 J**	< 0.500	< 0.500	**4.90**
MPW-08E	03/27/2024	24C3449	**0.590**	**0.940**	**0.310 J**	< 0.500	**0.360 J**	< 0.500	NA	< 0.500	< 0.500	< 0.500	**2.00**
MPW-09A	03/27/2024	24C3451	< 0.500	< 0.500	< 0.500	< 0.500	**0.270 J**	< 0.500	NA	**0.140 J**	**0.210 J**	< 0.500	**7.30**
MPW-09B	03/27/2024	24C3451	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	NA	**0.830**	**2.70**	< 0.500	**27.0**
MPW-09C	03/27/2024	24C3451	< 0.500	**0.190 J**	< 0.500	**0.130 J**	**0.270 J**	**0.720**	NA	**0.430 J**	**12.0**	< 0.500	**42.0**
MPW-09D	03/27/2024	24C3451	**0.500**	**1.10**	**0.310 J**	**0.120 J**	**0.480 J**	**1.00**	NA	**0.220 J**	**4.20**	< 0.500	**70.0**
MPW-09E	03/27/2024	24C3451	**0.210 J**	**0.400 J**	< 0.500	< 0.500	**0.280 J**	< 0.500	NA	< 0.500	< 0.500	< 0.500	**0.600**
MPW-10A	04/09/2024	24D1463	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	**0.160 J**	NA	< 0.500	**1.50**	< 0.500	**2.70**
MPW-10B	04/09/2024	24D1463	< 0.500	< 0.500	< 0.500	< 0.500	**0.450 J**	< 0.500	NA	**0.180 J**	**1.20**	< 0.500	**1.90**
MPW-10C	04/09/2024	24D1463	< 0.500	< 0.500	< 0.500	< 0.500	**0.600**	< 0.500	NA	**0.170 J**	**0.840**	< 0.500	**0.760**
MPW-10D	04/09/2024	24D1463	< 0.500	< 0.500	< 0.500	< 0.500	**0.640**	< 0.500	NA	**0.170 J**	**0.280 J**	< 0.500	**0.300 J**
MW-05	04/09/2024	24D1463	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	NA	< 0.500	< 0.500	< 0.500	**0.190 J**
MW-ISCO-5	04/08/2024	24D1463	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	NA	< 0.500	**0.450 J**	< 0.500	**16.0**
MW-PD-11	04/05/2024	24D0932	< 0.500	< 0.500	< 0.500	< 0.500	**1.20**	< 0.500	NA	< 0.500	< 0.500	< 0.500	< 0.500
MW-PD-12	04/03/2024	24D0681	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	NA	< 0.500	**3.60**	< 0.500	**96.0 D**
MW-PD-13	04/02/2024	24D0341	< 0.500	< 0.500	< 0.500	< 0.500	**0.350 J**	< 0.500	NA	< 0.500	< 0.500	< 0.500	< 0.500
MW-PD-14	04/03/2024	24D0680	< 0.500	< 0.500	< 0.500	< 0.500	**1.10**	**0.170 J**	NA	**0.210 J**	**1.50**	< 0.500	**75.0**
MW-PD-15	04/02/2024	24D0341	**0.580**	**0.830**	**0.300 J**	< 0.500	**0.590**	< 0.500	NA	**0.250 J**	**2.90**	< 0.500	**2.80**
MW-PD-16	04/03/2024	24D0681	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	NA	**0.600 JD**	**4.40 D**	< 2.00	**250 D**
MW-PD-17	04/02/2024	24D0341	**0.420 J**	< 0.500	**0.140 J**	< 0.500	**0.330 J**	< 0.500	NA	< 0.500	< 0.500	< 0.500	**0.180 J**
PZ-01	04/04/2024	24D0681	< 0.500	< 0.500	< 0.500	< 0.500	**0.310 J**	< 0.500	NA	< 0.500	< 0.500	< 0.500	**0.220 J**
PZ-04	04/04/2024	24D0680	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	NA	< 0.500	< 0.500	< 0.500	**0.180 J**
PZ-05	04/03/2024	24D0681	< 0.500	< 0.500	< 0.500	< 0.500	**2.50**	< 0.500	NA	< 0.500	**0.900**	< 0.500	**4.30**
PZ-07	04/04/2024	24D0681	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	NA	< 0.500	**2.00**	< 0.500	**16.0**
SDW-1	03/27/2024	24C3451	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	NA	**0.250 J**	< 0.500	< 0.500	< 0.500

Legend

<1	Parameter not detected above the laboratory reporting limit
1	Parameter reported at a concentrations greater than NYSDEC TOGS 1.1.1 Class GA Criteria
1	Parameter reported above the laboratory reporting limit but below the applicable regulatory standard/criterion

Notes

Only compounds detected above the laboratory reporting limits are presented
µg/L = micrograms per liter
J = Estimated values
D = Sample was diluted for analysis
NA = Not Analyzed
NE = No criteria established
NYSDEC = New York State Department of Environmental Conservation
DCA=Dichloroethane
DCE=Dichloroethene
MTBE=Methyltertbutyl ether
PCE=Tetrachloroethne
TCA=Trichloroethane
TCE=Trichloroethane
TCP=Trichloropropane

Table 7
Surface Water Sample Data
March - April 2024
Lawrence Aviation Industries
Port Jefferson Station, New York

	ID:	SW-05	SW-06	SW-07	SW-08	SW-15	SW-15	SW-16
	Sample ID:	SW-05	SW-06	SW-07	SW-08	SW-15	SW-15-DUP	SW-16
	Date Collected:	03/25/2024	03/25/2024	03/25/2024	03/25/2024	03/25/2024	03/25/2024	03/25/2024
	Lab Report Number:	24C3017	24C3017	24C3017	24C3017	24C3017	24C3017	24C3017
	Sample Type:	N	N	N	N	N	FD	N
Parameter	NYDEC Class GA Criteria							
PFAS Compounds (mg/L)								
Total Suspended Solids	NE	< 10000 U	< 10000 U	< 10000 U	< 10000 U	**130000**	**86000**	**94000**
PFAS Compounds (ng/L)								
Perfluorobutanesulfonic acid (PFBS)	NE	**2.9**	**4.7**	**1.8**	**1.6**	< 5.00 U	**0.440 J**	**0.420 J**
Perfluorobutanoic acid (PFBA)	NE	**3.9**	**4.7**	**2.80 J**	**2.70 J**	< 20.0 U	< 3.90 U	< 3.90 U
Perfluoroheptanoic acid (PFHpA)	NE	**2.7**	**2.4**	**1.8**	**1.7**	< 5.00 U	**0.440 J**	**0.510 J**
Perfluorohexanesulfonic acid (PFHxS)	NE	**3.4**	**3.8**	**5.5**	**5.7**	< 5.00 U	**0.470 J**	**0.510 J**
Perfluorohexanoic acid (PFHxA)	NE	**8.2**	**8.9**	**5.2**	**4.8**	**1.30 J**	**0.98**	**1.1**
Perfluorononanoic acid (PFNA)	NE	< 0.970 U	< 1.00 U	< 1.00 U	< 0.980 U	< 5.00 U	< 0.980 U	**0.300 J**
Perfluorooctanesulfonic acid (PFOS)	2.7	**1.7**	**1.6**	**1.3**	**1.4**	< 5.00 U	**1**	**1.2**
Perfluorooctanoic acid (PFOA)	6.7	**6.8**	**5.6**	**3.9**	**3.8**	**1.80 J**	**0.880 J**	**1**
Perfluoropentane sulfonate (PFPeS)	NE	**0.750 J**	**0.950 J**	**0.740 J**	**0.840 J**	< 5.00 U	< 0.980 U	< 0.990 U
Perfluoropentanoic acid (PFPeA)	NE	**6.8**	**8.6**	**4.4**	**4.4**	< 10.0 U	**1.00 J**	**1.20 J**
Semivolatile Organic Compounds (SVOCs) (µg/L)								
1,4-Dioxane	0.35	**0.130 J**	**0.120 J**	**0.29**	**0.31**	< 0.200 U	< 0.190 U	< 0.190 U
Volatile Organic Compounds (VOCs) (µg/L)								
Chloroform	7	**0.6**	**0.71**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
cis-1,2-Dichloroethene	5	< 0.500 U	**1.1**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Methyltertbutyl ether	10	< 0.500 U	< 0.500 U	**0.170 J**	**0.180 J**	< 0.500 U	< 0.500 U	< 0.500 U
Tetrachloroethene	0.7	< 0.500 U	**0.190 J**	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U	< 0.500 U
Trichloroethene	5	**1.6**	**5.9**	**1.3**	**1.2**	< 0.500 U	< 0.500 U	**1.4**

Legend

<1 Parameter not detcted above the laboratory reporting limit

1 Parameter reported at a concentrations greater than NYSDEC Class GA Criteria

1 Parameter reported above the laboratory reporting limit but below the appilicable regulatory standard/criterion

Notes

Only compounds detected above the laboratory reporting limits are presented

mg/L = milligrams per liter

µg/L = micrograms per liter

ng/L = nanograms per liter

NA = Not Analyzed

NE - No criteria established

NYSDEC = New York State Department of Environmental Conservation

Table 9
Groundwater Sampling Requirements and Schedule
March - April 2024
Lawrence Aviation Industries
Port Jefferson Station, New York

Well ID	Port	Top of Casing Elevation (ft amsl)	X Coordinate	Y Coordinate	Diameter of Well (inches)	Top of Screened Interval (ft bgs)	Bottom of Screened Interval (ft bgs)	Analytical Parameters/ Every 15-months
ERT-EW-1	NA	22.58	1240345.53	284149.95	6	120	140	VOCs (8260), TAL Metals (6010), PFAS (1633), 1,4-Dioxane (8270)
ERT-EW-2	NA	22.76	1240321.71	284149.95	6	90	110	
ERT-EW-3	NA	22.88	1240370.46	284174.31	6	90	110	
ERT-EW-4	NA	22.56	1240343.76	284193.23	6	60	80	
ERT-EW-5	NA	22.84	1240325.56	284206.51	4	20	40	
ERT-EW-6	NA	18.97	1240263.92	284057.195	6	90	120	
ERT-MW-1A	NA	9.01	1240499.10	285084.50	2	47	57	
ERT-MW-1B	NA	8.93	1240495.10	285086.60	2	72	82	
ERT-MW-2A	NA	12.61	1240083.17	285072.26	2	46	56	
ERT-MW-2B	NA	12.71	1240086.33	285075.08	2	71	81	
ERT-MW-2C	NA	5.67	1240087.14	285062.176	2	90	100	
ERT-MW-2D	NA	5.54	1240087.02	285062.4	2	120	130	
ERT-MW-3	NA	109.37	1239306.16	284533.89	2	223	233	
ERT-MW-4A	A	7.74	1241389.04	284724.897	2	70	80	
ERT-MW-4B	B	7.79	1241389.16	284725.116	2	120	130	
ERT-MW-5A	A	9.18	1241022.36	284951.901	2	90	100	
ERT-MW-5B	B	9.17	1241022.56	284952.129	2	120	130	
ERT-MW-6A	A	16.52	1240626.9	284309.368	2	80	90	
ERT-MW-6B	B	16.52	1240627.15	284309.238	2	125	135	
EW-01	NA	219.30	1241213.95	278985.42	10	182	248	
EW-02	NA	222.61	1241367.23	279180.5	10	182	240	
EW-03	NA	228.25	1241397.043	278955.772	6	185	225	
IW-ISCO-2	NA	228.50	1241522	278784	2	200	220	
IW-ISCO-3	NA	228.50	1241536	278807	2	200	220	
IW-ISCO-10	NA	228.50	1241521.28	278897.45	2	200	220	
MPW-01-A	A	183.40	1242101.12	277475.448	4	160	170	
MPW-01-B	B	183.40	1242101.12	277475.448	4	185	195	
MPW-01-C	C	183.40	1242101.12	277475.448	4	210	220	
MPW-02-A	A	221.02	1241241.06	279049.859	4	190	200	
MPW-02-B	B	221.02	1241241.06	279049.859	4	215	225	
MPW-02-C	C	221.02	1241241.06	279049.859	4	240	250	
MPW-02-D	D	221.02	1241241.06	279049.859	4	265	275	
MPW-03-A	A	189.73	1241315.64	280017.573	4	175	185	
MPW-03-B	B	189.73	1241315.64	280017.573	4	195	205	
MPW-03-C	C	189.73	1241315.64	280017.573	4	215	225	
MPW-03-D	D	189.73	1241315.64	280017.573	4	235	245	
MPW-04-A	A	177.23	1240440.96	279964.528	4	150	160	
MPW-04-B	B	177.23	1240440.96	279964.528	4	170	180	
MPW-04-C	C	177.23	1240440.96	279964.528	4	200	210	
MPW-04-D	D	177.23	1240440.96	279964.528	4	220	230	
MPW-04-E	E	177.23	1240440.96	279964.528	4	240	250	
MPW-05-A	A	156.80	1239723.03	282879.48	4	160	170	
MPW-05-B	B	156.80	1239723.03	282879.48	4	185	195	
MPW-05-C	C	156.80	1239723.03	282879.48	4	205	215	
MPW-05-D	D	156.80	1239723.03	282879.48	4	225	235	
MPW-06-A	A	57.29	1241197.55	282627.237	4	65	75	
MPW-06-B	B	57.29	1241197.55	282627.237	4	90	100	
MPW-06-C	C	57.29	1241197.55	282627.237	4	115	125	
MPW-06-D	D	57.29	1241197.55	282627.237	4	160	170	
MPW-08-A	A	17.08	1240764.77	284605.552	4	25	35	
MPW-08-B	B	17.08	1240764.77	284605.552	4	45	55	
MPW-08-C	C	17.08	1240764.77	284605.552	4	75	85	
MPW-08-D	D	17.08	1240764.77	284605.552	4	95	105	
MPW-08-E	E	17.08	1240764.77	284605.552	4	115	125	
MPW-09-A	A	9.66	1240317.25	284384.575	4	10	20	
MPW-09-B	B	9.66	1240317.25	284384.575	4	45	55	
MPW-09-C	C	9.66	1240317.25	284384.575	4	70	80	
MPW-09-D	D	9.66	1240317.25	284384.575	4	90	100	
MPW-09-E	E	9.66	1240317.25	284384.575	4	125	135	
MPW-10-A	A	170.73	1240276.04	280640.585	4	160	170	
MPW-10-B	B	170.73	1240276.04	280640.585	4	185	195	
MPW-10-C	C	170.73	1240276.04	280640.585	4	215	225	
MPW-10-D	D	170.73	1240276.04	280640.585	4	235	245	
MW-05	NA	220.63	1241539.11	279606.08	4	180	195	
MW-ISCO-02R	NA	228.39	1241434.30	278942.40	2	200	220	
MW-ISCO-04	NA	228.58	1241504.14	278807.98	4	207	217	
MW-ISCO-05	NA	228.43	1241498.63	278760.26	4	206	216	
MW-PD-11	NA	164.90	1239752.51	280312.47	4	195	205	
MW-PD-12	NA	142.70	1240644.56	280706.4	4	150	160	
MW-PD-13	NA	177.30	1241574.79	281370.71	4	175	185	
MW-PD-14	NA	177.62	1240627.49	282166.23	4	239	249	
MW-PD-15	NA	95.26	1239734.72	284168.4	4	204	214	
MW-PD-16	NA	86.11	1240340.86	283265.25	4	190	200	
MW-PD-17	NA	24.74	1241728.59	283697.93	4	80	90	
PZ-01	NA	224.04	1242210.32	278999.38	2	198	208	
PZ-04	NA	224.63	1241742.8	278687.26	2	201	211	
PZ-05	NA	226.81	1241082	278576	2	196	206	
PZ-06	NA	230.20	1241414	279038	2	201.5	211.5	
PZ-07	NA	218.14	1241606	279410	2	190	200	
SDW-1	NA	13.14	1240558.67	284960.84	6	2	12	

Notes:

01/30/2025 - MW-ISCO-02R is a replacement well for MW-ISCO-02 (damaged).

Coordinates are in New York State Plane - Long Island, Datum: NAD83, Units: feet

ft amsl - Feet above mean sea level

ft bgs - Feet below ground surface

Table 10
Monitoring Well Construction
Lawrence Aviation Industries
Port Jefferson Station, New York

Well ID	Port	Top of Casing Elevation (ft amsl)	X Coordinate	Y Coordinate	Diameter of Well (inches)	Top of Screened Interval (ft bgs)	Bottom of Screened Interval (ft bgs)
ERT-EW-1	NA	22.58	1240345.53	284149.95	6	120	140
ERT-EW-2	NA	22.76	1240321.71	284149.95	6	90	110
ERT-EW-3	NA	22.88	1240370.46	284174.31	6	90	110
ERT-EW-4	NA	22.56	1240343.76	284193.23	6	60	80
ERT-EW-5	NA	22.84	1240325.56	284206.51	4	20	40
ERT-EW-6	NA	18.97	1240263.92	284057.195	6	90	120
ERT-MW-1A	NA	9.01	1240499.10	285084.50	2	47	57
ERT-MW-1B	NA	8.93	1240495.10	285086.60	2	72	82
ERT-MW-2A	NA	12.61	1240083.17	285072.26	2	46	56
ERT-MW-2B	NA	12.71	1240086.33	285075.08	2	71	81
ERT-MW-2C	NA	5.67	1240087.14	285062.176	2	90	100
ERT-MW-2D	NA	5.54	1240087.02	285062.4	2	120	130
ERT-MW-3	NA	109.37	1239306.16	284533.89	2	223	233
ERT-MW-4A	A	7.74	1241389.04	284724.897	2	70	80
ERT-MW-4B	B	7.79	1241389.16	284725.116	2	120	130
ERT-MW-5A	A	9.18	1241022.36	284951.901	2	90	100
ERT-MW-5B	B	9.17	1241022.56	284952.129	2	120	130
ERT-MW-6A	A	16.52	1240626.9	284309.368	2	80	90
ERT-MW-6B	B	16.52	1240627.15	284309.238	2	125	135
ERT-OW-1	NA	22.65	1240326.9	284172.47	2	95	105
ERT-OW-2	NA	22.73	1240339.27	284175.07	2	95	105
EW-01	NA	219.30	1241213.95	278985.42	10	182	248
EW-02	NA	222.61	1241367.23	279180.5	10	182	240
EW-03	NA	228.25	1241397.043	278955.772	6	185	225
FG-01	NA	201.43	1243376.35	280474.705	2	170	180
IW-01	NA	225.99	1241693.86	278204.79	6	183	248
HRP-IW-01	NA	228.86	1241396.70	278810.80	6	200	220
HRP-IW-02	NA	228.85	1241433.00	278880.90	6	200	220
IW-02	NA	225.27	1241766.61	278227.33	6	183	248
IW-03	NA	224.99	1241790.03	278192.12	6	183	248
IW-04	NA	225.68	1241826.33	278167.07	6	183	248
IW-05	NA	224.48	1241758.26	278150.73	6	183	248
IW-ISCO-1	NA	228.50	1241495	278742	2	200	220
IW-ISCO-2	NA	228.50	1241522	278784	2	200	220
IW-ISCO-3	NA	228.50	1241536	278807	2	200	220
IW-ISCO-4	NA	228.50	1241454	278769	2	200	220
IW-ISCO-5	NA	228.50	1241486.95	278795.69	2	200	220
IW-ISCO-6	NA	228.50	1241462	278811	2	200	220
IW-ISCO-7	NA	228.50	1241505	278834	2	200	220
IW-ISCO-8	NA	228.50	1241501	278870	2	200	220
IW-ISCO-9	NA	228.50	1241537	278864	2	200	220
IW-ISCO-10	NA	228.50	1241521.28	278897.45	2	200	220
IW-ISCO-11	NA	228.10	1241382	278842	2	200	220
IW-ISCO-12	NA	227.60	1241408	278884	2	200	220
IW-ISCO-13	NA	227.20	1241436	278926	2	200	220
MPW-01-A	A	183.40	1242101.12	277475.448	4	160	170
MPW-01-B	B	183.40	1242101.12	277475.448	4	185	195
MPW-01-C	C	183.40	1242101.12	277475.448	4	210	220
MPW-02-A	A	221.02	1241241.06	279049.859	4	190	200
MPW-02-B	B	221.02	1241241.06	279049.859	4	215	225
MPW-02-C	C	221.02	1241241.06	279049.859	4	240	250
MPW-02-D	D	221.02	1241241.06	279049.859	4	265	275
MPW-03-A	A	189.73	1241315.64	280017.573	4	175	185
MPW-03-B	B	189.73	1241315.64	280017.573	4	195	205
MPW-03-C	C	189.73	1241315.64	280017.573	4	215	225
MPW-03-D	D	189.73	1241315.64	280017.573	4	235	245
MPW-04-A	A	177.23	1240440.96	279964.528	4	150	160
MPW-04-B	B	177.23	1240440.96	279964.528	4	170	180
MPW-04-C	C	177.23	1240440.96	279964.528	4	200	210
MPW-04-D	D	177.23	1240440.96	279964.528	4	220	230
MPW-04-E	E	177.23	1240440.96	279964.528	4	240	250
MPW-05-A	A	156.80	1239723.03	282879.48	4	160	170
MPW-05-B	B	156.80	1239723.03	282879.48	4	185	195
MPW-05-C	C	156.80	1239723.03	282879.48	4	205	215

Table 10
Monitoring Well Construction
Lawrence Aviation Industries
Port Jefferson Station, New York

Well ID	Port	Top of Casing Elevation (ft amsl)	X Coordinate	Y Coordinate	Diameter of Well (inches)	Top of Screened Interval (ft bgs)	Bottom of Screened Interval (ft bgs)
MPW-05-D	D	156.80	1239723.03	282879.48	4	225	235
MPW-06-A	A	57.29	1241197.55	282627.237	4	65	75
MPW-06-B	B	57.29	1241197.55	282627.237	4	90	100
MPW-06-C	C	57.29	1241197.55	282627.237	4	115	125
MPW-06-D	D	57.29	1241197.55	282627.237	4	160	170
MPW-07-A	A	229.11	1241498.44	278813.286	4	200	210
MPW-07-B	B	229.11	1241498.44	278813.286	4	220	230
MPW-07-C	C	229.11	1241498.44	278813.286	4	250	260
MPW-08-A	A	17.08	1240764.77	284605.552	4	25	35
MPW-08-B	B	17.08	1240764.77	284605.552	4	45	55
MPW-08-C	C	17.08	1240764.77	284605.552	4	75	85
MPW-08-D	D	17.08	1240764.77	284605.552	4	95	105
MPW-08-E	E	17.08	1240764.77	284605.552	4	115	125
MPW-09-A	A	9.66	1240317.25	284384.575	4	10	20
MPW-09-B	B	9.66	1240317.25	284384.575	4	45	55
MPW-09-C	C	9.66	1240317.25	284384.575	4	70	80
MPW-09-D	D	9.66	1240317.25	284384.575	4	90	100
MPW-09-E	E	9.66	1240317.25	284384.575	4	125	135
MPW-10-A	A	170.73	1240276.04	280640.585	4	160	170
MPW-10-B	B	170.73	1240276.04	280640.585	4	185	195
MPW-10-C	C	170.73	1240276.04	280640.585	4	215	225
MPW-10-D	D	170.73	1240276.04	280640.585	4	235	245
MW-05	NA	220.63	1241539.11	279606.08	4	180	195
MW-ISCO-01	NA	228.11	278874	1241384	4	206	216
MW-ISCO-02	NA	228.39	1241434.30	278942.40	4	205	215
MW-ISCO-02R	NA	228.39	1241434.30	278942.40	2	200	220
MW-ISCO-03	NA	228.50	278850	1241527	4	205.75	215.75
MW-ISCO-04	NA	228.58	1241504.14	278807.98	4	207	217
MW-ISCO-05	NA	228.43	1241498.63	278760.26	4	206	216
MW-PD-11	NA	164.90	1239752.51	280312.47	4	195	205
MW-PD-12	NA	142.70	1240644.56	280706.4	4	150	160
MW-PD-13	NA	177.30	1241574.79	281370.71	4	175	185
MW-PD-14	NA	177.62	1240627.49	282166.23	4	239	249
MW-PD-15	NA	95.26	1239734.72	284168.4	4	204	214
MW-PD-16	NA	86.11	1240340.86	283265.25	4	190	200
MW-PD-17	NA	24.74	1241728.59	283697.93	4	80	90
PZ-01	NA	224.04	1242210.32	278999.38	2	198	208
PZ-02	NA	226.99	1241653.38	278477.2	2	198	208
PZ-03	NA	227.90	1242062.76	278320.85	2	198	208
PZ-04	NA	224.63	1241742.8	278687.26	2	201	211
PZ-05	NA	226.81	1241082	278576	2	196	206
PZ-06	NA	230.20	1241414	279038	2	201.5	211.5
PZ-07	NA	218.14	1241606	279410	2	190	200
SDW-1	NA	13.14	1240558.67	284960.84	6	2	12
SW-05	NA	NA	1240241.93	284183.55	NA	NA	NA
SW-06	NA	NA	1240278.21	284357.85	NA	NA	NA
SW-07	NA	NA	1240327.17	284371.39	NA	NA	NA
SW-08	NA	NA	1240366.23	284350.04	NA	NA	NA
SW-15	NA	NA	1241004.83	285682.85	NA	NA	NA
SW-16	NA	NA	1240364.29	285520.26	NA	NA	NA

Notes:

01/30/2025 - MW-ISCO-02R is a replacement well for MW-ISCO-02 (damaged).

01/27/2025 - ERT-MW-1A and ERT-MW-2A resurveyed. Well casing cut at request of property owner.

Coordinates are in New York State Plane - Long Island, Datum: NAD83, Units: feet

ft amsl - Feet above mean sea level

ft bgs - Feet below ground surface

NA - Not available

APPENDIX A-1

EPA FEDERAL REGISTER NOTICE OF SITE DELETION

Order JO 7400.11 and publication of conforming amendments.

FOR FURTHER INFORMATION CONTACT: Colby Abbott, Rules and Regulations Group, Policy Directorate, Federal Aviation Administration, 600 Independence Avenue SW, Washington, DC 20597; telephone: (202) 267–8783.

SUPPLEMENTARY INFORMATION:

Background

The FAA published a final rule for Docket No. FAA–2024–1707 in the **Federal Register** (89 FR 97510; December 9, 2024), amending VOR Federal Airways V–68, V–212, and V–222, and United States RNAV Route T–220; and revoking VOR Federal Airway V–558 due to the planned decommissioning of the VOR portion of the Industry, TX, VORTAC NAVAID. Amendment of V–76 was removed from the docket action in the final rule. The effective date for that final rule was February 20, 2025. After the final rule was published, two STAR instrument procedures, one into George Bush Intercontinental/Houston Airport and one into San Antonio International Airport, failed required flight inspections. The FAA determined that the required update and flight inspection actions for the two failed STAR instrument procedures could not be completed in time to meet the original planned decommissioning date. As a result, the existing STARs remained in place until the next chart date and on January 16, 2025 (90 FR 4612), the final rule effective date was delayed from February 20, 2025, to April 17, 2025.

The two STAR instrument procedures that failed the initial flight inspections were updated and flight inspected a second time in preparation of meeting the April 17, 2025, effective date for amending and revoking the Air Traffic Service (ATS) routes affected by the planned decommissioning of the Industry, TX, VOR. The STAR into San Antonio International Airport passed the second flight inspection, but the STAR into George Bush Intercontinental/Houston Airport failed the second inspection. Therefore, the existing STARs need to remain in place until the STAR into George Bush Intercontinental/Houston Airport can be redesigned and flight inspected.

The FAA expects the required redesign and flight inspection for the STAR into George Bush Intercontinental/Houston Airport to be completed to meet an August 7, 2025, effective date. Therefore, the effective date of this final rule amending VOR Federal Airways V–68, V–212, and V–222, and United States RNAV Route T–220; and revoking VOR Federal Airway V–558 is delayed further to coincide with that date.

VOR Federal Airways are published in paragraph 6010(a) and United States Area Navigation Routes are published in paragraph 6011 of FAA Order JO 7400.11, Airspace Designations and Reporting Points, which is incorporated by reference in 14 CFR 71.1 on an annual basis. This document amends the current version of that order, FAA Order JO 7400.11J, dated July 31, 2024, and effective September 15, 2024. FAA Order JO 7400.11J is publicly available online at *www.faa.gov/air_traffic/publications/.* You may also contact the Rules and Regulations Group, Policy Directorate, Federal Aviation Administration, 600 Independence Avenue SW, Washington, DC 20597; telephone: (202) 267–8783.

FAA Order JO 7400.11J lists Class A, B, C, D, and E airspace areas, air traffic service routes, and reporting points.

Good Cause for No Notice and Comment

Section 553(b)(3)(B) of Title 5, United States Code, (the Administrative Procedure Act) authorizes agencies to dispense with notice and comment procedures for rules when the agency for ''good cause'' finds that those procedures are ''impracticable, unnecessary, or contrary to the public interest.'' Under this section, an agency, upon finding good cause, may issue a final rule without seeking comment prior to the rulemaking. The FAA finds that prior notice and public comment to this final rule is unnecessary due to the brief length of the extension of the effective date and the fact that there is no substantive change to the rule.

Delay of Effective Date

■ Accordingly, pursuant to the authority delegated to me, the effective date of the final rule for Airspace Docket 24–ASW–4, as published in the **Federal Register** on December 9, 2024 (89 FR 97510), FR Doc. 2024–28750, and of the final rule, delay of effective date as published in the **Federal Register** on January 16, 2025 (90 FR 4612), FR Doc. 2025–00732, are hereby delayed until August 7, 2025.

Authority: 49 U.S.C. 106(f); 40103, 40113, 40120; E.O. 10854, 24 FR 9565, 3 CFR, 1959–1963 Comp., P. 389.

Issued in Washington, DC, on February 27, 2025.

Brian Eric Konie,

Manager (A), Rules and Regulations Group.

[FR Doc. 2025–03482 Filed 3–4–25; 8:45 am]

BILLING CODE 4910–13–P

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 300

[EPA–HQ–OLEM–2022–0733; EPA–HQ–OLEM–2023–0602; EPA–HQ–OLEM–2024–0294; EPA–HQ–OLEM–2024–0326; FRL–12112–02–OLEM]

Deletion From the National Priorities List

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: The Environmental Protection Agency (EPA) announces the deletion of one site and partial deletion of three sites from the Superfund National Priorities List (NPL). The NPL, created under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, is an appendix of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The EPA and the States, through their designated State agencies, have determined that all appropriate response actions under CERCLA have been completed. However, this deletion does not preclude future actions under Superfund.

DATES: The document is effective March 5, 2025.

ADDRESSES: *Docket:* EPA has established a docket for this action under the Docket Identification included in Table 1 in the **SUPPLEMENTARY INFORMATION** section of this document. All documents in the docket are listed on the *https://www.regulations.gov* website. The Final Close-Out Report (FCOR, for a full site deletion) or the Partial Deletion Justification (PDJ, for a partial site deletion) is the primary document which summarizes site information to support the deletion. It is typically written for a broad, non-technical audience and this document is included in the deletion docket for each of the sites in this rulemaking. Although listed in the index, some information is not publicly available, *i.e.,* Confidential Business Information or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, is not placed on the internet and will be publicly available only in hard copy form. Docket materials are available through *https://www.regulations.gov* or at the corresponding Regional Records Centers. Locations, addresses, and phone numbers-of the Regional Records Center follows.

- Region 2 (NJ, NY, PR, VI), U.S. EPA, 290 Broadway, New York, NY 10007–1866; 212/637–4308.
- Region 4 (AL, FL, GA, KY, MS, NC, SC, TN), U.S. EPA, 61 Forsyth Street SW, Mail code 9T25, Atlanta, GA 30303.
- Region 9 (AZ, CA, HI, NV, GU, AS, MP), U.S. EPA, 75 Hawthorne Street, San Francisco, CA 94105; 415/947–8000.
- EPA Headquarters Docket Center Reading Room (deletion dockets for all States), William Jefferson Clinton (WJC) West Building, Room 3334, 1301 Constitution Avenue NW, Washington, DC 20004, (202) 566–1744.

EPA staff listed below in the **FOR FURTHER INFORMATION CONTACT** section may assist the public in answering inquiries about deleted sites, accessing deletion support documentation, and determining whether there are additional physical deletion dockets available.

FOR FURTHER INFORMATION CONTACT:

- Mabel Garcia, U.S. EPA Region 2 (NJ, NY, PR, VI), *garcia.mabel@epa.gov,* 212/637–4356.
- Alayna Famble, U.S. EPA Region 4 (AL, FL, GA, KY, MS, NC, SC, TN), *famble.alayna@epa.gov,* 470/445–0744.
- Anhtu Nguyen, U.S. EPA Region 9 (AZ, CA, HI, NV, GU, AS, MP), *nguyen.anhtu@epa.gov,* 415/972–3443.
- Charles Sands, U.S. EPA Headquarters, *sands.charles@epa.gov,* 202/566–1142.

SUPPLEMENTARY INFORMATION: The NPL, created under section 105 of CERCLA, as amended, is an appendix of the NCP. The NCP establishes the criteria that EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425(e), sites may be deleted from the NPL where no further response is appropriate. Partial deletion of sites is in accordance with 40 CFR 300.425(e) and are consistent with the Notice of Policy Change: Partial Deletion of Sites Listed on the National Priorities List, 60 FR 55466, (November 1, 1995). The sites to be deleted are listed in Table 1, including docket information containing reference documents with the rationale and data principally relied upon by the EPA to determine that the Superfund response is complete. The NCP permits activities to occur at a deleted site, or that media or parcel of a partially deleted site, including operation and maintenance of the remedy, monitoring, and five-year reviews. These activities for the site are entered in Table 1 in this **SUPPLEMENTARY INFORMATION** section, if applicable, under Footnote such that; 1 = site has continued operation and maintenance of the remedy, 2 = site receives continued monitoring, and 3 = site five-year reviews are conducted. As described in 40 CFR 300.425(e)(3) of the NCP, a site or portion of a site deleted from the NPL remains eligible for Fund-financed remedial action if future conditions warrant such actions.

TABLE 1

Site name	City/county, state	Type	Docket No.	Footnote
Del Amo	Los Angeles, CA	Partial	EPA–HQ–OLEM–2022–0733	1, 3
Mercury Refining, Inc	Colonie, NY	Full	EPA–HQ–OLEM–2023–0602	1, 2, 3
Lawrence Aviation Industries, Inc	Port Jefferson Station, NY.	Partial	EPA–HQ–OLEM–2024–0294	1, 2, 3
Redstone Arsenal (USARMY/NASA)	Huntsville, AL	Partial	EPA–HQ–OLEM–2024–0594	1, 3

Information concerning the sites to be deleted and partially deleted from the NPL, and the proposed rule for the deletion and partial deletion of the sites, are included in Table 2.

TABLE 2

Site name	Date, proposed rule	FR citation	Public comment	Responsiveness summary	Full site deletion (full) or media/parcels/ description for partial deletion
Del Amo	8/16/2024	89 FR 66665	Yes	Yes	Ten parcels and one road section located in Operable Unit 1.
Mercury Refining, Inc	8/16/2024	89 FR 66665	No	No	Full.
Lawrence Aviation Industries, Inc.	8/16/2024	89 FR 66665	No	No	125-acre land/soils portion of the Site and all groundwater not included in Figure 2 of the PDJ, which shows the remaining groundwater plume.
Redstone Arsenal (USARMY/NASA).	8/16/2024	89 FR 66665	No	No	Soils and sediments from Operable Unit 8.

For the sites proposed for deletion, the closing date for comments in the proposed rule was September 16, 2024. The EPA extended the public comment period for the proposed partial deletion of the Del Amo site until November 16, 2024. The EPA received five submissions for the Del Amo site, each with multiple comments. The EPA received no public comment for any of the other three sites in this final rule. The EPA prepared a Responsiveness Summary to address public comment for the Del Amo site partial deletion. The EPA placed the public submissions with comments and Responsiveness Summary for the Del Amo site in the docket specified in Table 1, on *https://www.regulations.gov,* and in the appropriate Regional Records Center listed in the **ADDRESSES** section.

Commenters for the Del Amo site expressed concerns that portions of the site proposed for deletion still contain contamination. The EPA believes the portions of the site proposed for deletion from the NPL does not contain contamination exceeding residential risk screening levels, and the EPA is proposing to delete only the portions of the site where all appropriate response actions are completed, and cleanup goals met. The EPA clarified which areas are included in the proposed deletion, whether the areas included in the area proposed for deletion were

studied during the Remedial Investigation, and what work was performed at those portions of the site to clean them up. Other commenters expressed concern about groundwater contamination and operating groundwater remedies. The EPA wants to make clear that the proposed partial deletion will have no effect on the groundwater remedy, which is part of the Dual Site Groundwater Operable Unit for the Montrose Chemical and Del Amo Superfund Sites. The proposed partial deletion includes surface and subsurface soils, but not groundwater, for specified areas of Operable Unit 1 of the Del Amo site. Commenters requested information about how the Building Permit Review Institutional Control Layer 2 (Building Permit Review) works and expressed concern about how the EPA will protect against contaminated dust from the soil in the deleted parcels during construction and redevelopment. The EPA explained Institutional Control Layer 2 (Building Permit Review) creates a process where building permits applications are reviewed by the Del Amo Environmental Review Team, who then prepares and submits a Screening Evaluation Summary Report. The Screening Evaluation Summary Report, which is reviewed and approved by the EPA, includes an evaluation of the potential for exposure to impacted material during performance of the construction project based on existing environmental data, locations and documented historic information concerning types of former rubber plant facilities and their operation, and findings from previously issued reports, as well as recommendations for mitigating risks as applicable.

Commenters also expressed concerns that the Institutional Controls are insufficient to protect trench workers who may encounter contaminated soil at depth in the deleted portions of the Site. The EPA has investigated concentrations of chemicals of concern within the soil in the site area proposed for deletion and determined that concentrations of the chemicals of concern within the soil do not present a risk to human health or the environment under a residential use or worker scenario. In addition, out of an abundance of caution, Institutional Control Layers 1 and 2 will remain in place following the partial deletion. Keeping them in place helps ensure current and future owners and tenants are aware of the site's history. All these comments were carefully considered in the EPA's final decision to delete a portion of the Del Amo Site from the NPL. The EPA is proceeding with the partial deletion action as originally proposed.

Thus, the EPA concluded the deletion criteria for all four sites were met and documented in the specified dockets, and that the specified deletion actions from the NPL can proceed.

The EPA maintains the NPL as the list of sites that appear to present a significant risk to public health, welfare, or the environment. Deletion from the NPL does not preclude further remedial action. Whenever there is a significant release from a site deleted from the NPL, the deleted site may be restored to the NPL without application of the hazard ranking system. Deletion of a site from the NPL does not affect responsible party liability in the unlikely event that future conditions warrant further actions.

List of Subjects in 40 CFR Part 300

Environmental protection, Air pollution control, Chemicals, Hazardous substances, Hazardous waste, Intergovernmental relations, Natural resources, Oil pollution, Penalties, Reporting and recordkeeping requirements, Superfund, Water pollution control, Water supply.

Dated: February 7, 2025.

Larry Douchand,

Office Director, Office of Superfund Remediation and Technology Innovation.

For reasons set out in the preamble, the EPA amends 40 CFR part 300 as follows:

PART 300—NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN

■ 1. The authority citation for part 300 continues to read as follows:

Authority: 33 U.S.C. 1251 *et seq.;* 42 U.S.C. 9601–9657; E.O. 13626, 77 FR 56749, 3 CFR, 2013 Comp., p. 306; E.O. 12777, 56 FR 54757, 3 CFR, 1991 mp., p. 351; E.O. 12580, 52 FR 2923, 3 CFR, 1987 Comp., p. 193.

■ 2. In Appendix B to part 300 amend Table 1 by:

■ a. Revising the entry for ''CA'', ''Del Amo'', ''Los Angeles''.

■ b. Revising the entry for ''NY'', ''Lawrence Aviation Industries, Inc.'', ''Port Jefferson Station''.

■ c. Removing the entry for ''NY'', ''Mercury Refining, Inc'', ''Colonie''.

The revisions read as follows:

Appendix B to Part 300—National Priorities List

TABLE 1—GENERAL SUPERFUND SECTION

State	Site name	City/county	Notes (a)
*	* * * *	* *	*
CA	Del Amo	Los Angeles	P
*	* * * *	* *	*
NY	Lawrence Aviation, Inc	Port Jefferson Station	P
*	* * * *	* *	*

* P = Sites with partial deletion(s).

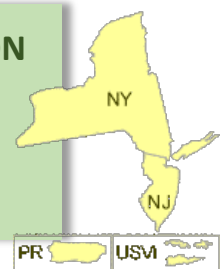
[FR Doc. 2025–03227 Filed 3–4–25; 8:45 am]

BILLING CODE 6560–50–P

United States Environmental Protection Agency

THE EPA DELETES A PART OF THE LAWRENCE AVIATION INDUSTRIES INC. SUPERFUND SITE FROM THE NATIONAL PRIORITIES LIST

PORT JEFFERSON STATION, NEW YORK



FEBRUARY 2025

The U.S. Environmental Protection Agency is deleting the land, soil, and groundwater portion (which does not include the groundwater plume) of the Lawrence Aviation Industries Inc. Superfund site in Port Jefferson Station, New York, from the National Priorities List, or NPL. The EPA has found, and the New York State Department of Environmental Conservation, or NYSDEC agrees, that the cleanup of soil and land at the site is protecting people and the environment, and no further work is needed. The EPA will continue to monitor and treat the groundwater plume (an area where contaminants disperse) at this site until it meets cleanup goals. Once the groundwater plume meets the cleanup goals, the site will be eligible for full removal from the NPL.

Because pollutants or contaminants remain on the Lawrence Aviation Industries Superfund site in levels that require some restrictions on how the site can be used, the EPA will continue to review this site every five years—even after NPL deletion—to ensure the cleanup continues to protect people from contaminants beneath the surface.

What is the NPL?

The National Priorities List, or NPL, includes some of the nation's most serious uncontrolled or abandoned releases of contamination. The EPA deletes sites or parts of sites from the NPL when no further cleanup is required to protect people's health or the environment. Years, and sometimes decades, of complex investigation and cleanup work have gone into getting these sites to where they are today. In this case, the EPA removed almost 20,000 tons of contaminated soil, old transformers and liquid waste from this site.

We Heard from You!

From August 16 to September 16, 2024, the EPA asked the public to comment on its intent to delete the land/soil portion of the site from the NPL. Information on the agency's notice of deletion can be found at: www.epa.gov/superfund/lawrence-aviation

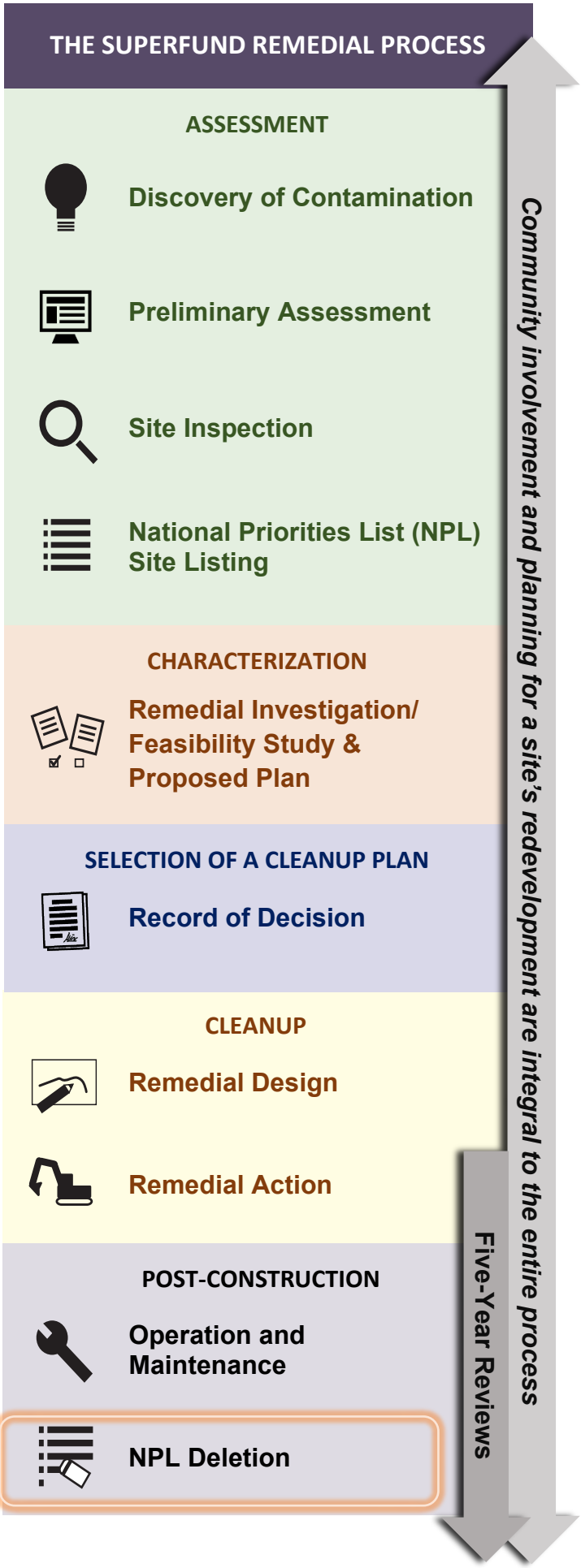
Redevelopment

This partial deletion is expected to facilitate redevelopment of the 125-acre property. Prospects for redevelopment include a solar power array on the former industrial area and a possible Long Island Railroad rail yard on the northeastern section of the property. A portion of the property will remain as open space. The EPA will continue to coordinate with NYSDEC and local stakeholders on redevelopment plans for the 125-acre property.

Cleanup and Past Activities

Between work conducted in 2009 and again in 2013 and 2014, the EPA removed and disposed of a total of approximately 17,000 tons of soil contaminated with polychlorinated biphenyls, or PCBs, and lead from the former Drum Crushing area and other areas on the Lawrence Aviation Industries property. In April 2014 and June 2019, the EPA and the NYSDEC removed and properly disposed of 30 transformers which contained approximately 1,600 gallons of liquid containing PCBs.

The EPA transferred the operation and maintenance of two groundwater pump and treat systems at the Lawrence Aviation Industries Superfund site to the NYSDEC in September 2021 and September 2022. The NYSDEC will continue the operation and maintenance of the two groundwater treatment systems in order to address the groundwater plume (an



area where contaminants disperse) coming from the Lawrence Aviation Industries Inc. facility, which is not included for deletion as part of this action.

In March 2024, the NYSDEC demolished the abandoned buildings onsite to re-use the property. The NYSDEC sampled the soil to identify potential sources of contamination beneath the building slabs, including 34 known machine pits/trenches located throughout the building area, and investigated the soil beneath and around the perimeter of each machine pit/trench location. Based on the sampling data, no sources of contamination were found, but the sampling revealed a small, localized area of PCB-contaminated soil along the southeast portion of the site. The NYSDEC removed and transported approximately 26 cubic yards of PCB-contaminated soil in June 2024 off-site for proper disposal.

Background

The Lawrence Aviation Industries, Inc. Superfund site is a 125-acre manufacturing plant comprised of ten buildings in the southwestern portion of the property, an abandoned lagoon in the west, a former drum-crushing area to the south, and a vacant wooden area in the northeast and east. The site property was part of a turkey farm owned by the Lawrence Aviation Industries Inc previous owner, Ledkote Products Company of New York. The facility has manufactured products from titanium sheet metal, including golf clubs and products for the aeronautics industry since 1959.

To clean up its facility in 1980, Lawrence Aviation Industries reportedly crushed more than 1,600 drums and allowed the liquid contents to spill onto unprotected soil. The facility's unsafe release of hazardous substances also affected groundwater, surface water, and sediment. Suffolk County's Department of Health Services and the NYSDEC conducted several investigations and documented various potential environmental concerns in the late 1900s. The list of contaminants at the site includes trichloroethylene, or TCE, Tetrachloroethylene, or PCE, acid wastes, oils, sludge, and metals.

The EPA placed the site on the Superfund program's National Priorities List in February 2000.

EPA Contact Information

Shereen Kandil
Community Involvement Coordinator
(212) 637-4333
Kandil.Shereen@epa.gov

Maria Jon
Remedial Project Manager
(212) 637-3967
Jon.Maria@epa.gov

www.epa.gov/superfund/lawrence-aviation
www.facebook.com/eparegion2/
www.x.com/EPA region2

APPENDIX A-2

ENVIRONMENTAL EASEMENT / NOTICE / DEED RESTRICTION

CC # : C24-33365

COUNTY CLERK'S OFFICE

STATE OF NEW YORK
COUNTY OF SUFFOLK

The Clerk of the County of Suffolk and the Court of Record thereof do hereby certify that I have compared the annexed with the original

EASEMENT

recorded in my office on **07/19/2024** under Liber **D00013256** and Page **267** and, that the same is a true copy thereof, and of the whole of such original.

In Testimony Whereof, I have hereunto set my hand and affixed the seal of said County and Court this **07/19/2024** .

SUFFOLK COUNTY CLERK

V Puleo

VINCENT PULEO

SEAL







SUFFOLK COUNTY CLERK
RECORDS OFFICE
RECORDING PAGE

Type of Instrument: EASEMENT
Number of Pages: 12
Receipt Number : 24-0089590
TRANSFER TAX NUMBER: 23-36655

Recorded: 07/19/2024
At: 11:53:51 AM

LIBER: D00013256
PAGE: 267

District:	Section:	Block:	Lot:
0200	159.00	02.00	019.000

EXAMINED AND CHARGED AS FOLLOWS

Deed Amount: $1.00

Received the Following Fees For Above Instrument

		Exempt			Exempt
Page/Filing	$0.00	YES	Handling	$0.00	YES
COE	$0.00	YES	NYS SRCHG	$0.00	YES
TP-584	$0.00	YES	Notation	$0.00	YES
Cert.Copies	$0.00	YES	RPT	$0.00	YES
Transfer tax	$0.00	YES			
			Fees Paid	$0.00	

TRANSFER TAX NUMBER: 23-36655

THIS PAGE IS A PART OF THE INSTRUMENT
THIS IS NOT A BILL

VINCENT PULEO
County Clerk, Suffolk County

1 | 2

Number of pages 12

This document will be public record. Please remove all Social Security Numbers prior to recording.

RECORDED
2024 Jul 19 11:53:51 AM
VINCENT PULEO
CLERK OF
SUFFOLK COUNTY
L D00013256
P 267
DT# 23-36655

Deed / Mortgage Instrument	Deed / Mortgage Tax Stamp	Recording / Filing Stamps

3 FEES

Page / Filing Fee	60-	Mortgage Amt.	
Handling	20. 00	1. Basic Tax	
TP-584	5-	2. Additional Tax	
Notation		Sub Total	
EA-52 17 (County)		Spec./Assit. or Spec. /Add.	
EA-5217 (State)		TOT. MTG. TAX	
R.P.T.S.A.	(+2) 600	Dual Town ____ Dual County ____ Held for Appointment ____	
Comm. of Ed.	5. 00	Transfer Tax	Ø
Affidavit		Mansion Tax	
Certified Copy	13.75		
NYS Surcharge	15. 00		
Other			
Sub Total			
Grand Total	Exempt		

The property covered by this mortgage is or will be improved by a one or two family dwelling only.
YES ____ or NO ____
If NO, see appropriate tax clause on page # ____ of this instrument.

7-18-24

4	Dist. 0200	Section 159.00	Block 02.00	Lot 019.000	5	Community Preservation Fund
				1022000		

Real Property Tax Service Agency Verification RA 7/19/24 (REAL PROPERTY TAX SERVICE AGENCY SUFFOLK COUNTY)

Stat ID 5354713

0200
15900
02126000

Consideration Amount $ 1

CPF Tax Due $ ____

6 Satisfactions/Discharges/Releases List Property Owners Mailing Address
RECORD & RETURN TO:
Suffolk County Landbank Corporation
ATTN: Matthew Kapell, Executive Director
100 Veterans Memorial Highway, 2nd FL
Hauppague, NY 11788

Improved ____
Vacant Land ____
TD ____
TD ____
TD ____

Mail to: Vincent Puleo, Suffolk County Clerk
310 Center Drive, Riverhead, NY 11901
www.suffolkcountyny.gov/clerk

7 Title Company Information
Co. Name
Title #

8 Suffolk County Recording & Endorsement Page

This page forms part of the attached Environmental Easment made by:
(SPECIFY TYPE OF INSTRUMENT)

SCLB Holdings, LLC

The premises herein is situated in SUFFOLK COUNTY, NEW YORK.

TO
New York State Department of Environmental Conservation

In the TOWN of Brookhaven
In the VILLAGE or HAMLET of Port Jefferson Station

BOXES **6** THRU **8** MUST BE TYPED OR PRINTED IN BLACK INK ONLY PRIOR TO RECORDING OR FILING.

(over)

County: Suffolk Site No: 152016

DECLARATION OF COVENANTS, RESTRICTIONS AND ENVIRONMENTAL EASEMENT

This Declaration of Covenants, Restrictions and Environmental Easement is made this 18th day of July, 2024, by and between SCLB Holdings, LLC, organized and existing under the laws of the State of New York, having its principal office at 100 Veterans Memorial Highway, 2nd Floor, Hauppauge, New York 11788 ("Grantor"), and the People of the State of New York acting through their Commissioner of the New York State Department of Environmental Conservation with its Central Office, located at 625 Broadway, Albany, New York 12233 ("Grantee").

WITNESSETH:

WHEREAS, Grantor is the owner of parcels of land located in the Town of Brookhaven, County of Suffolk, State of New York, known and designated on the tax map of the County Clerk of Suffolk as tax map parcel numbers: Parcel 159-2-19 and Parcel 159-1-26, and recorded in the Suffolk County Clerk's Office in Liber 13202 and Page 410, and Liber 13202 and Page 415, respectively (hereinafter, the "Property"). The Property subject to this Declaration of Covenants, Restrictions and Environmental Easement comprises approximately 36.27 +/- acres, and is hereinafter more fully described in Exhibit A and depicted in Exhibit B. The Property includes any buildings and improvements thereon and appurtenances thereto and is part of the Lawrence Aviation Industries, Inc. Superfund Site ("Site"), which the United States Environmental Protection Agency ("EPA"), pursuant to Section 105 of the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"), 42 U.S.C. § 9605, placed on the National Priorities List, as set forth in Appendix B of the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), 40 C.F.R. Part 300, by publication in the Federal Register on March 6, 2000; and

WHEREAS, in a Record of Decision dated September 29, 2006 ("ROD"), EPA selected, and the New York State Department of Environmental Conservation ("NYSDEC") concurred with, a remedial action for the Site pursuant to CERCLA, which provided for, in pertinent part: excavation and off-Site disposal of contaminated soils and backfilling of excavated areas; construction of groundwater extraction and treatment systems at the Property and downgradient of the Property; application of in situ chemical oxidation within an area of high trichloroethene concentrations in groundwater at the Property; implementation of certain Site institutional controls and a Site Management Plan ("SMP"); investigation of potential soil vapor intrusion into structures within the groundwater plume area and implementation of sub-slab ventilation systems if required; and implementation of a long-term groundwater and surface water monitoring program; and

WHEREAS, the parties hereto have agreed that in accordance with the terms of a consent decree entitled Consent Decree Concerning Distribution of Certain Assets Among Claimants, relating to resolving litigation in the matter of *U.S. v. Lawrence Aviation Industries, Inc. et al.*, Civ. No: 2-06-cv-04818-JMA-AYS, which was entered by the Court on May 12, 2023, Grantor shall grant to the Grantee a permanent environmental easement ("Environmental Easement") pursuant to Article 71, Title 36 of the New York State Environmental Conservation Law, provide covenants with respect to restrictions on the use of the Property, and provide a right of access to the Property in

favor of Grantee, all of which shall run with the land, for purposes of implementing, facilitating and monitoring the CERCLA response action in order to protect human health and the environment; and WHEREAS, Grantor wishes to cooperate fully with the Grantee in the implementation of all response actions at the Site.

NOW, THEREFORE:

1. Grant: Grantor, on behalf of itself, its successors and assigns, does hereby give, grant, covenant, and declare in favor of the Grantee that the Property shall be subject to this Declaration of Covenants, Restrictions and Environmental Easement, and Grantor does further give, grant, and convey to the Grantee the perpetual right to enforce said restrictions, covenants, right of access, and this Declaration of Covenants, Restrictions and Environmental Easement, all of which shall be of the nature and character, and for the purposes hereinafter set forth, with respect to the Property.

2. Purpose: It is the purpose of this instrument to convey to the Grantee real property rights, which will run with the land, to facilitate the continued protectiveness of the remediation of past environmental contamination and to impose use restrictions and covenants to protect human health and the environment by reducing the risk of exposure to contaminants.

3. Restrictions on Use and Maintenance of Engineering Controls: The following restrictions, as more comprehensively established in the SMP on file with EPA and NYSDEC and as may, from time to time, be amended, apply to the use of the Property, as provided below, run with the land, and are binding on the Grantor and its successors in title and assigns:

   a) **Commercial/Industrial Use.** The Property may be used for only commercial and industrial uses as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and (v).

   b) **Restriction of Use of Groundwater.** The use of groundwater underlying the Property is prohibited without necessary water quality treatment as determined by the New York State Department of Health or the Suffolk County Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department.

   c) **Vapor Intrusion Evaluation for New Construction.** The potential for vapor intrusion must be evaluated for any buildings constructed on the Property, and any potential impacts that are identified must be monitored or mitigated in accordance with the SMP.

   d) **Inspections and Monitoring.** Site inspections, monitoring of groundwater, and maintenance of fencing and other engineering controls must be implemented in accordance with the provisions of the SMP.

4. Modification or termination of restrictions and covenants: The restrictions specified in the preceding paragraph of this instrument may only be modified or terminated, in whole or in part, in writing, by the Grantee with approval of EPA, provided, however, that any

modification or termination of said restrictions shall not adversely affect the remedy selected by EPA for the Site. If approved by Grantee and EPA and it is requested by the Grantor, such writing will be executed by Grantee in recordable form. Any request by Grantor for such a modification or termination of this instrument shall be made, not less than 30-days in advance of any modification or termination, in writing by Grantor to Grantee and to EPA in accordance with paragraph 15 of this instrument.

5. Right of access: Grantors hereby convey to Grantee and to EPA a right of access to the Property at all reasonable times for the following purposes, which right of access shall run with the land and be binding on Grantor, its successors and /or assigns, and on any tenants or any other parties having an interest and/or rights to any portion of the Property:

   a) Implementing the remedy selected in the ROD;

   b) Verifying any data or information relating to the Site;

   c) Verifying that no action is being taken at the Site that is in violation of the terms of this instrument or of any federal or state environmental laws or regulations;

   d) Conducting investigations under CERCLA relating to contamination on or near the Site, including, without limitation, sampling of air, water, sediments, or soils; and

   e) Implementing additional or new response actions under CERCLA.

6. Reserved rights of Grantor: Grantor hereby reserves unto itself, and its successors and assigns, all rights and privileges in and to the use of the Property that are not incompatible with the restrictions, rights, covenants, and easement granted herein.

7. Federal authority: Nothing in this document shall limit or otherwise affect EPA's rights of entry and access or EPA's authority to take response actions under CERCLA, the NCP, or other federal law.

8. State authority: Nothing herein shall constitute a waiver of any rights the State may have pursuant to the Environmental Conservation Law, state regulation, and/or relevant provisions of statutory or common law.

9. No public access and use: No right of access or use by the general public to any portion of the Site is conveyed by this instrument.

10. Public notice: Grantor, on behalf of itself and its successors and assigns, agrees to include in each instrument conveying any interest in any portion of the Property, including but not limited to deeds, leases, and mortgages, a notice that is in substantially the following form:

NOTICE: THIS PROPERTY IS SUBJECT TO A DECLARATION OF COVENANTS, RESTRICTIONS, AND AN ENVIRONMENTAL EASEMENT DATED_____, 20__ , RECORDED IN THE SUFFOLK COUNTY CLERK'S OFFICE ON_____, 20__, IN BOOK_____, PAGE_____, AND HELD BY THE NEW YORK

STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION PURSUANT TO TITLE 36, ARTICLE 71 OF THE ENVIRONMENTAL CONSERVATION LAW. THE DECLARATION OF COVENANTS, RESTRICTIONS, AND ENVIRONMENTAL EASEMENT SHALL BE ENFORCEABLE BY THE PEOPLE OF THE STATE OF NEW YORK AND BY THE UNITED STATES OF AMERICA AS THIRD-PARTY BENEFICIARY.

Within thirty (30) days of the date any such instrument of conveyance is executed, Grantor agrees to provide Grantee and EPA with a certified true copy of said instrument and, if it has been recorded in the public land records, its recording reference.

11. Enforcement: This Environmental Easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

12. Damages: Grantee shall also be entitled to recover damages for breach of any covenant or violation of the terms of this instrument including any impairment to the selected remedy that increases the cost of the selected remedy for the Site as a result of such breach or violation.

13. Waiver of certain defenses: Grantor hereby waives any defense of laches, estoppel, or prescription.

14. Covenants: Grantor hereby covenants that the Grantor is lawfully seized in fee simple of the real property at the Site, that the Grantor has a good and lawful right and power to sell and convey it or any interest therein and that the Site is free and clear of encumbrances.

15. Notices: Any notice, demand, request, consent, approval, or communication under this instrument that either party desires or is required to give to the other shall be in writing and shall either be served personally or sent by first class mail, postage prepaid, addressed as follows:

To Grantor:

SCLB Holdings, LLC
100 Veterans Memorial Highway
2nd Floor
Hauppauge, New York 11788

To Grantee:
Office of General Counsel
NYS Department of Environmental Conservation
625 Broadway
Albany, New York 12233-5500

And

Suffolk County Attorney's Office
100 Veterans Memorial Highway
6th Floor
Hauppauge, New York 11788

And

NYS Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Site Control
625 Broadway
Albany, New York 12233

A copy of each such communication shall also be sent to EPA in the same manner as to Grantor or Grantee, and addressed to the following two addressees:

U.S. Environmental Protection Agency
Superfund and Emergency Management Division
290 Broadway, 19th Floor,
New York, New York 10007-1866
Attention: Lawrence Aviation Industries, Inc. Superfund Site Remedial Project Manager

U.S. Environmental Protection Agency
Office of Regional Counsel
290 Broadway, 17th Floor,
New York, New York 10007-1866
Attention: Lawrence Aviation Industries, Inc. Superfund Site Attorney

16. General provisions:

a) Controlling law: The interpretation and performance of this instrument shall be governed by the laws of the State of New York, and with respect to other matters, shall be governed by the laws of the United States or, if there are no applicable federal laws, by the laws of the State of New York.

b) Liberal construction: Any general rule of construction to the contrary notwithstanding, this instrument shall be liberally construed in favor of the grant to affect the purpose of this instrument and the policy and purpose of CERCLA. If any provision of this instrument is found to be ambiguous, an interpretation consistent with the purpose of this instrument that would render the provision valid shall be favored over any interpretation that would render it invalid.

c) Severability: If any provision of this instrument or the application of it to any person or circumstance is found to be invalid, the remainder of the provisions of this instrument, or the application of such provisions to persons or circumstances other than those to which it is found to be invalid, as the case may be, shall not be affected thereby.

d) No forfeiture: Nothing contained herein will result in a forfeiture or reversion of Grantor's title in any respect.

e) Joint obligation: If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

f) Successors: The covenants, easements, terms, conditions, and restrictions set forth in this instrument shall be binding upon, and inure to the benefit of, the parties hereto and their respective personal representatives, heirs, successors, and assigns and shall continue as a servitude running in perpetuity with the real property at the Site. The term "Grantor", wherever used herein, and any pronouns used in place thereof, shall include the persons and/or entities named at the beginning of this document, identified as "Grantor" and their personal representatives, heirs, successors, and assigns. The term "Grantee", wherever used herein, and any pronouns used in place thereof, shall mean the People of the State of New York acting through their Commissioner of NYSDEC or through any successor department or agency of the State of New York.

g) Captions: The captions in this instrument have been inserted solely for convenience of reference and are not a part of this instrument and shall have no effect upon construction or interpretation.

h) Counterparts: The parties may execute this instrument in two or more counterparts, which shall, in the aggregate, be signed by both parties; each counterpart shall be deemed an original instrument as against any party who has signed it. In the event of any disparity between the counterparts produced, the recorded counterpart shall be controlling.

i) Third-Party Beneficiary: Grantor and Grantee hereby agree that the United States, through EPA, shall be, on behalf of the public, a third-party beneficiary of the benefits, rights, and obligations conveyed to Grantee in this instrument; provided that nothing in this instrument shall be construed to create any obligations on the part of EPA.

17. Recordation: Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner of the New York State Department of Environmental Conservation or her/his authorized representative in the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

TO HAVE AND TO HOLD unto the Grantee and its assigns forever.

IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its name.

Executed this 18 day of July, 2024.

SCLB Holdings, LLC
By: Matthew Kapell
Title: Executive Director

Grantor's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF Suffolk)

On the 18th day of July, in the year 2024, before me, the undersigned, personally appeared Matthew Kapell, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity as Executive Director of SCLB Holdings LLC, and that by his/her signature on the instrument, the Grantor, upon behalf of which the individual acted, executed the instrument.

MICHELE MARTINES
NOTARY PUBLIC STATE OF NEW YORK
No. 01MA6191505
Qualified in Suffolk County
~~Certified in Nassau County~~
My Commission Expires 8/8/2024

Michele Martines
Notary Public - State of New York

THIS DECLARATION OF COVENANTS, RESTRICTIONS AND ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK, Acting By and Through the Department of Environmental Conservation as Designee of the Commissioner.

By: Andrew Guglielmi
Andrew O. Guglielmi, Director
Division of Environmental Remediation

Date: July 17, 2024

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF Albany)

On the 17th day of July, in the year 2024, before me, the undersigned, personally appeared Andrew O. Guglielmi, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his capacity as designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his signature on the instrument, the People of the State of New York, upon behalf of which the individual acted, executed the instrument.

Notary Public - State of New York

Cheryl A. Salem
Notary Public State of New York
Registration No. 01SA0002177
Qualified in Albany County
My Commission Expires March 3, 2027

EXHIBIT A
Declaration of Covenants, Restrictions and Environmental Easement

Lawrence Aviation Industries, Inc. Superfund Site

METES AND BOUNDS DESCRIPTION OF AN ENVIRONMENTAL EASEMENT HAMLET OF PORT JEFFERSON STATION, TOWN OF BROOKHAVEN, STATE OF NEW YORK, BEING ALL OF SUFFOLK COUNTY TAX MAP LOT 200-159-1-26 AND A PORTION OF 200-159-2-19 & 22

BEGINNING AT A POINT AT THE SOUTHWESTERLY CORNER OF LAND NOW OR FORMERLY OF SHEEP PASTURE HOLDINGS LLC AND THE NORTHEASTERLY SIDE OF AN EXISTING LIPA RIGHT OF WAY, SAID POINT BEING NORTH 50 DEGREES 28 MINUTES 58 SECONDS WEST 447.67 FEET MEASURED FROM THE INTERSECTION OF THE NORTHERLY SIDE OF THE SETAUKET-PORT JEFFERSON GREENWAY MULTI-USE PATH (NEW YORK STATE ROUTE 5232-A) AND THE NORTHEASTERLY SIDE OF AN EXISTING LIPA RIGHT OF WAY;

THENCE NORTHERLY FROM SAID POINT OF BEGINNING ALONG LAND NOW OR FORMERLY OF SHEEP PASTURE HOLDINGS LLC AND THE EASTERLY SIDE OF THE MAP OF HARBORVIEW PARK FILED MAY 19, 1928 AS FILE NO. 161 NORTH 43 DEGREES 11 MINUTES 40 SECONDS EAST 1519.49 FEET (DEED) 1519.37 FEET TO LAND NOW OR FORMERLY OF 2384 BELMONT AVENUE LLC;

THENCE SOUTHEASTERLY AND SOUTHERLY ALONG SAID LANDS OF BELMONT AVENUE LLC AND LAND NOW OR FORMERLY OF SCLB HOLDINGS LLC THE FOLLOWING SIX (6) COURSES AND DISTANCES:

1) SOUTH 47 DEGREES 43 MINUTES 16 SECONDS EAST 250.47 FEET
2) SOUTH 43 DEGREES 10 MINUTES 55 SECONDS WEST 74.64 (DEED) 74.52 FEET
3) SOUTH 47 DEGREES 43 MINUTES 09 SECONDS EAST 179.20 FEET
4) NORTH 52 DEGREES 16 MINUTES 51 SECONDS EAST 18.20 FEET
5) SOUTH 63 DEGREES 56 MINUTES 09 SECONDS EAST 401.00 FEET
6) SOUTH 58 DEGREES 04 MINUTES 09 SECONDS EAST 407.80 FEET TO A POINT;

THENCE SOUTHERLY ALONG SAID LANDS OF SCLB HOLDINGS LLC SOUTH 31 DEGREES 40 MINUTES 40 SECONDS WEST 587.08 FEET TO THE NORTHERLY SIDE OF THE SETAUKET-PORT JEFFERSON GREENWAY MULTI-USE PATH (NEW YORK STATE ROUTE 5232-A);

THENCE WESTERLY ALONG SAID LAND NOW OR FORMERLY OF THE SETAUKET-PORT JEFFERSON GREENWAY MULTI-USE PATH (NEW YORK STATE ROUTE 5232-A) ALONG THE ARC OF A CURVE TO THE RIGHT WITH A RADIUS OF 5654.58 FEET (DEED) 5654.16 FEET, ARC LENGTH OF 1387.79 FEET

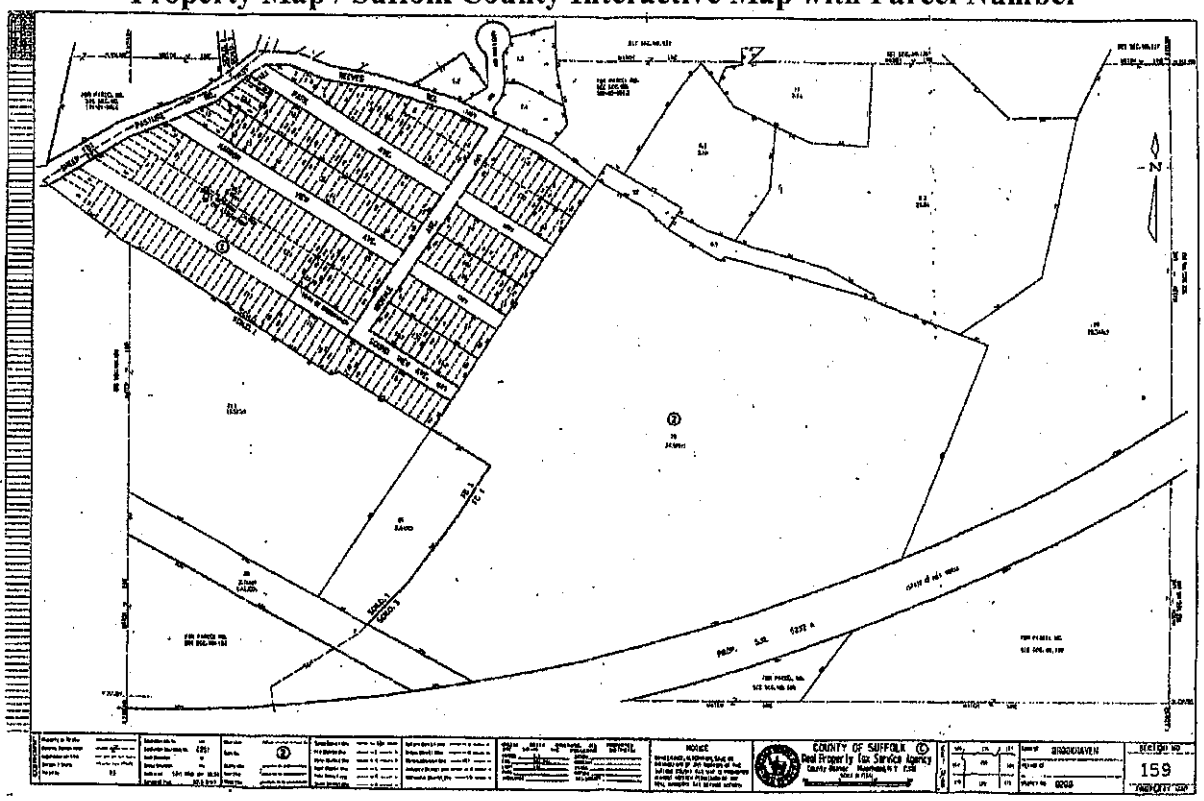
(DEED) 1387.77 FEET AND CHORD BEARING SOUTH 82 DEGREES 59 MINUTES 44 SECONDS WEST 1384.29 FEET TO NORTHERLY SIDE OF AN EXISTING LIPA RIGHT OF WAY;

THENCE NORTHWESTERLY ALONG THE NORTHERLY SIDE OF SAID EXISTING LIPA RIGHT OF WAY NORTH 50 DEGREES 28 MINUTES 58 SECONDS WEST 447.63 (DEED) 447.67 FEET TO THE POINT OR PLACE OF BEGINNING CONTAINING WITHIN SAID BOUNDS 36.268 ACRES.

EXHIBIT B
Declaration of Covenants, Restrictions and Environmental Easement

Lawrence Aviation Industries, Inc. Superfund Site

Property Map / Suffolk County Interactive Map with Parcel Number



1 | 2

Number of pages

This document will be public record. Please remove all Social Security Numbers prior to recording.

Deed / Mortgage Instrument	Deed / Mortgage Tax Stamp	Recording / Filing Stamps

3 FEES

Page / Filing Fee _____
Handling 20. 00
TP-584 _____
Notation _____
EA-52 17 (County) _____
EA-5217 (State) _____
R.P.T.S.A. _____
Comm. of Ed. 5. 00
Affidavit _____
Certified Copy _____
NYS Surcharge 15. 00
Other _____

Sub Total _____

Sub Total _____

Grand Total _____

Mortgage Amt. _____
1. Basic Tax _____
2. Additional Tax _____ _____
Sub Total _____
Spec./Assit.
or
Spec. /Add. _____
TOT. MTG. TAX _____
Dual Town _____ Dual County _____
Held for Appointment _____
Transfer Tax _____
Mansion Tax _____

The property covered by this mortgage is or will be improved by a one or two family dwelling only.
YES _____ or NO _____

If NO, see appropriate tax clause on page # _____ of this instrument.

4	Dist. 0200	Section 159.00	Block 02.00	Lot 019.000	5	Community Preservation Fund

Real Property Tax Service Agency Verification

Consideration Amount $ _____

CPF Tax Due $ _____

6 Satisfactions/Discharges/Releases List Property Owners Mailing Address
RECORD & RETURN TO:
Suffolk County Landbank Corporation
ATTN: Matthew Kapell, Executive Director
100 Veterans Memorial Highway, 2nd FL
Hauppague, NY 11788

Improved _____
Vacant Land _____
TD _____
TD _____
TD _____

Mail to: Vincent Puleo, Suffolk County Clerk
310 Center Drive, Riverhead, NY 11901
www.suffolkcountyny.gov/clerk

7 Title Company Information

Co. Name

Title #

8 Suffolk County Recording & Endorsement Page

TP-584 (4/13)

New York State Department of Taxation and Finance

Combined Real Estate Transfer Tax Return, Credit Line Mortgage Certificate, and Certification of Exemption from the Payment of Estimated Personal Income Tax

Recording office time stamp

See Form TP-584-I, Instructions for Form TP-584, *before completing this form. Print or type.*

Schedule A — Information relating to conveyance

Grantor/Transferor

☐ Individual
☒ Corporation
☐ Partnership
☐ Estate/Trust
☐ Single member LLC
☐ Other

Name *(if individual, last, first, middle initial)* (☐ *check if more than one grantor)*: SCLB Holdings, LLC

Social security number

Mailing address: 100 Veterans Memorial Hwy.

Social security number

City: Hauppauge | State: NY | ZIP code: 11788

Federal EIN: 61-1985629

Single member's name if grantor is a single member LLC *(see instructions)*

Single member EIN or SSN

Grantee/Transferee

☐ Individual
☐ Corporation
☐ Partnership
☐ Estate/Trust
☐ Single member LLC
☒ Other

Name *(if individual, last, first, middle initial)* (☐ *check if more than one grantee)*: New York State Department of Environmental Conservation

Social security number

Mailing address: 625 Broadway

Social security number

City: New York | State: NY | ZIP code: 12233

Federal EIN: 14-6013200

Single member's name if grantee is a single member LLC *(see instructions)*

Single member EIN or SSN

Location and description of property conveyed

Tax map designation – Section, block & lot *(include dots and dashes)*	SWIS code (six digits)	Street address	City, town, or village	County
159.00-02.00-019.000	472213	Rte 25A By-Pass	Port Jefferson Sta	Suffolk

Type of property conveyed *(check applicable box)*

1 ☐ One- to three-family house
2 ☐ Residential cooperative
3 ☐ Residential condominium
4 ☐ Vacant land
5 ☐ Commercial/Industrial
6 ☐ Apartment building
7 ☐ Office building
8 ☒ Other Easement

Date of conveyance: 07 (month) | 18 (day) | 2024 (year)

Percentage of real property conveyed which is residential real property 0 % *(see instructions)*

Condition of conveyance *(check all that apply)*

a. ☐ Conveyance of fee interest
b. ☐ Acquisition of a controlling interest (state percentage acquired _____ %)
c. ☐ Transfer of a controlling interest (state percentage transferred _____ %)
d. ☐ Conveyance to cooperative housing corporation
e. ☐ Conveyance pursuant to or in lieu of foreclosure or enforcement of security interest *(attach Form TP-584.1, Schedule E)*
f. ☐ Conveyance which consists of a mere change of identity or form of ownership or organization *(attach Form TP-584.1, Schedule F)*
g. ☐ Conveyance for which credit for tax previously paid will be claimed *(attach Form TP-584.1, Schedule G)*
h. ☐ Conveyance of cooperative apartment(s)
i. ☐ Syndication
j. ☐ Conveyance of air rights or development rights
k. ☐ Contract assignment
l. ☐ Option assignment or surrender
m. ☐ Leasehold assignment or surrender
n. ☐ Leasehold grant
o. ☒ Conveyance of an easement
p. ☐ Conveyance for which exemption from transfer tax claimed *(complete Schedule B, Part III)*
q. ☐ Conveyance of property partly within and partly outside the state
r. ☐ Conveyance pursuant to divorce or separation
s. ☐ Other *(describe)* _____

For recording officer's use	Amount received Schedule B., Part I $ Schedule B., Part II $	Date received	Transaction number

Schedule B — Real estate transfer tax return (Tax Law, Article 31)

Part I – Computation of tax due

1	Enter amount of consideration for the conveyance *(if you are claiming a total exemption from tax, check the exemption claimed box, enter consideration and proceed to Part III)* ☒ **Exemption claimed**	1.	1 00
2	Continuing lien deduction *(see instructions if property is taken subject to mortgage or lien)*	2.	
3	Taxable consideration *(subtract line 2 from line 1)*	3.	
4	Tax: $2 for each $500, or fractional part thereof, of consideration on line 3	4.	
5	Amount of credit claimed for tax previously paid *(see instructions and attach Form TP-584.1,* Schedule G*)*	5.	
6	Total tax due* *(subtract line 5 from line 4)*	6.	

Part II – Computation of additional tax due on the conveyance of residential real property for $1 million or more

1	Enter amount of consideration for conveyance *(from* Part I*, line 1)*	1.	
2	Taxable consideration *(multiply line 1 by the percentage of the premises which is residential real property, as shown in* Schedule A*)*	2.	
3	Total additional transfer tax due* *(multiply line 2 by 1% (.01))*	3.	

Part III – Explanation of exemption claimed on Part I, line 1 *(check any boxes that apply)*

The conveyance of real property is exempt from the real estate transfer tax for the following reason:

a. Conveyance is to the United Nations, the United States of America, the state of New York, or any of their instrumentalities, agencies, or political subdivisions (or any public corporation, including a public corporation created pursuant to agreement or compact with another state or Canada) ..... a ☒

b. Conveyance is to secure a debt or other obligation ..... b ☐

c. Conveyance is without additional consideration to confirm, correct, modify, or supplement a prior conveyance ..... c ☐

d. Conveyance of real property is without consideration and not in connection with a sale, including conveyances conveying realty as bona fide gifts ..... d ☐

e. Conveyance is given in connection with a tax sale ..... e ☐

f. Conveyance is a mere change of identity or form of ownership or organization where there is no change in beneficial ownership. (This exemption cannot be claimed for a conveyance to a cooperative housing corporation of real property comprising the cooperative dwelling or dwellings.) Attach Form TP-584.1, Schedule F ..... f ☐

g. Conveyance consists of deed of partition ..... g ☐

h. Conveyance is given pursuant to the federal Bankruptcy Act ..... h ☐

i. Conveyance consists of the execution of a contract to sell real property, without the use or occupancy of such property, or the granting of an option to purchase real property, without the use or occupancy of such property ..... i ☐

j. Conveyance of an option or contract to purchase real property with the use or occupancy of such property where the consideration is less than $200,000 and such property was used solely by the grantor as the grantor's personal residence and consists of a one-, two-, or three-family house, an individual residential condominium unit, or the sale of stock in a cooperative housing corporation in connection with the grant or transfer of a proprietary leasehold covering an individual residential cooperative apartment ..... j ☐

k. Conveyance is not a conveyance within the meaning of Tax Law, Article 31, section 1401(e) *(attach documents supporting such claim)* ..... k ☐

*The total tax (from Part I, line 6 and Part II, line 3 above) is due within 15 days from the date conveyance. Please make check(s) payable to the county clerk where the recording is to take place. If the recording is to take place in the New York City boroughs of Manhattan, Bronx, Brooklyn, or Queens, make check(s) payable to the ***NYC Department of Finance.*** If a recording is not required, send this return and your check(s) made payable to the ***NYS Department of Taxation and Finance***, directly to the NYS Tax Department, RETT Return Processing, PO Box 5045, Albany NY 12205-0045.

Schedule C — Credit Line Mortgage Certificate (Tax Law, Article 11)

Complete the following only if the interest being transferred is a fee simple interest.
I (we) certify that: *(check the appropriate box)*

1. ☐ The real property being sold or transferred is not subject to an outstanding credit line mortgage.

2. ☐ The real property being sold or transferred is subject to an outstanding credit line mortgage. However, an exemption from the tax is claimed for the following reason:
   - ☐ The transfer of real property is a transfer of a fee simple interest to a person or persons who held a fee simple interest in the real property (whether as a joint tenant, a tenant in common or otherwise) immediately before the transfer.
   - ☐ The transfer of real property is (A) to a person or persons related by blood, marriage or adoption to the original obligor or to one or more of the original obligors or (B) to a person or entity where 50% or more of the beneficial interest in such real property after the transfer is held by the transferor or such related person or persons (as in the case of a transfer to a trustee for the benefit of a minor or the transfer to a trust for the benefit of the transferor).
   - ☐ The transfer of real property is a transfer to a trustee in bankruptcy, a receiver, assignee, or other officer of a court.
   - ☐ The maximum principal amount secured by the credit line mortgage is $3,000,000 or more, and the real property being sold or transferred is **not** principally improved nor will it be improved by a one- to six-family owner-occupied residence or dwelling.

     Please note: for purposes of determining whether the maximum principal amount secured is $3,000,000 or more as described above, the amounts secured by two or more credit line mortgages may be aggregated under certain circumstances. See TSB-M-96(6)-R for more information regarding these aggregation requirements.
   - ☐ Other *(attach detailed explanation)*.

3. ☐ The real property being transferred is presently subject to an outstanding credit line mortgage. However, no tax is due for the following reason:
   - ☐ A certificate of discharge of the credit line mortgage is being offered at the time of recording the deed.
   - ☐ A check has been drawn payable for transmission to the credit line mortgagee or his agent for the balance due, and a satisfaction of such mortgage will be recorded as soon as it is available.

4. ☐ The real property being transferred is subject to an outstanding credit line mortgage recorded in _____ (insert liber and page or reel or other identification of the mortgage). The maximum principal amount of debt or obligation secured by the mortgage is _____. No exemption from tax is claimed and the tax of _____ is being paid herewith. *(Make check payable to county clerk where deed will be recorded or, if the recording is to take place in New York City but not in Richmond County, make check payable to the **NYC Department of Finance.**)*

Signature (both the grantor(s) and grantee(s) must sign)

The undersigned certify that the above information contained in schedules A, B, and C, including any return, certification, schedule, or attachment, is to the best of his/her knowledge, true and complete, and authorize the person(s) submitting such form on their behalf to receive a copy for purposes of recording the deed or other instrument effecting the conveyance.

Grantor signature	Title	Grantee signature	Title
As Exec Director	Exec Director	Andrew Duguid	Director of Remediation

Reminder: Did you complete all of the required information in Schedules A, B, and C? Are you required to complete Schedule D? If you checked *e*, *f*, or *g* in Schedule A, did you complete Form TP-584.1? Have you attached your check(s) made payable to the county clerk where recording will take place or, if the recording is in the New York City boroughs of Manhattan, Bronx, Brooklyn, or Queens, to the ***NYC Department of Finance***? If no recording is required, send your check(s), made payable to the ***Department of Taxation and Finance,*** directly to the NYS Tax Department, RETT Return Processing, PO Box 5045, Albany NY 12205-0045.

Schedule D - Certification of exemption from the payment of estimated personal income tax (Tax Law, Article 22, section 663)

Complete the following only if a fee simple interest or a cooperative unit is being transferred by an individual or estate or trust.

If the property is being conveyed by a referee pursuant to a foreclosure proceeding, proceed to Part II, and check the second box under *Exemptions for nonresident transferor(s)/seller(s)* and sign at bottom.

Part I - New York State residents

If you are a New York State resident transferor(s)/seller(s) listed in Schedule A of Form TP-584 (or an attachment to Form TP-584), you must sign the certification below. If one or more transferors/sellers of the real property or cooperative unit is a resident of New York State, **each** resident transferor/seller must sign in the space provided. If more space is needed, please photocopy this Schedule D and submit as many schedules as necessary to accommodate all resident transferors/sellers.

Certification of resident transferor(s)/seller(s)

This is to certify that at the time of the sale or transfer of the real property or cooperative unit, the transferor(s)/seller(s) as signed below was a resident of New York State, and therefore is not required to pay estimated personal income tax under Tax Law, section 663(a) upon the sale or transfer of this real property or cooperative unit.

Signature	Print full name	Date
Signature	Print full name	Date
Signature	Print full name	Date
Signature	Print full name	Date

Note: A resident of New York State may still be required to pay estimated tax under Tax Law, section 685(c), but not as a condition of recording a deed.

Part II - Nonresidents of New York State

If you are a nonresident of New York State listed as a transferor/seller in Schedule A of Form TP-584 (or an attachment to Form TP-584) but are not required to pay estimated personal income tax because one of the exemptions below applies under Tax Law, section 663(c), check the box of the appropriate exemption below. If any one of the exemptions below applies to the transferor(s)/seller(s), that transferor(s)/seller(s) is not required to pay estimated personal income tax to New York State under Tax Law, section 663. **Each** nonresident transferor/seller who qualifies under one of the exemptions below must sign in the space provided. If more space is needed, please photocopy this Schedule D and submit as many schedules as necessary to accommodate all nonresident transferors/sellers.

If none of these exemption statements apply, you must complete Form IT-2663, *Nonresident Real Property Estimated Income Tax Payment Form*, or Form IT-2664, *Nonresident Cooperative Unit Estimated Income Tax Payment Form.* For more information, see *Payment of estimated personal income tax,* on page 1 of Form TP-584-I.

Exemption for nonresident transferor(s)/seller(s)

This is to certify that at the time of the sale or transfer of the real property or cooperative unit, the transferor(s)/seller(s) (grantor) of this real property or cooperative unit was a nonresident of New York State, but is not required to pay estimated personal income tax under Tax Law, section 663 due to one of the following exemptions:

☐ The real property or cooperative unit being sold or transferred qualifies in total as the transferor's/seller's principal residence (within the meaning of Internal Revenue Code, section 121) from _____ (Date) to _____ (Date) *(see instructions)*.

☐ The transferor/seller is a mortgagor conveying the mortgaged property to a mortgagee in foreclosure, or in lieu of foreclosure with no additional consideration.

☐ The transferor or transferee is an agency or authority of the United States of America, an agency or authority of the state of New York, the Federal National Mortgage Association, the Federal Home Loan Mortgage Corporation, the Government National Mortgage Association, or a private mortgage insurance company.

Signature	Print full name	Date
Signature	Print full name	Date
Signature	Print full name	Date
Signature	Print full name	Date

Department of Taxation and Finance

Change in Mailing Address for Certain Real Estate Transfer Tax Forms if Using a Private Delivery Service

TP-39
(1/17)

There has been a change to the address that must be used when submitting certain forms through a private delivery service rather than by U.S. Mail.

Send **Form TP-584**, *Combined Real Estate Transfer Tax Return, Credit Line Mortgage Certificate, and Certification of Exemption from the Payment of Estimated Personal Income Tax,* to:

NYS TAX DEPARTMENT
RETT PROCESSING UNIT
90 COHOES AVE
GREEN ISLAND NY 12183-1515

Send **Form TP-588**, *Cooperative Housing Corporation Information Return,* to:

NYS TAX DEPARTMENT
TDAB – TRANSFER TAX
90 COHOES AVE
GREEN ISLAND NY 12183-1515

See Publication 55, *Designated Private Delivery Services,* for information about establishing the date you filed, and for the address to use for other forms.

NEW YORK STATE

Department of Taxation and Finance

Important Notice to Home Buyers

TP-41
(6/16)

If you are buying residential property and you plan to make it your primary residence, you may be entitled to school tax relief through the New York State STAR credit. To receive this credit, you must register with the Tax Department after you have taken title to the property. To register or to get more information, visit our website at *www.tax.ny.gov* or call 518-457-2036. Do **not** file an application for the STAR "exemption" with your assessor, since new STAR exemptions will no longer be granted. School tax relief is now provided to new applicants through the STAR credit.

APPENDIX A-3

RESPONSIBILITIES of OWNER and REMEDIAL PARTY

Responsibilities

The responsibilities for implementing the Site Management Plan (SMP) for the Lawrence Aviation Industries site (the "site"), No. 152016 are divided between the site owner(s) and a Remedial Party, as defined below. The owner is currently listed as:
SCLB Holdings LLC (the "owner").

Solely for the purposes of this document and based upon the facts related to a particular site and the remedial program being carried out, the term Remedial Party (RP) refers to any of the following: certificate of completion (COC) holder, volunteer, applicant, responsible party, and, in the event the New York State Department of Environmental Conservation (NYSDEC) is carrying out remediation or site management, NYSDEC and/or an agent acting on its behalf. The RP is:

New York State Department of Environmental Conservation
625 Broadway
Albany, New York

Nothing on this page shall supersede the provisions of an Environmental Easement, Order on Consent, ROD, or other legally binding document that affects rights and obligations relating to the site.

A Declaration of Covenants, Restrictions, and Environmental Easement was established by SCLB on July 18, 2024 (Environmental Easement). The Environmental Easement conveys to the Grantee real property rights, which will run with the land, to facilitate the continued protectiveness of the remediation of past environmental contamination and to impose use restrictions and covenants to protect human health and the environment by reducing risk of exposure to contaminants. The NYSDEC Class-4 Site includes the groundwater treatment area encompassing an area of approximately 5.50-acres on the western, west central, and southern portion of the former industrial area, which includes the LAI GWTF on the southwest corner of the property on Tax Parcel 159-1-26, the active treatment area that overlies the west-central portion of the industrial area on Tax Parcel 159-2-19, extending out to, and along the western property boundary (SMP Figure 2, Figure 2a)

The institutional controls (ICs) for the Site include:

- Limit the use of parcels 159-2-19 and 159-1-26 to commercial and industrial use only.
- The use of groundwater underlying parcels 159-2-19 and 159-1-26 is prohibited without necessary water treatment.
- The potential for vapor intrusion must be evaluated for any building developed within parcels 159-2-19 and 159-1-26.
- The Site has been remediated for commercial/ industrial use only. Any future intrusive work requires compliance with the Excavation Workplan (Appendix E).

The engineering controls for DEC class 4 site and parcels 159-2-19 and 159-1-26 include:

- Groundwater treatment and groundwater source area control.
- Offsite groundwater monitoring wells.
- Vapor intrusion mitigation systems for affected offsite properties.
- Site perimeter fencing and Site security – Site inspections, monitoring of groundwater, and maintenance of fencing and other engineering controls (ECs) must be implemented in accordance with the provisions of the SMP.

Site Owner's Responsibilities:

1) The owner shall follow the provisions of the SMP as they relate to future construction and excavation at the site.
2) Maintain Site security and Site security fencing of the Class-4 Site. The RP remains ultimately responsible for maintaining the ECs.
3) The owner is responsible for compliance with ICs, and compliance with commercial and industrial Site use restrictions.
4) The owner shall grant access to the site to the NYSDEC, the EPA and its agents to conduct Site inspections and implement remedial and/or site management activities and assuring compliance with the SMP.
5) The owner is responsible for maintaining Site access, assuring the security of the remedial components located on its property to the best of its ability. If damage to the remedial components or vandalism is evident, the owner shall notify the Site's RP and NYSDEC in accordance with the timeframes indicated in Section 1.3-Notifications.
6) If some action or inaction by the owner adversely impacts the site, the owner must notify the NYSDEC in accordance with the time frame indicated in Section 1.3- Notifications and coordinate the performance of necessary corrective actions with the RP.
7) The owner must notify NYSDEC of any change in ownership of the site property (identifying the tax map numbers in any correspondence) and provide contact information for the new owner of the site properties. 6 NYCRR Part contains notification requirements applicable to any construction or activity changes and changes in ownership. Among the notification requirements is the following: Sixty days prior written notification must be made to NYSDEC. Notification is to be submitted to the NYSDEC DER's Site Control Section. Notification requirements for a change in use are detailed in Section 1.3 of the SMP. A change of use includes, but is not limited to, any activity that may increase direct human or environmental exposure (e.g., day care, school, or park). A 60-Day Advance Notification Form and Instructions are found at http://www.dec.ny.gov/chemical/76250.html.
8) The owner will ensure NYSDEC retains Site access and construct or maintain roadways of sufficient width (20-feet) to allow for heavy equipment, including drill rigs, cranes, support vehicles and hauling trucks, to access the Class-4 Site for ongoing operations and maintenance of the ECs, including maintain security fences, and conduct mowing or land clearing as applicable on behalf of the RP.
9) In accordance with a periodic time frame determined by NYSDEC, the owner shall periodically certify, in writing, that all ICs set forth in a(n) Environmental Easement remain

in place and continue to be complied with. The owner shall provide a written certification to NYSDEC, to include the certification in the Site's PRR certification to NYSDEC.

10) In accordance with the tenant notification law, within 15 days of receipt, the owner must supply a copy of any vapor intrusion data, that is produced with respect to structures and that exceeds NYSDOH or OSHA guidelines on the site, whether produced by NYSDEC, RP, or owner, to the tenants on the property. The owner must otherwise comply with the tenant and occupant notification provisions of Environmental Conservation Law Article 27, Title 24.

11) The Site has been remediated for commercial/ industrial use only. Any future intrusive work that disturbs surficial soil or the former building slabs within the former 36-acre industrial area requires compliance with the Excavation Workplan (Appendix E). Any work conducted pursuant to the EWP must also be conducted in accordance with the Site-Specific HASP, which is in current compliance with DER 10, and 29 CFR 1910 and 1926, and all other applicable State and Federal regulations.

Remedial Party Responsibilities

1) The NYSDEC must follow the SMP provisions regarding any construction and/or excavation it undertakes at the site.
2) The NYSDEC shall report all activities required for remediation, operation, maintenance, monitoring, and reporting. Such reporting includes, but is not limited to, PRRs and certifications, electronic data deliverables, corrective action work plans and reports, and updated SMPs.
3) The NYSDEC shall provide to (i) the owner, upon the owner's request, (ii) other entities, if required by the SMP, a copy of any data generated during the site visit and/or any final report produced.
4) If NYSDEC determines that an update of the SMP is necessary, within 5 business days after NYSDEC approval, the NYSDEC shall submit a copy of the approved SMP to the owner(s).
5) ~~ECs~~.
6) The NYSDEC is responsible for the proper maintenance of any installed vapor intrusion mitigation systems associated with the site, as required in Section 3.3.3 or Appendix G (Operation, Monitoring and Maintenance Manual) of the SMP.
7) Prior to a change in use that impacts the remedial system or requirements and/or responsibilities for implementing the SMP, the NYSDEC shall amend the SMP.
8) Any change in use, change in ownership, change in site classification (*e.g.*, delisting), reduction or expansion of remediation, and other significant changes related to the site may result in a change in responsibilities and, therefore, necessitate an update to the SMP and/or updated legal documents. The NYSDEC project manager and agents shall discuss the need to update such documents.

Change in control and/or site ownership does not affect the NYSDECs obligations with respect to the site unless a legally binding document executed by the owner and/or NYSDEC releases the obligations.

Future site owners and RPs and their successors and assigns are required to carry out the activities set forth above.

APPENDIX B1

LIST OF SITE CONTACTS

Name	Contact Information
Kira Bruno, Environmental Program Specialist Trainee 1 NYSDEC Site Project Manager	(518) 402-8068 Kira.bruno@dec.ny.gov
Payson Long, P.E. – NYSDEC Section Chief, Remedial Section B, Remedial Bureau E, Project Managers Supervisor	(518) 402-9651 Payson.Long@dec.ny.gov
Michael Cruden – NYSDEC Section Chiefs Supervisor	(518) 402-9825 Michael.Cruden@dec.ny.gov
Michael C. Murphy – Associate Attorney, NYSDEC Office of General counsel	(518) 402-8564 michael.murphy1@dec.ny.gov
Kelly Lewandowski – NYSDEC Site Control	(518) 402-9569 Kelly.Lewandowski@dec.ny.gov
Mark Sergott – NYSDOH Project Manager	518-402-7860 mark.sergott@health.ny.gov
Stephanie Selmer – NYSDOH Public Health Specialist	518-402-7860 Stephanie.selmer@health.ny.gov
Mathew Kappel – Suffolk County Land Bank, Executive Director	631-853-3127 Matthew.Kapell@suffolkcountyny.gov
Damian J. Duda - EPA Supervisor	212.637.4269 Duda.Damian@epa.gov
Michael Sivak – EPA Site Manager	212.637.4310 Sivak.michael@epa.gov
EPA Community Hotline	1.800.962.6215 CommunityHotline@epa.gov
Mark Wright, PG – HRP Contract Manager	518-877-7101 x1415 mark.wright@hrpassociates.com
Derek Roy, PG – HRP Project Manager	860-428-9366 derek.roy@hrpassociates.com
Thomas Battles, PE – HRP Senior Engineer	631-853-3127 thomas.battles@hrpassociates.com

APPENDIX B2

Sub-Slab Depressurization Units Sampling

CONFIDENTIAL INFORMATION

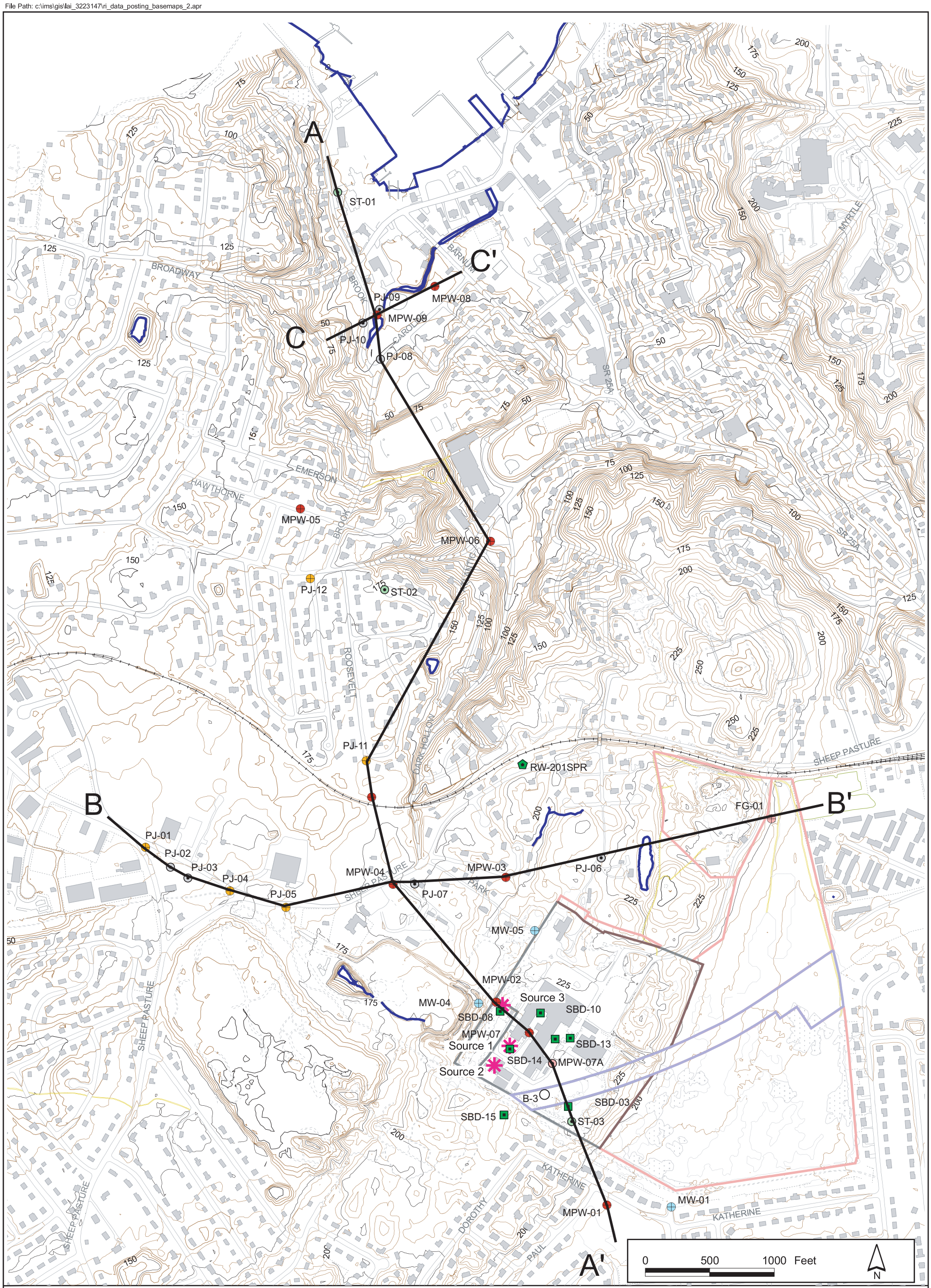
Current Owner Name	Unit ID	Address	Telephone	Sampling Location
The owner information has been redacted for public distribution				

CONFIDENTIAL

APPENDIX C

CROSS SECTIONS

File Path: c:\ims\gis\lai_3223147\ri_data_posting_basemaps_2.apr



LEGEND

- Multiport Monitoring Well
- NYDEC Monitoring Well
- LAI Monitoring Well
- Stratigraphic Boring
- MPW-07A Boring and Groundwater Screening Location
- Suffolk County Monitoring Well and Groundwater Screening Location
- Deep Exterior Soil Boring Location
- Outlying Parcels
- Waterbody
- Buildings
- Fence
- 25 Foot Topographic Contour
- 5 Foot Topographic Contour
- Obscured Ground
- Dirt Trail
- Long Island Railroad
- LAI Facility
- NYDOT Right-of-Way
- TCE Source Area Identified in the HRS
- NYDEC Soil Boring B-3 Installed 12/97
- Suffolk County Groundwater Screening Location
- Residential Well Sampling Location

Figure 3-10
Cross Section Location Map
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

CDM

C

C'

PJ-10

MPW-09

PJ-09

MPW-08

Elevation (feet amsl)

50

0

-50

-100

190
650
610
1500
1100
190
1100
410

870
220
160

12.53
15.12
15.50
15.83
16.19

10.87 3
11.24 4.6
11 1
10.01 45
11.42 9.5

Fill

Peat

Upper Glacial Aquifer

Magothy Formation

?

500

15

100

10

10

X

0

100

200

300

400

500

600

Lithologic Legend

- Clay
- Clay and Sand
- Clay and Silt
- Clayey Sand
- Clayey Silt
- Fill
- Gravel
- Gravel and Silt
- Gravel and Sand
- Magothy Sand
- Peat
- Sand
- Sand and Gravel
- Sand and Silt
- Sandy Clay
- Sandy Silt
- Silt
- Silty Sand
- Topsoil
- STC Smithtown Clay

LEGEND

U or ND - Not Detected, if U value to is the detection limit
J - Estimated

59 - TCE Results, Round 1 Groundwater samples, February-March 2005

? - Unknown

2600 - SCHD TCE Groundwater Screening Data, July 1991-March 1992

12.53 - Water Level Elevation, feet amsl, March 7, 2005

MPW - multiport monitoring well
PJ - Suffolk County Health Dept. (SCHD) Groundwater Screening Location
ST - Stratigraphic boring
amsl - above mean sea level

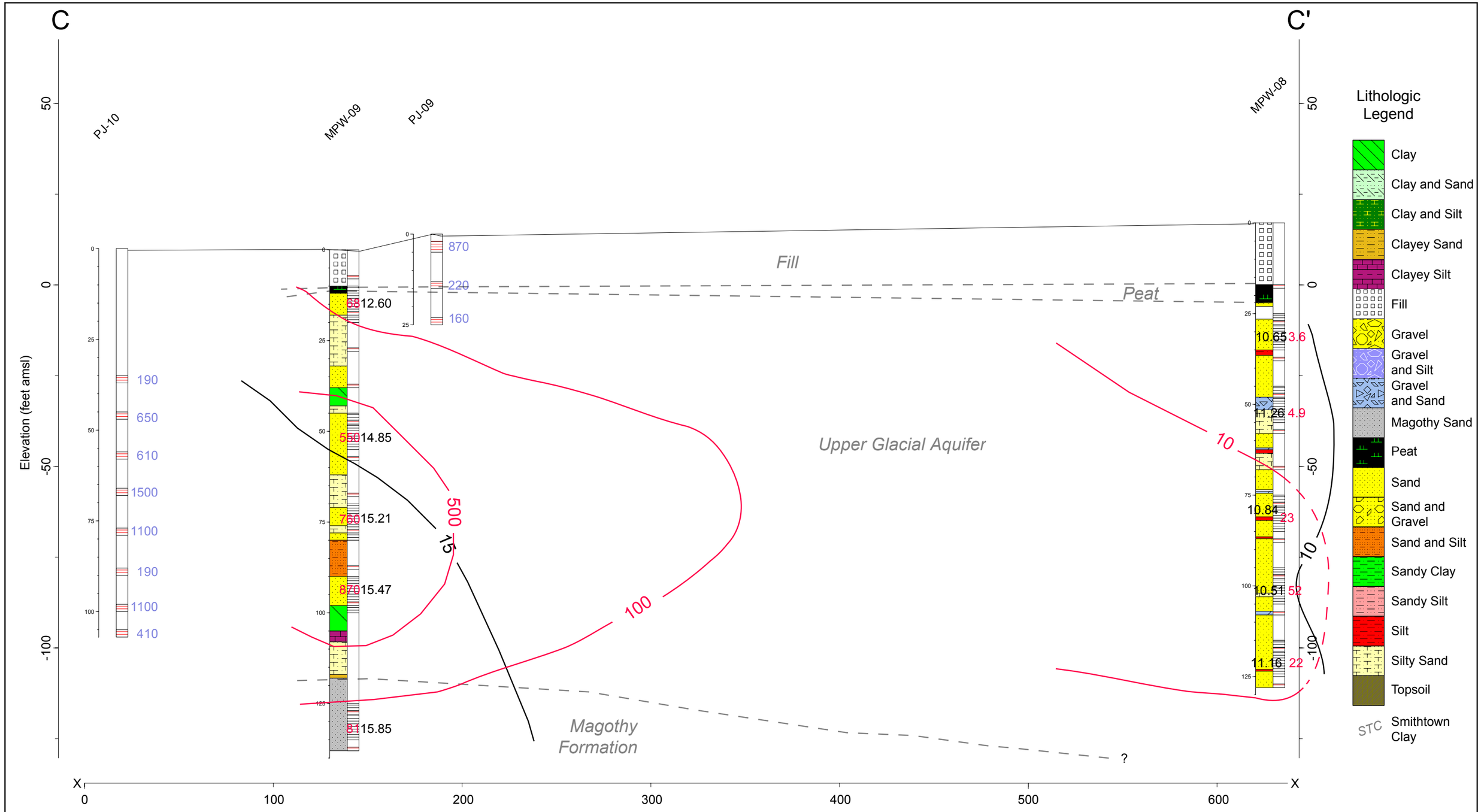
- Potentiometric surface contour, dashed where inferred, March 7, 2005, feet amsl
- TCE Isoconcentration contour, dashed where inferred, March 2005, micrograms/liter

All TCE Data is in micrograms/liter

Vertical Exagerration: 2
Horizontal Scale: 1:600
Vertical Scale: 1:300

Figure 3-13
Cross Section C-C'
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

CDM



LEGEND

U or ND - Not Detected, if U value to is the detection limit
J - Estimated

59 - TCE Results, Round 1 Groundwater samples, April-May 2005

? - Unknown

2600 - SCHD TCE Groundwater Screening Data, July 1991-March 1992

12.53 - Water Level Elevation, feet amsl, April 25, 2005

MPW - multiport monitoring well
PJ - Suffolk County Health Dept. (SCHD) Groundwater Screening Location
ST - Stratigraphic boring
amsl - above mean sea level

- Potentiometric surface contour, dashed where inferred,April 25, 2005, feet amsl

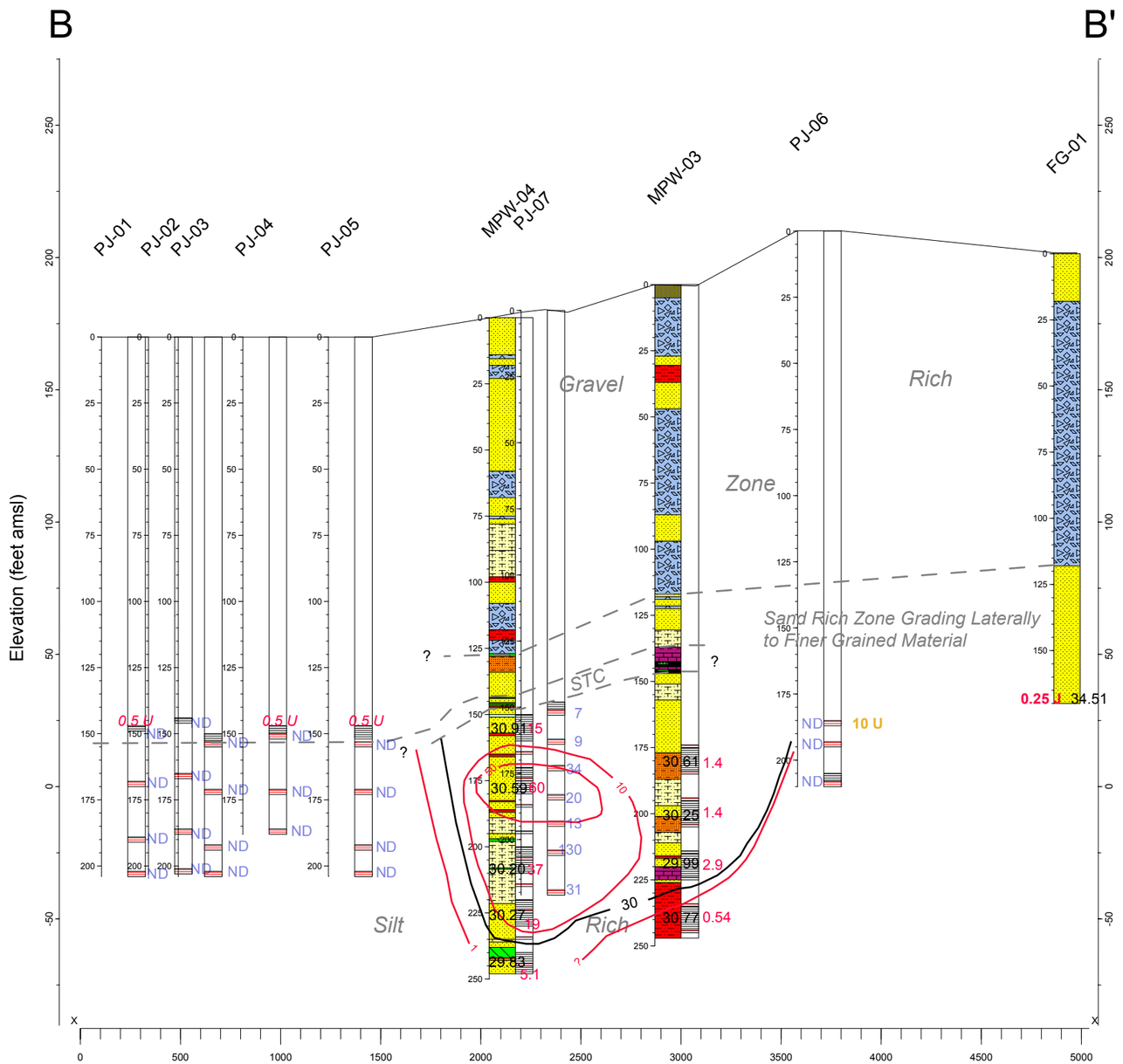
- TCE Isoconcentration contour, dashed where inferred, March 2005, micrograms/liter

All TCE Data is in micrograms/liter

Vertical Exagerration: 2
Horizontal Scale: 1:600
Vertical Scale: 1:300

Figure 3-13A
Cross Section C-C'
Round 2 Water Level and TCE Data
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

CDM



LEGEND

U or ND - Not Detected, if U value to is the detection limit

59 - TCE Results, Round 1 Groundwater samples, February-March 2005

0.25 J - TCE Results, 2/23/2005

0.5 U - TCE Results, 10/23/2003

J - Estimated ? - Unknown

2600 - SCHD TCE Groundwater Screening Data, July 1991-March 1992

1 - TCE Groundwater Screening Data, Summer 2004

10 U - TCE in Groundwater Sample, 3/24/2000

12.53 - Water Level Elevation, feet amsl, March 7, 2005

MPW - multiport monitoring well
PJ - Suffolk County Health Dept. (SCHD) Groundwater Screening Location
ST - Stratigraphic boring
amsl - above mean sea level

——— - Potentiometric surface contour, dashed where inferred, March 7, 2005, feet amsl

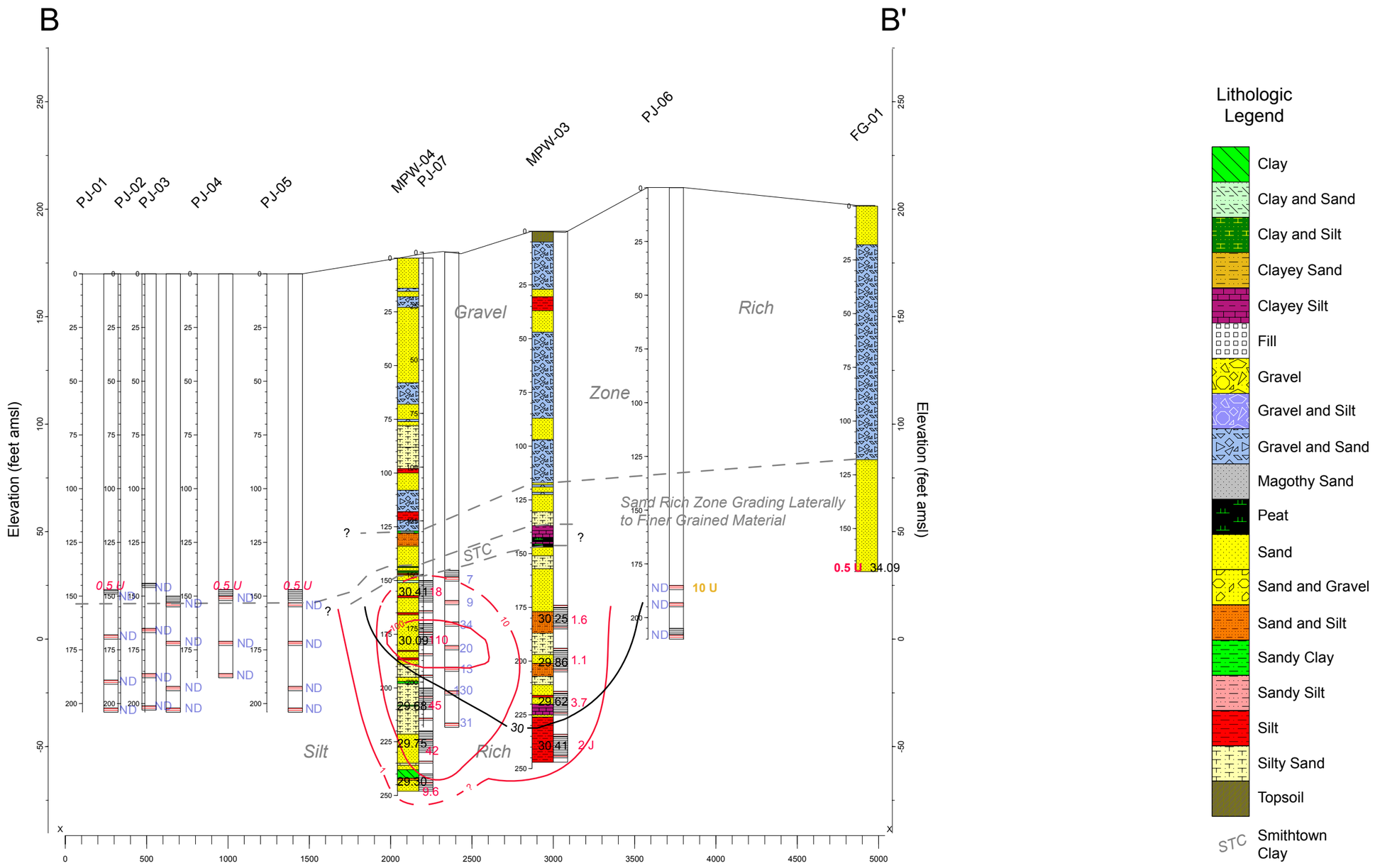
——— - TCE Isoconcentration contour, dashed where inferred, March 2005, micrograms/liter

All TCE Data is in micrograms/liter

Vertical Exagerration: 14
Horizontal Scale: 1:8400
Vertical Scale: 1:600

Figure 3-12
Cross Section B-B'
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

CDM



Lithologic Legend

- Clay
- Clay and Sand
- Clay and Silt
- Clayey Sand
- Clayey Silt
- Fill
- Gravel
- Gravel and Silt
- Gravel and Sand
- Magothy Sand
- Peat
- Sand
- Sand and Gravel
- Sand and Silt
- Sandy Clay
- Sandy Silt
- Silt
- Silty Sand
- Topsoil
- STC Smithtown Clay

LEGEND

U or ND - Not Detected, if U value to is the detection limit

59 - TCE Results, Round 1 Groundwater samples, April-May 2005

0.25 J - TCE Results, 4/27/2005

0.5 U - TCE Results, 10/23/2003

J - Estimated ? - Unknown

2600 - SCHD TCE Groundwater Screening Data, July 1991-March 1992

1 - TCE Groundwater Screening Data, Summer 2004

10 U - TCE in Groundwater Sample, 3/24/2000

12.53 - Water Level Elevation, feet amsl, April 25, 2005

MPW - multiport monitoring well
PJ - Suffolk County Health Dept. (SCHD) Groundwater Screening Location
ST - Stratigraphic boring
amsl - above mean sea level

——— - Potentiometric surface contour, dashed where inferred, April 25, 2005, feet amsl

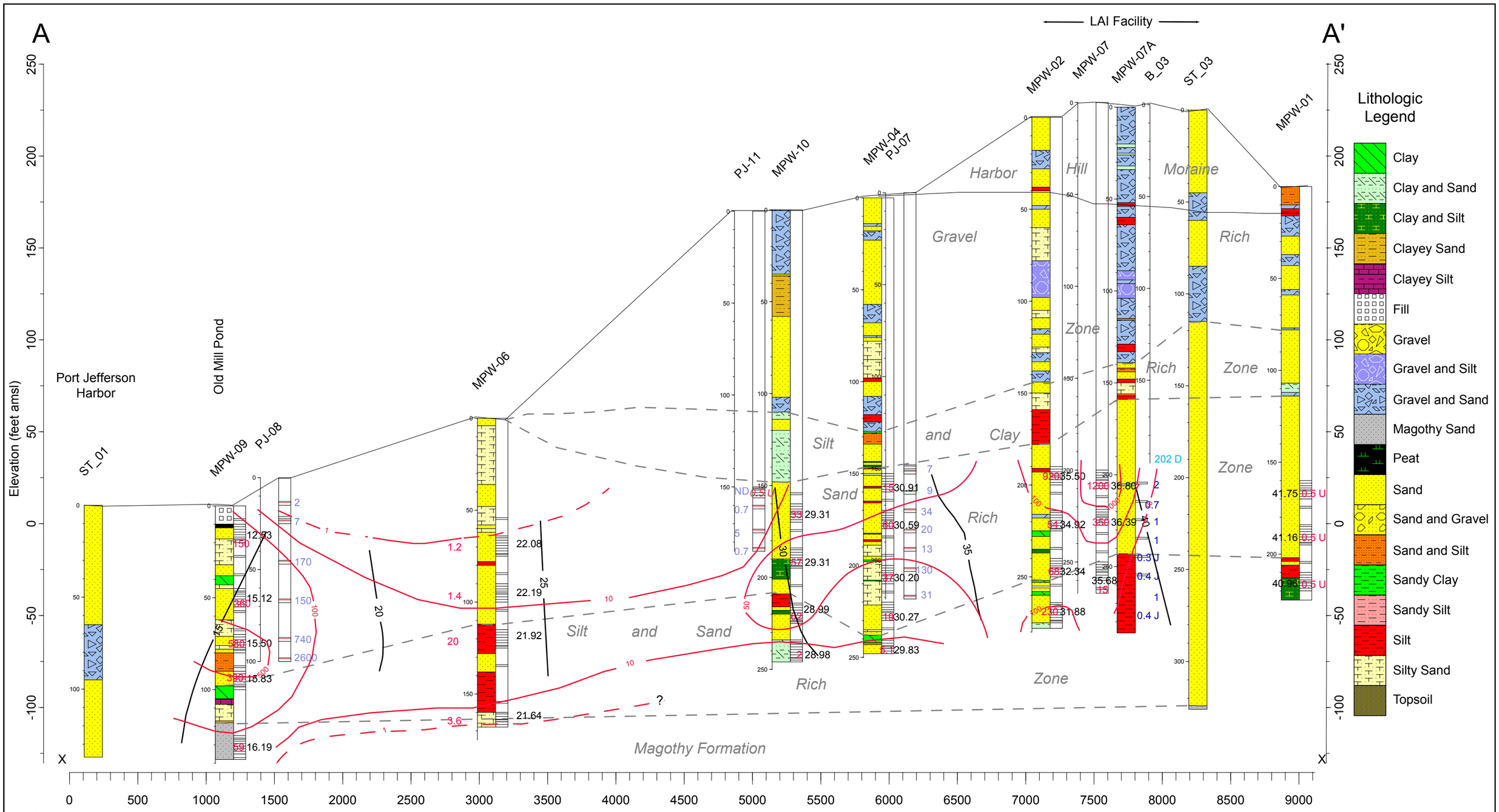
——— - TCE Isoconcentration contour, dashed where inferred, April-May 2005, micrograms/liter

All TCE Data is in micrograms/liter

Vertical Exagerration: 14
Horizontal Scale: 1:8400
Vertical Scale: 1:600

Figure 3-12A
Cross Section B-B'
Round 2 Water Level and TCE Data
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

CDM



LEGEND

U or ND - Not Detected, if U value to is the detection limit

59 - TCE Results, Round 1 Groundwater samples, February-March 2005

202 D - TCE Results, groundwater screening sample, 12/3/1997

J - Estimated

D - Dilluted Sample

E - Estimated, result above calibration range

U - Not Detected

2600 - SCHD TCE Groundwater Screening Data, July 1991-March 1992

1 - TCE Groundwater Screening Data, Summer 2004

0.5 U - TCE Results, 10/23/2003

12.53 - Water Level Elevation, feet amsl, March 7, 2005

MPW - multiport monitoring well

PJ - Suffolk County Health Dept. (SCHD) Groundwater Screening Location

ST - Stratigraphic boring

amsl - above mean sea level

- Potentiometric surface contour, dashed where inferred, March 7, 2005, feet amsl

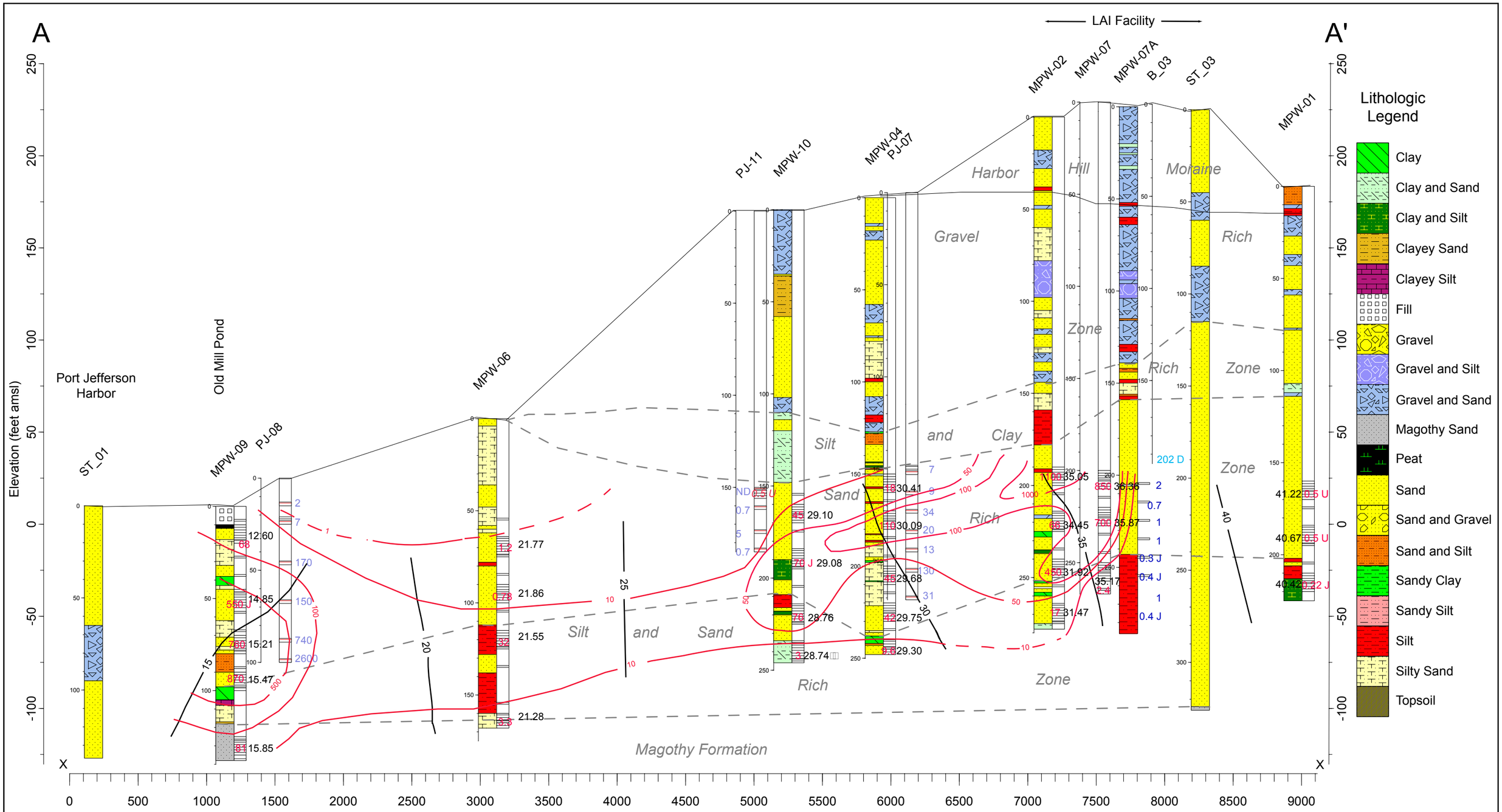
- TCE Isoconcentration contour, dashed where inferred, March 2005, micrograms/liter

All TCE Data is in micrograms/liter

Vertical Exagerration: 14
Horizontal Scale: 1:8400
Vertical Scale: 1:600

Figure 3-11
Cross Section A-A'
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

CDM



LEGEND

U or ND - Not Detected, if U value to is the detection limit

59 - TCE Results, Round 1 Groundwater samples, April-May 2005

202 D - TCE Results, groundwater screening sample, 12/3/1997

J - Estimated

D - Dilluted Sample

E - Estimated, result above calibration range

U - Not Detected

2600 - SCHD TCE Groundwater Screening Data, July 1991-March 1992

1 - TCE Groundwater Screening Data, Summer 2004

0.5 U - TCE Results, 10/23/2003

12.53 - Water Level Elevation, feet amsl, April 25, 2005

MPW - multiport monitoring well

PJ - Suffolk County Health Dept. (SCHD) Groundwater Screening Location

ST - Stratigraphic boring

amsl - above mean sea level

- Potentiometric surface contour, dashed where inferred, April 25, 2005, feet amsl

- TCE Isoconcentration contour, dashed where inferred, April-May 2005, micrograms/liter

All TCE Data is in micrograms/liter

Vertical Exagerration: 14
Horizontal Scale: 1:8400
Vertical Scale: 1:600

Figure 3-11A
Cross Section A-A'
Round 2 Water Level and TCE Data
Remedial Investigation/Feasibility Study
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

CDM

APPENDIX D

MONITORING WELL CONSTRUCTION LOGS

Project No: SERA02-SER00053

Log of Wells: MW-2C & 2D

Project: Lawrence Aviation Industries

Client: EPA/ERT

Location: Port Jefferson, NY

Logged By: J. Bolduc

MW-2C Northing (ft): 285062.1757

MW-2C Easting (ft): 1240087.142

MW-2C Elevation (ft AMSL): 5.667

MW-2D Northing (ft): 285062.4002

MW-2D Easting (ft): 1240087.024

MW-2D Elevation (ft AMSL): 5.542

SUBSURFACE PROFILE

Depth (ft)	Depth (m)	Symbol	Description	Elev.
0	0		Ground Surface	0.00
0–5	0–1		**Not Logged** Hand cleared to five feet. Gray, hydrocarbon stained soil from 3.5 to 5 feet. Wet at 2 feet.	-5.00
5–13	1–4		**Sand With Gravel** Dark grayish brown, fine to coarse, some fine and coarse well rounded gravel, little silt, micaceous, very loose, wet. Faint hydrocarbon odor between 6 and 11 feet. Trace well rounded cobbles from 7 to 13 feet.	-13.00
13–14	4		**Sandy Clay** Light yellowish brown to dark grayish brown, some fine-grained sand, little silt, abundant rootlets, micaceous, low plasticity, medium stiff, wet.	-14.00
14–17	4–5		**Gravel With Sand** Yellowish brown, fine and coarse, well rounded, some fine- to coarse-grained sand, little silt, micaceous, dense, wet.	-17.00
17–25	5–7		**Sand With Gravel** Yellowish brown, fine to coarse, some fine and coarse well rounded gravel, micaceous, loose, wet.	

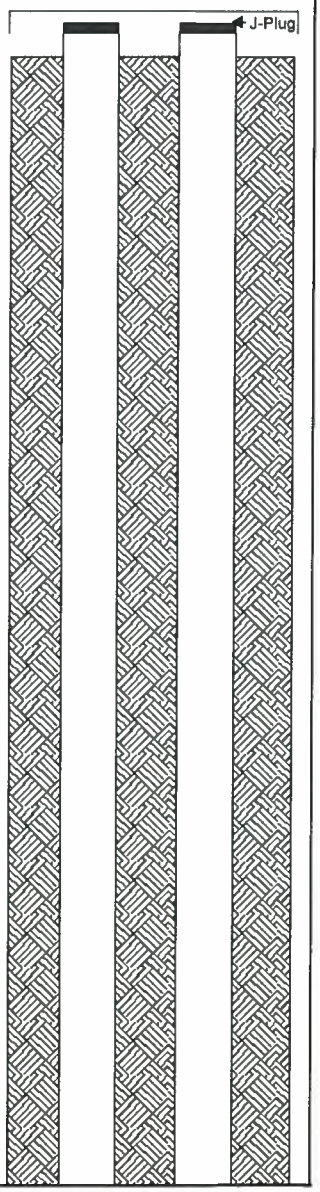
SAMPLE

Number	Type	Recovery

PID Reading (ppbv)

Depth (ft)	PID (ppbv)
5	440
6	330
7	150
8	100
9	50
10	0
11	0
12	0
13	0
14	0
15	0
16	0
17	0
18	0
19	0
20	0
21	0
22	0
23	0
24	0
25	0

Well Completion Details



Drill Method: Rotary Sonic

Drill Company: Boart Longyear

Start Date: 7/12/13

End Date: 7/13/13

Hole Size: 8 inches

Sheet: 1 of 6

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Project No: SERA02-SER00053

Log of Wells: MW-2C & 2D

Project: Lawrence Aviation Industries

Client: EPA/ERT

Location: Port Jefferson, NY

Logged By: J. Bolduc

MW-2C Northing (ft): 285062.1757

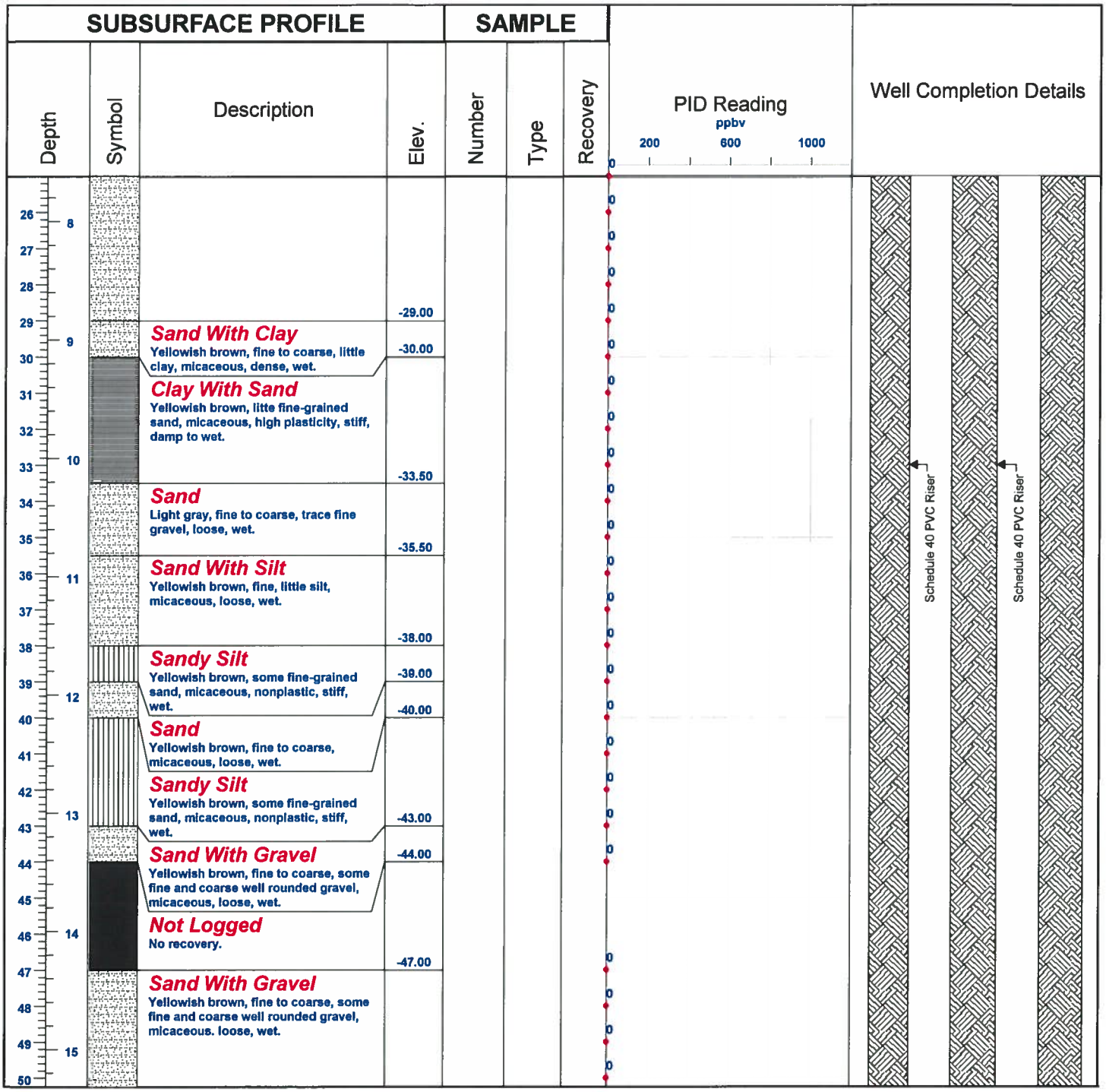
MW-2C Easting (ft): 1240087.142

MW-2C Elevation (ft AMSL): 5.667

MW-2D Northing (ft): 285062.4002

MW-2D Easting (ft): 1240087.024

MW-2D Elevation (ft AMSL): 5.542



Drill Method: Rotary Sonic

Start Date: 7/12/13

Hole Size: 8 inches

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Drill Company: Boart Longyear

End Date: 7/13/13

Project No: SERA02-SER00053

Log of Wells: MW-2C & 2D

Project: Lawrence Aviation Industries

Client: EPA/ERT

Location: Port Jefferson, NY

Logged By: J. Bolduc

MW-2C Northing (ft): 285062.1757

MW-2C Easting (ft): 1240087.142

MW-2C Elevation (ft AMSL): 5.667

MW-2D Northing (ft): 285062.4002

MW-2D Easting (ft): 1240087.024

MW-2D Elevation (ft AMSL): 5.542

SUBSURFACE PROFILE

SAMPLE

Depth	Symbol	Description	Elev.	Number	Type	Recovery	PID Reading (ppbv)	Well Completion Details
51			-52.00				0	
52		**Silty Sand** Yellowish brown, fine, some silt, micaceous, dense, wet.				16	0	
53							0	
54							0	
55			-55.00				0	
56		**Sand** Light gray, fine to coarse, micaceous, loose, wet.	-56.00			17	0	
57		**Sand With Silt** Yellowish brown, fine, few silt, micaceous, dense, wet.	-57.00				0	
58		**Sand With Gravel** Yellowish brown, fine to coarse, little fine well rounded gravel, micaceous, loose, wet. Fine gravel interbeds from 59 to 60 and 61 to 62 feet.					0	
59						18	0	
60							0	
61							0	
62			-62.00				0	
63		**Silty Sand** Yellowish brown, fine with fine to coarse interbeds, little to some silt, micaceous, dense, wet.				19	0	
64							0	
65							0	
66						20	0	
67			-67.00				0	
68		**Sand** Yellowish brown, fine to coarse, trace silt, micaceous, loose, wet.					0	
69			-69.00			21	0	
70		**Sand With Silt** Yellowish brown, fine to coarse, little silt, trace fine gravel, micaceous, dense, wet.					0	
71							0	
72						22	0	
73							0	
74			-74.00				0	
75							0	

Bentonite Grout

Drill Method: Rotary Sonic

Start Date: 7/12/13

Hole Size: 8 inches

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Drill Company: Boart Longyear

End Date: 7/13/13

Project No: SERA02-SER00053

Log of Wells: MW-2C & 2D

Project: Lawrence Aviation Industries

Client: EPA/ERT | **MW-2C Northing (ft):** 285062.1757 | **MW-2D Northing (ft):** 285062.4002

Location: Port Jefferson, NY | **MW-2C Easting (ft):** 1240087.142 | **MW-2D Easting (ft):** 1240087.024

Logged By: J. Bolduc | **MW-2C Elevation (ft AMSL):** 5.667 | **MW-2D Elevation (ft AMSL):** 5.542

SUBSURFACE PROFILE				SAMPLE				
Depth	Symbol	Description	Elev.	Number	Type	Recovery	PID Reading (ppbv: 200, 600, 1000)	Well Completion Details
23 (76)		**Sand** Light yellowish brown, fine, trace silt, micaceous, very dense, wet.	-78.00				0	
24 (79)		**Clayey Sand** Yellowish brown, fine to medium with fine to coarse lenses, little to some clay, trace fine well rounded gravel, micaceous, loose to very dense, wet.	-82.00				0	
25 (82)		**Sand With Silt** Yellowish brown, fine, little silt, trace clay, micaceous, dense, wet.	-87.00				0	Bentonite
26 (86)		**Sand With Gravel** Yellowish brown, fine to coarse, little fine well rounded gravel, trace silt, micaceous, loose, wet.	-95.00				0	#00 Choke Sand
27 (89)							0	
28 (92)							0	#1 Filpro Sand
29 (95)		**Not Logged** No recovery.	-97.00				0	10-Slot Schedule 40 PVC Screen - MW-2C
30 (98)		**Sand With Gravel** Yellowish brown, fine to coarse, little fine well rounded gravel, trace silt, micaceous, loose, wet. Fine gravel with fine to coarse sand lenses at 94 to 95 and 97 to 98 feet.					0	
100								

Drill Method: Rotary Sonic

Drill Company: Boart Longyear

Start Date: 7/12/13

End Date: 7/13/13

Hole Size: 8 inches

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Project No: SERA02-SER00053

Log of Wells: MW-2C & 2D

Project: Lawrence Aviation Industries

Client: EPA/ERT

Location: Port Jefferson, NY

Logged By: J. Bolduc

MW-2C Northing (ft): 285062.1757

MW-2C Easting (ft): 1240087.142

MW-2C Elevation (ft AMSL): 5.667

MW-2D Northing (ft): 285062.4002

MW-2D Easting (ft): 1240087.024

MW-2D Elevation (ft AMSL): 5.542

SUBSURFACE PROFILE

Depth	Symbol	Description	Elev.
			-103.00
		Sand With Clay Yellowish brown, fine to medium, little coarse, little clay, few silt, micaceous, loose, wet.	-107.00
		Sand With Silt Yellowish brown, fine to coarse, trace fine well rounded gravel, few silt, micaceous, wet.	-109.00
		Clayey Sand Yellowish brown, fine to medium, little coarse, trace fine well rounded gravel, some clay, few silt, very dense, wet.	

SAMPLE

Number	Type	Recovery

PID Reading (ppbv): 0, 200, 600, 1000

Well Completion Details: #00 Choke Sand; Bentonite; #00 Choke Sand; #1 Filpro Sand

Drill Method: Rotary Sonic

Start Date: 7/12/13

Hole Size: 8 inches

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Drill Company: Boart Longyear

End Date: 7/13/13

Project No: SERA02-SER00053

Log of Wells: MW-2C & 2D

Project: Lawrence Aviation Industries

Client: EPA/ERT

Location: Port Jefferson, NY

Logged By: J. Bolduc

MW-2C Northing (ft): 285062.1757

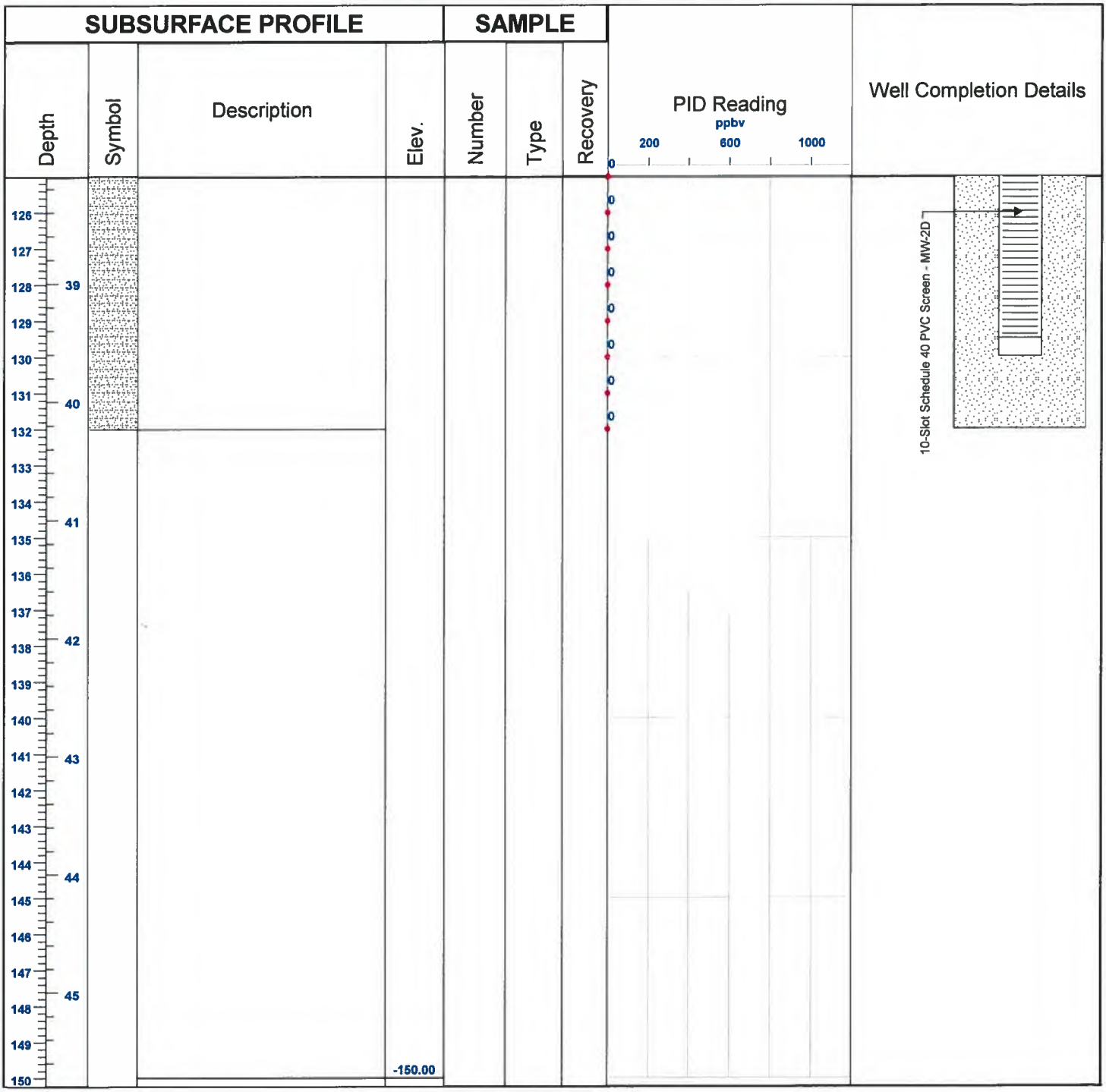
MW-2C Easting (ft): 1240087.142

MW-2C Elevation (ft AMSL): 5.667

MW-2D Northing (ft): 285062.4002

MW-2D Easting (ft): 1240087.024

MW-2D Elevation (ft AMSL): 5.542



Drill Method: Rotary Sonic

Drill Company: Boart Longyear

Start Date: 7/12/13

End Date: 7/13/13

Hole Size: 8 inches

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Sheet: 6 of 6

Project No: SERA02-SER00053

Log of Wells: MW-4A & 4B

Project: Lawrence Aviation Superfund Site

Client: EPA/ERT

Location: Port Jefferson, NY

Logged By: J. Bolduc

MW-4A Northing (ft): 284724.8967

MW-4A Easting (ft): 1241389.039

MW-4A Elevation (ft AMSL): 7.736

MW-4B Northing (ft): 284725.116

MW-4B Easting (ft): 1241389.157

MW-4B Elevation (ft AMSL): 7.791

SUBSURFACE PROFILE

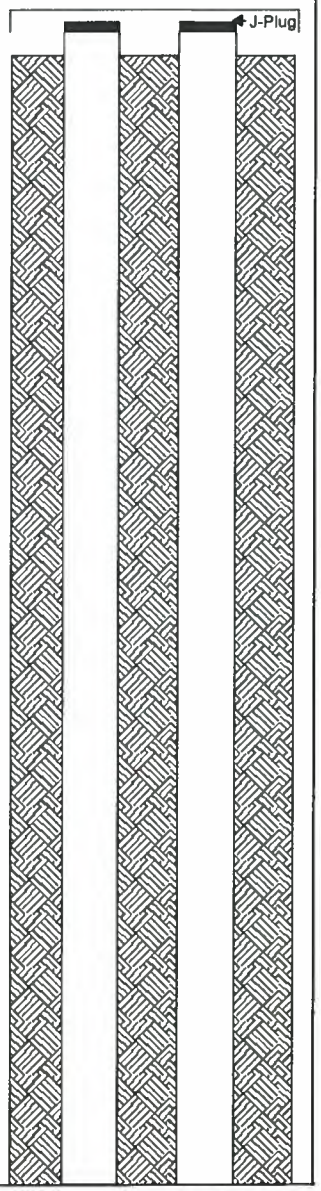
Depth (ft)	Depth (m)	Symbol	Description	Elev.
0	0		Ground Surface	0.00
			Not Logged Hand cleared to five feet.	
				-5.00
			Sand Yellowish brown to dark gray at 7 feet, fine to coarse, little fine and coarse well rounded gravel, trace silt, micaceous, faint hydrocarbon odor at 7 feet, moist to wet at 7 feet. Becomes black at 13.5 feet.	
				-13.50
			Clay Gray, some silt, little fine to coarse sand in upper one foot, black tar-like hydrocarbon from 13.5 to 14.5 feet, micaceous, high plasticity, very stiff, moist.	
				-17.00
			Sand Gray, fine to coarse, trace silt, micaceous, wet.	-18.00
			Clay With Sand Gray, little fine- to coarse-grained sand, micaceous, medium plasticity, stiff, damp.	-19.00
			Sand Gray, fine to coarse, trace to few silt, micaceous, loose, wet.	
				-24.00
25	7			

SAMPLE

Number	Type	Recovery	PID Reading (ppbv)
			0
			0
			70
			80
			910
			20
			20
			20
			10
			0
			0
			0
			0
			0
			0
			0

PID Reading ppbv: 200, 600, 1000

Well Completion Details



Drill Method: Rotary Sonic

Start Date: 7/14/13

Hole Size: 8 inches

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Drill Company: Boart Longyear

End Date: 7/15/13

Sheet: 1 of 6

Project No: SERA02-SER00053

Log of Wells: MW-4A & 4B

Project: Lawrence Aviation Superfund Site

Client: EPA/ERT

Location: Port Jefferson, NY

Logged By: J. Bolduc

MW-4A Northing (ft): 284724.8967

MW-4A Easting (ft): 1241389.039

MW-4A Elevation (ft AMSL): 7.736

MW-4B Northing (ft): 284725.116

MW-4B Easting (ft): 1241389.157

MW-4B Elevation (ft AMSL): 7.791

SUBSURFACE PROFILE

Depth (ft)	Depth (m)	Symbol	Description	Elev.
0	0		Ground Surface	0.00
0–5	0–1		**Not Logged** Hand cleared to five feet.	-5.00
5–13.5	1–4		**Sand** Yellowish brown to dark gray at 7 feet, fine to coarse, little fine and coarse well rounded gravel, trace silt, micaceous, faint hydrocarbon odor at 7 feet, moist to wet at 7 feet. Becomes black at 13.5 feet.	-13.50
13.5–17	4–5		**Clay** Gray, some silt, little fine to coarse sand in upper one foot, black tar-like hydrocarbon from 13.5 to 14.5 feet, micaceous, high plasticity, very stiff, moist.	-17.00
17–18	5		**Sand** Gray, fine to coarse, trace silt, micaceous, wet.	-18.00
18–19	5–6		**Clay With Sand** Gray, little fine- to coarse-grained sand, micaceous, medium plasticity, stiff, damp.	-19.00
19–24	6–7		**Sand** Gray, fine to coarse, trace to few silt, micaceous, loose, wet.	-24.00

SAMPLE

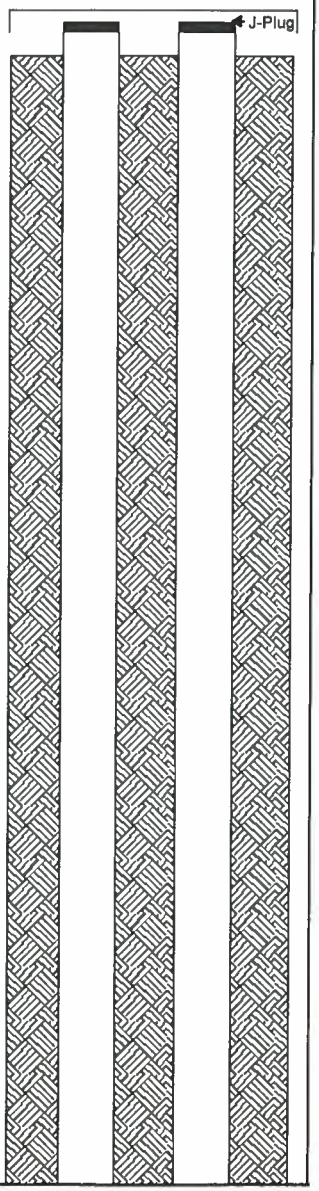
Number	Type	Recovery

PID Reading (ppbv)

200 | 600 | 1000

0, 0, 70, 80, 910, 20, 20, 20, 10, 0, 0, 0, 0, 0, 0, 0, 0

Well Completion Details



Drill Method: Rotary Sonic

Start Date: 7/14/13

Hole Size: 8 inches

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Drill Company: Boart Longyear

End Date: 7/15/13

Sheet: 1 of 6

Project No: SERA02-SER00053

Log of Wells: MW-4A & 4B

Project: Lawrence Aviation Superfund Site

Client: EPA/ERT

Location: Port Jefferson, NY

Logged By: J. Bolduc

MW-4A Northing (ft): 284724.8967

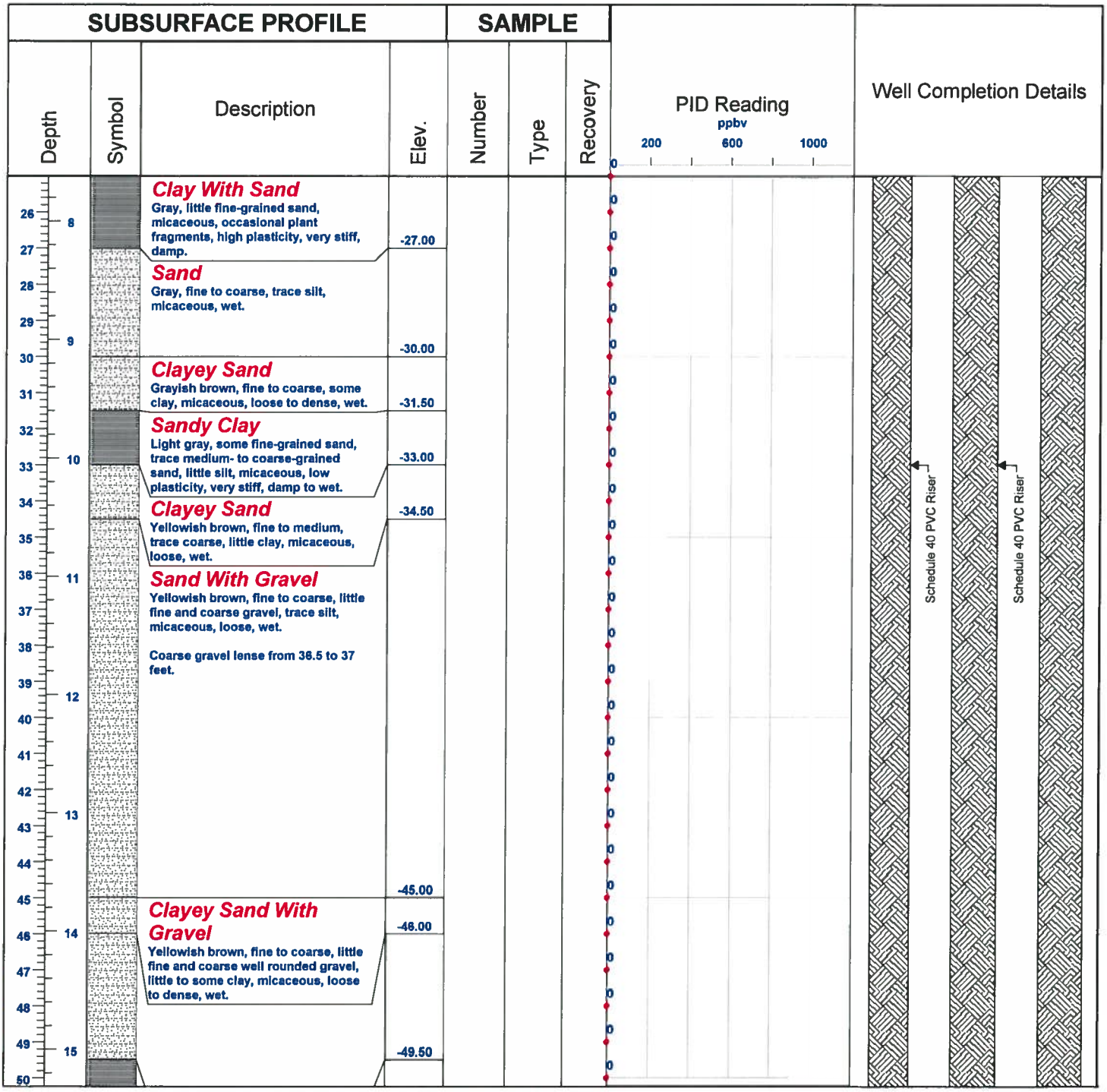
MW-4A Easting (ft): 1241389.039

MW-4A Elevation (ft AMSL): 7.736

MW-4B Northing (ft): 284725.116

MW-4B Easting (ft): 1241389.157

MW-4B Elevation (ft AMSL): 7.791



Drill Method: Rotary Sonic

Drill Company: Boart Longyear

Start Date: 7/14/13

End Date: 7/15/13

Hole Size: 8 inches

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Project No: SERA02-SER00053

Log of Wells: MW-4A & 4B

Project: Lawrence Aviation Superfund Site

Client: EPA/ERT | ***MW-4A Northing (ft):*** 284724.8967 | ***MW-4B Northing (ft):*** 284725.116

Location: Port Jefferson, NY | ***MW-4A Easting (ft):*** 1241389.039 | ***MW-4B Easting (ft):*** 1241389.157

Logged By: J. Bolduc | ***MW-4A Elevation (ft AMSL):*** 7.736 | ***MW-4B Elevation (ft AMSL):*** 7.791

SUBSURFACE PROFILE

Depth	Symbol	Description	Elev.
51		**Sand With Gravel** Yellowish brown, fine to coarse, some fine and coarse well rounded gravel, little silt, micaceous, loose, wet. Becomes white at 46 feet.	-51.00
52			-52.00
53	16	**Clay to Sandy Clay** Olive, some fine sand at 50 feet, high plasticity, very stiff, damp to wet at 50 feet.	
54			
55		**Sand** Olive, fine, few silt, micaceous, loose, wet.	-55.50
56	17		
57		**Clayey Sand** Olive, fine to medium, some clay, trace silt, micaceous, dense, wet. 0.25-foot thick clay lense at 55 feet.	-57.00
58			
59	18	**Silt** Olive, little fine-grained sand, little clay, micaceous, very stiff, damp to wet.	-59.00
60			
61		**Clay** Olive, little fine-grained sand, micaceous, very stiff, damp to wet.	
62	19	**Clayey Sand** Olive, fine to medium, some clay, little silt, micaceous, very dense, damp to wet.	
63			
64			
65			
66	20		
67			-67.00
68		**Silty Sand** Olive gray, fine to coarse, little to some silt, micaceous, nonplastic, dense, wet.	
69	21		
70			
71			
72	22	**Not Logged** No recovery.	-72.00
73			
74			
75			

SAMPLE

Number	Type	Recovery

PID Reading

ppbv

200 | 600 | 1000

0 0 0

Project No: SERA02-SER00053

Log of Wells: MW-4A & 4B

Project: Lawrence Aviation Superfund Site

Client: EPA/ERT

Location: Port Jefferson, NY

Logged By: J. Bolduc

MW-4A Northing (ft): 284724.8967

MW-4A Easting (ft): 1241389.039

MW-4A Elevation (ft AMSL): 7.736

MW-4B Northing (ft): 284725.116

MW-4B Easting (ft): 1241389.157

MW-4B Elevation (ft AMSL): 7.791

SUBSURFACE PROFILE

Depth	Symbol	Description	Elev.
			-77.00
23–24		**Gravel With Sand** Olive gray, fine and coarse, some fine- to coarse-grained sand, little clay in bottom 0.5 foot, micaceous, loose, wet.	-80.50
24–25		**Clay With Sand** Yellowish brown, little fine sand, micaceous, high plasticity, very stiff, damp.	-82.50
25–29		**Sand With Clay** Olive brown, fine to coarse, trace fine gravel, few to little clay, micaceous, loose to very dense, wet. Occasional thin clay lenses between 87 and 96.5 feet.	-96.50
29–30		**Clay** Olive, few fine-grained sand, little silt, micaceous, high plasticity, very stiff, damp.	-97.00

SAMPLE

Number	Type	Recovery

PID Reading (ppbv): 200, 600, 1000

Well Completion Details: 10-Slot Schedule 40 PVC Screen - MW-4A; #00 Choke Sand

Drill Method: Rotary Sonic

Start Date: 7/14/13

Hole Size: 8 inches

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Drill Company: Boart Longyear

End Date: 7/15/13

Project No: SERA02-SER00053

Log of Wells: MW-4A & 4B

Project: Lawrence Aviation Superfund Site

Client: EPA/ERT

Location: Port Jefferson, NY

Logged By: J. Bolduc

MW-4A Northing (ft): 284724.8967

MW-4A Easting (ft): 1241389.039

MW-4A Elevation (ft AMSL): 7.736

MW-4B Northing (ft): 284725.116

MW-4B Easting (ft): 1241389.157

MW-4B Elevation (ft AMSL): 7.791

SUBSURFACE PROFILE

Depth	Symbol	Description	Elev.
101–125	31–38	**Clayey Sand** Yellowish brown, fine to coarse, predominantly fine, trace to some clay, thin clay lenses interbedded with well graded sand lenses, micaceous, dense to very dense, wet.	-105.00
		Sand With Silt Yellowish brown, fine to coarse, few to little silt, micaceous, loose, wet.	-107.00
		Sand With Clay Yellowish brown, fine to coarse, trace fine and coarse gravel, few to little clay, micaceous, loose, wet.	-108.00
		Gravel With Sand Yellowish brown, fine and coarse, trace well rounded cobbles, some fine- to coarse-grained sand, few silt, micaceous, loose, wet.	-110.50
		Not Logged No recovery.	-117.00
		Sand White, fine to coarse, trace fine and coarse well rounded gravel, micaceous, loose, wet.	-119.50
		Gravel White, fine and coarse, well rounded, little fine- to coarse-grained sand, very loose, wet.	-120.00
		Not Logged No recovery.	

SAMPLE

Number	Type	Recovery

PID Reading (ppbv): 200, 600, 1000

Well Completion Details: Bentonite; #00 Choke Sand; #1 Filpro Sand

Drill Method: Rotary Sonic

Start Date: 7/14/13

Hole Size: 8 inches

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Drill Company: Boart Longyear

End Date: 7/15/13

Project No: SERA02-SER00053

Log of Wells: MW-4A & 4B

Project: Lawrence Aviation Superfund Site

Client: EPA/ERT

Location: Port Jefferson, NY

Logged By: J. Bolduc

MW-4A Northing (ft): 284724.8967

MW-4A Easting (ft): 1241389.039

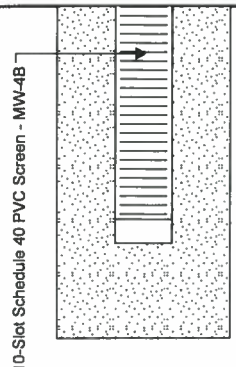
MW-4A Elevation (ft AMSL): 7.736

MW-4B Northing (ft): 284725.116

MW-4B Easting (ft): 1241389.157

MW-4B Elevation (ft AMSL): 7.791

SUBSURFACE PROFILE				SAMPLE				
Depth	Symbol	Description	Elev.	Number	Type	Recovery	PID Reading ppbv (200 / 600 / 1000)	Well Completion Details
126								
127								
128 (39)								
129								
130								
131 (40)								
132								
133								
134 (41)								
135								
136								
137								
138 (42)								
139								
140								
141 (43)								
142								
143								
144 (44)								
145								
146								
147								
148 (45)								
149								
150			-150.00					



Drill Method: Rotary Sonic

Drill Company: Boart Longyear

Start Date: 7/14/13

End Date: 7/15/13

Hole Size: 8 inches

Sheet: 6 of 6

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Project No: SERA02-SER00053

Log of Wells: MW-5A & 5B

Project: Lawrence Aviation Superfund Site

Client: EPA/ERT

Location: Port Jefferson, NY

Logged By: J. Bolduc

MW-5A Northing (ft): 284951.901

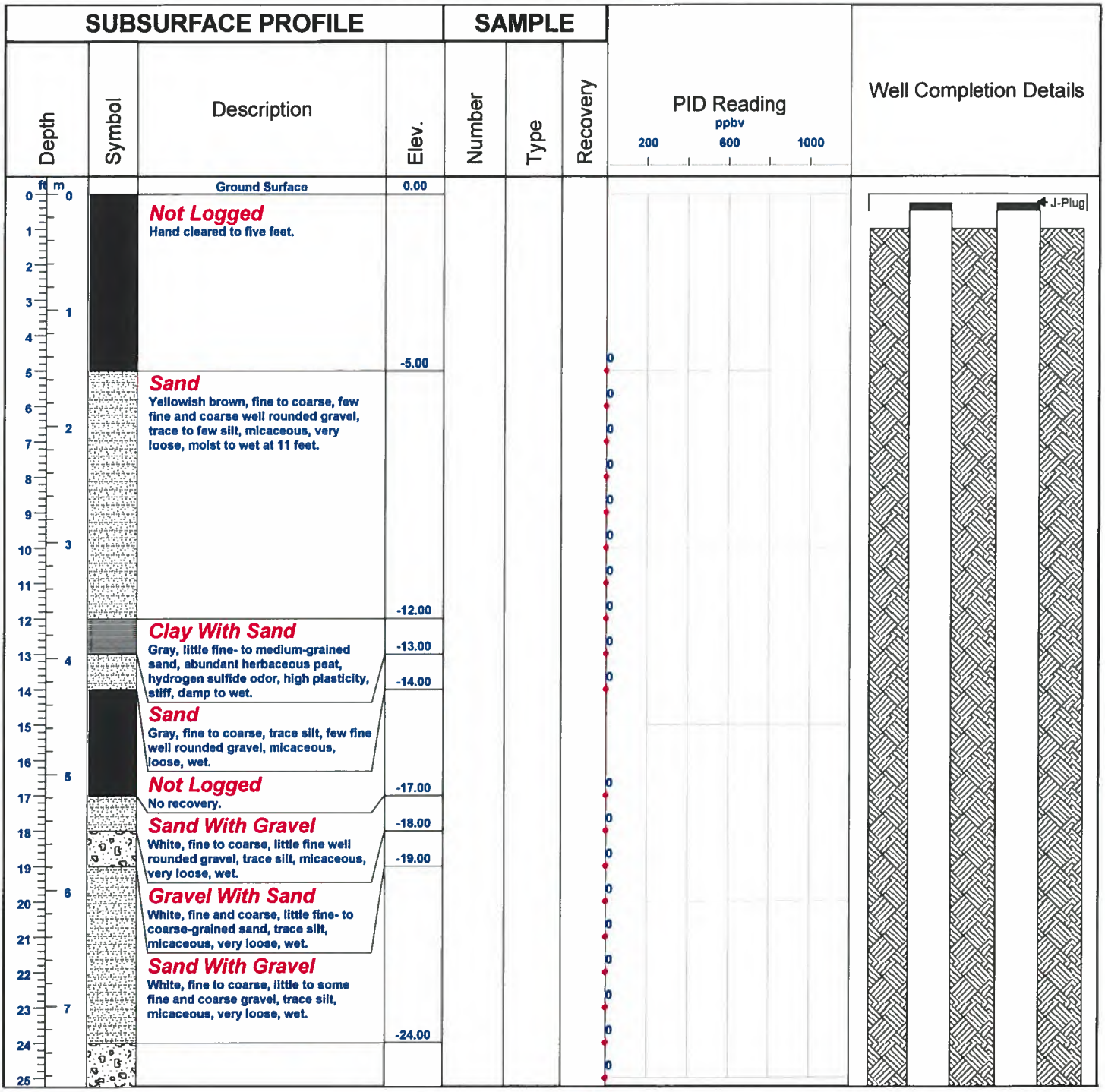
MW-5A Easting (ft): 1241022.358

MW-5A Elevation (ft AMSL): 9.176

MW-5B Northing (ft): 284952.1288

MW-5B Easting (ft): 1241022.564

MW-5B Elevation (ft AMSL): 9.169



Drill Method: Rotary Sonic

Start Date: 7/15/13

Hole Size: 8 inches

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Drill Company: Boart Longyear

End Date: 7/16/13

Sheet: 1 of 6

Project No: SERA02-SER00053

Log of Wells: MW-5A & 5B

Project: Lawrence Aviation Superfund Site

Client: EPA/ERT

Location: Port Jefferson, NY

Logged By: J. Bolduc

MW-5A Northing (ft): 284951.901

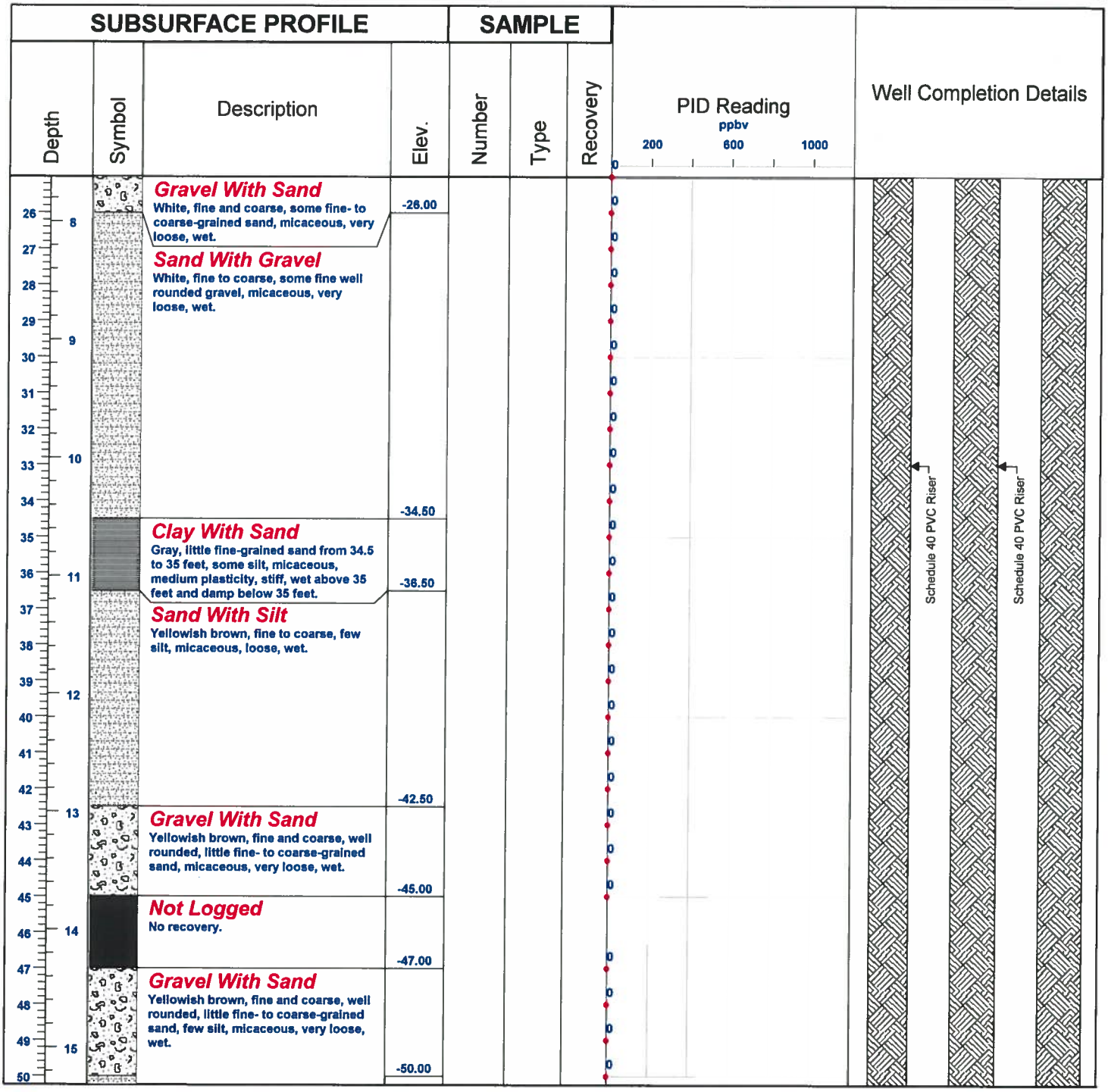
MW-5A Easting (ft): 1241022.358

MW-5A Elevation (ft AMSL): 9.176

MW-5B Northing (ft): 284952.1288

MW-5B Easting (ft): 1241022.564

MW-5B Elevation (ft AMSL): 9.169



Drill Method: Rotary Sonic

Start Date: 7/15/13

Hole Size: 8 inches

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Drill Company: Boart Longyear

End Date: 7/16/13

Sheet: 2 of 6

Project No: SERA02-SER00053

Log of Wells: MW-5A & 5B

Project: Lawrence Aviation Superfund Site

Client: EPA/ERT | **MW-5A Northing (ft):** 284951.901 | **MW-5B Northing (ft):** 284952.1288

Location: Port Jefferson, NY | **MW-5A Easting (ft):** 1241022.358 | **MW-5B Easting (ft):** 1241022.564

Logged By: J. Bolduc | **MW-5A Elevation (ft AMSL):** 9.176 | **MW-5B Elevation (ft AMSL):** 9.169

SUBSURFACE PROFILE				SAMPLE				
Depth	Symbol	Description	Elev.	Number	Type	Recovery	PID Reading (ppbv: 200, 600, 1000)	Well Completion Details
51		**Sand** Yellowish brown, fine to coarse, few fine and coarse well rounded gravel, trace to few silt, micaceous, loose, wet.					0	
52	16						0	
53							0	
54							0	
55			-55.50				0	
56	17	**Not Logged** No recovery.	-57.00				0	
57		**Sand** Yellowish brown, fine to coarse, few fine and coarse well rounded gravel, trace to few silt, micaceous, loose, wet.	-59.00				0	
58		**Gravel** Yellowish brown, fine and coarse, well rounded, few fine- to coarse-grained sand, few silt, micaceous, dense, wet.	-59.00				0	
59	18						0	
60							0	
61							0	
62	19	**Sand** Light olive brown, fine to coarse, predominantly fine, trace to few clay, trace silt, dense, wet. Clay lense between 65 and 65.5 feet.					0	
63							0	
64							0	
65							0	
66	20						0	
67			-67.00				0	
68		**Sand** Yellowish brown, fine to coarse, trace to few silt, micaceous, loose, wet.					0	
69	21						0	
70			-70.00				0	
71		**Sand With Clay** Light olive brown, fine to coarse, predominantly fine, few fine gravel, little to some clay, micaceous, very loose, wet.					0	
72	22		-72.50				0	
73		**Gravel With Sand** Light olive brown, fine and coarse, predominantly fine, some fine- to coarse-grained sand, few silt, micaceous, very loose, wet.					0	
74							0	
75								Bentonite Grout

Drill Method: Rotary Sonic

Drill Company: Boart Longyear

Start Date: 7/15/13

End Date: 7/16/13

Hole Size: 8 inches

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Project No: SERA02-SER00053

Log of Wells: MW-5A & 5B

Project: Lawrence Aviation Superfund Site

Client: EPA/ERT | **MW-5A Northing (ft):** 284951.901 | **MW-5B Northing (ft):** 284952.1288

Location: Port Jefferson, NY | **MW-5A Easting (ft):** 1241022.358 | **MW-5B Easting (ft):** 1241022.564

Logged By: J. Bolduc | **MW-5A Elevation (ft AMSL):** 9.176 | **MW-5B Elevation (ft AMSL):** 9.169

SUBSURFACE PROFILE

Depth	Symbol	Description	Elev.
23			-76.00
		Sand Light olive brown, fine to medium, trace coarse, trace fine and coarse subrounded to rounded gravel, micaceous, very dense, damp to wet.	-77.00
24		**Sand With Clay** Light olive brown, fine to coarse, predominantly fine, little clay, some gravel from 78 to 79 feet, micaceous, wet.	
25			-85.00
26		**Sand** Light olive brown, fine to coarse, trace fine gravel, trace to few silt, micaceous, dense, wet.	
27			
28			-93.00
29		**Sand With Gravel** Light yellowish brown to pale brown, fine to coarse, few fine and coarse well rounded gravel, trace silt, micaceous, loose, wet.	-97.00
30		**Sand** Yellowish brown, fine to coarse, few fine gravel, few silt, micaceous, very loose, wet.	-99.00
			-99.50

SAMPLE

Number | Type | Recovery

PID Reading (ppbv): 200 | 600 | 1000

Well Completion Details: Bentonite; #00 Choke Sand; #1 Filpro Sand; 10-Slot Schedule 40 PVC Screen - MW-5A

Drill Method: Rotary Sonic

Drill Company: Boart Longyear

Start Date: 7/15/13

End Date: 7/16/13

Hole Size: 8 inches

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Project No: SERA02-SER00053

Log of Wells: MW-5A & 5B

Project: Lawrence Aviation Superfund Site

Client: EPA/ERT | **MW-5A Northing (ft):** 284951.901 | **MW-5B Northing (ft):** 284952.1288

Location: Port Jefferson, NY | **MW-5A Easting (ft):** 1241022.358 | **MW-5B Easting (ft):** 1241022.564

Logged By: J. Bolduc | **MW-5A Elevation (ft AMSL):** 9.176 | **MW-5B Elevation (ft AMSL):** 9.169

SUBSURFACE PROFILE

Depth	Symbol	Description	Elev.
101		**Gravel With Sand** Yellowish brown, fine and coarse, little fine- to coarse-grained sand, trace silt, micaceous, wet.	-101.00
102	31		-102.00
		Sand Yellowish brown, fine to coarse, few fine and coarse gravel, trace silt, micaceous, loose, wet.	-102.50
103			
104		**Gravel With Sand** Yellowish brown, fine and coarse, well rounded, some fine- to coarse-grained sand, few silt, micaceous, very loose, wet.	
105	32		
106			
107		**Clayey Sand** Yellowish brown, fine to medium, little to some clay, micaceous, dense, wet.	-107.00
108	33	**Not Logged** No recovery.	
109		**Sand** White, fine to coarse, trace silt, micaceous, loose, wet.	-109.00
110			
111		**Gravel** Light olive brown, fine and coarse, predominantly coarse, few fine- to coarse-grained sand, few silt, micaceous, loose, wet.	-111.00
112	34		
113		**Sand With Gravel** Pale yellow, fine to coarse, trace silt, few to some fine and coarse well rounded gravel, micaceous, loose to very loose, wet.	
114			-114.50
115	35	**Silt** Light olive brown, little fine-grained sand, micaceous, nonplastic, very stiff, damp.	-115.50
116			
117		**Gravel With Sand** Light olive brown to dark grayish brown, fine and coarse, well rounded, some fine- to coarse-grained sand, little silt, micaceous, loose, wet.	-117.00
118	36		
119			
120		**Sand With Gravel** Dark grayish brown, fine to coarse, few to some fine and coarse well rounded gravel, few silt, micaceous, very loose to loose, wet.	-120.00
121	37		
122		**Sand** Yellowish brown to light olive brown between 126 and 128 feet, fine to coarse, trace fine gravel, trace to few clay, micaceous, very loose, wet.	
123			
124			
125	38		

SAMPLE

Number	Type	Recovery

PID Reading (ppbv): 200, 600, 1000

Well Completion Details: Bentonite; #00 Choke Sand; #00 Choke Sand; #1 Filpro Sand

Drill Method: Rotary Sonic

Drill Company: Boart Longyear

Start Date: 7/15/13

End Date: 7/16/13

Hole Size: 8 inches

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Project No: SERA02-SER00053

Log of Wells: MW-5A & 5B

Project: Lawrence Aviation Superfund Site

Client: EPA/ERT

MW-5A Northing (ft): 284951.901

MW-5B Northing (ft): 284952.1288

Location: Port Jefferson, NY

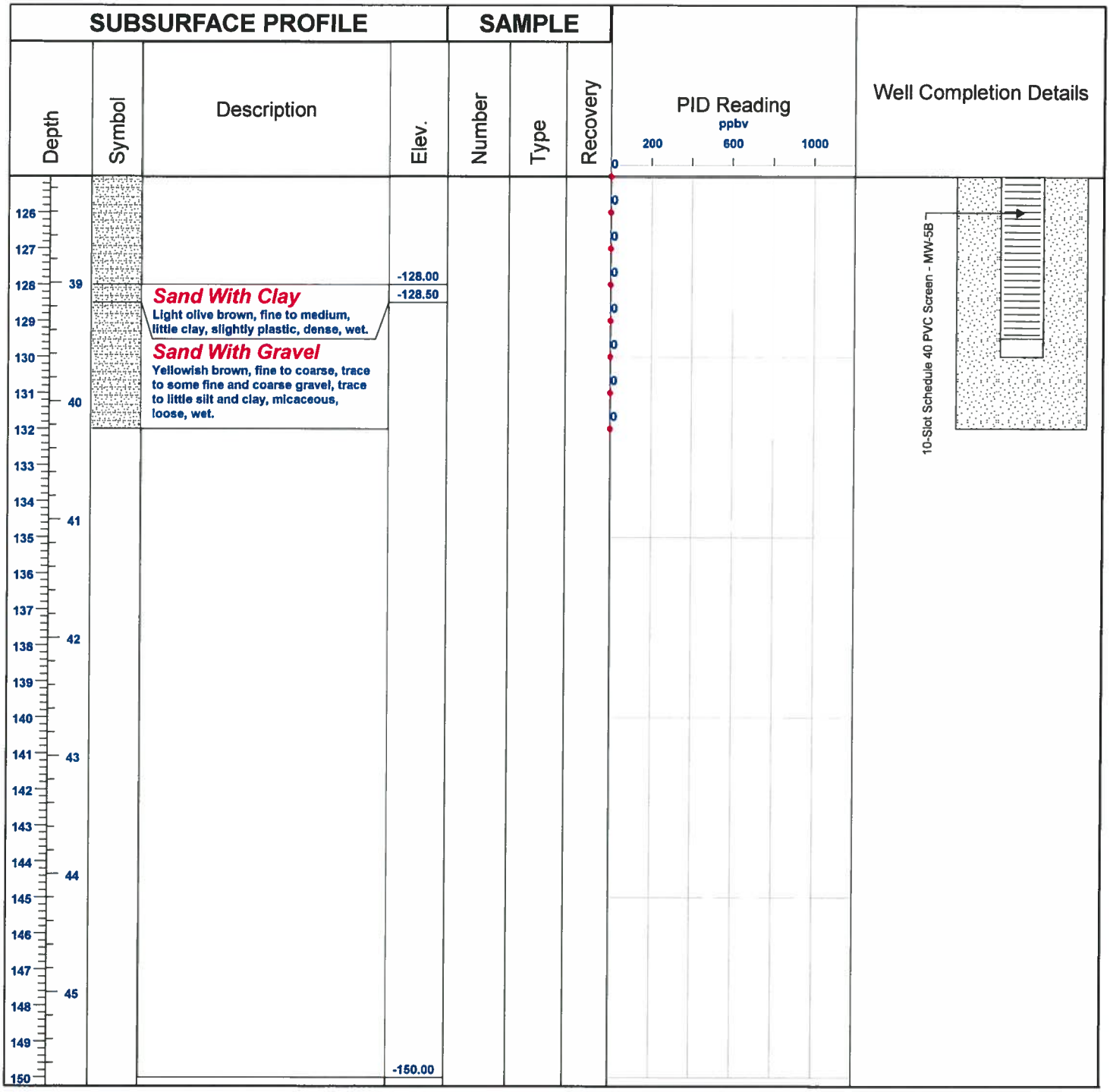
MW-5A Easting (ft): 1241022.358

MW-5B Easting (ft): 1241022.564

Logged By: J. Bolduc

MW-5A Elevation (ft AMSL): 9.176

MW-5B Elevation (ft AMSL): 9.169



Drill Method: Rotary Sonic

Drill Company: Boart Longyear

Start Date: 7/15/13

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

End Date: 7/16/13

Hole Size: 8 inches

Sheet: 6 of 6

Project No: SERA02-SER00053

Log of Wells: MW-6A & 6B

Project: Lawrence Aviation Superfund Site

Client: EPA/ERT

Location: Port Jefferson, NY

Logged By: J. Bolduc

MW-6A Northing (ft): 284309.368

MW-6A Easting (ft): 1240626.904

MW-6A Elevation (ft AMSL): 16.523

MW-6B Northing (ft): 284309.2381

MW-6B Easting (ft): 1240627.145

MW-6B Elevation (ft AMSL): 16.517

SUBSURFACE PROFILE

SAMPLE

Depth (ft / m)	Symbol	Description	Elev.	Number	Type	Recovery	PID Reading (ppbv)	Well Completion Details
0 / 0		Ground Surface	0.00				200 600 1000	J-Plug
0–7 / 0–2		**Not Logged** Vacuum excavated and backfilled with soil cuttings to nine feet.	-7.00				0	
7–9 / 2–3		**Sand With Silt And Gravel Backfill** Light yellowish brown, fine to coarse, little fine and coarse rounded gravel, few silt, micaceous, loose, moist.	-9.00				0	
9–16 / 3–5		**Sand** Yellowish brown, fine to coarse, little to some fine and coarse subrounded to rounded gravel, little silt, micaceous, loose, wet.	-16.00				0	
16–17 / 5		**Not Logged** No recovery.	-17.00				0	
17–22.75 / 5–7		**Sand** Yellowish brown, fine to coarse, little to some fine and coarse subrounded to rounded gravel, little silt, micaceous, loose, wet.	-22.75				0	
22.75–25 / 7		**Clay** Dark gray, few fine-grained sand, little silt, high plasticity, abundant herbaceous plant fragments, very stiff, hydrogen sulfide odor, damp to	-25.00				0	

Drill Method: Rotary Sonic

Start Date: 7/22/13

Hole Size: 8 inches

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Drill Company: Boart Longyear

End Date: 7/22/13

Sheet: 1 of 6

Project No: SERA02-SER00053

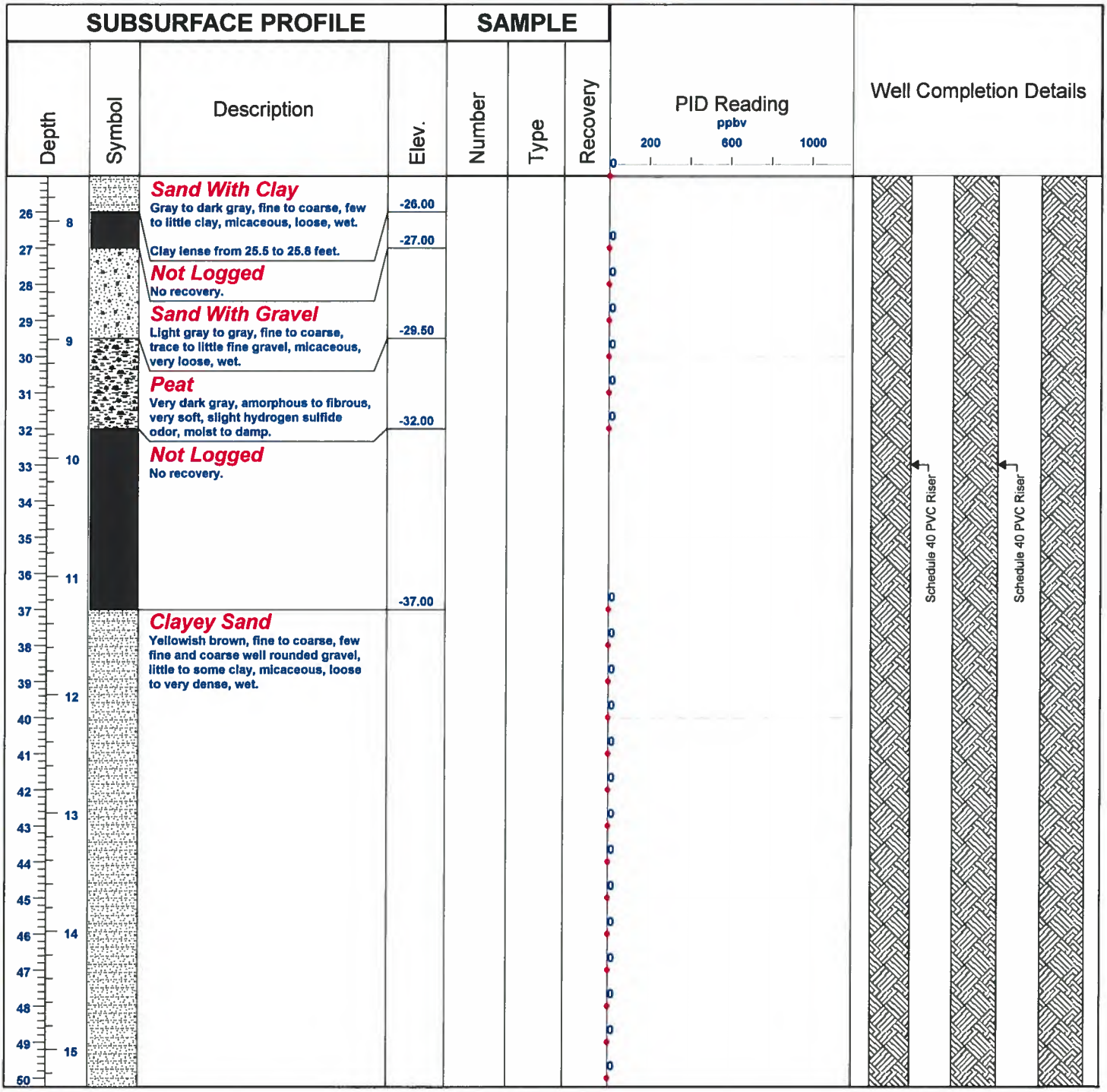
Log of Wells: MW-6A & 6B

Project: Lawrence Aviation Superfund Site

Client: EPA/ERT | **MW-6A Northing (ft):** 284309.368 | **MW-6B Northing (ft):** 284309.2381

Location: Port Jefferson, NY | **MW-6A Easting (ft):** 1240626.904 | **MW-6B Easting (ft):** 1240627.145

Logged By: J. Bolduc | **MW-6A Elevation (ft AMSL):** 16.523 | **MW-6B Elevation (ft AMSL):** 16.517



Drill Method: Rotary Sonic

Drill Company: Boart Longyear

Start Date: 7/22/13

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

End Date: 7/22/13

Hole Size: 8 inches

Sheet: 2 of 6

Project No: SERA02-SER00053

Log of Wells: MW-6A & 6B

Project: Lawrence Aviation Superfund Site

Client: EPA/ERT

MW-6A Northing (ft): 284309.368

MW-6B Northing (ft): 284309.2381

Location: Port Jefferson, NY

MW-6A Easting (ft): 1240626.904

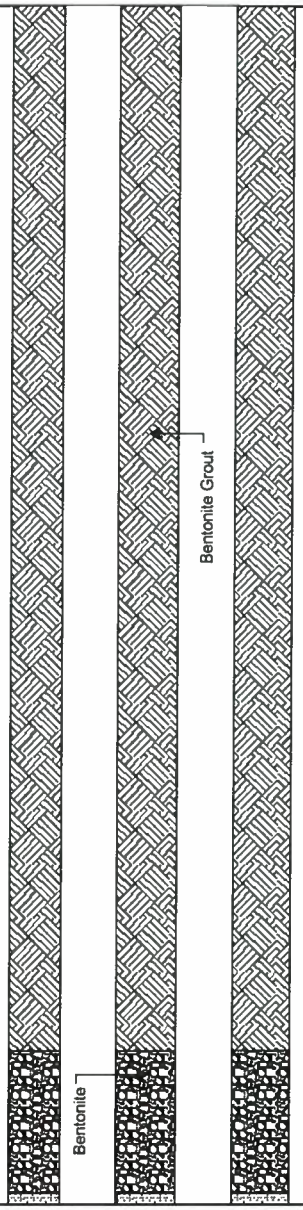
MW-6B Easting (ft): 1240627.145

Logged By: J. Bolduc

MW-6A Elevation (ft AMSL): 16.523

MW-6B Elevation (ft AMSL): 16.517

SUBSURFACE PROFILE				SAMPLE				
Depth	Symbol	Description	Elev.	Number	Type	Recovery	PID Reading ppbv (200, 600, 1000)	Well Completion Details
51			-51.50				0	
52		***Silt*** Yellowish brown, few fine sand, some clay, nonplastic, very stiff, wet. Dark gray to black, fine-grained sand lense from 55 to 56 feet. Becomes brown at 56 feet.					0	
53	16						0	
54							0	
55							0	
56	17		-57.00				0	
57		***Sand With Silt*** Yellowish brown, fine to medium, trace coarse sand, little silt, micaceous, dense, wet. Becomes dark grayish brown at 66 feet.					0	
58							0	
59	18						0	
60							0	
61							0	
62	19						0	
63							0	
64							0	
65							0	
66	20						0	
67			-67.00				0	
68		***Sand With Clay*** Yellowish brown, fine to coarse, few to little clay, trace silt, trace fine gravel, micaceous, dense, wet. Becomes brown at 76 feet.					0	
69	21						0	
70							0	
71							0	
72	22						0	
73							0	
74							0	
75							0	



Drill Method: Rotary Sonic

Drill Company: Boart Longyear

Start Date: 7/22/13

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

End Date: 7/22/13

Hole Size: 8 inches

Sheet: 3 of 6

Project No: SERA02-SER00053

Log of Wells: MW-6A & 6B

Project: Lawrence Aviation Superfund Site

Client: EPA/ERT

Location: Port Jefferson, NY

Logged By: J. Bolduc

MW-6A Northing (ft): 284309.368

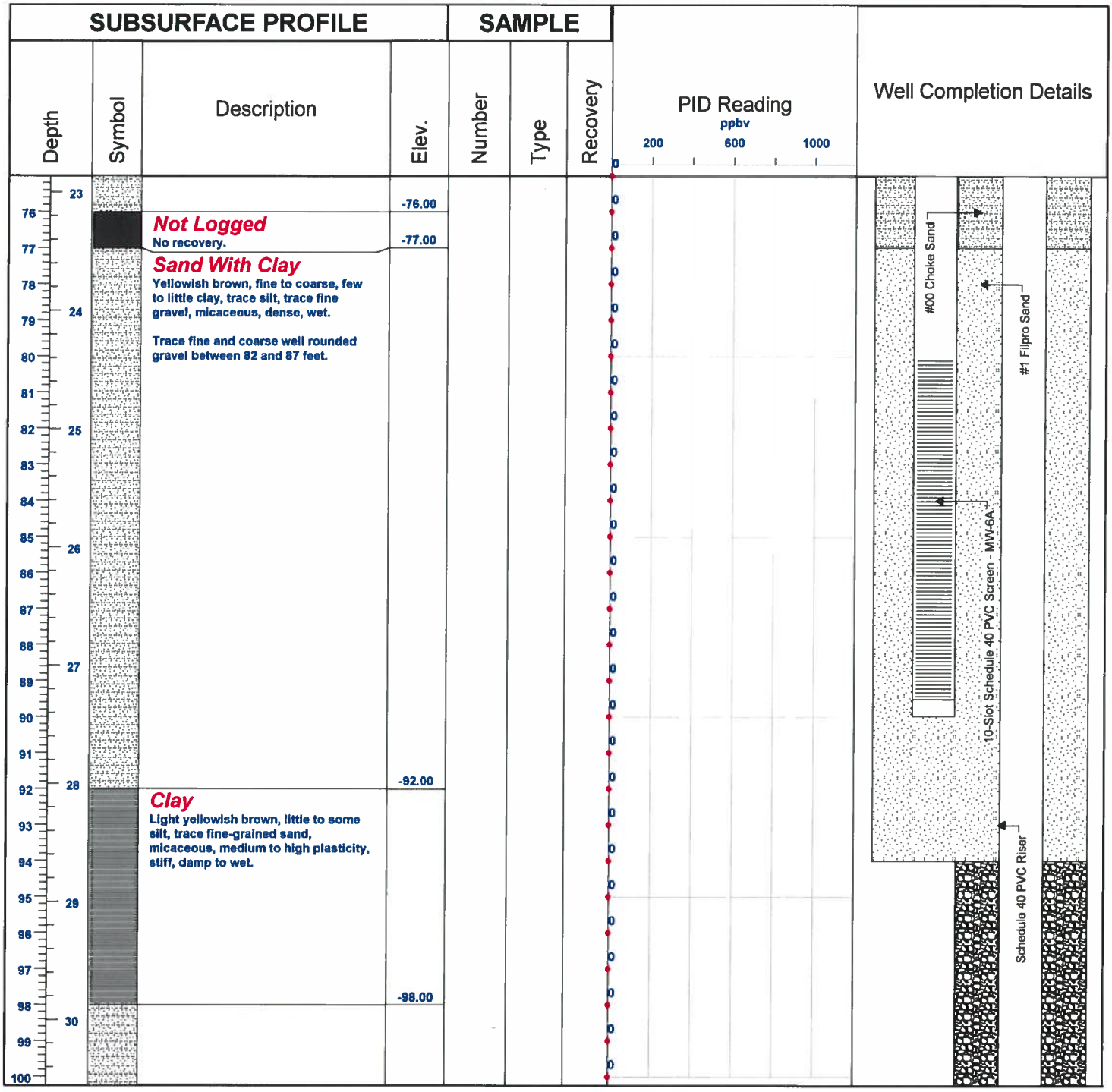
MW-6A Easting (ft): 1240626.904

MW-6A Elevation (ft AMSL): 16.523

MW-6B Northing (ft): 284309.2381

MW-6B Easting (ft): 1240627.145

MW-6B Elevation (ft AMSL): 16.517



Drill Method: Rotary Sonic

Start Date: 7/22/13

Hole Size: 8 inches

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Drill Company: Boart Longyear

End Date: 7/22/13

Sheet: 4 of 6

Project No: SERA02-SER00053

Log of Wells: MW-6A & 6B

Project: Lawrence Aviation Superfund Site

Client: EPA/ERT

MW-6A Northing (ft): 284309.368

MW-6B Northing (ft): 284309.2381

Location: Port Jefferson, NY

MW-6A Easting (ft): 1240626.904

MW-6B Easting (ft): 1240627.145

Logged By: J. Bolduc

MW-6A Elevation (ft AMSL): 16.523

MW-6B Elevation (ft AMSL): 16.517

SUBSURFACE PROFILE				SAMPLE				
Depth	Symbol	Description	Elev.	Number	Type	Recovery	PID Reading (ppbv: 200, 600, 1000)	Well Completion Details
101		**Clayey Sand** Brown, fine to medium, trace coarse sand, trace fine and coarse well rounded gravel, little to some clay, trace silt, micaceous, very dense, damp to wet.					0	
102	31						0	
103							0	
104			-104.00				0	
105	32	**Sandy Gravel** Yellowish brown, fine and coarse, some fine- to coarse-grained sand, trace to few silt, micaceous, loose, wet.	-105.00				0	
106		**Not Logged** No recovery.	-107.00				0	
107							0	
108	33	**Sand With Gravel** Yellowish brown, fine to coarse, some fine and coarse gravel fom 109 to 109.5 feet, few clay, trace silt, micaceous, loose to dense, wet.	-110.00				0	Bentonite
109							0	
110		**Clay** Yellowish brown, little silt, few fine-grained sand, micaceous, high plasticity, very stiff, damp to wet.	-112.00				0	
111	34						0	
112		**Sand With Gravel** Yellowish brown, fine to coarse, little fine and coarse well rounded gravel, trace silt, micaceous, very loose, wet.	-113.50				0	
113							0	
114		**Silty Sand** Pale yellow, fine, little silt, micaceous, dense, wet.	-115.00				0	
115	35	**Not Logged** No recovery.	-117.00				0	
116							0	
117		**Sand With Gravel** White, fine to coarse, little fine and coarse subrounded to rounded gravel, trace silt, micaceous, very loose, wet.	-119.00				0	
118	36						0	
119		**Not Logged** No recovery.						
120								
121	37							
122								
123								#00 Choke Sand
124								
125	38							

Drill Method: Rotary Sonic

Drill Company: Boart Longyear

Start Date: 7/22/13

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

End Date: 7/22/13

Hole Size: 8 inches

Sheet: 5 of 6

Project No: SERA02-SER00053

Log of Wells: MW-6A & 6B

Project: Lawrence Aviation Superfund Site

Client: EPA/ERT

MW-6A Northing (ft): 284309.368

MW-6B Northing (ft): 284309.2381

Location: Port Jefferson, NY

MW-6A Easting (ft): 1240626.904

MW-6B Easting (ft): 1240627.145

Logged By: J. Bolduc

MW-6A Elevation (ft AMSL): 16.523

MW-6B Elevation (ft AMSL): 16.517

SUBSURFACE PROFILE

Depth	Symbol	Description	Elev.
126–150			
39			
40			
41			
42			
43			
44			
45			
			-133.00
		Sand Yellowish brown, fine to coarse, trace fine well rounded gravel, trace silt, micaceous, loose, wet.	-135.00
		Silty Sand Yellowish brown to light greenish gray, fine, little to some silt, occasional clay stringers, very dense, wet.	
			-150.00

SAMPLE

Number	Type	Recovery

PID Reading (ppbv): 200 | 600 | 1000

0 0 0 0 0 0 0 0 0 0 0 0

Well Completion Details

10-Slot Schedule 40 PVC Screen - MW-6B

#1 Filpro Sand

Drill Method: Rotary Sonic

Drill Company: Boart Longyear

Start Date: 7/22/13

End Date: 7/22/13

Hole Size: 8 inches

Sheet: 6 of 6

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Project No: SERA02-SER00053

Project: Lawrence Aviation Superfund Site

Client: EPA/ERT

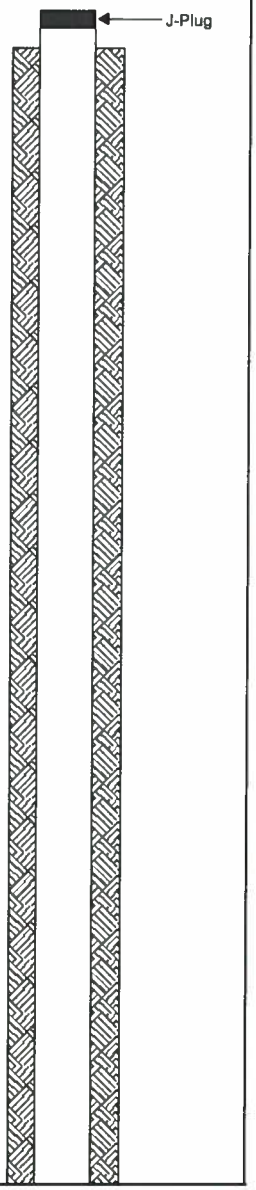
Location: Port Jefferson, NY

Log of Well: EW-6

Northing (ft): 284057.1952 **Elevation (ft AMSL):** 18.973

Easting (ft): 1240263.916 **Logged By:** J. Bolduc

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Description	Elev.	Number	Type	Recovery	PID Reading (ppbv; 200 / 600 / 1000)	Well Completion Details
0 / 0		Ground Surface	0.00					
0–5 / 0–1		**Not Logged** Hand cleared to five feet.	-5.00					
5–7 / 1–2		**Sand With Gravel** Light yellowish brown, fine to coarse, little fine and coarse subrounded to rounded gravel, micaceous, loose, moist to wet at nine feet.	-7.00					
7–12 / 2–3		**Sand With Silt and Gravel** Yellowish brown, fine to coarse, little to some fine and coarse subrounded to rounded gravel, little silt, micaceous, loose, wet.	-12.00					
12–15 / 3–4		**Sand With Gravel** Yellowish brown to very pale brown, fine to coarse, little to some fine and coarse subangular to rounded gravel, micaceous, loose, wet.	-15.00					
15–16 / 4–5		**Silty Sand** Dark gray, fine to medium, some silt, occasional roots and small to large twigs, micaceous, dense, wet.	-16.00 -17.00					
16–20 / 5–6		**Clay With Sand** Light gray, little fine- to coarse-grained sand, little fine and coarse gravel at the bottom, medium plasticity, damp to wet at the bottom.	-20.00					
20–23 / 6–7		**Silty Sand** Light yellowish brown, fine to coarse, few fine and coarse gravel, little silt, micaceous, loose, wet.						
23–30 / 7–9		**Sand With Silt And Gravel** Light gray, fine to medium, trace coarse, few silt, few fine gravel, micaceous, loose, wet. Medium plasticity, damp, silty clay lense from 24 to 24.25 feet. Low plasticity clay lense from 36 to 36.1 feet. Occasional thin silt and clay lenses between 37 and 42 feet.						



Drill Method: Rotary Sonic

Start Date: 7/9/13

Hole Size: 10 inches

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Drill Company: Boart Longyear

End Date: 7/12/13

Sheet: 1 of 5

Project No: SERA02-SER00053

Project: Lawrence Aviation Superfund Site

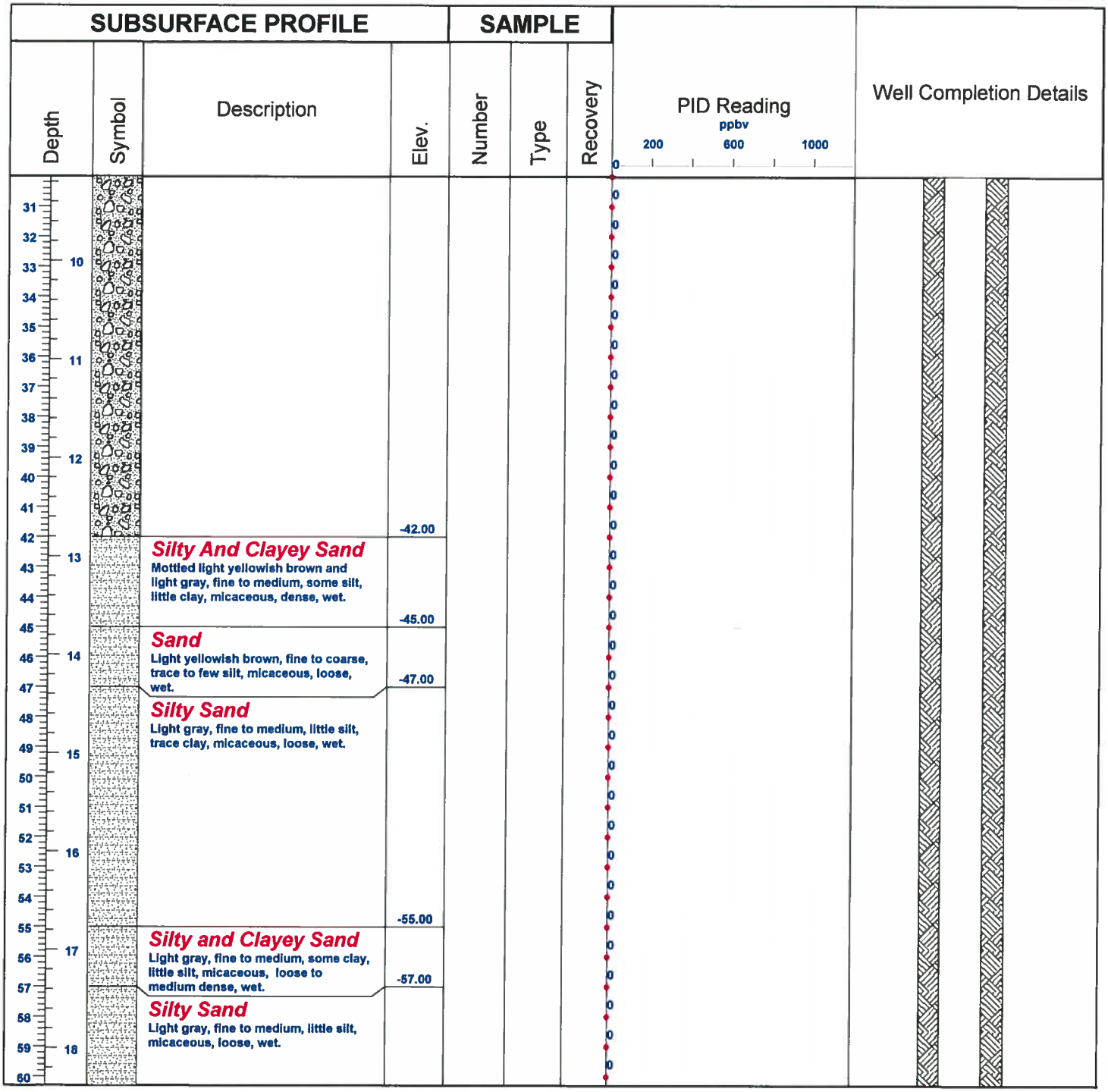
Client: EPA/ERT

Location: Port Jefferson, NY

Log of Well: EW-6

Northing (ft): 284057.1952 **Elevation (ft AMSL):** 18.973

Easting (ft): 1240263.916 **Logged By:** J. Bolduc



Drill Method: Rotary Sonic

Start Date: 7/9/13

Hole Size: 10 inches

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Drill Company: Boart Longyear

End Date: 7/12/13

Project No: SERA02-SER00053

Project: Lawrence Aviation Superfund Site

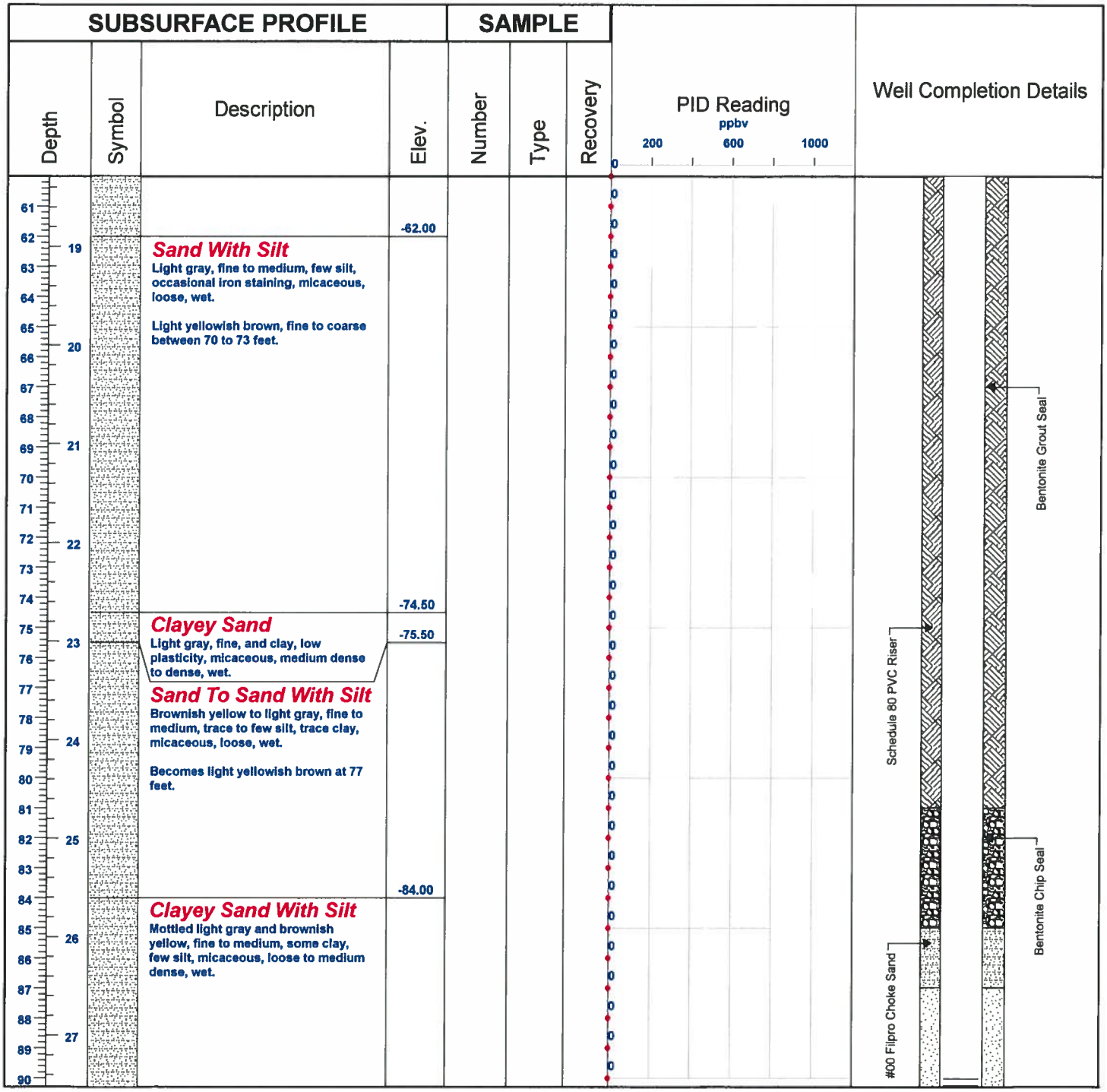
Client: EPA/ERT

Location: Port Jefferson, NY

Log of Well: EW-6

Northing (ft): 284057.1952 **Elevation (ft AMSL):** 18.973

Easting (ft): 1240263.916 **Logged By:** J. Bolduc



Drill Method: Rotary Sonic

Start Date: 7/9/13

Hole Size: 10 inches

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Drill Company: Boart Longyear

End Date: 7/12/13

Sheet: 3 of 5

Project No: SERA02-SER00053

Project: Lawrence Aviation Superfund Site

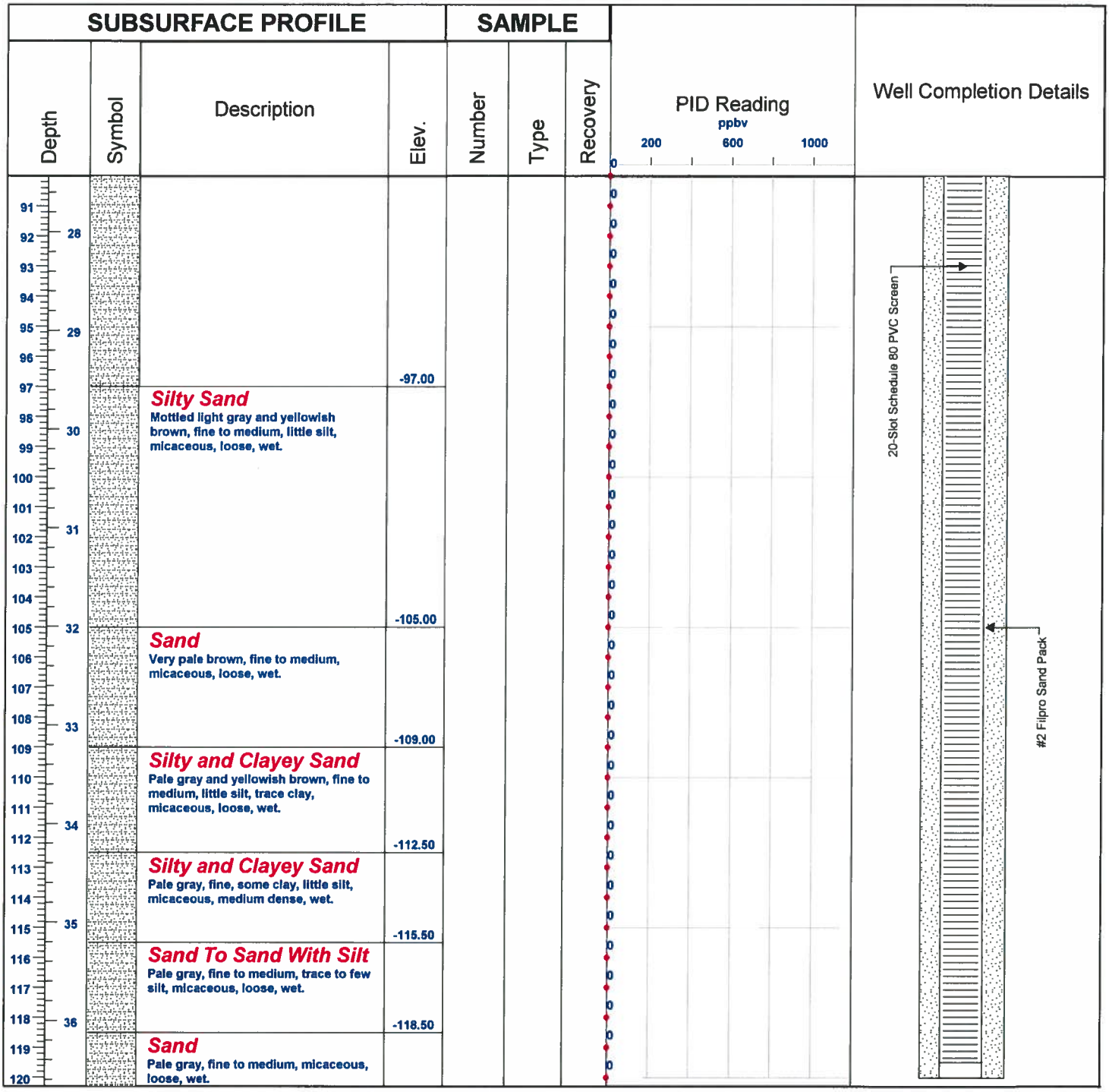
Client: EPA/ERT

Location: Port Jefferson, NY

Log of Well: EW-6

Northing (ft): 284057.1952 **Elevation (ft AMSL):** 18.973

Easting (ft): 1240263.916 **Logged By:** J. Bolduc



Drill Method: Rotary Sonic

Start Date: 7/9/13

Hole Size: 10 inches

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Drill Company: Boart Longyear

End Date: 7/12/13

Sheet: 4 of 5

Project No: SERA02-SER00053

Project: Lawrence Aviation Superfund Site

Client: EPA/ERT

Location: Port Jefferson, NY

Log of Well: EW-6

Northing (ft): 284057.1952 **Elevation (ft AMSL):** 18.973

Easting (ft): 1240263.916 **Logged By:** J. Bolduc

SUBSURFACE PROFILE				SAMPLE				
Depth	Symbol	Description	Elev.	Number	Type	Recovery	PID Reading (ppbv: 200, 600, 1000)	Well Completion Details
121–150		**Silty Sand** Pale gray, fine to medium, little silt, micaceous, medium dense, wet.	-121.50				0	
			-150.00					

Drill Method: Rotary Sonic

Start Date: 7/9/13

Hole Size: 10 inches

Lockheed Martin/SERAS
2890 Woodbridge Avenue
Building 209 Annex
Edison, NJ 08837

Drill Company: Boart Longyear

End Date: 7/12/13

Sheet: 5 of 5

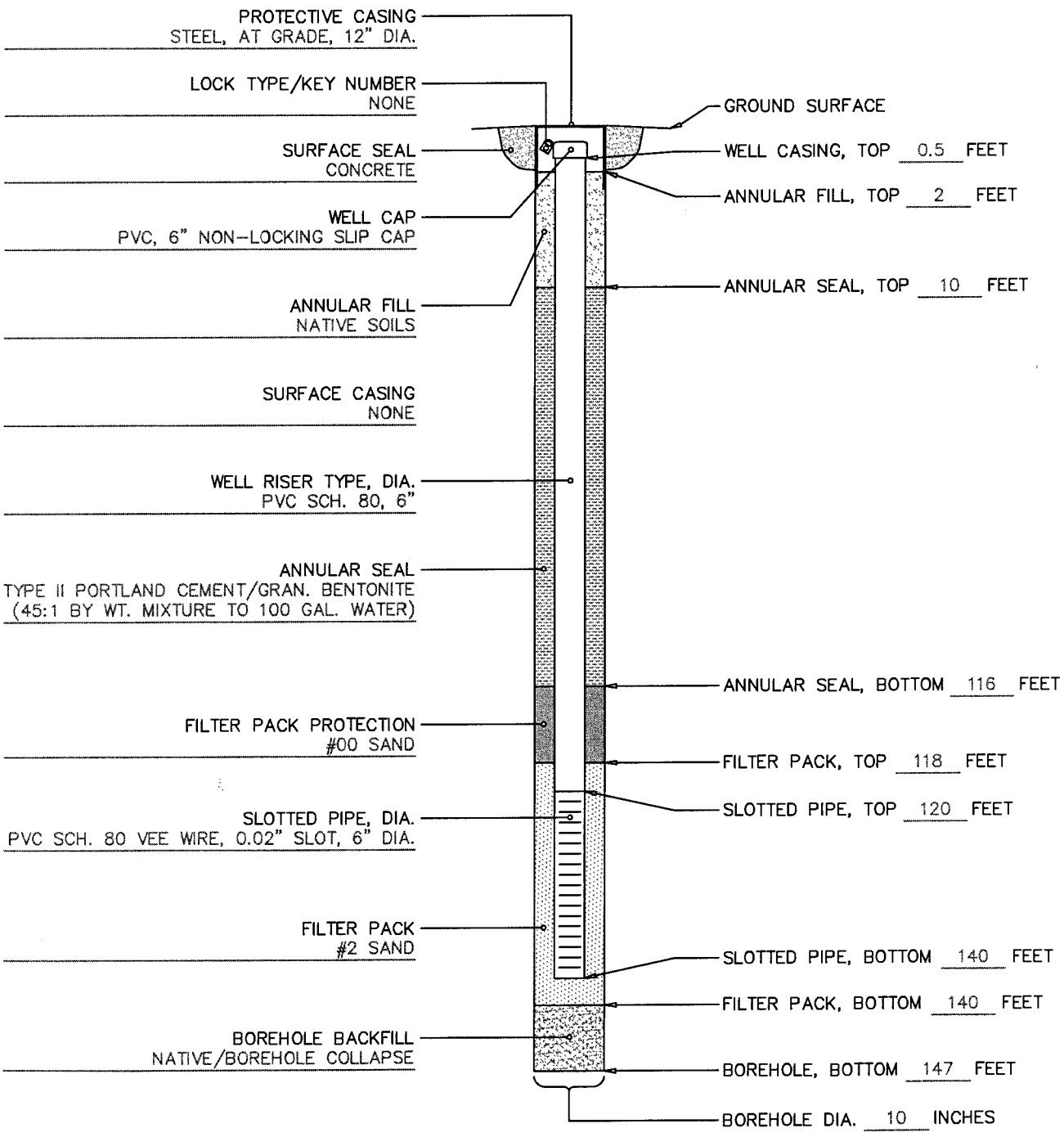
APPENDIX K

WELL CONSTRUCTION LOGS

WELL CONSTRUCTION DIAGRAM

WELL DESIGNATION: ERT-EW1

CLIENT U.S. EPA ENVIRONMENTAL RESPONSE TEAM	**CONTRACT NAME** RESPONSE ENGINEERING AND ANALYTICAL CONTRACT (REAC)
PROJECT NAME LAWRENCE AVIATION SUPERFUND SITE	**CONTRACT NO.** EP-C-04-032
PROJECT CITY, STATE PORT JEFFERSON STATION, NY	**CONTRACTOR** LOCKHEED MARTIN
PROJECT NO. EAC401-EAC00242	**INSPECTOR** CHRIS SKLANEY
DRILLING ORGANIZATION BOART LONGYEAR ENGINEERING & INFRASTRUCTURE	**PERMIT NO.** N/A
DRILLER NAME DAN O'MARA	**WELL LOCATION** +40.94287861 N, -073.07300932 W
DRILLING RIG/METHOD ROTARY SONIC	**MEASUREMENT REFERENCE POINT** GROUND SURFACE
INSTALLATION START DATE 11/17/2008 / **INSTALLATION COMPLETION DATE** 11/18/2008	**REFERENCE POINT ELEVATION** +22.58 MSL



NOT TO SCALE

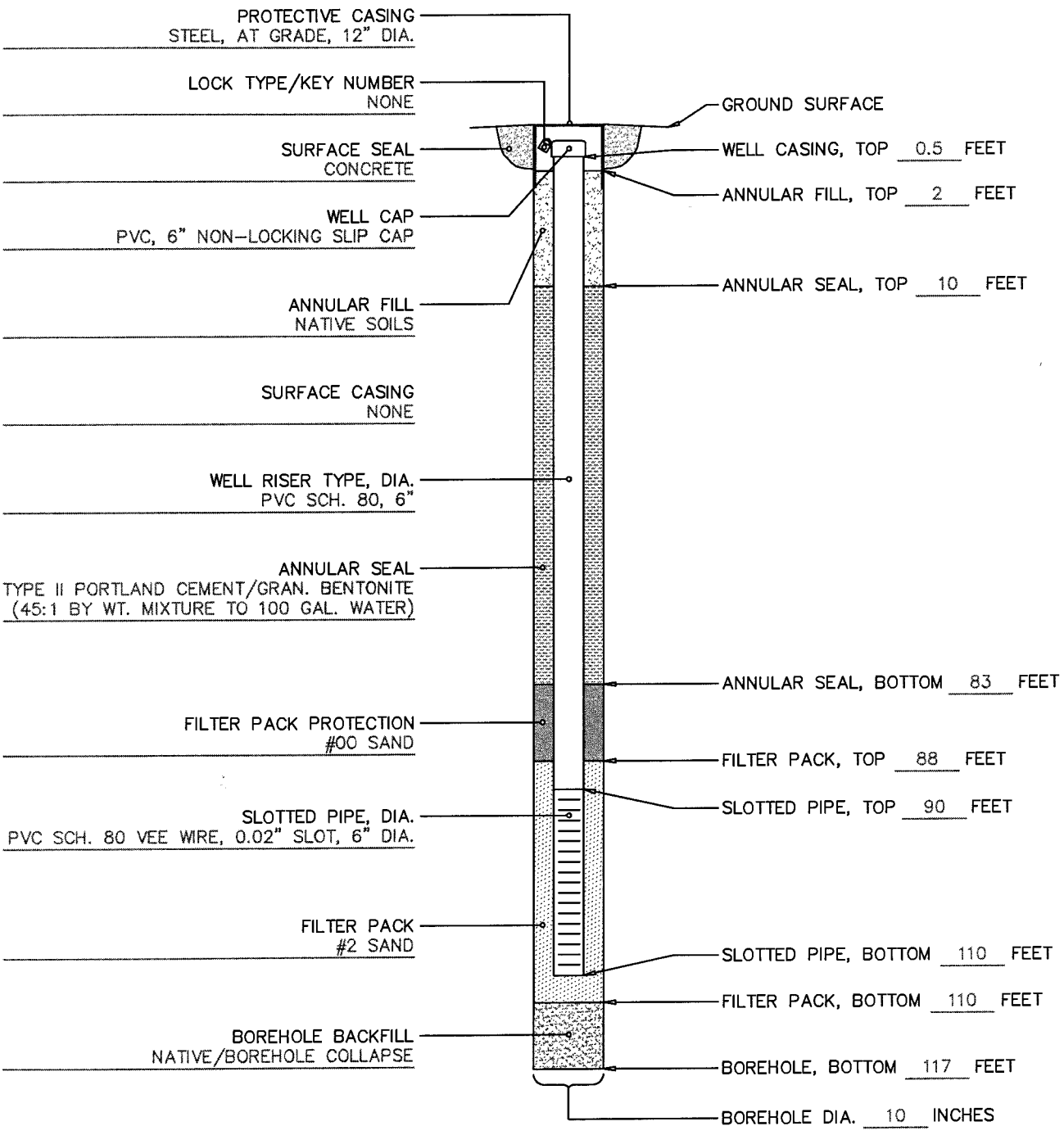
POSITIVE DEPTHS DOWNHOLE FROM MEAS. R.P.

I:\GEO\242 LAWRENCE AVIATION\LOGS\WCD_ERT-EW1.DWG

WELL CONSTRUCTION DIAGRAM

WELL DESIGNATION: ERT-EW2

CLIENT U.S. EPA ENVIRONMENTAL RESPONSE TEAM	**CONTRACT NAME** RESPONSE ENGINEERING AND ANALYTICAL CONTRACT (REAC)
PROJECT NAME LAWRENCE AVIATION SUPERFUND SITE	**CONTRACT NO.** EP-C-04-032
PROJECT CITY, STATE PORT JEFFERSON STATION, NY	**CONTRACTOR** LOCKHEED MARTIN
PROJECT NO. EAC401-EAC00242	**INSPECTOR** CHRIS SKLANEY
DRILLING ORGANIZATION BOART LONGYEAR ENGINEERING & INFRASTRUCTURE	**PERMIT NO.** N/A
DRILLER NAME DAN O'MARA	**WELL LOCATION** +40.94291754 N, -073.07309499 W
DRILLING RIG/METHOD ROTARY SONIC	**MEASUREMENT REFERENCE POINT** GROUND SURFACE
INSTALLATION START DATE 11/10/2008 — **INSTALLATION COMPLETION DATE** 11/11/2008	**REFERENCE POINT ELEVATION** +22.76 MSL



NOT TO SCALE

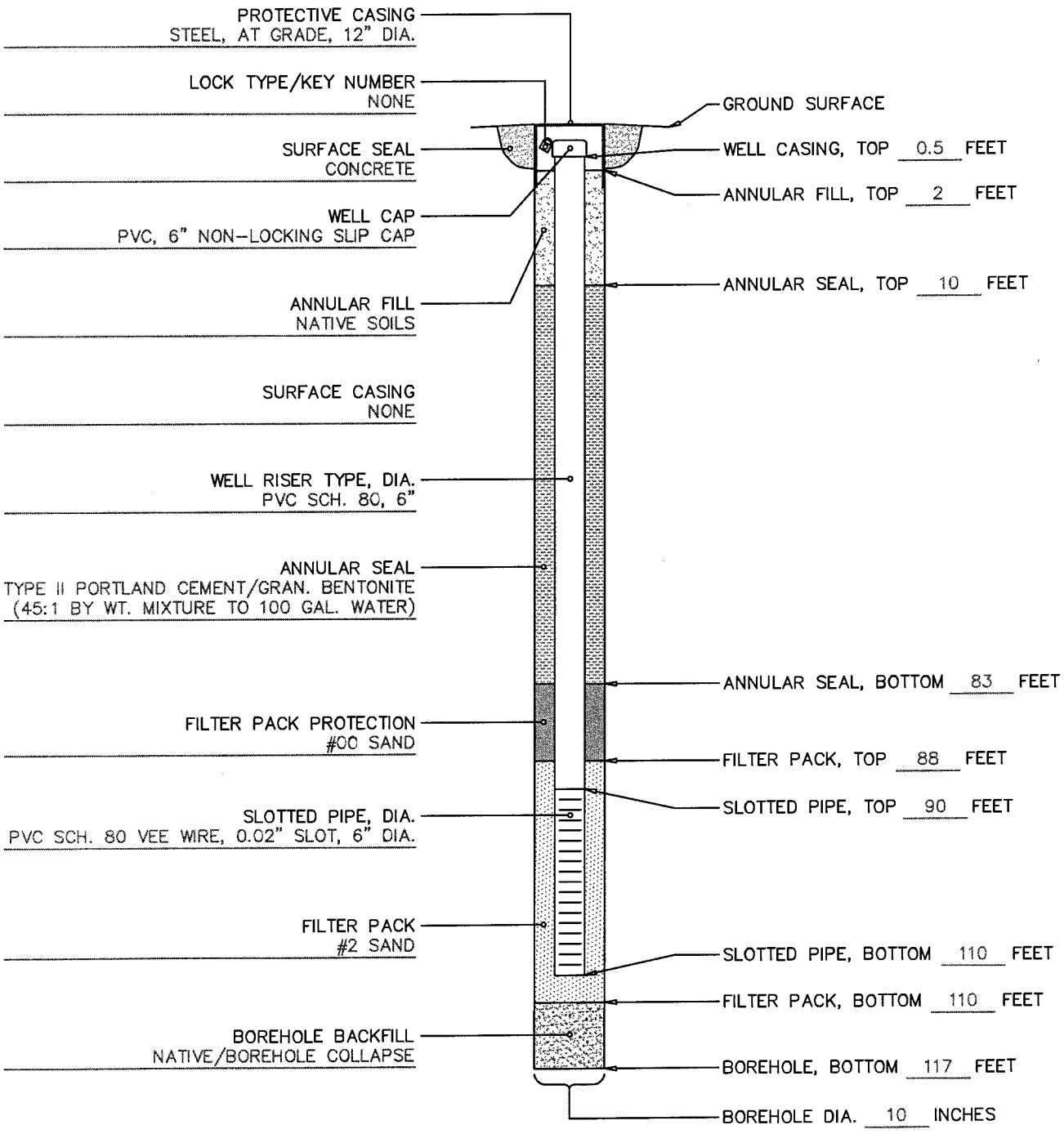
POSITIVE DEPTHS DOWNHOLE FROM MEAS. R.P.

I:\GEO\242 LAWRENCE AVIATION\LOGS\WCD_ERT-EW2.DWG

WELL CONSTRUCTION DIAGRAM

WELL DESIGNATION: ERT-EW3

CLIENT U.S. EPA ENVIRONMENTAL RESPONSE TEAM	**CONTRACT NAME** RESPONSE ENGINEERING AND ANALYTICAL CONTRACT (REAC)
PROJECT NAME LAWRENCE AVIATION SUPERFUND SITE	**CONTRACT NO.** EP-C-04-032
PROJECT CITY, STATE PORT JEFFERSON STATION, NY	**CONTRACTOR** LOCKHEED MARTIN
PROJECT NO. EAC401-EAC00242	**INSPECTOR** CHRIS SKLANEY
DRILLING ORGANIZATION BOART LONGYEAR ENGINEERING & INFRASTRUCTURE	**PERMIT NO.** N/A
DRILLER NAME DAN O'MARA	**WELL LOCATION** +40.94294473 N, -073.07291816 W
DRILLING RIG/METHOD ROTARY SONIC	**MEASUREMENT REFERENCE POINT** GROUND SURFACE
INSTALLATION START DATE 11/13/2008 / **INSTALLATION COMPLETION DATE** 11/13/2008	**REFERENCE POINT ELEVATION** +22.88 MSL



NOT TO SCALE

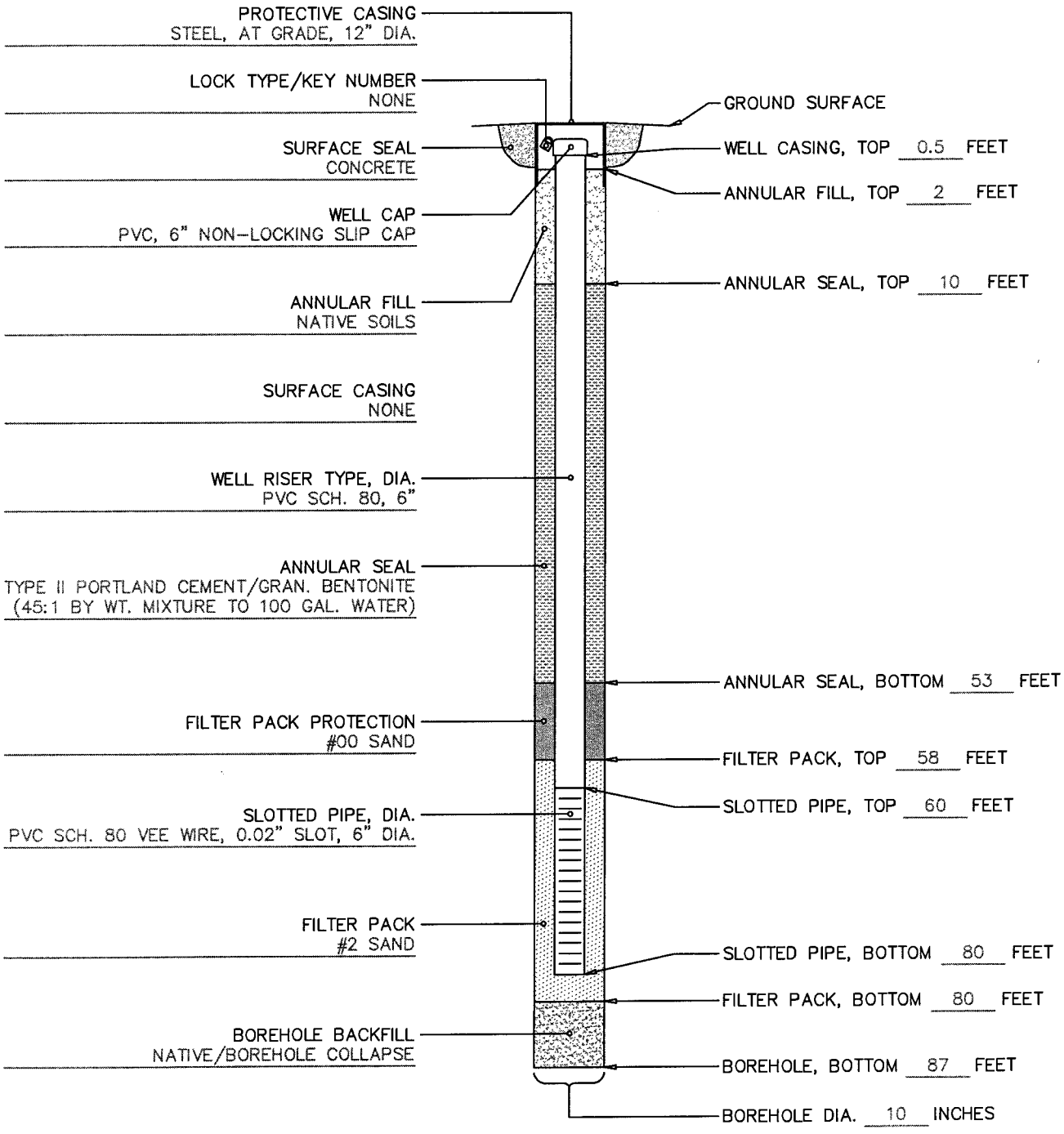
POSITIVE DEPTHS DOWNHOLE FROM MEAS. R.P.

I:\GEO\242 LAWRENCE AVIATION\LOGS\WCD_ERT-EW3.DWG

WELL CONSTRUCTION DIAGRAM

WELL DESIGNATION: ERT-EW4

CLIENT U.S. EPA ENVIRONMENTAL RESPONSE TEAM	**CONTRACT NAME** RESPONSE ENGINEERING AND ANALYTICAL CONTRACT (REAC)
PROJECT NAME LAWRENCE AVIATION SUPERFUND SITE	**CONTRACT NO.** EP-C-04-032
PROJECT CITY, STATE PORT JEFFERSON STATION, NY	**CONTRACTOR** LOCKHEED MARTIN
PROJECT NO. EAC401-EAC00242	**INSPECTOR** CHRIS SKLANEY
DRILLING ORGANIZATION BOART LONGYEAR ENGINEERING & INFRASTRUCTURE	**PERMIT NO.** N/A
DRILLER NAME DAN O'MARA	**WELL LOCATION** +40.94299743 N, -073.07301407 W
DRILLING RIG/METHOD ROTARY SONIC	**MEASUREMENT REFERENCE POINT** GROUND SURFACE
INSTALLATION START DATE 11/06/2008 — **INSTALLATION COMPLETION DATE** 11/07/2008	**REFERENCE POINT ELEVATION** +22.56 MSL



NOT TO SCALE

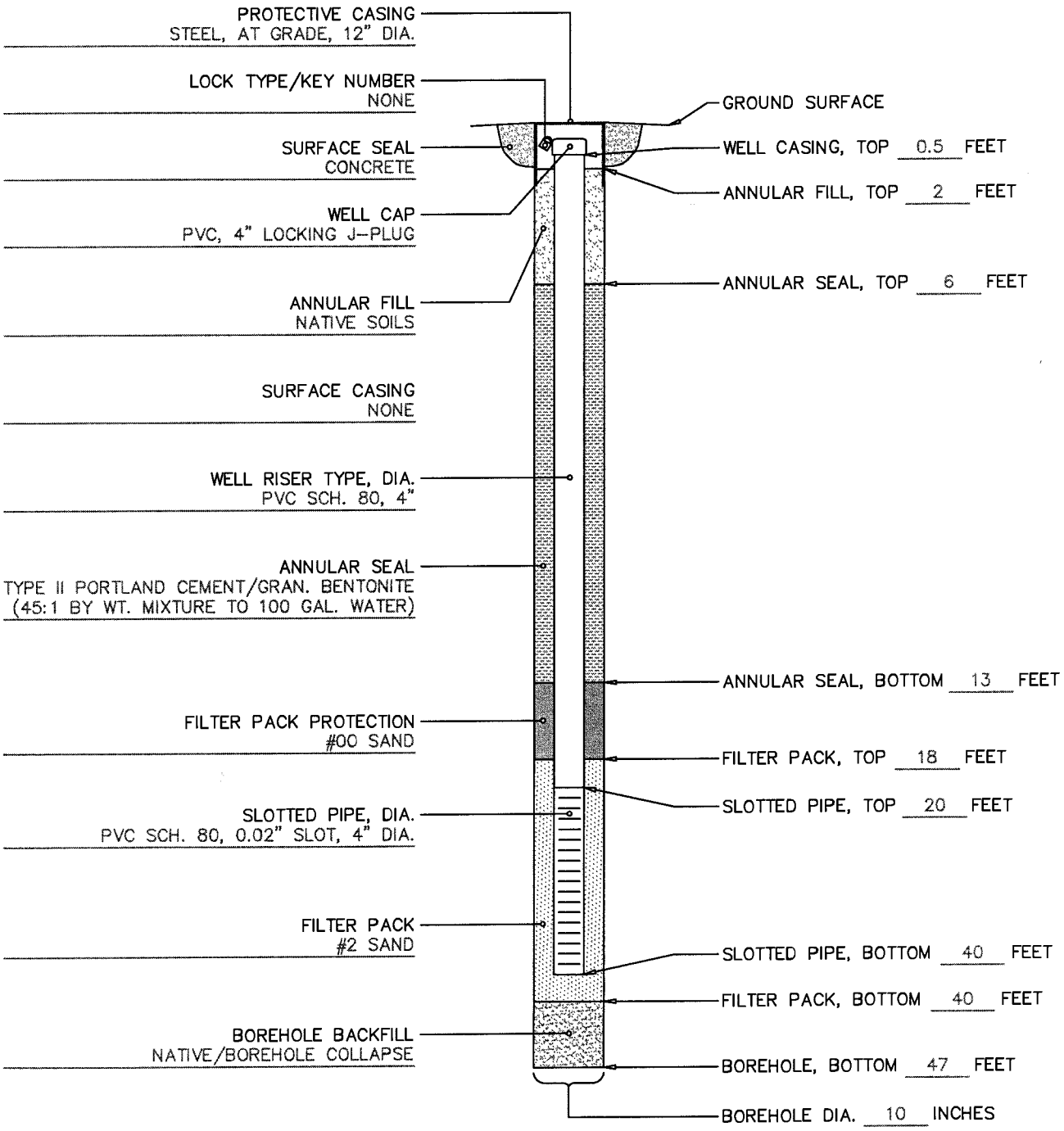
POSITIVE DEPTHS DOWNHOLE FROM MEAS. R.P.

I:\GEO\242 LAWRENCE AVIATION\LOGS\WCD_ERT-EW4.DWG

WELL CONSTRUCTION DIAGRAM

WELL DESIGNATION: ERT-EW5

CLIENT U.S. EPA ENVIRONMENTAL RESPONSE TEAM	**CONTRACT NAME** RESPONSE ENGINEERING AND ANALYTICAL CONTRACT (REAC)
PROJECT NAME LAWRENCE AVIATION SUPERFUND SITE	**CONTRACT NO.** EP-C-04-032
PROJECT CITY, STATE PORT JEFFERSON STATION, NY	**CONTRACTOR** LOCKHEED MARTIN
PROJECT NO. EAC401-EAC00242	**INSPECTOR** CHRIS SKLANEY
DRILLING ORGANIZATION BOART LONGYEAR ENGINEERING & INFRASTRUCTURE	**PERMIT NO.** N/A
DRILLER NAME DAN O'MARA	**WELL LOCATION** +40.94303443 N, -073.07307945 W
DRILLING RIG/METHOD ROTARY SONIC	**MEASUREMENT REFERENCE POINT** GROUND SURFACE
INSTALLATION START DATE 11/13/2008 / **INSTALLATION COMPLETION DATE** 11/13/2008	**REFERENCE POINT ELEVATION** +22.84 MSL



NOT TO SCALE

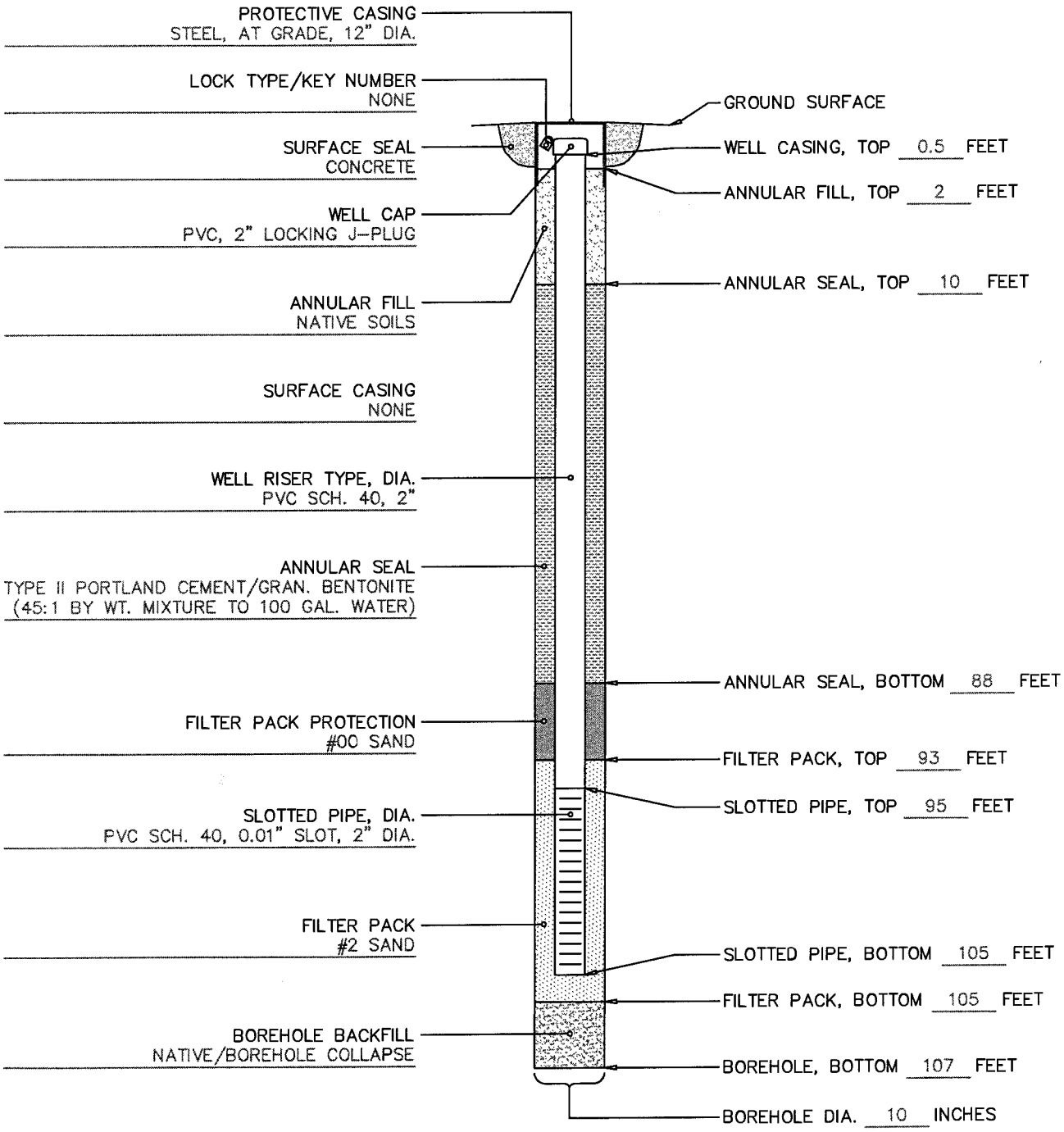
POSITIVE DEPTHS DOWNHOLE FROM MEAS. R.P.

I:\GEO\242 LAWRENCE AVIATION\LOGS\WCD_ERT-EW5.DWG

WELL CONSTRUCTION DIAGRAM

WELL DESIGNATION: ERT-OW1

CLIENT U.S. EPA ENVIRONMENTAL RESPONSE TEAM	**CONTRACT NAME** RESPONSE ENGINEERING AND ANALYTICAL CONTRACT (REAC)
PROJECT NAME LAWRENCE AVIATION SUPERFUND SITE	**CONTRACT NO.** EP-C-04-032
PROJECT CITY, STATE PORT JEFFERSON STATION, NY	**CONTRACTOR** LOCKHEED MARTIN
PROJECT NO. EAC401-EAC00242	**INSPECTOR** CHRIS SKLANEY
DRILLING ORGANIZATION BOART LONGYEAR ENGINEERING & INFRASTRUCTURE	**PERMIT NO.** N/A
DRILLER NAME DAN O'MARA	**WELL LOCATION** +40.94294095 N, -073.07307590 W
DRILLING RIG/METHOD ROTARY SONIC	**MEASUREMENT REFERENCE POINT** GROUND SURFACE
INSTALLATION START DATE 10/30/2008 / **INSTALLATION COMPLETION DATE** 10/30/2008	**REFERENCE POINT ELEVATION** +22.65 MSL



NOT TO SCALE

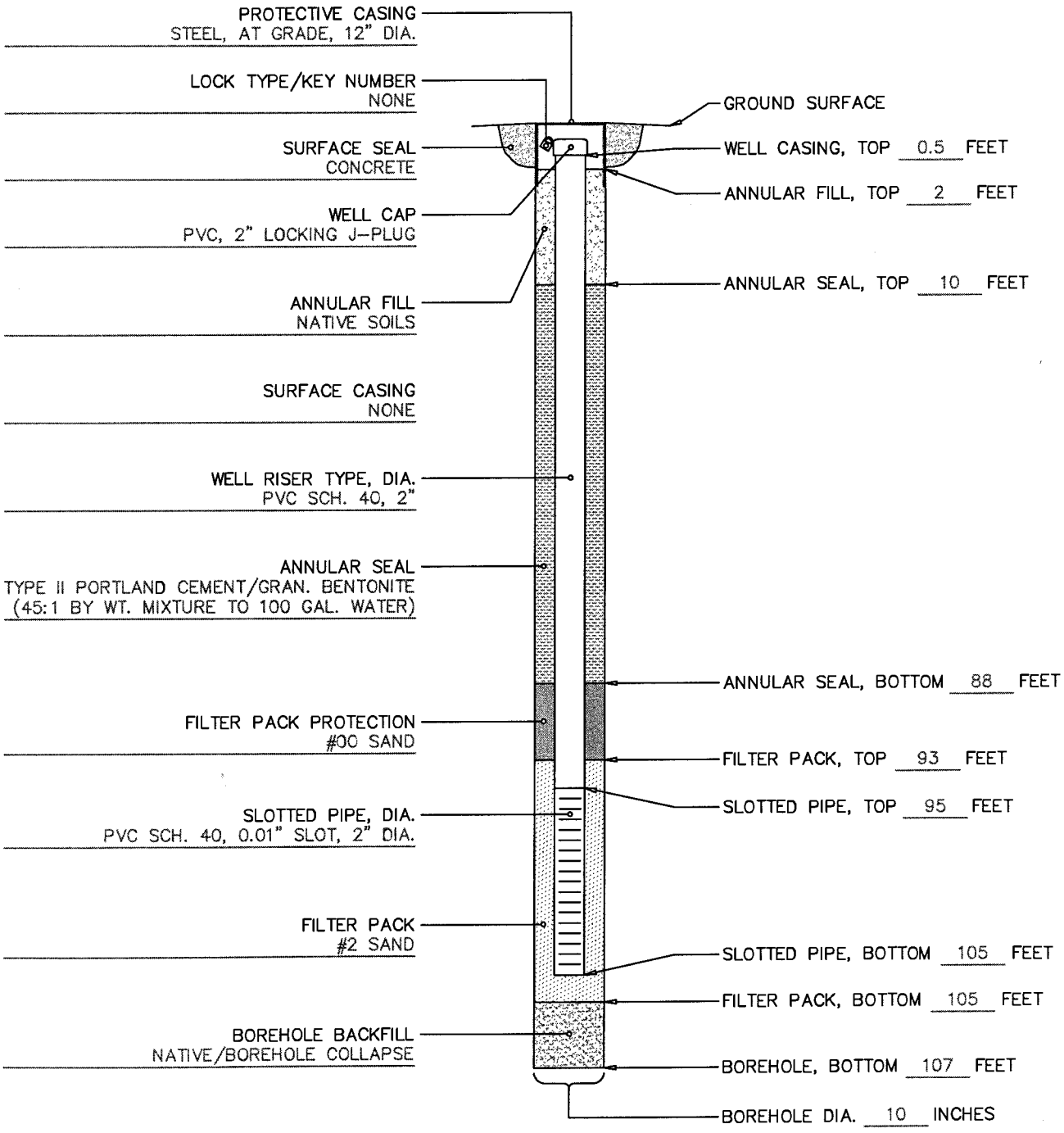
POSITIVE DEPTHS DOWNHOLE FROM MEAS. R.P.

I:\GEO\242 LAWRENCE AVIATION\LOGS\WCD_ERT-OW1.DWG

WELL CONSTRUCTION DIAGRAM

WELL DESIGNATION: ERT-OW2

CLIENT: U.S. EPA ENVIRONMENTAL RESPONSE TEAM	CONTRACT NAME: RESPONSE ENGINEERING AND ANALYTICAL CONTRACT (REAC)
PROJECT NAME: LAWRENCE AVIATION SUPERFUND SITE	CONTRACT NO.: EP-C-04-032
PROJECT CITY, STATE: PORT JEFFERSON STATION, NY	CONTRACTOR: LOCKHEED MARTIN
PROJECT NO.: EAC401-EAC00242	INSPECTOR: CHRIS SKLANEY
DRILLING ORGANIZATION: BOART LONGYEAR ENGINEERING & INFRASTRUCTURE	PERMIT NO.: N/A
DRILLER NAME: DAN O'MARA	WELL LOCATION: +40.94294773 N, -073.07303102 W
DRILLING RIG/METHOD: ROTARY SONIC	MEASUREMENT REFERENCE POINT: GROUND SURFACE
INSTALLATION START DATE: 10/30/2008 / INSTALLATION COMPLETION DATE: 10/30/2008	REFERENCE POINT ELEVATION: +22.73 MSL



NOT TO SCALE

POSITIVE DEPTHS DOWNHOLE FROM MEAS. R.P.

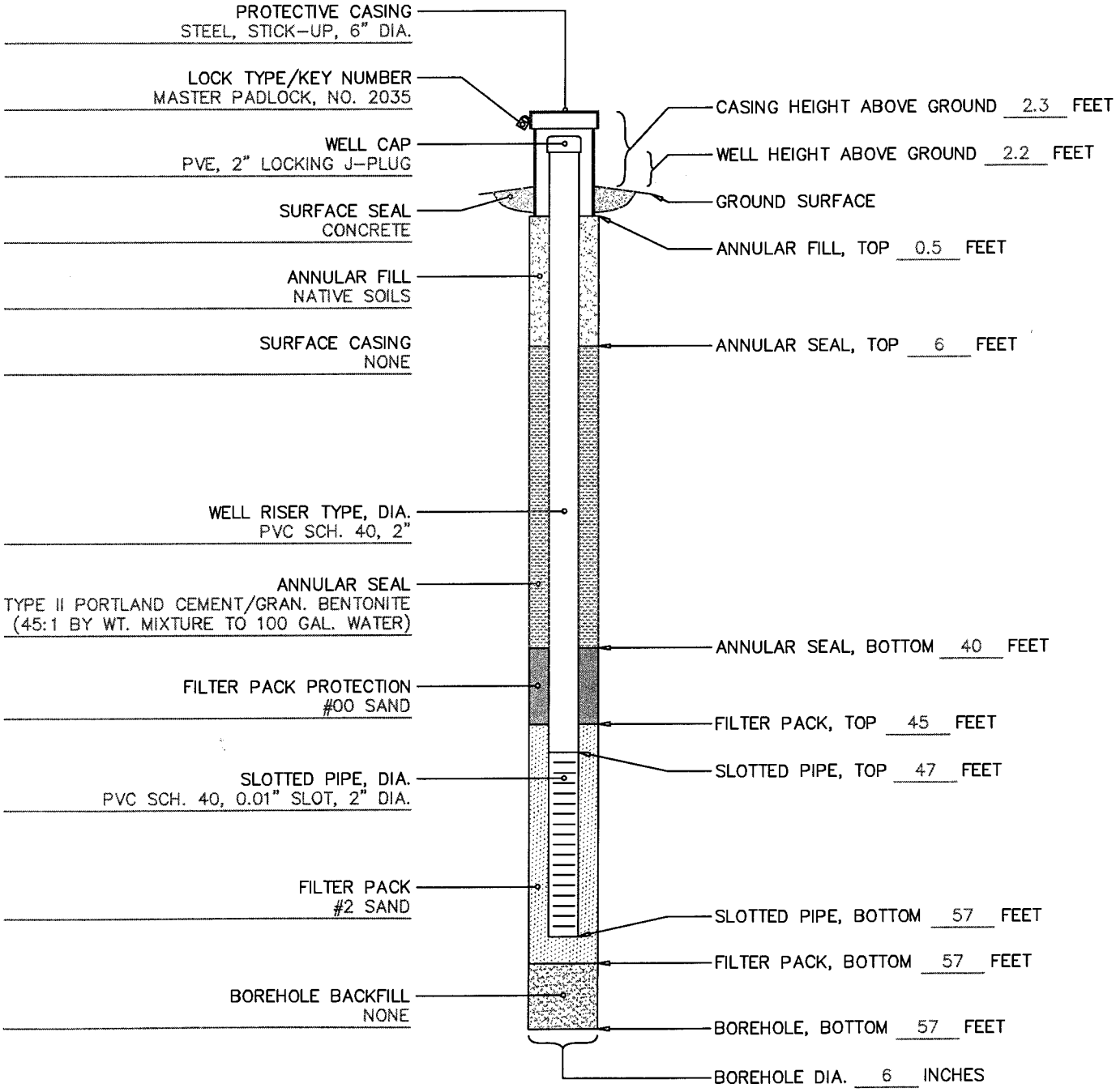
I:\GEO\242 LAWRENCE AVIATION\LOGS\WCD_ERT-OW2.DWG

WELL CONSTRUCTION DIAGRAM

WELL DESIGNATION: ERT-MW1A

CLIENT U.S. EPA ENVIRONMENTAL RESPONSE TEAM	**CONTRACT NAME** RESPONSE ENGINEERING AND ANALYTICAL CONTRACT (REAC)
PROJECT NAME LAWRENCE AVIATION SUPERFUND SITE	**CONTRACT NO.** EP-C-04-032
PROJECT CITY, STATE PORT JEFFERSON STATION, NY	**CONTRACTOR** LOCKHEED MARTIN
PROJECT NO. EAC401-EAC00242	**INSPECTOR** CHRIS SKLANEY
DRILLING ORGANIZATION BOART LONGYEAR ENGINEERING & INFRASTRUCTURE	**PERMIT NO.** N/A
DRILLER NAME DAN O'MARA	**WELL LOCATION** +40.94545419 N, -073.07240762 W
DRILLING RIG/METHOD ROTARY SONIC	**MEASUREMENT REFERENCE POINT** GROUND SURFACE
INSTALLATION START DATE 11/19/2008 / **INSTALLATION COMPLETION DATE** 11/19/2008	**REFERENCE POINT ELEVATION** +11.33 MSL

NOTE: ADDED SAND IN SPACE BETWEEN PROTECTIVE CASING AND WELL WITH SAND TO PROMOTE DRAINAGE



NOT TO SCALE

POSITIVE DEPTHS DOWNHOLE FROM MEAS. R.P.

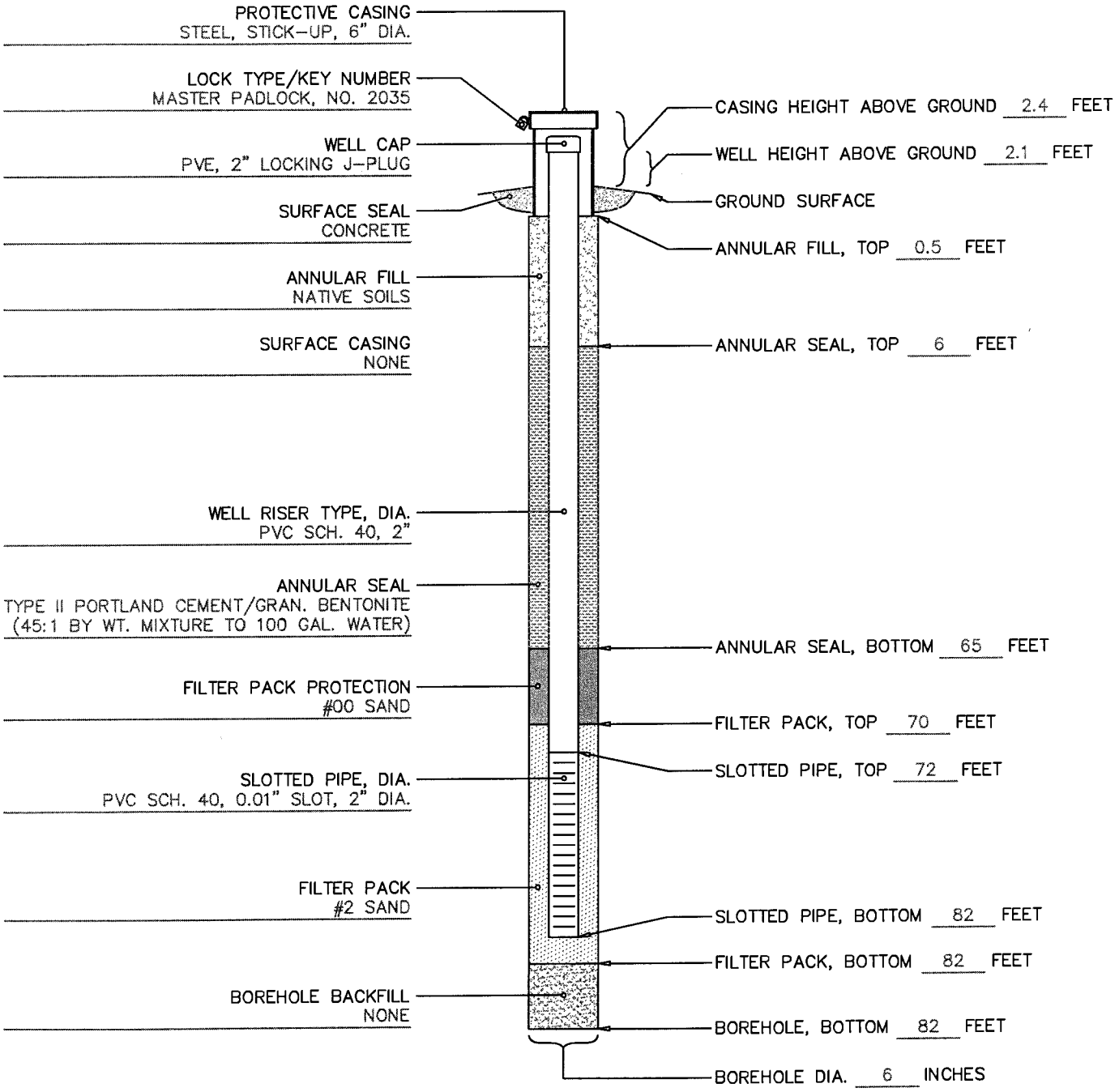
I:\GEO\242 LAWRENCE AVIATION\LOGS\WCD_ERT-MW1A.DWG

WELL CONSTRUCTION DIAGRAM

WELL DESIGNATION: ERT-MW1B

CLIENT U.S. EPA ENVIRONMENTAL RESPONSE TEAM	**CONTRACT NAME** RESPONSE ENGINEERING AND ANALYTICAL CONTRACT (REAC)
PROJECT NAME LAWRENCE AVIATION SUPERFUND SITE	**CONTRACT NO.** EP-C-04-032
PROJECT CITY, STATE PORT JEFFERSON STATION, NY	**CONTRACTOR** LOCKHEED MARTIN
PROJECT NO. EAC401-EAC00242	**INSPECTOR** CHRIS SKLANEY
DRILLING ORGANIZATION BOART LONGYEAR ENGINEERING & INFRASTRUCTURE	**PERMIT NO.** N/A
DRILLER NAME DAN O'MARA	**WELL LOCATION** +40.94546413 N, -073.07242288 W
DRILLING RIG/METHOD ROTARY SONIC	**MEASUREMENT REFERENCE POINT** GROUND SURFACE
INSTALLATION START DATE 11/19/2008 / **INSTALLATION COMPLETION DATE** 11/19/2008	**REFERENCE POINT ELEVATION** +11.38 MSL

NOTE: ADDED SAND IN SPACE BETWEEN PROTECTIVE CASING AND WELL WITH SAND TO PROMOTE DRAINAGE



NOT TO SCALE

POSITIVE DEPTHS DOWNHOLE FROM MEAS. R.P.

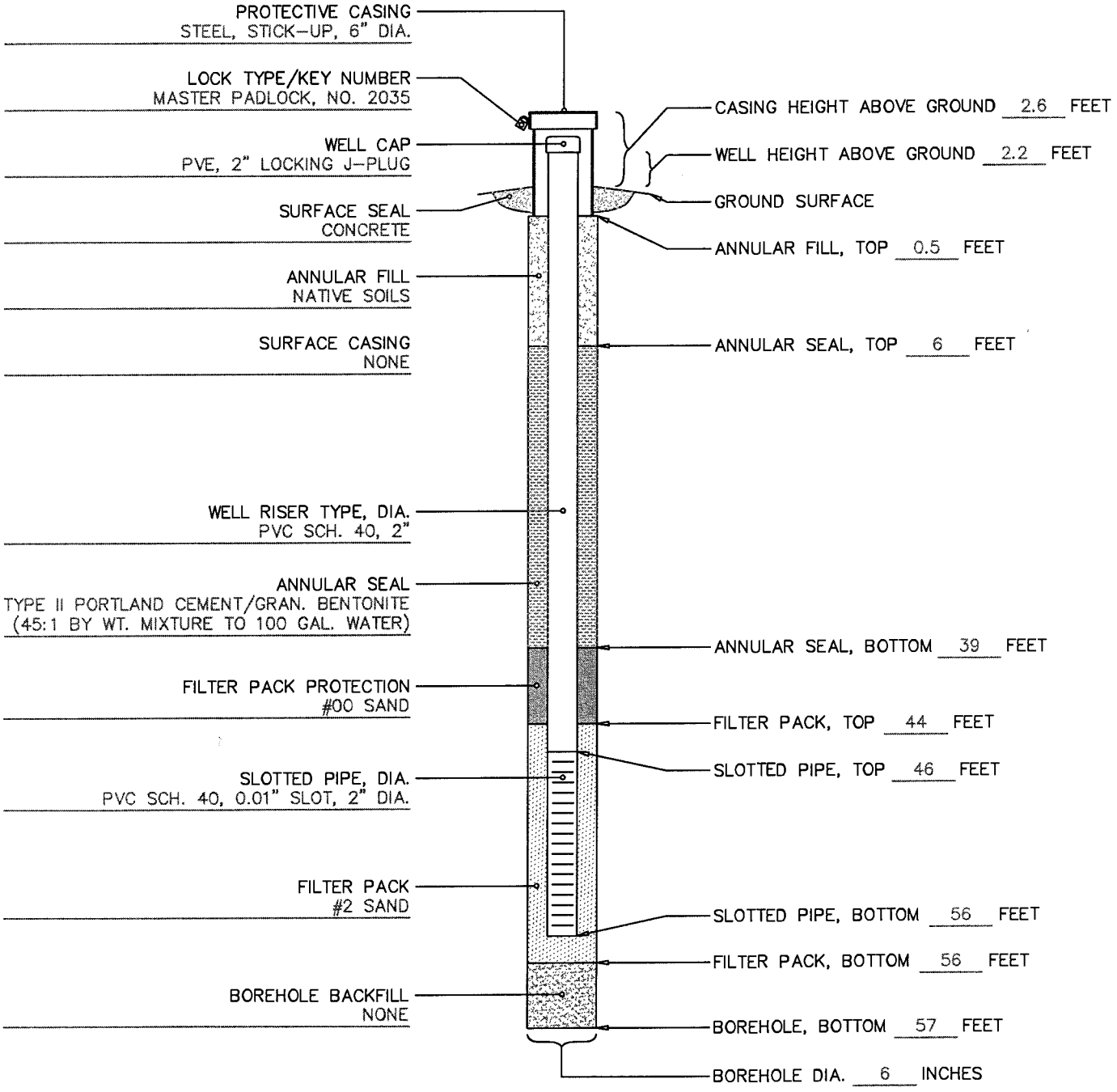
I:\GEO\242 LAWRENCE AVIATION\LOGS\WCD_ERT-MW1B.DWG

WELL CONSTRUCTION DIAGRAM

WELL DESIGNATION: ERT-MW2A

CLIENT U.S. EPA ENVIRONMENTAL RESPONSE TEAM	**CONTRACT NAME** RESPONSE ENGINEERING AND ANALYTICAL CONTRACT (REAC)
PROJECT NAME LAWRENCE AVIATION SUPERFUND SITE	**CONTRACT NO.** EP-C-04-032
PROJECT CITY, STATE PORT JEFFERSON STATION, NY	**CONTRACTOR** LOCKHEED MARTIN
PROJECT NO. EAC401-EAC00242	**INSPECTOR** CHRIS SKLANEY
DRILLING ORGANIZATION BOART LONGYEAR ENGINEERING & INFRASTRUCTURE	**PERMIT NO.** N/A
DRILLER NAME DAN O'MARA	**WELL LOCATION** +40.94541751 N, -073.07392361 W
DRILLING RIG/METHOD ROTARY SONIC	**MEASUREMENT REFERENCE POINT** GROUND SURFACE
INSTALLATION START DATE 11/20/2008 / **INSTALLATION COMPLETION DATE** 11/20/2008	**REFERENCE POINT ELEVATION** +13.53 MSL

NOTE: ADDED SAND IN SPACE BETWEEN PROTECTIVE CASING AND WELL WITH SAND TO PROMOTE DRAINAGE



NOT TO SCALE

POSITIVE DEPTHS DOWNHOLE FROM MEAS. R.P.

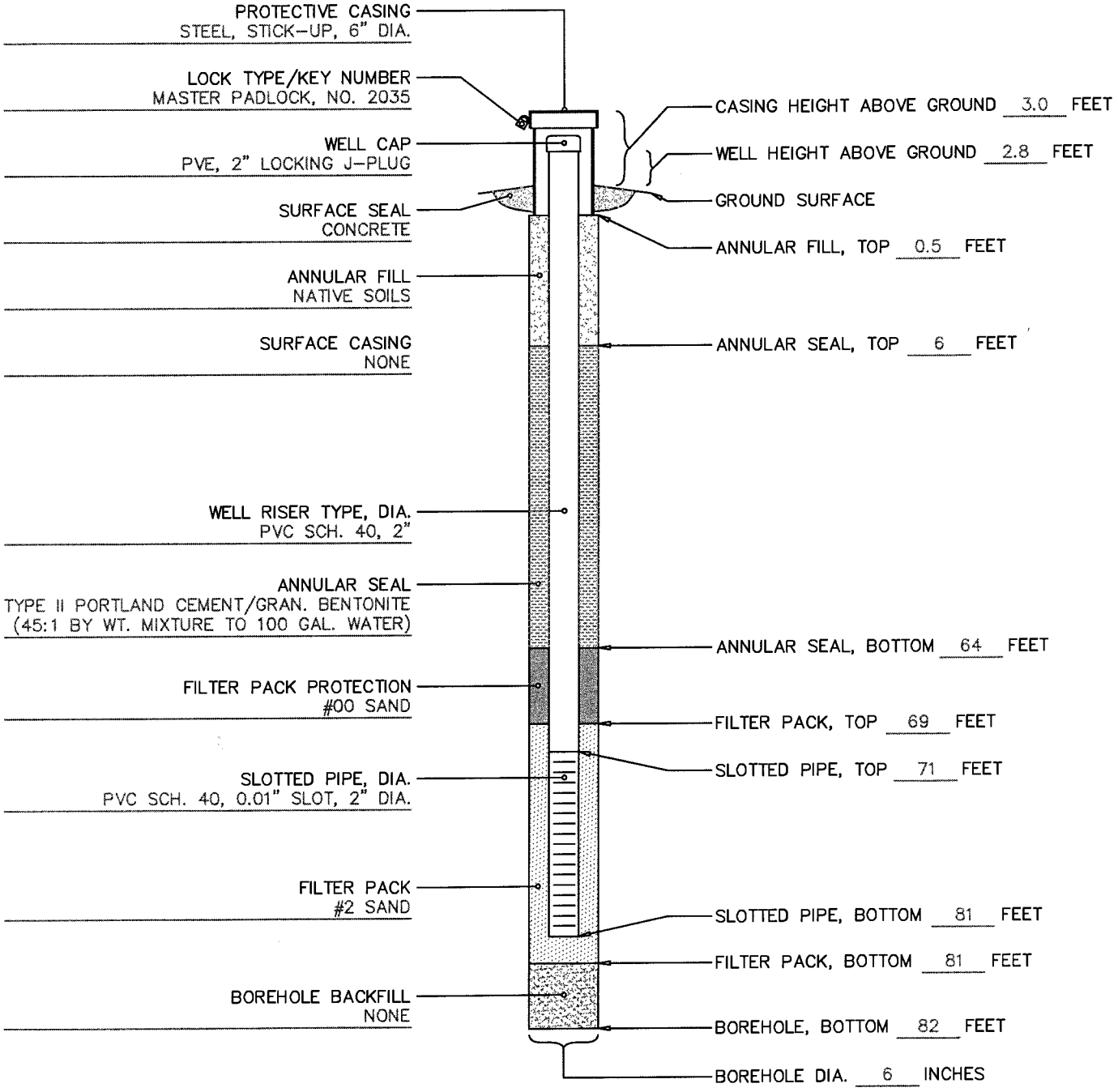
I:\GEO\242 LAWRENCE AVIATION\LOGS\WCD_ERT-MW2A.DWG

WELL CONSTRUCTION DIAGRAM

WELL DESIGNATION: ERT-MW2B

CLIENT: U.S. EPA ENVIRONMENTAL RESPONSE TEAM	CONTRACT NAME: RESPONSE ENGINEERING AND ANALYTICAL CONTRACT (REAC)
PROJECT NAME: LAWRENCE AVIATION SUPERFUND SITE	CONTRACT NO.: EP-C-04-032
PROJECT CITY, STATE: PORT JEFFERSON STATION, NY	CONTRACTOR: LOCKHEED MARTIN
PROJECT NO.: EAC401-EAC00242	INSPECTOR: CHRIS SKLANEY
DRILLING ORGANIZATION: BOART LONGYEAR ENGINEERING & INFRASTRUCTURE	PERMIT NO.: N/A
DRILLER NAME: DAN O'MARA	WELL LOCATION: +40.94542516 N, -073.07391209 W
DRILLING RIG/METHOD: ROTARY SONIC	MEASUREMENT REFERENCE POINT: GROUND SURFACE
INSTALLATION START DATE: 11/20/2008 / INSTALLATION COMPLETION DATE: 11/20/2008	REFERENCE POINT ELEVATION: +13.63 MSL

NOTE: ADDED SAND IN SPACE BETWEEN PROTECTIVE CASING AND WELL WITH SAND TO PROMOTE DRAINAGE



NOT TO SCALE

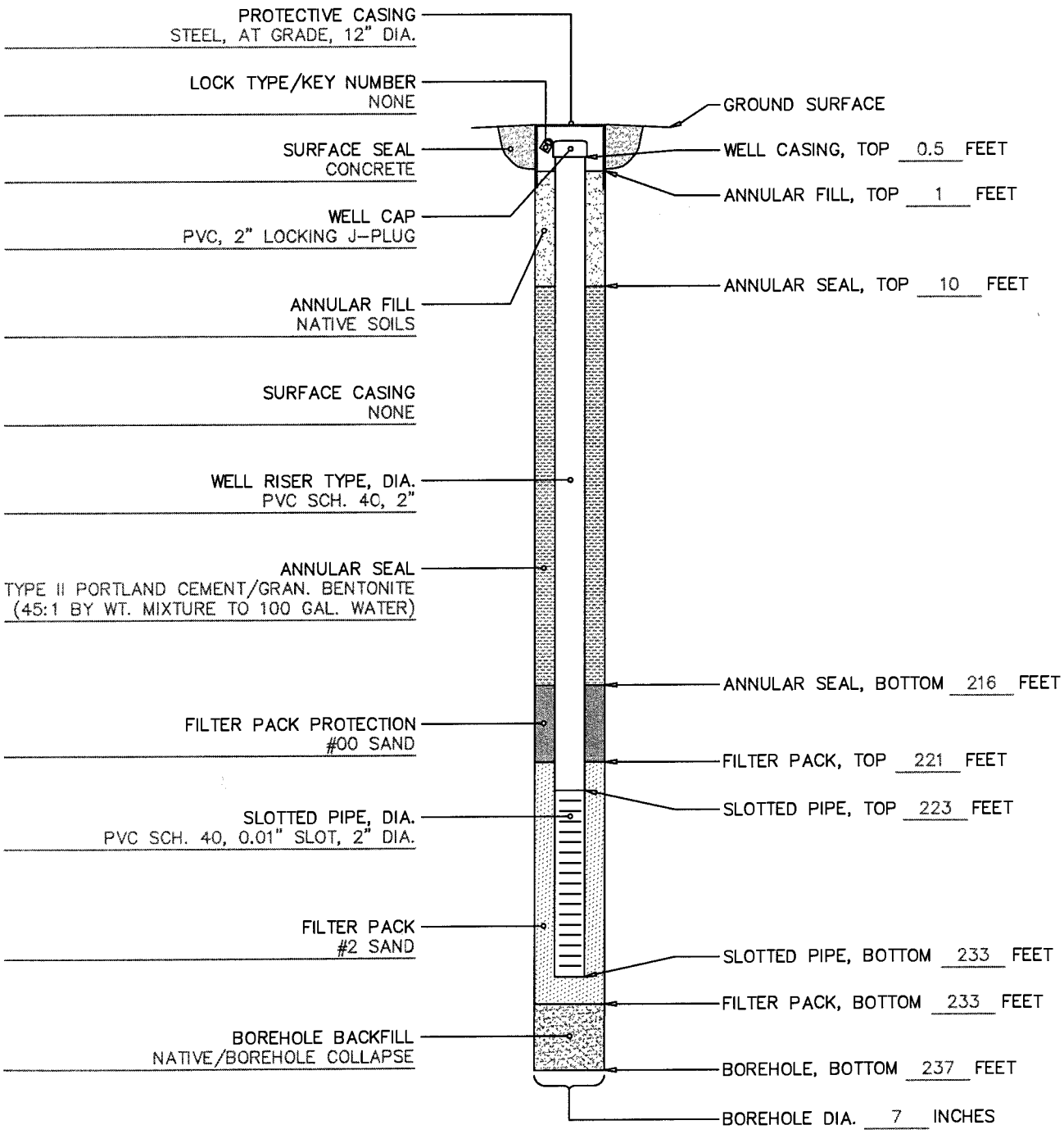
POSITIVE DEPTHS DOWNHOLE FROM MEAS. R.P.

I:\GEO\242 LAWRENCE AVIATION\LOGS\WCD_ERT-MW2B.DWG

WELL CONSTRUCTION DIAGRAM

WELL DESIGNATION: ERT-MW3

CLIENT U.S. EPA ENVIRONMENTAL RESPONSE TEAM	**CONTRACT NAME** RESPONSE ENGINEERING AND ANALYTICAL CONTRACT (REAC)
PROJECT NAME LAWRENCE AVIATION SUPERFUND SITE	**CONTRACT NO.** EP-C-04-032
PROJECT CITY, STATE PORT JEFFERSON STATION, NY	**CONTRACTOR** LOCKHEED MARTIN
PROJECT NO. EAC401-EAC00242	**INSPECTOR** CHRIS SKLANEY
DRILLING ORGANIZATION BOART LONGYEAR ENGINEERING & INFRASTRUCTURE	**PERMIT NO.** N/A
DRILLER NAME DAN O'MARA	**WELL LOCATION** +40.94396245 N, -073.07675661 W
DRILLING RIG/METHOD ROTARY SONIC	**MEASUREMENT REFERENCE POINT** GROUND SURFACE
INSTALLATION START DATE 12/04/2008 / **INSTALLATION COMPLETION DATE** 12/04/2008	**REFERENCE POINT ELEVATION** +109.37 MSL



NOT TO SCALE

POSITIVE DEPTHS DOWNHOLE FROM MEAS. R.P.

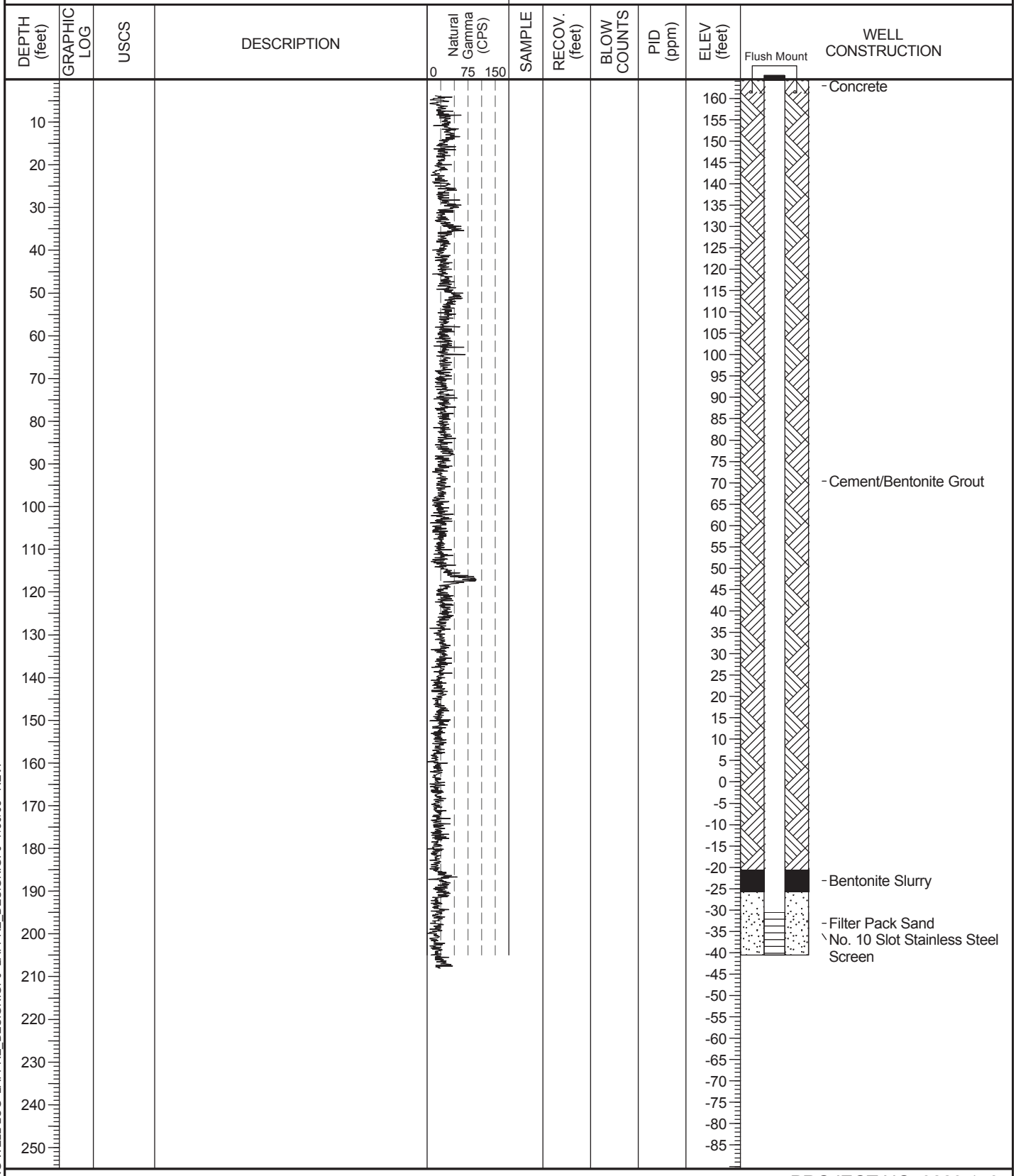
I:\GEO\242 LAWRENCE AVIATION\LOGS\WCD_ERT-MW3.DWG

PROJECT: Lawrence Aviation Industries
LOCATION: Port Jefferson Station, New York

MONITORING WELL NO: **MW-PD-11**

STARTED: 1/21/08 COMPLETED: 1/22/08
DRILLING COMPANY: ADT
DRILLING EQUIPMENT: CME 85
DRILLING METHOD: 6.25" ID Hollow Stem Augers
SAMPLING METHOD: NA
SURFACE COMPLETION: Steel Flush-mount

NORTHING: 280312.47 feet EASTING: 1239752.51 feet
ELEVATION: 164.42 feet M.P. ELEV:
WATER: TOTAL DEPTH: 205.0 feet
LOGGED BY: Mike Ehnot CHECKED BY:
HORIZONTAL DATUM: NAD83 as revised, COORD. SYS.: NYSP, LI
VERTICAL DATUM: NAVD88



LAI MONITORING WELL LOG LAI-PRE_DESIGN.GPJ LAI-PRE_DESIGN.GPJ 7/30/08 REV.

CDM
Raritan Plaza I, Raritan Center
Edison, NJ 08818
Telephone: 732-225-7000

Monitoring Well Construction Log

PROJECT NO. 3223.173

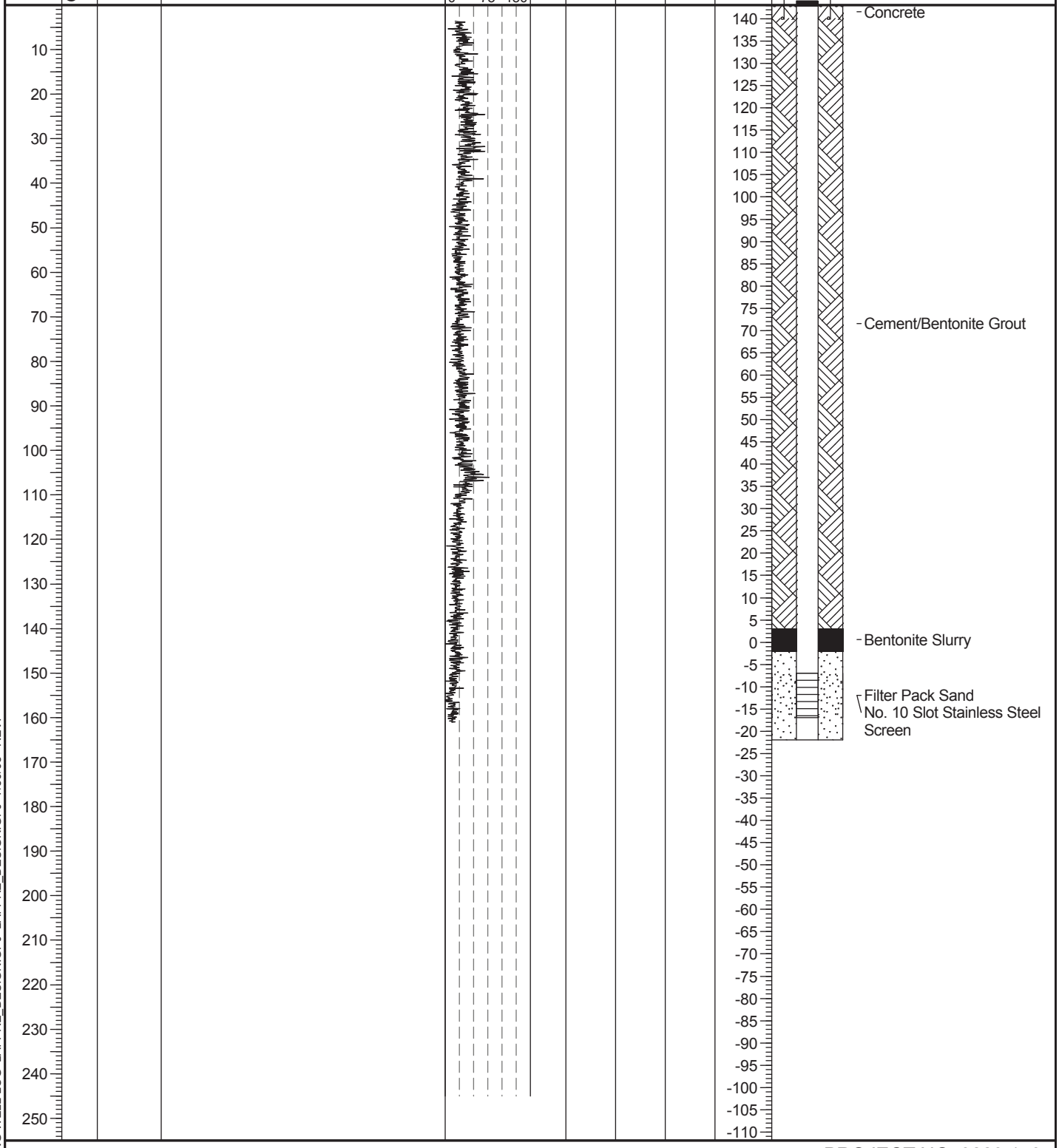
PROJECT: Lawrence Aviation Industries
LOCATION: Port Jefferson Station, New York

MONITORING WELL NO: **MW-PD-12**

STARTED: 1/30/08 COMPLETED: 1/31/08
DRILLING COMPANY: ADT
DRILLING EQUIPMENT: CME 85
DRILLING METHOD: 6.25" ID Hollow Stem Augers
SAMPLING METHOD: NA
SURFACE COMPLETION: Steel Flush-mount

NORTHING: 280706.40 feet EASTING: 1240644.56 feet
ELEVATION: 143.08 feet M.P. ELEV:
WATER: TOTAL DEPTH: 245.0 feet
LOGGED BY: Mike Ehnot CHECKED BY:
HORIZONTAL DATUM: NAD83 as revised, COORD. SYS.: NYSP, LI
VERTICAL DATUM: NAVD88

DEPTH (feet)	GRAPHIC LOG	USCS	DESCRIPTION	Natural Gamma (CPS) 0 75 150	SAMPLE	RECOV. (feet)	BLOW COUNTS	PID (ppm)	ELEV (feet)	WELL CONSTRUCTION



LAI MONITORING WELL LOG LAI-PRE_DESIGN.GPJ LAI-PRE_DESIGN.GPJ 7/30/08 REV.

CDM
Raritan Plaza I, Raritan Center
Edison, NJ 08818
Telephone: 732-225-7000

Monitoring Well Construction Log

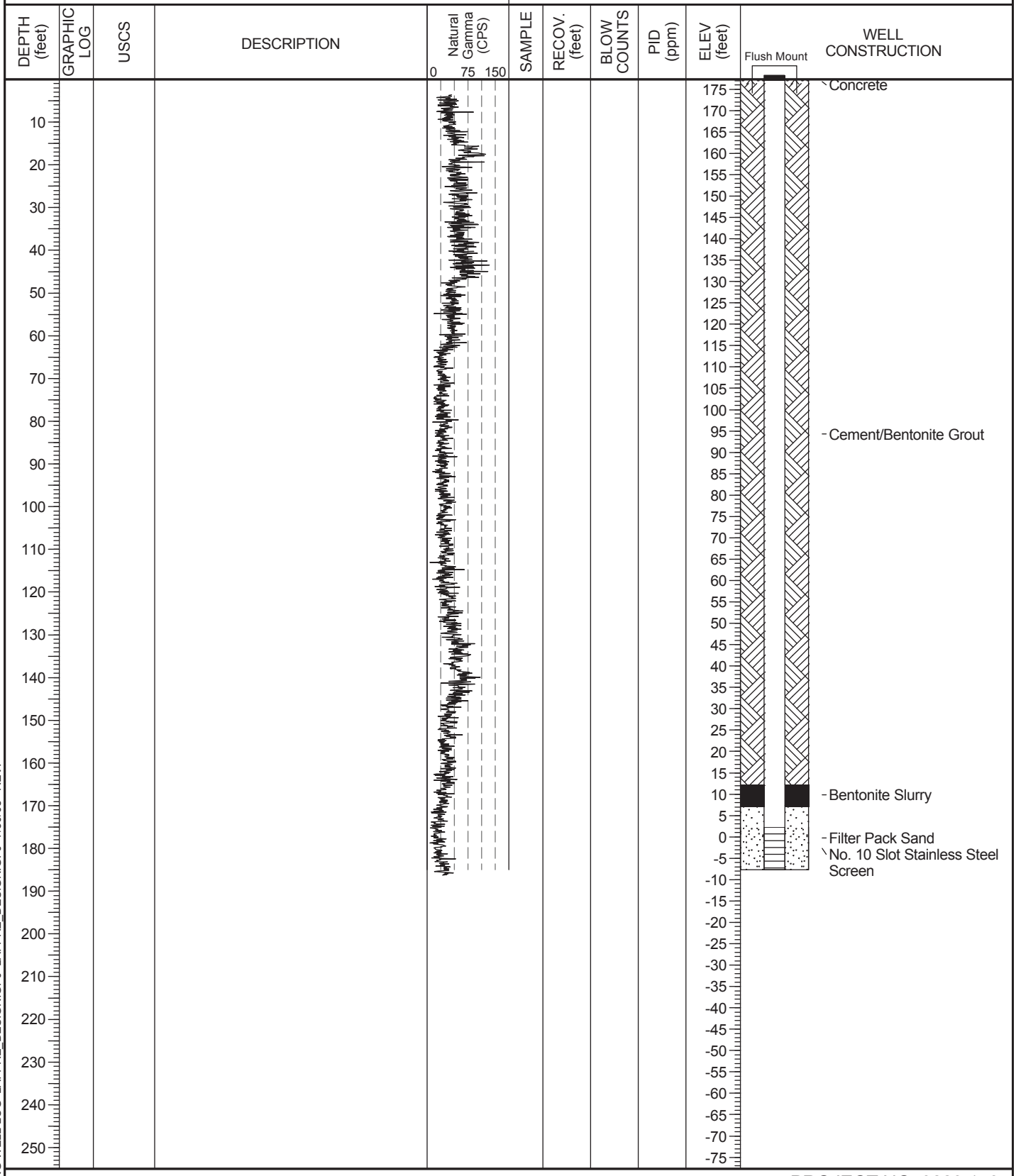
PROJECT NO. 3223.173

PROJECT: Lawrence Aviation Industries
LOCATION: Port Jefferson Station, New York

MONITORING WELL NO: **MW-PD-13**

STARTED: 5/14/08 COMPLETED: 5/22/08
DRILLING COMPANY: ADT
DRILLING EQUIPMENT: CME 85
DRILLING METHOD: 6.25" ID Hollow Stem Augers
SAMPLING METHOD: NA
SURFACE COMPLETION: Steel Flush-mount

NORTHING: 281370.71 feet EASTING: 1241574.79 feet
ELEVATION: 177.3 feet M.P. ELEV:
WATER: TOTAL DEPTH: 185.0 feet
LOGGED BY: Mike Ehnot CHECKED BY:
HORIZONTAL DATUM: NAD83 as revised, COORD. SYS.: NYSP, LI
VERTICAL DATUM: NAVD88



LAI MONITORING WELL LOG LAI-PRE_DESIGN.GPJ LAI-PRE_DESIGN.GPJ 7/30/08 REV.

CDM
Raritan Plaza I, Raritan Center
Edison, NJ 08818
Telephone: 732-225-7000

Monitoring Well Construction Log

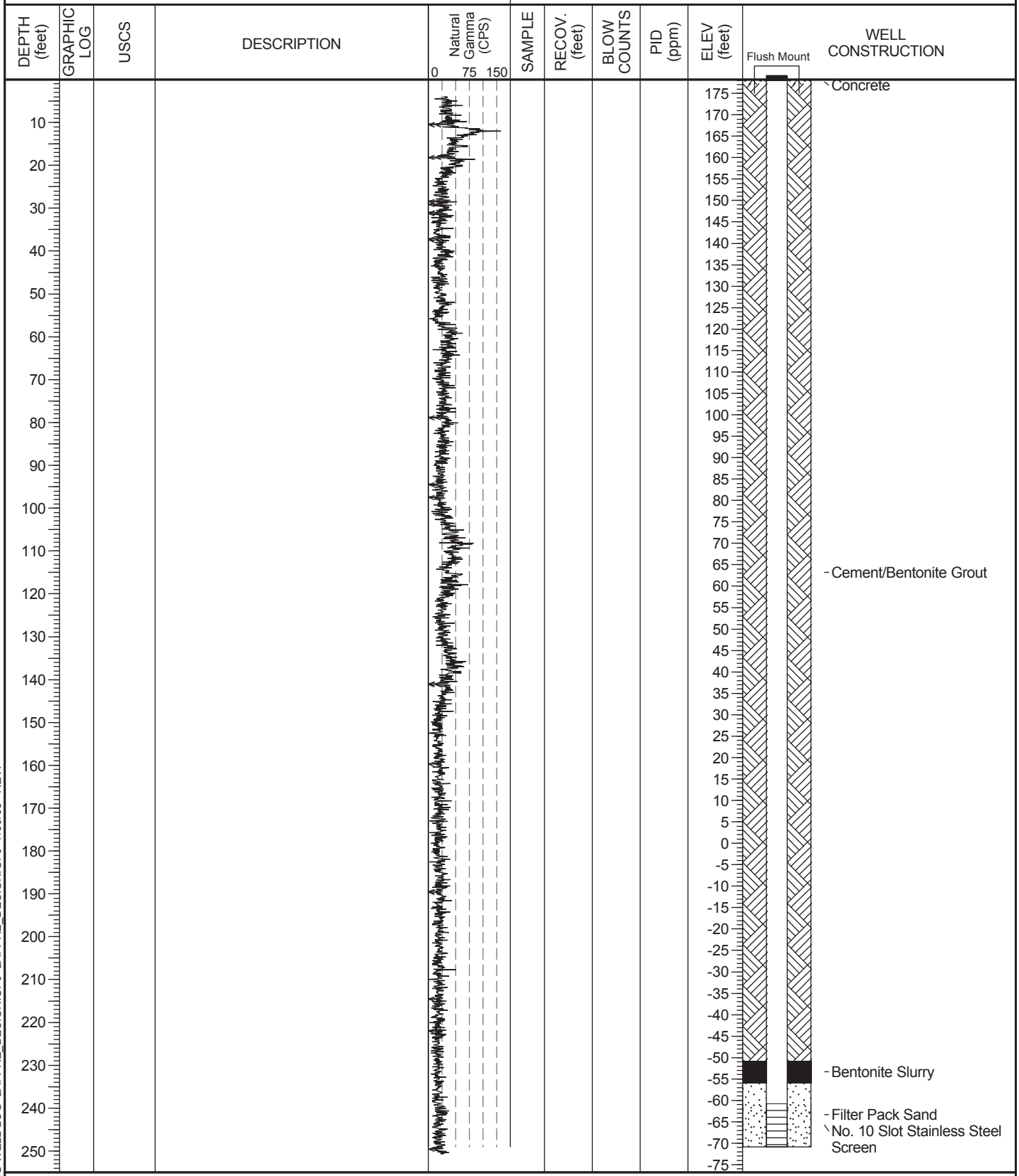
PROJECT NO. 3223.173

PROJECT: Lawrence Aviation Industries
LOCATION: Port Jefferson Station, New York

MONITORING WELL NO: **MW-PD-14**

STARTED: 4/29/08 COMPLETED: 5/2/08
DRILLING COMPANY: ADT
DRILLING EQUIPMENT: CME 85
DRILLING METHOD: 6.25" ID Hollow Stem Augers
SAMPLING METHOD: NA
SURFACE COMPLETION: Steel Flush-mount

NORTHING: 282166.23 feet EASTING: 1240627.49 feet
ELEVATION: 178.2 feet M.P. ELEV:
WATER: TOTAL DEPTH: 249.0 feet
LOGGED BY: Mike Ehnot CHECKED BY:
HORIZONTAL DATUM: NAD83 as revised, COORD. SYS.: NYSP, LI
VERTICAL DATUM: NAVD88



LAI MONITORING WELL LOG LAI-PRE_DESIGN.GPJ LAI-PRE_DESIGN.GPJ 7/30/08 REV.

CDM
Raritan Plaza I, Raritan Center
Edison, NJ 08818
Telephone: 732-225-7000

Monitoring Well Construction Log

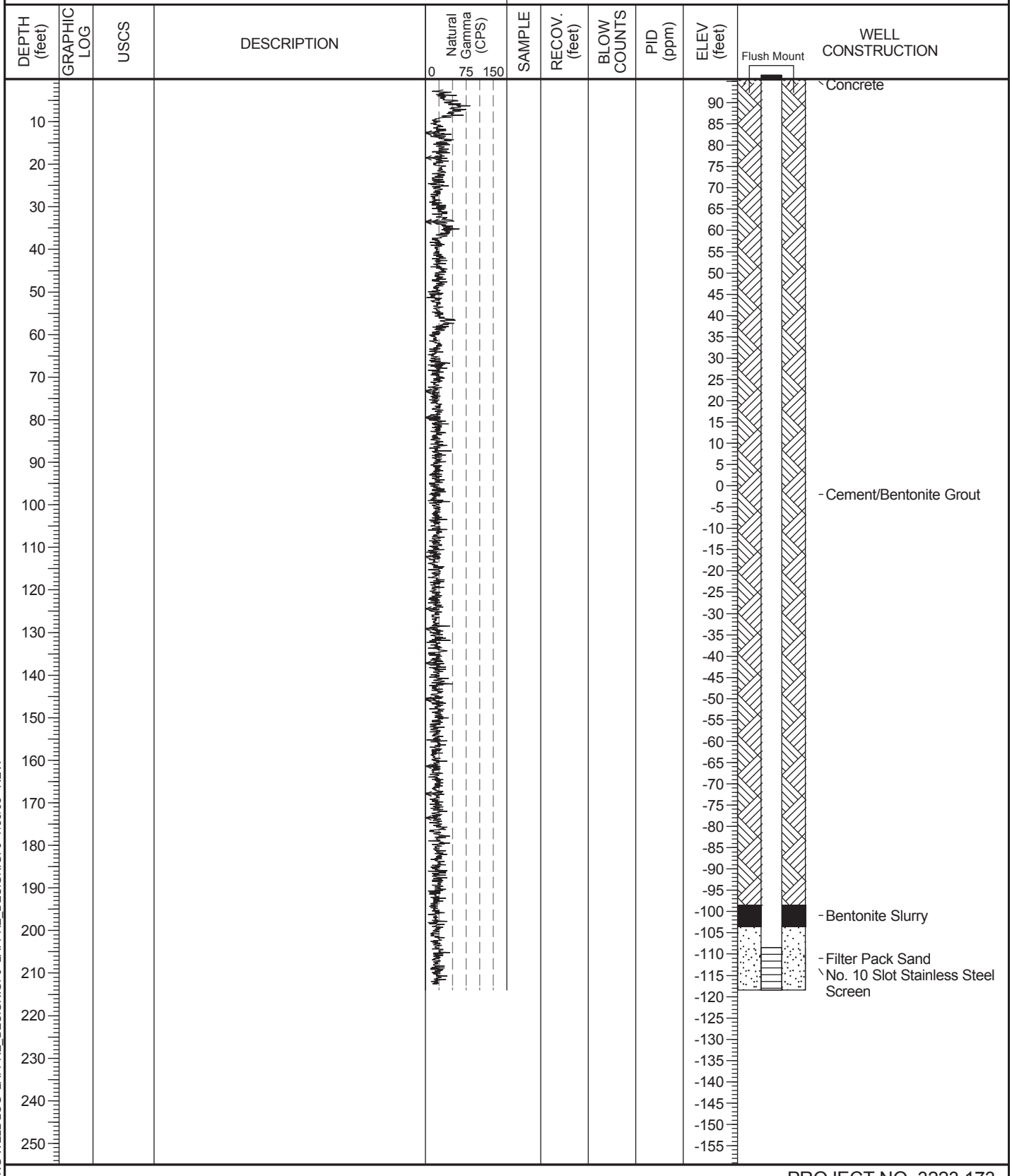
PROJECT NO. 3223.173

PROJECT: Lawrence Aviation Industries
LOCATION: Port Jefferson Station, New York

MONITORING WELL NO: **MW-PD-15**

STARTED: 5/5/08 COMPLETED: 5/13/08
DRILLING COMPANY: ADT
DRILLING EQUIPMENT: CME 85
DRILLING METHOD: 6.25" ID Hollow Stem Augers
SAMPLING METHOD: NA
SURFACE COMPLETION: Steel Flush-mount

NORTHING: 284168.40 feet EASTING: 1239734.72 feet
ELEVATION: 95.54 feet M.P. ELEV:
WATER: TOTAL DEPTH: 214.0 feet
LOGGED BY: Mike Ehnot CHECKED BY:
HORIZONTAL DATUM: NAD83 as revised, COORD. SYS.: NYSP, LI
VERTICAL DATUM: NAVD88



CDM
Raritan Plaza I, Raritan Center
Edison, NJ 08818
Telephone: 732-225-7000

Monitoring Well Construction Log

PROJECT NO. 3223.173

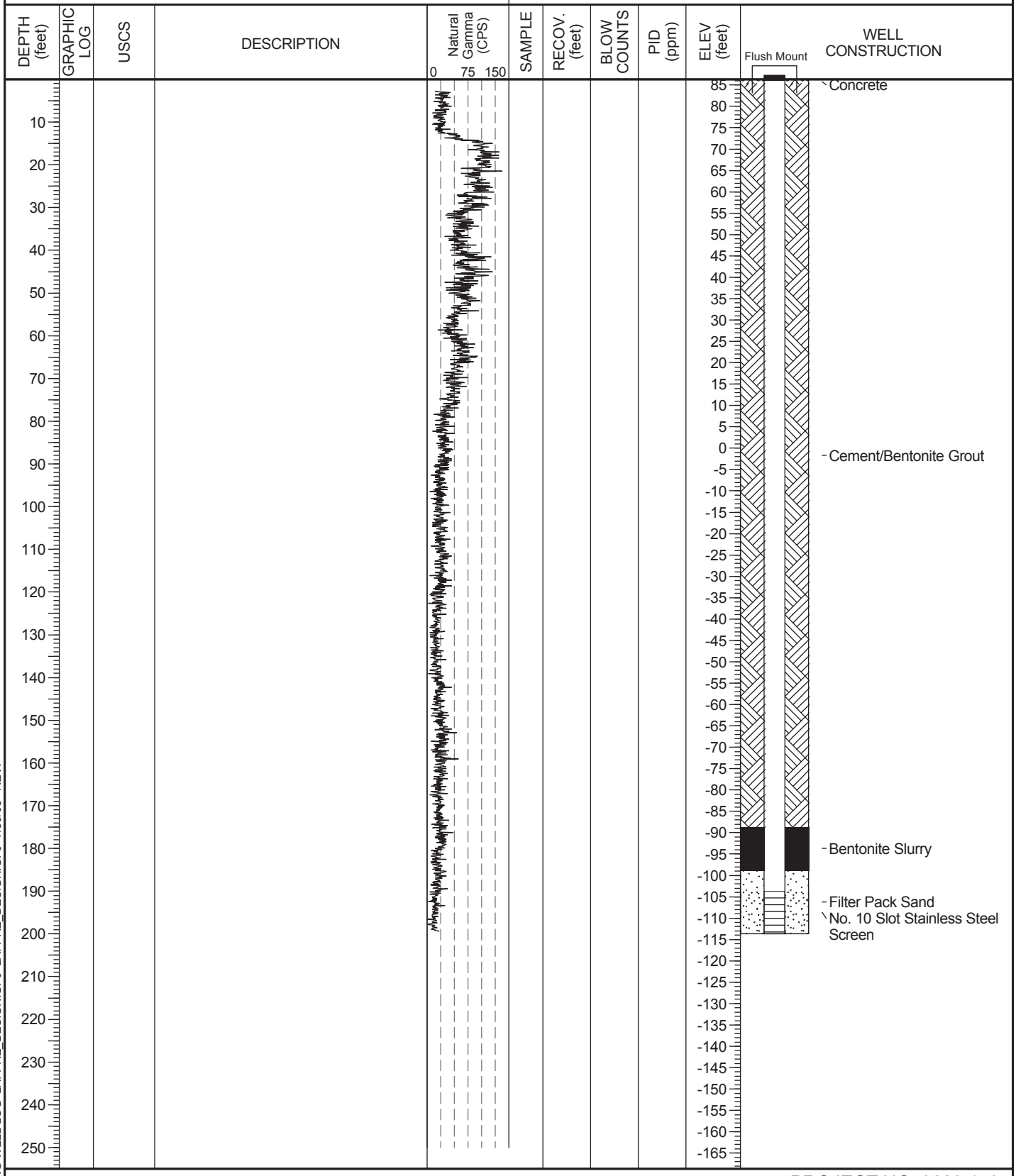
LAI MONITORING WELL LOG LAI-PRE_DESIGN.GPJ LAI-PRE_DESIGN.GPJ 7/30/08 REV.

PROJECT: Lawrence Aviation Industries
LOCATION: Port Jefferson Station, New York

MONITORING WELL NO: **MW-PD-16**

STARTED: 2/21/08 COMPLETED: 4/2/08
DRILLING COMPANY: ADT
DRILLING EQUIPMENT: CME 85
DRILLING METHOD: 6.25" ID Hollow Stem Augers
SAMPLING METHOD: NA
SURFACE COMPLETION: Steel Flush-mount

NORTHING: 283265.25 feet EASTING: 1240340.86 feet
ELEVATION: 86.31 feet M.P. ELEV:
WATER: TOTAL DEPTH: 250.0 feet
LOGGED BY: Mike Ehnot CHECKED BY:
HORIZONTAL DATUM: NAD83 as revised, COORD. SYS.: NYSP, LI
VERTICAL DATUM: NAVD88



CDM
Raritan Plaza I, Raritan Center
Edison, NJ 08818
Telephone: 732-225-7000

Monitoring Well Construction Log

PROJECT NO. 3223.173

LAI MONITORING WELL LOG LAI-PRE_DESIGN.GPJ LAI-PRE_DESIGN.GPJ 7/30/08 REV.

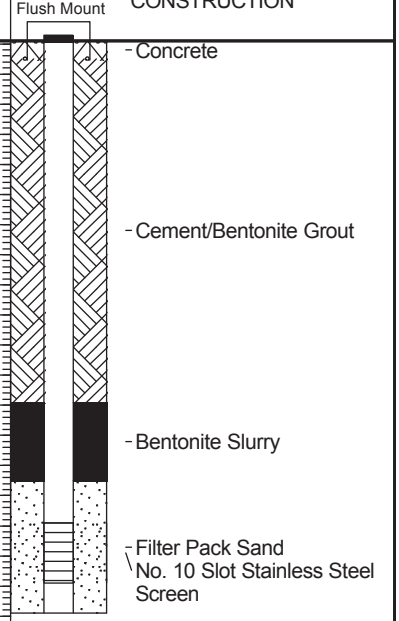
PROJECT: Lawrence Aviation Industries
LOCATION: Port Jefferson Station, New York

MONITORING WELL NO: **MW-PD-17**

STARTED: 2/19/08 COMPLETED: 2/20/08
DRILLING COMPANY: ADT
DRILLING EQUIPMENT: CME 85
DRILLING METHOD: 6.25" ID Hollow Stem Augers
SAMPLING METHOD: NA
SURFACE COMPLETION: Steel Flush-mount

NORTHING: 283697.93 feet EASTING: 1241728.59 feet
ELEVATION: 25.49 feet M.P. ELEV:
WATER: TOTAL DEPTH: 240.0 feet
LOGGED BY: Mike Ehnot CHECKED BY:
HORIZONTAL DATUM: NAD83 as revised, COORD. SYS.: NYSP, LI
VERTICAL DATUM: NAVD88

DEPTH (feet)	GRAPHIC LOG	USCS	DESCRIPTION	Natural Gamma (CPS) 0 75 150	SAMPLE	RECOV. (feet)	BLOW COUNTS	PID (ppm)	ELEV (feet)	WELL CONSTRUCTION



LAI MONITORING WELL LOG LAI-PRE_DESIGN.GPJ LAI-PRE_DESIGN.GPJ 7/30/08 REV.

CDM
Raritan Plaza I, Raritan Center
Edison, NJ 08818
Telephone: 732-225-7000

Monitoring Well Construction Log

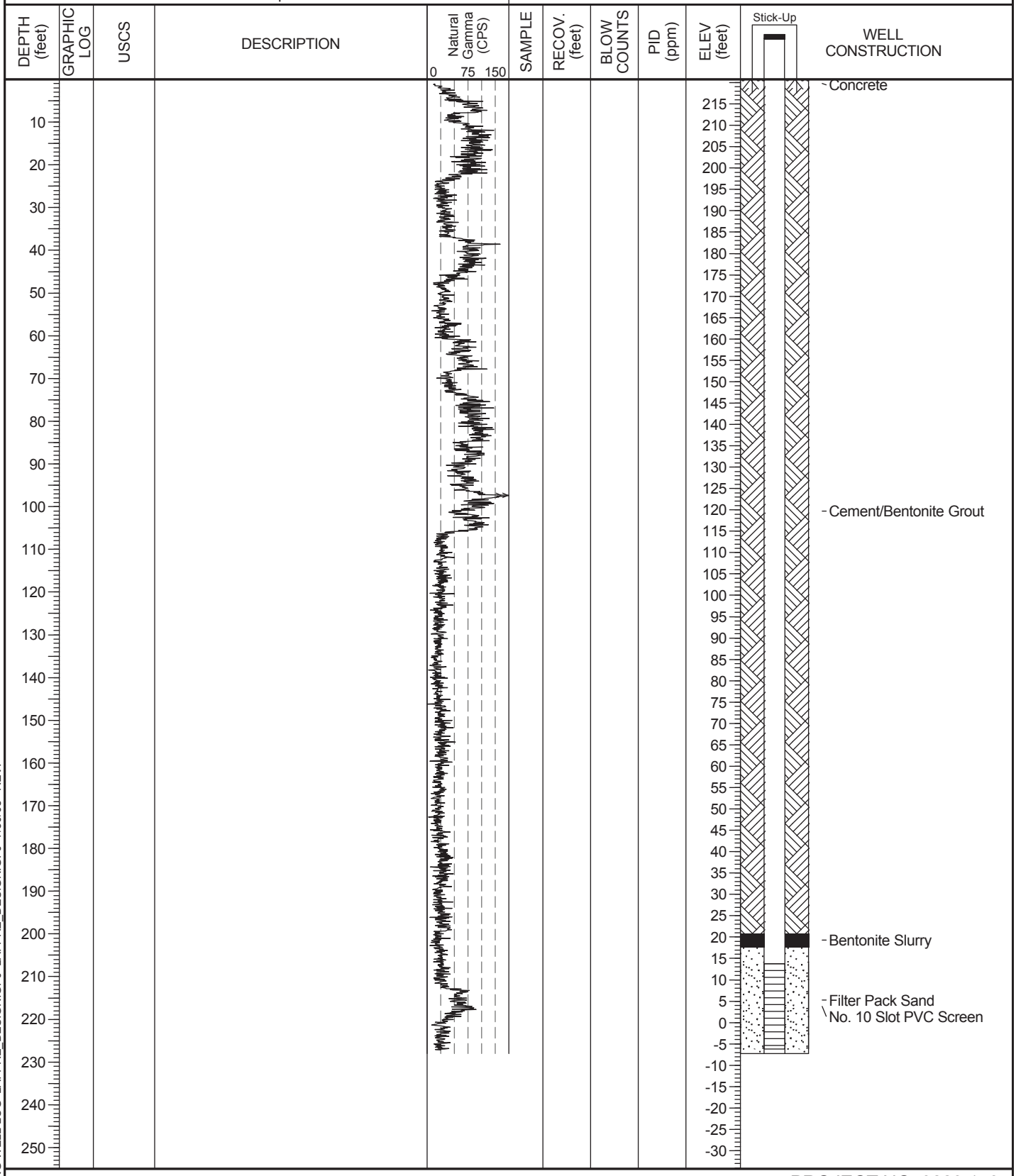
PROJECT NO. 3223.173

PROJECT: Lawrence Aviation Industries
LOCATION: Port Jefferson Station, New York

MONITORING WELL NO: **PZ-PD-01**

STARTED: 1/4/08 COMPLETED: 1/8/08
DRILLING COMPANY: ADT
DRILLING EQUIPMENT: Failing F-10
DRILLING METHOD: 4.25" ID Hollow Stem Augers
SAMPLING METHOD: NA
SURFACE COMPLETION: Steel Stickup

NORTHING: 279011.11 feet EASTING: 1241174.71 feet
ELEVATION: 220.75 feet M.P. ELEV:
WATER: TOTAL DEPTH: 228.0 feet
LOGGED BY: Joe Button CHECKED BY:
HORIZONTAL DATUM: NAD83 as revised, COORD. SYS.: NYSP, LI
VERTICAL DATUM: NAVD88



LAI MONITORING WELL LOG LAI-PRE_DESIGN.GPJ LAI-PRE_DESIGN.GPJ 7/30/08 REV.

CDM
Raritan Plaza I, Raritan Center
Edison, NJ 08818
Telephone: 732-225-7000

Monitoring Well Construction Log

PROJECT NO. 3223.173

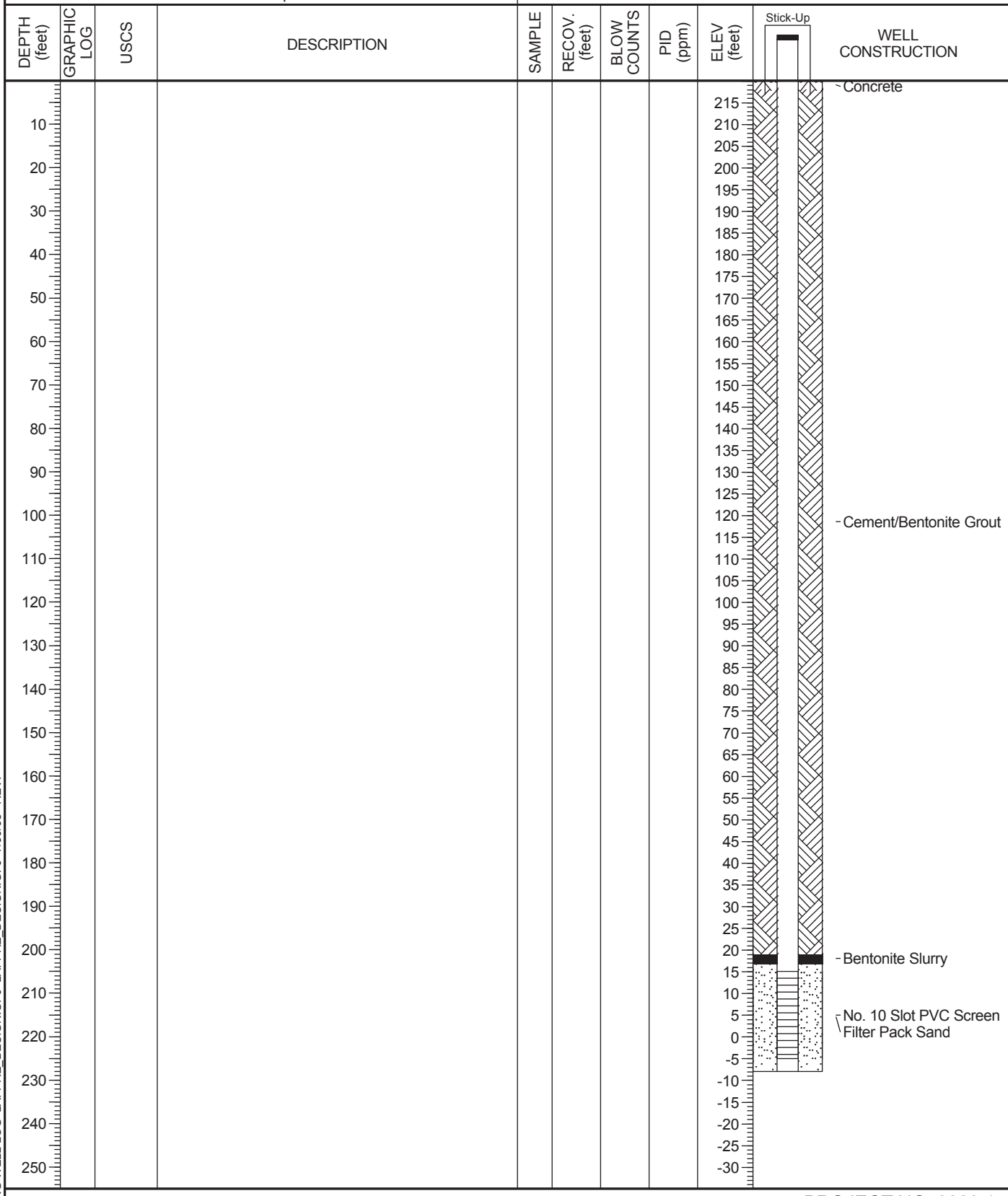
PROJECT: Lawrence Aviation Industries
LOCATION: Port Jefferson Station, New York

MONITORING WELL NO: **PZ-PD-02**

STARTED: 12/26/08 COMPLETED: 1/2/08
DRILLING COMPANY: ADT
DRILLING EQUIPMENT: Failing F-10
DRILLING METHOD: 4.25" ID Hollow Stem Augers
SAMPLING METHOD: NA
SURFACE COMPLETION: Steel Stickup

NORTHING: 279065.04 feet EASTING: 1241159.69 feet
ELEVATION: 220.08 feet M.P. ELEV:
WATER: TOTAL DEPTH: 228.0 feet
LOGGED BY: Andrea Soo CHECKED BY:
HORIZONTAL DATUM: NAD83 as revised, COORD. SYS.: NYSP, LI
VERTICAL DATUM: NAVD88

DEPTH (feet)	GRAPHIC LOG	USCS	DESCRIPTION	SAMPLE	RECOV. (feet)	BLOW COUNTS	PID (ppm)	ELEV (feet)	WELL CONSTRUCTION



CDM
Raritan Plaza I, Raritan Center
Edison, NJ 08818
Telephone: 732-225-7000

Monitoring Well Construction Log

PROJECT NO. 3223.173

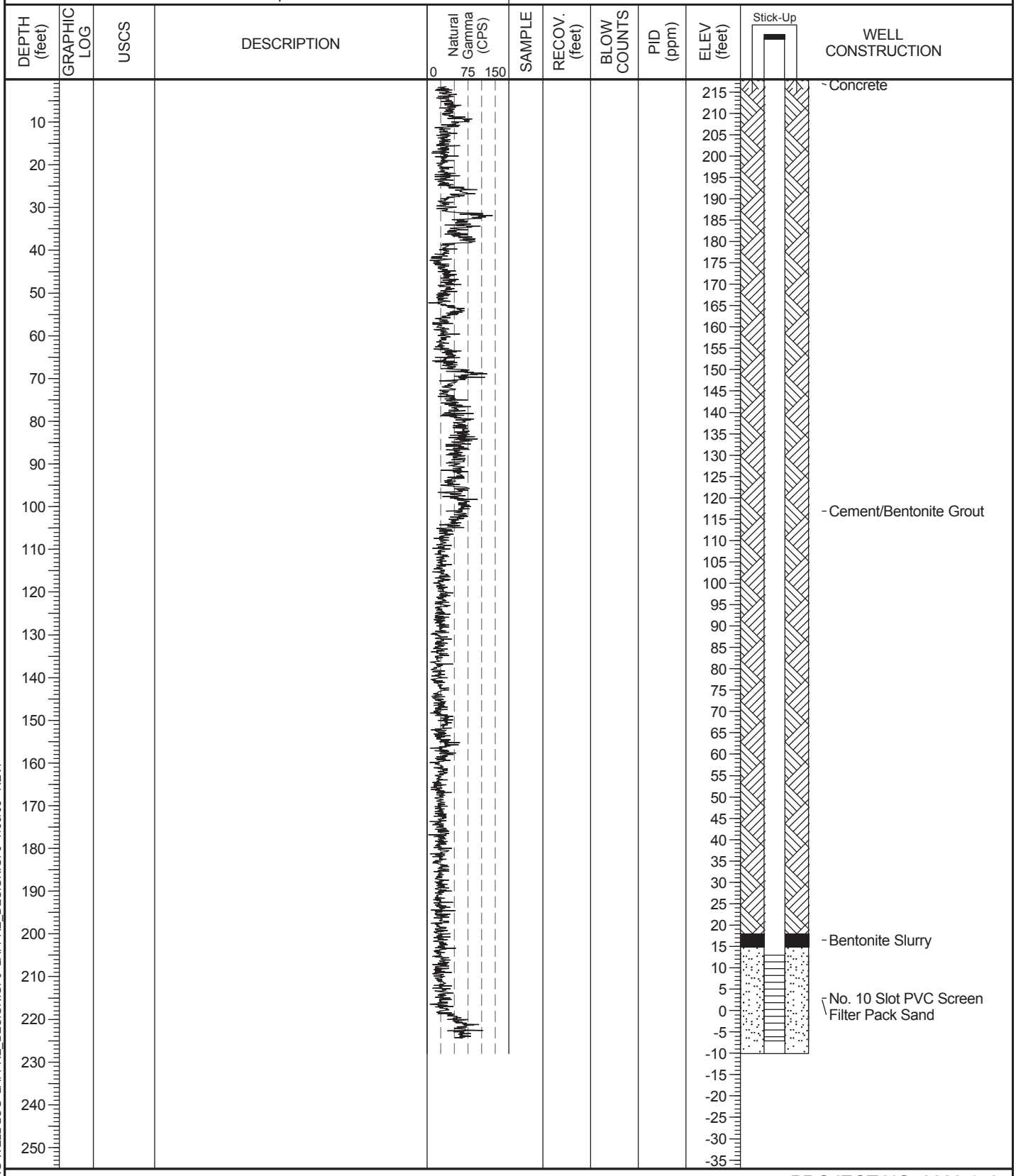
LAI MONITORING WELL LOG LAI-PRE_DESIGN.GPJ LAI-PRE_DESIGN.GPJ 7/30/08 REV.

PROJECT: Lawrence Aviation Industries
LOCATION: Port Jefferson Station, New York

MONITORING WELL NO: **PZ-PD-03**

STARTED: 12/18/07 COMPLETED: 12/21/08
DRILLING COMPANY: ADT
DRILLING EQUIPMENT: Failing F-10
DRILLING METHOD: 4.25" ID Hollow Stem Augers
SAMPLING METHOD: NA
SURFACE COMPLETION: Steel Stickup

NORTHING: 279087.95 feet EASTING: 1241091.93 feet
ELEVATION: 217.94 feet M.P. ELEV:
WATER: TOTAL DEPTH: 228.0 feet
LOGGED BY: Joe Button CHECKED BY:
HORIZONTAL DATUM: NAD83 as revised, COORD. SYS.: NYSP, LI
VERTICAL DATUM: NAVD88



LAI MONITORING WELL LOG LAI-PRE_DESIGN.GPJ LAI-PRE_DESIGN.GPJ 7/30/08 REV.

CDM
Raritan Plaza I, Raritan Center
Edison, NJ 08818
Telephone: 732-225-7000

Monitoring Well Construction Log

PROJECT NO. 3223.173

PROJECT: Lawrence Aviation Industries
LOCATION: Port Jefferson Station, New York

MONITORING WELL NO: **TW-01**

STARTED: 3/19/08 COMPLETED: 4/7/08
DRILLING COMPANY: ADT
DRILLING EQUIPMENT: CME 85
DRILLING METHOD: 6 5/8-inch ID HAS
SAMPLING METHOD: Split-spoon (ASTM D1586)
SURFACE COMPLETION: Steel Stickup

NORTHING: 279044.40 feet EASTING: 1241187.33 feet
ELEVATION: 220.91 feet M.P. ELEV:
WATER: 181.5 feet TOTAL DEPTH: 240.0 feet
LOGGED BY: Mike Ehnot CHECKED BY:
HORIZONTAL DATUM: NAD83 as revised, COORD. SYS.: NYSP, LI
VERTICAL DATUM: NAVD88

DEPTH (feet)	GRAPHIC LOG	USCS	DESCRIPTION	Natural Gamma (CPS) 0 75 150	SAMPLE	RECOV. (feet)	BLOW COUNTS	PID (ppm)	ELEV (feet)	WELL CONSTRUCTION
10									220	Stick-Up, Concrete
20									215	
									210	
									205	
									200	

CDM
Raritan Plaza I, Raritan Center
Edison, NJ 08818
Telephone: 732-225-7000

Monitoring Well Construction Log

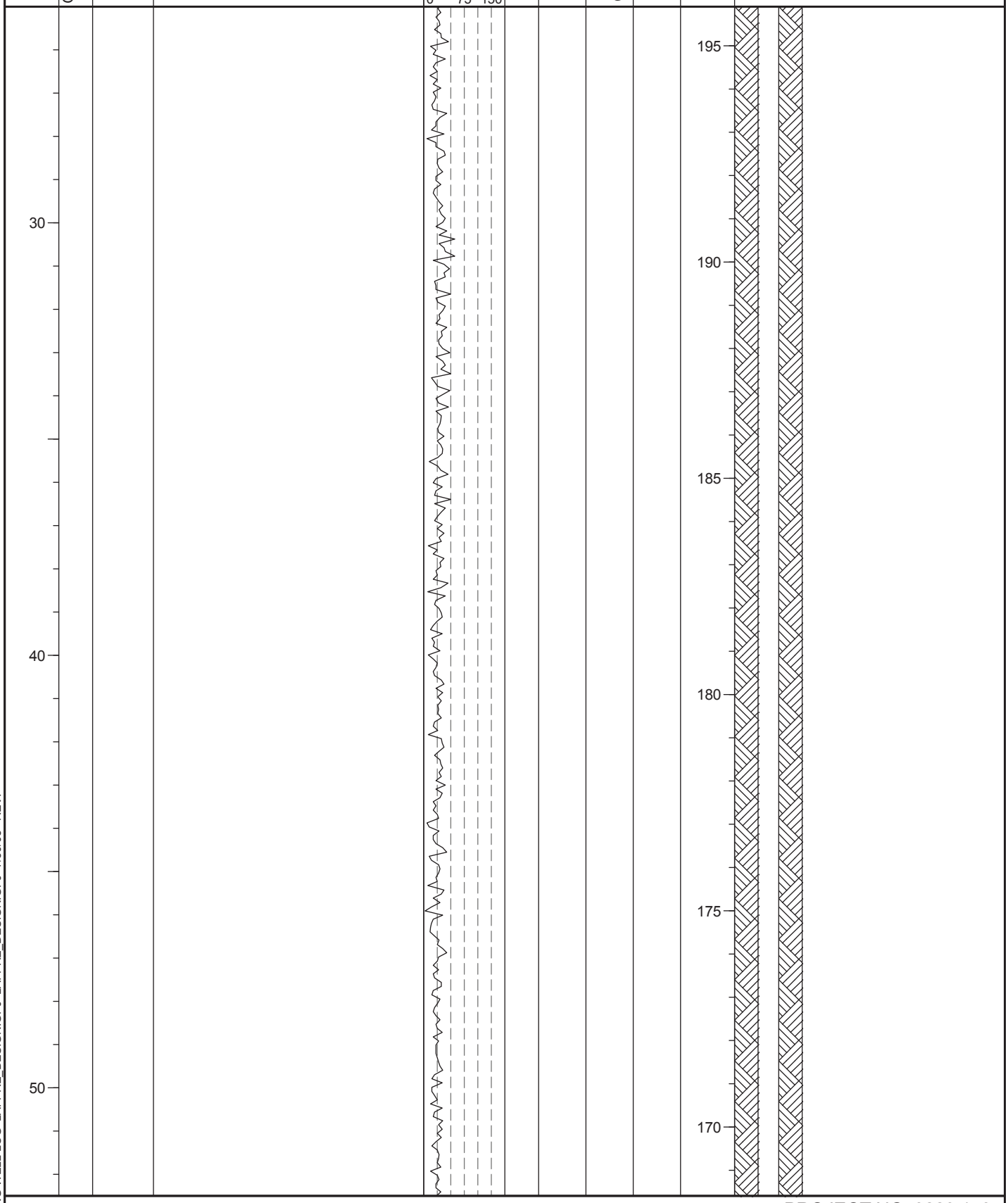
PROJECT NO. 3223.173

LAI MONITORING WELL LOG LAI-PRE_DESIGN.GPJ LAI-PRE_DESIGN.GPJ 7/30/08 REV.

PROJECT: Lawrence Aviation Industries
LOCATION: Port Jefferson Station, New York

MONITORING WELL NO: **TW-01**

DEPTH (feet)	GRAPHIC LOG	USCS	DESCRIPTION	Natural Gamma (CPS) 0 75 150	SAMPLE	RECOV. (feet)	BLOW COUNTS	PID (ppm)	ELEV (feet)	WELL CONSTRUCTION



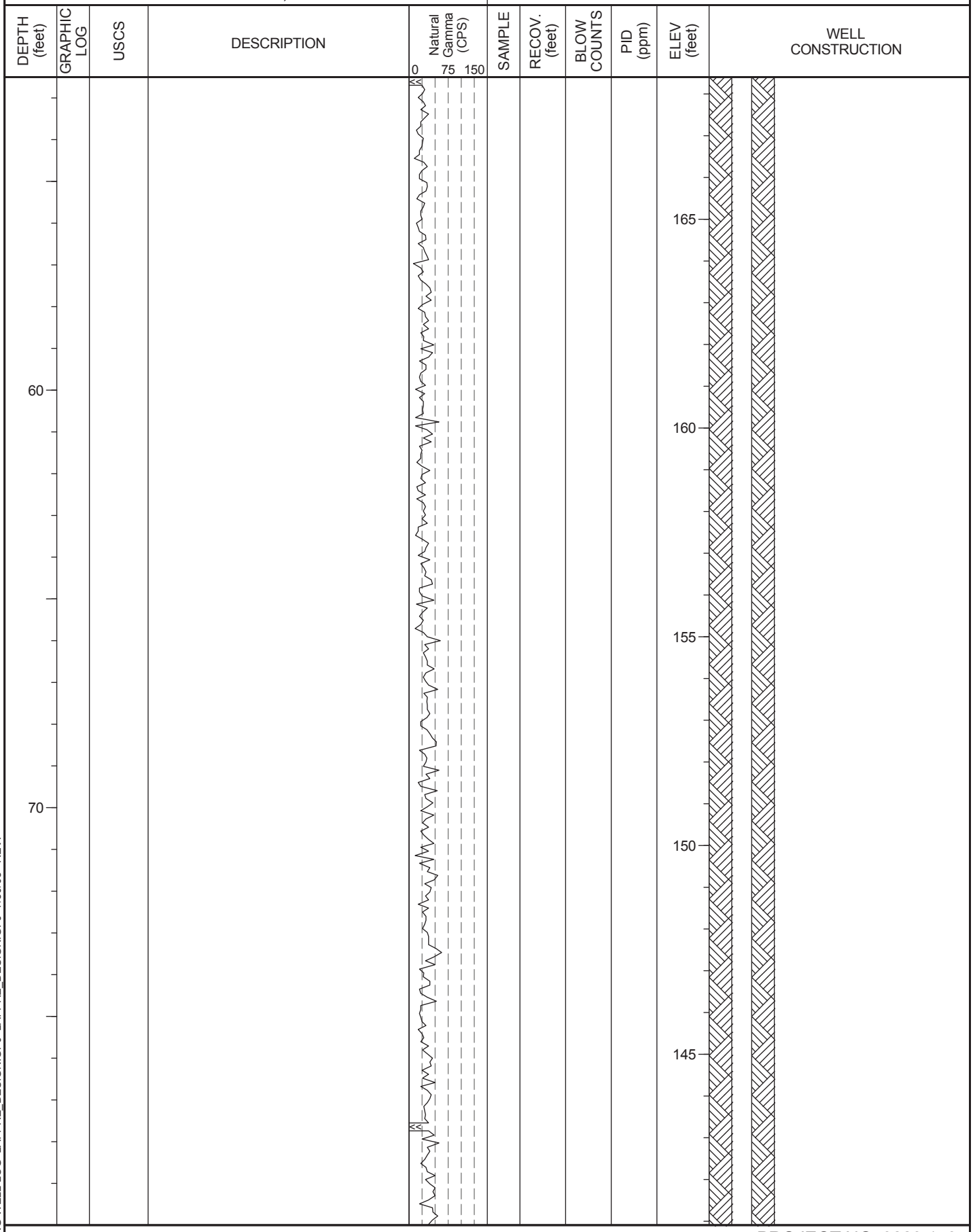
CDM
Raritan Plaza I, Raritan Center
Edison, NJ 08818
Telephone: 732-225-7000

Monitoring Well Construction Log

PROJECT NO. 3223.173

PROJECT: Lawrence Aviation Industries
LOCATION: Port Jefferson Station, New York

MONITORING WELL NO: **TW-01**



CDM
Raritan Plaza I, Raritan Center
Edison, NJ 08818
Telephone: 732-225-7000

Monitoring Well Construction Log

PROJECT NO. 3223.173

LAI MONITORING WELL LOG LAI-PRE_DESIGN.GPJ LAI-PRE_DESIGN.GPJ 7/30/08 REV.

PROJECT: Lawrence Aviation Industries
LOCATION: Port Jefferson Station, New York

MONITORING WELL NO: **TW-01**

DEPTH (feet)	GRAPHIC LOG	USCS	DESCRIPTION	Natural Gamma (CPS) 0 75 150	SAMPLE	RECOV. (feet)	BLOW COUNTS	PID (ppm)	ELEV (feet)	WELL CONSTRUCTION
90									140	
100									135	Cement/Bentonite Grout
									130	
									125	
									120	
									115	

CDM
Raritan Plaza I, Raritan Center
Edison, NJ 08818
Telephone: 732-225-7000

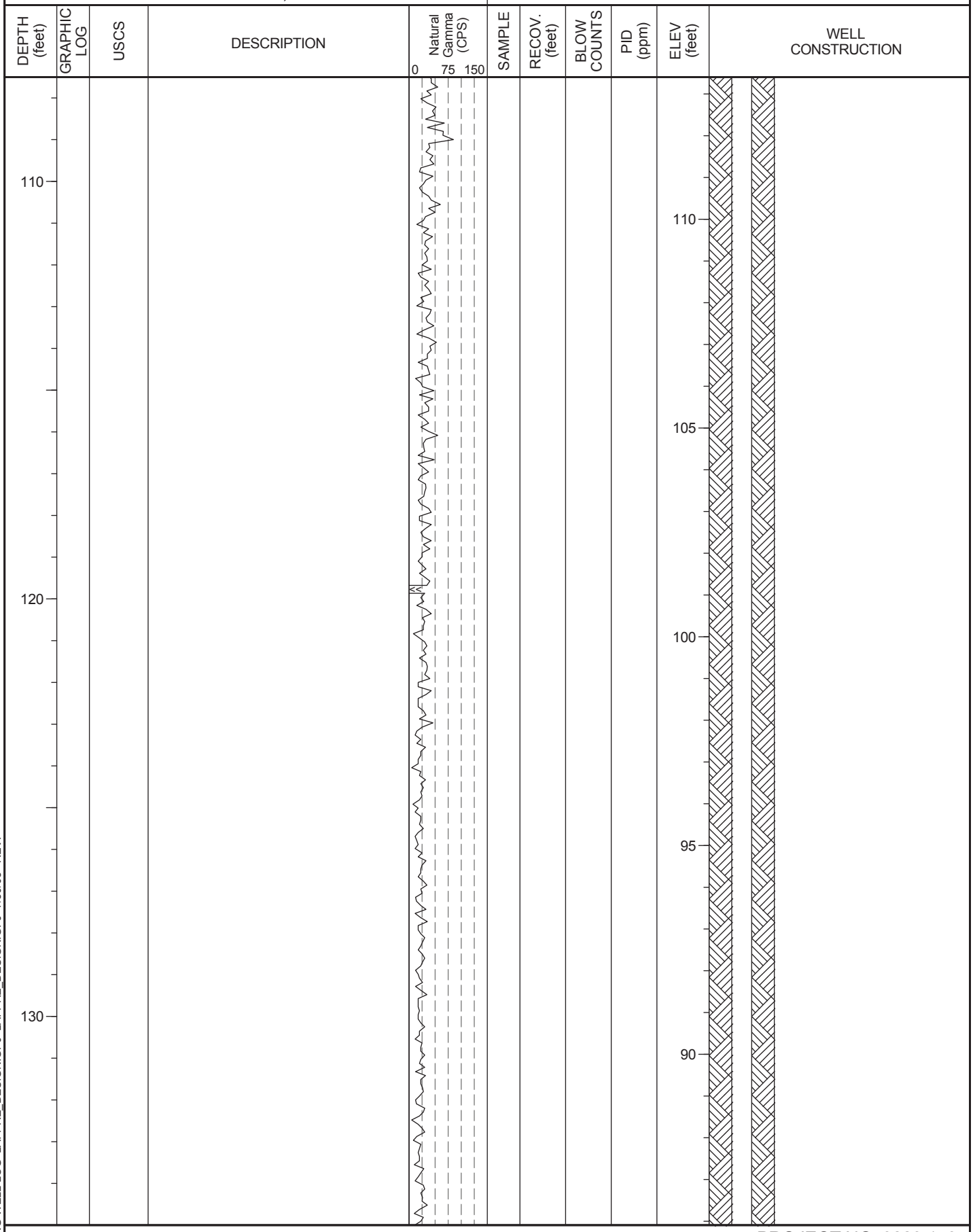
Monitoring Well Construction Log

PROJECT NO. 3223.173

LAI MONITORING WELL LOG LAI-PRE_DESIGN.GPJ LAI-PRE_DESIGN.GPJ 7/30/08 REV.

PROJECT: Lawrence Aviation Industries
LOCATION: Port Jefferson Station, New York

MONITORING WELL NO: **TW-01**



CDM
Raritan Plaza I, Raritan Center
Edison, NJ 08818
Telephone: 732-225-7000

Monitoring Well Construction Log

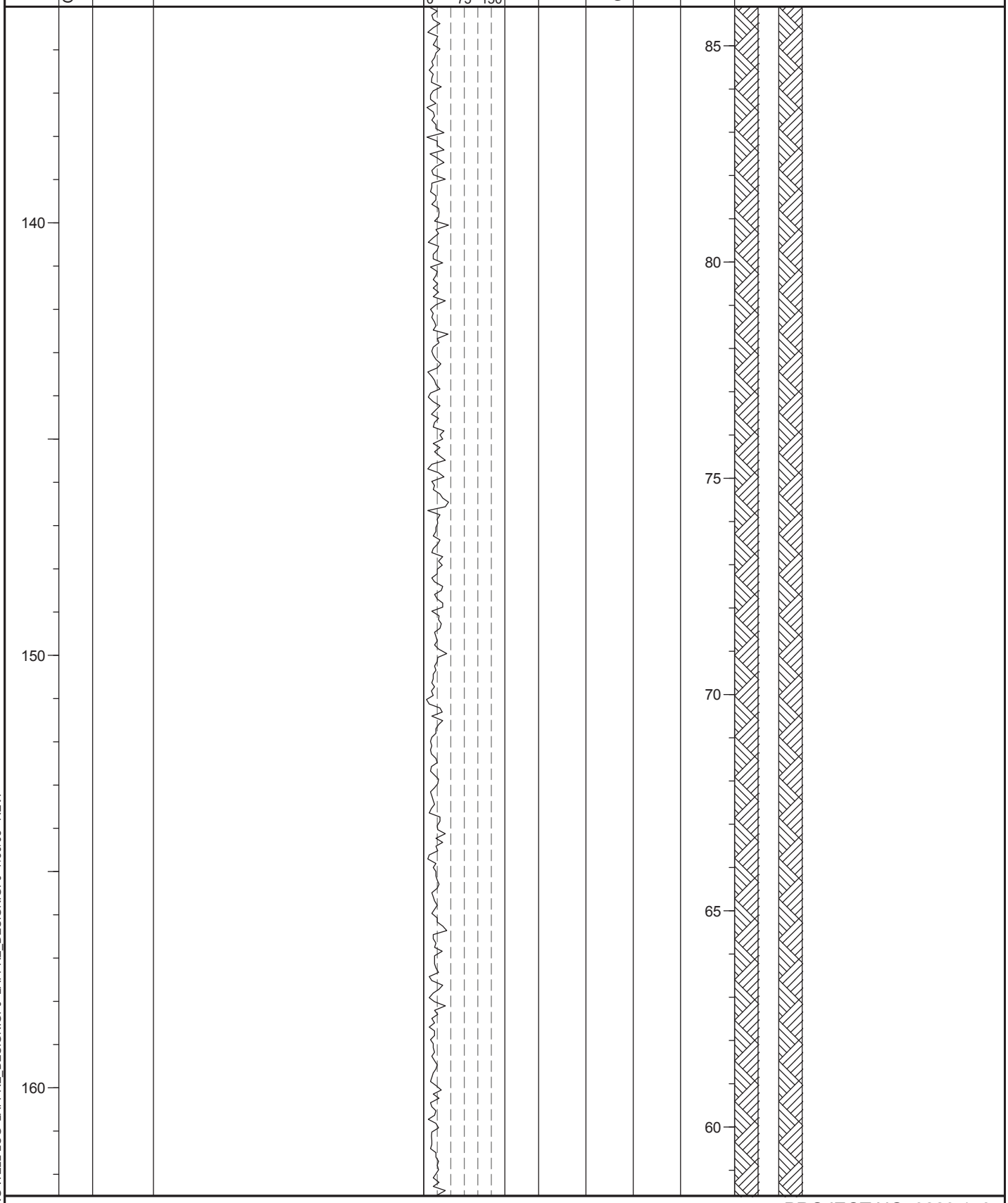
PROJECT NO. 3223.173

LAI MONITORING WELL LOG LAI-PRE_DESIGN.GPJ LAI-PRE_DESIGN.GPJ 7/30/08 REV.

PROJECT: Lawrence Aviation Industries
LOCATION: Port Jefferson Station, New York

MONITORING WELL NO: **TW-01**

DEPTH (feet)	GRAPHIC LOG	USCS	DESCRIPTION	Natural Gamma (CPS) 0 75 150	SAMPLE	RECOV. (feet)	BLOW COUNTS	PID (ppm)	ELEV (feet)	WELL CONSTRUCTION



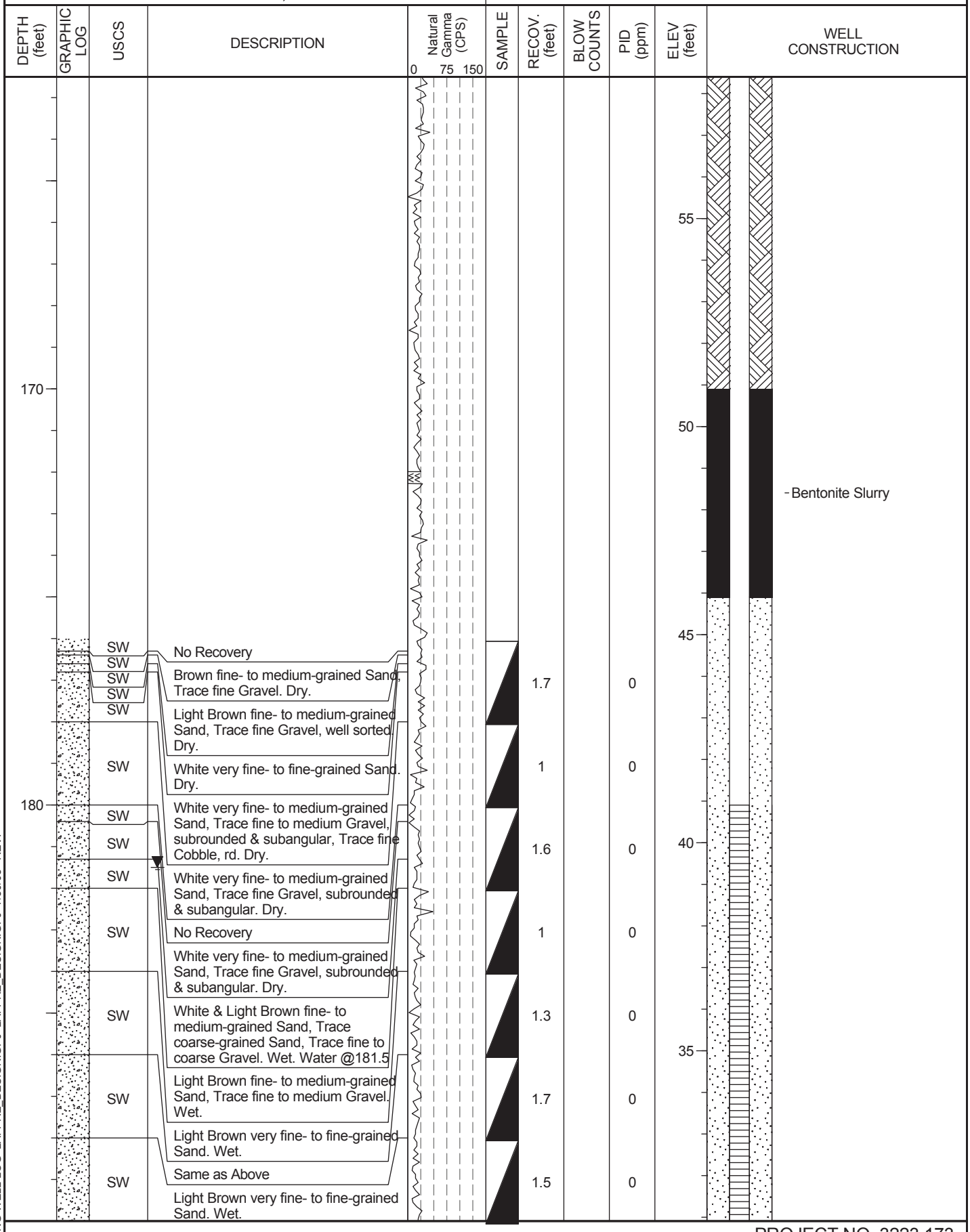
CDM
Raritan Plaza I, Raritan Center
Edison, NJ 08818
Telephone: 732-225-7000

Monitoring Well Construction Log

PROJECT NO. 3223.173

PROJECT: Lawrence Aviation Industries
LOCATION: Port Jefferson Station, New York

MONITORING WELL NO: **TW-01**



CDM
Raritan Plaza I, Raritan Center
Edison, NJ 08818
Telephone: 732-225-7000

Monitoring Well Construction Log

PROJECT NO. 3223.173

LAI MONITORING WELL LOG LAI-PRE_DESIGN.GPJ LAI-PRE_DESIGN.GPJ 7/30/08 REV.

PROJECT: Lawrence Aviation Industries
LOCATION: Port Jefferson Station, New York

MONITORING WELL NO: **TW-01**

DEPTH (feet)	GRAPHIC LOG	USCS	DESCRIPTION	Natural Gamma (CPS) 0 75 150	SAMPLE	RECOV. (feet)	BLOW COUNTS	PID (ppm)	ELEV (feet)	WELL CONSTRUCTION
		SW	Light Brown very fine- to fine-grained Sand, Trace fine to medium Gravel, rounded. Wet.			1.8		0	30	
		SW	Light Brown very fine- to fine-grained Sand. Saturated.			1.7		0		
		SW	Light Brown very fine- to fine-grained Sand, Trace medium Gravel. Wet.			1.8		0		
		SW	Light Brown very fine- to fine-grained Sand. Wet.			1.8		0	25	
		SW	Light Brown very fine- to fine-grained Sand, dense. Slightly Moist.			1.6		0		
200		SW	Light Brown very fine- to fine-grained Sand. Very moisture to Wet.			1.8		0		
		SW	Light Brown very fine- to fine-grained Sand, dense. Very Moist.			2		0	20	
		SW	Light Brown very fine- to medium-grained Sand. Very Moist.			0.5		0		
		SW	Light Brown very fine- to medium-grained Sand. Moist.			1.1		0		
		SW	Light Brown very fine- to medium-grained Sand, Trace fine Gravel, subrounded. Very Moist to Wet.			1		0	15	- Filter Pack Sand
210		SW	Light Brown very fine- to medium-grained Sand, Trace fine to coarse Gravel, rounded, Trace fine Cobble, rounded. Wet.			1.2		0		- No. 10 Slot Stainless Steel Screen
		SW	Light Brown fine- to medium-grained Sand, Trace Cobble, rounded. Slightly Moist.			1.7		0	10	
		SW	Brown Silt, Trace to Little Clay. Dry.			1.1		0		
		SW	Brown Silt, Trace to Little Clay. Dry.			0.3		0	5	

CDM
Raritan Plaza I, Raritan Center
Edison, NJ 08818
Telephone: 732-225-7000

Monitoring Well Construction Log

PROJECT NO. 3223.173

LAI MONITORING WELL LOG LAI-PRE_DESIGN.GPJ LAI-PRE_DESIGN.GPJ 7/30/08 REV.

PROJECT: Lawrence Aviation Industries
LOCATION: Port Jefferson Station, New York

MONITORING WELL NO: **TW-01**

DEPTH (feet)	USCS	DESCRIPTION	SAMPLE	RECOV. (feet)	BLOW COUNTS	PID (ppm)	ELEV (feet)
	SW						
	SW	No Recovery					
	SW	Brown Silt, Trace to Little Clay. Dry.		1.6		0	
220	SW	Brown Silt w/ Light Brown very thin interbeds of fine- to medium-grained Sand. Dry.					
	SW	Gray very fine- to fine-grained Sand, Trace medium-grained Sand. Dry.		1.4		0	0
	SW	No Recovery					
	SW	Yellow Brown fine- to medium-grained Sand, Trace fine to coarse Gravel. Wet.		1.5		0	
	SW	Gray fine- to medium-grained Sand. Wet.					
	SW	Yellow Brown fine- to medium-grained Sand,Trace Silt lens. Wet.		1.1		0	
	SW	Gray Silty fine- to medium-grained Sand, laminated, Little orange brown color. Moist.		0.8		0	-5
	SW	No Recovery					
	SW	Same as Above w/ Odor.					
	SW	Gray to Black Silt, friable. Odor. Dry.		0.6		0	
230	SW	Black stained? Gray very fine- to fine-grained Sand, Trace Silt. Slightly Moist. Odor.					
	SW	No Recovery		0		0	-10
	SW	Orange Brown & Gray very fine- to medium-grained Sand, laminated, Trace to Little Silt w/ depth. Slightly Moist.		1.1		0	
	SW	No Recovery					
	SW	Gray fine- to medium-grained Sand, Little Orange Brown color,, Trace Silt @ 235'-235.2'. Wet to Saturated.		1		0	-15
	SW	Grayish Yellow Brown fine- to medium-grained Sand. Very Moist to Moist.		1.6		0	
	SW	Grayish Yellow Brown fine- to medium-grained Sand. Wet.		1		0	
240							-20

Natural Gamma (CPS): 0 75 150

WELL CONSTRUCTION

CDM
Raritan Plaza I, Raritan Center
Edison, NJ 08818
Telephone: 732-225-7000

Monitoring Well Construction Log

PROJECT NO. 3223.173

LAI MONITORING WELL LOG LAI-PRE_DESIGN.GPJ LAI-PRE_DESIGN.GPJ 7/30/08 REV.

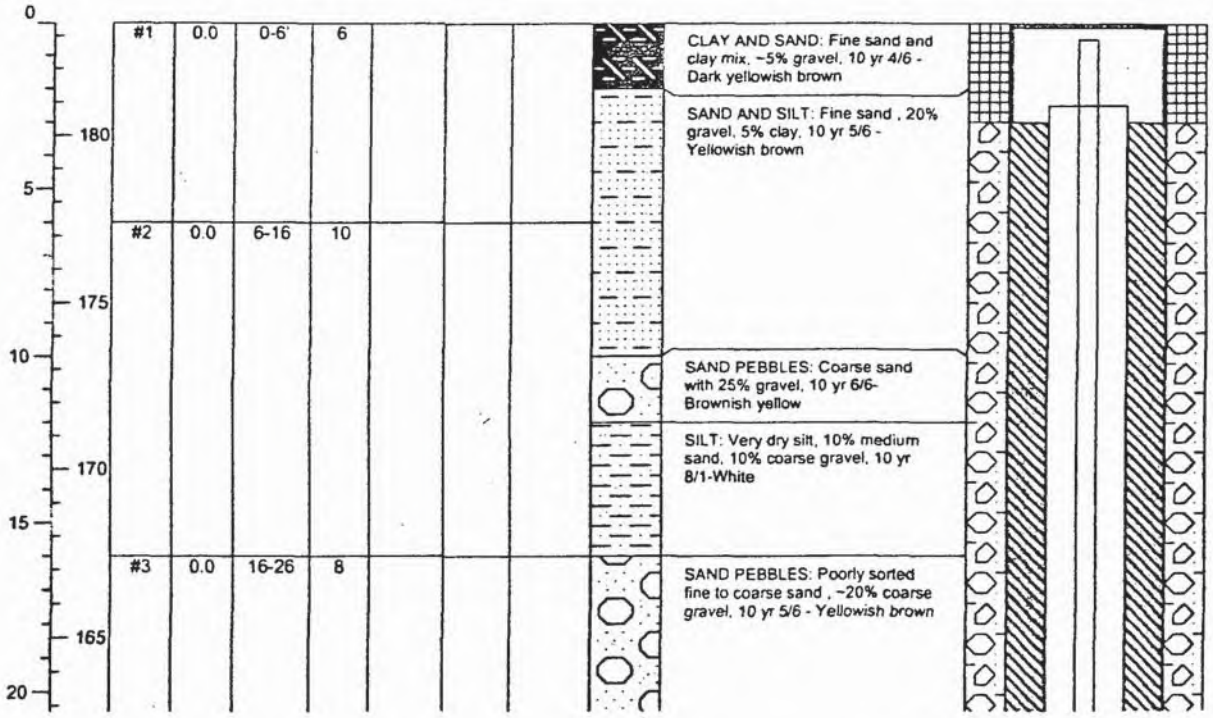
MPW-01

302328

US 00019730

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-01 **Boring Location:** Katherine St.; Port J., NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147
Drilling Contractor: Uni-Tech Drilling Co. **Drilling Method:** Rotasonic **Sample Method:** Vibration Extraction **Date Started:** 12/13/2004 **Date Completed:** 02/09/2005 **Logged By:** Adrian Steinhauff (P.W.GROSSER, INC.)	**Northing:** 277475.448 **Easting:** 1242101.12 **Surface Elevation (ft. above msl):** 183.40 **Total Depth (ft bgs):** 225 **Initial Depth to Water (ft bgs):** **Field Screening Instrument:** PID

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
0	180	#1	0.0	0-6'	6					CLAY AND SAND: Fine sand and clay mix, ~5% gravel, 10 yr 4/6 - Dark yellowish brown	
5	175	#2	0.0	6-16	10					SAND AND SILT: Fine sand , 20% gravel, 5% clay, 10 yr 5/6 - Yellowish brown	
10	170									SAND PEBBLES: Coarse sand with 25% gravel, 10 yr 6/6- Brownish yellow	
15	165	#3	0.0	16-26	8					SILT: Very dry silt, 10% medium sand, 10% coarse gravel, 10 yr 8/1-White	
20										SAND PEBBLES: Poorly sorted fine to coarse sand , ~20% coarse gravel, 10 yr 5/6 - Yellowish brown	



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

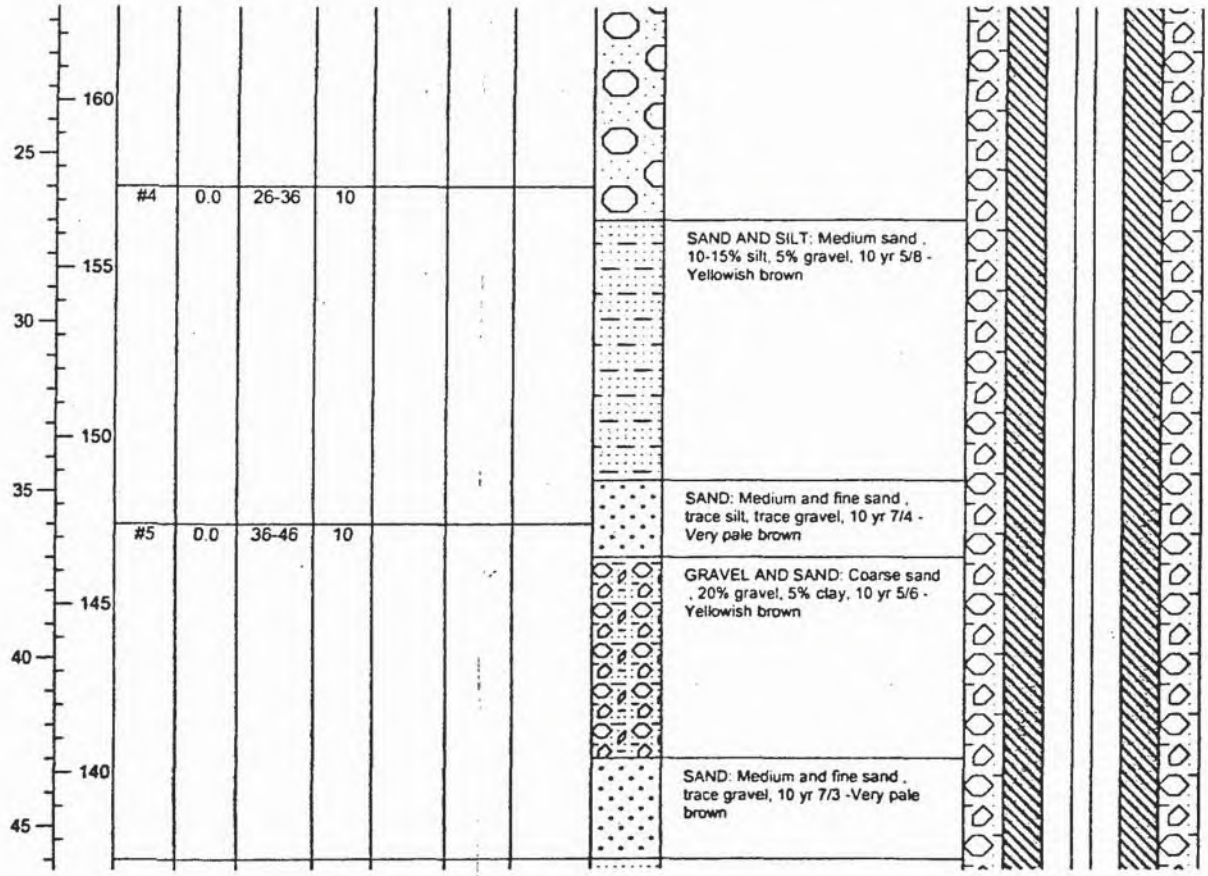
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302329

US 00019731

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-01 **Boring Location:** Katherine St.; Port J., NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

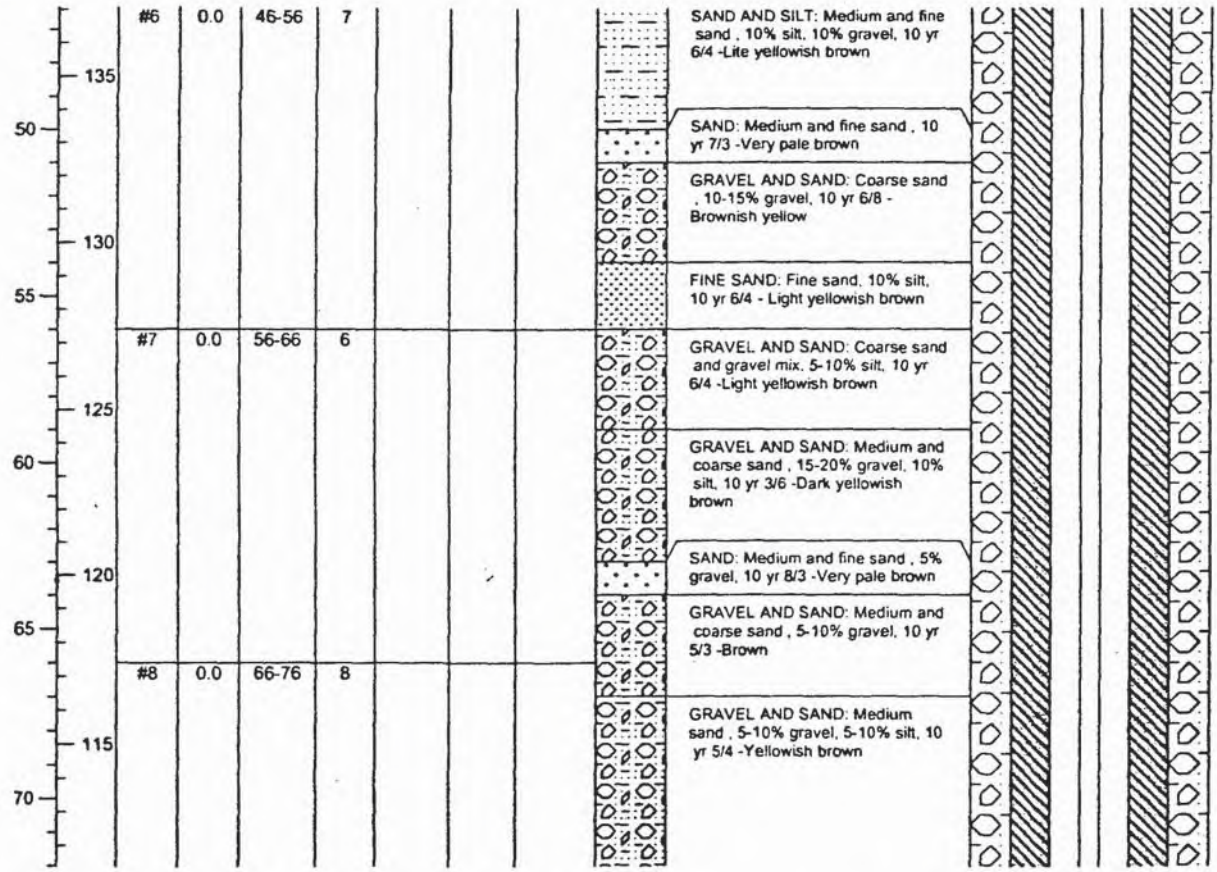
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302330

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-01 **Boring Location:** Katherine St.; Port J., NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302331

US 00019733

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-01
	Boring Location: Katherine St.; Port J., NY
Client: U.S. Environmental Protection Agency	Project Name: Lawrence Aviation RI/FS
Site Location: Port Jefferson Station, New York	Project Number: 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
75	110									SAND: Medium and fine sand , 5% gravel, 10 yr 7/4 -Very pale brown	
		#9	0.0	76-86	5						
80	105									GRAVEL: Medium gravel , 10% coarse sand, 10 yr 6/3 -Pale brown	
										SAND AND SILT: Medium sand , 5% gravel, 5-10% silt, 10 yr 5/4 - Yellowish brown	
85	100										
		#10	0.0	86-96	7						
90	95									GRAVEL AND SAND: Medium and coarse sand , 10% gravel, 10 yr 6/4 -Light yellowish brown	
95	90										
		#11	0.0	96-106	5						

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

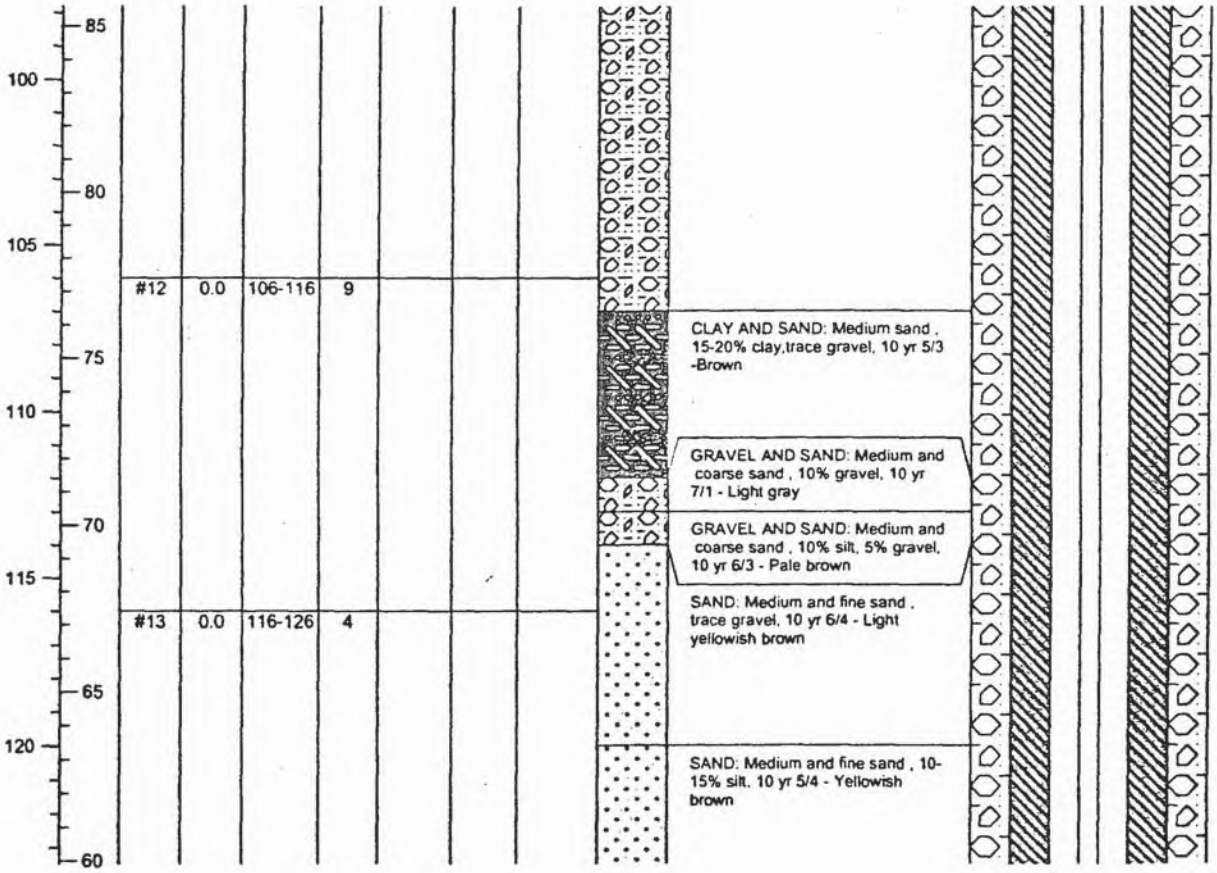
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302332

US 00019734

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-01
	Boring Location: Katherine St.; Port J., NY
Client: U.S. Environmental Protection Agency	**Project Name:** Lawrence Aviation RI/FS
Site Location: Port Jefferson Station, New York	**Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

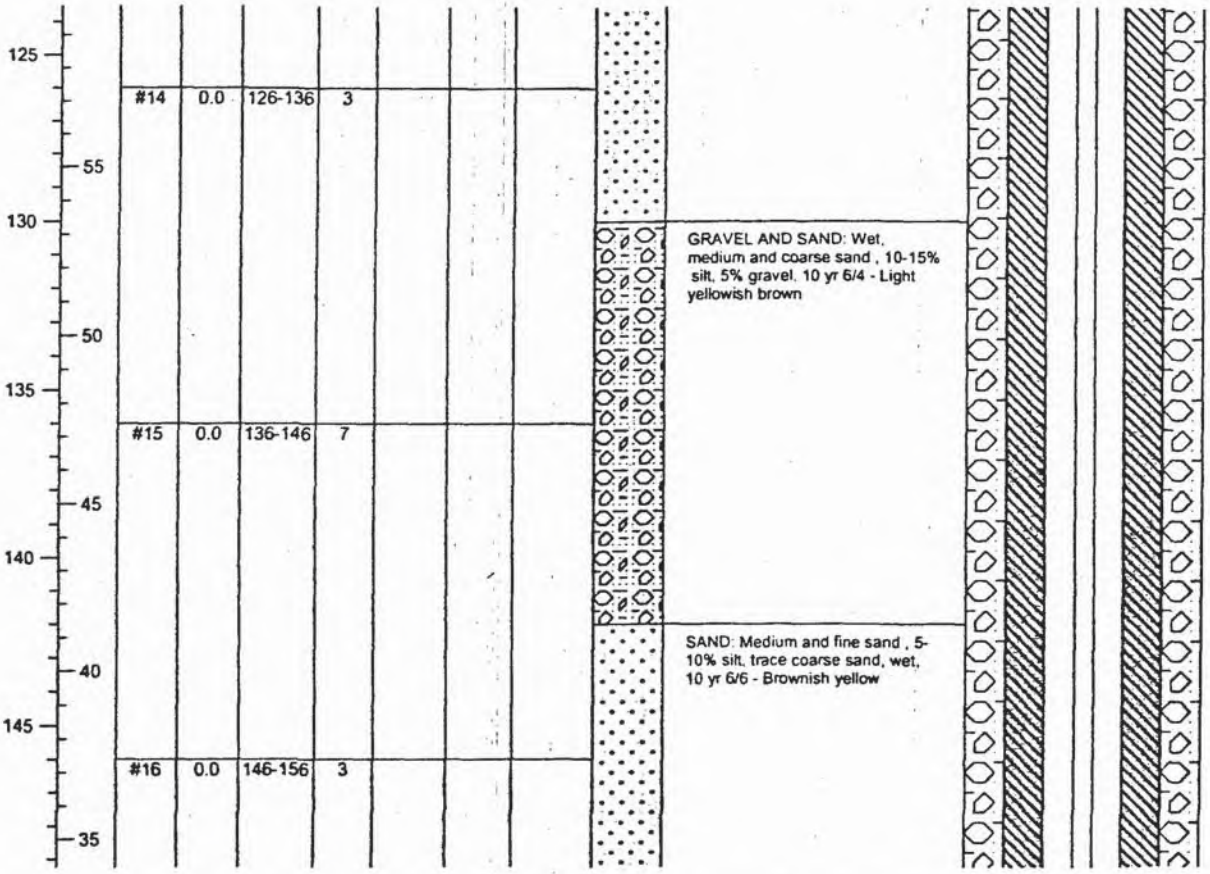
Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-01 Boring Location: Katherine St.; Port J., NY
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302334

US 00019736

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-01 **Boring Location:** Katherine St.; Port J., NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
150										GRAVEL AND SAND: Wet, medium and coarse sand , 5-10% gravel, 10 yr 6/3 - Pale brown	
30											
155		#17	0.0	156-166	10						
25											
160											
20		A				0.5 U					
165		#18		166-176	9		0.5 U	0.5 U			
15											
170											
10		B				0.5 U					

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

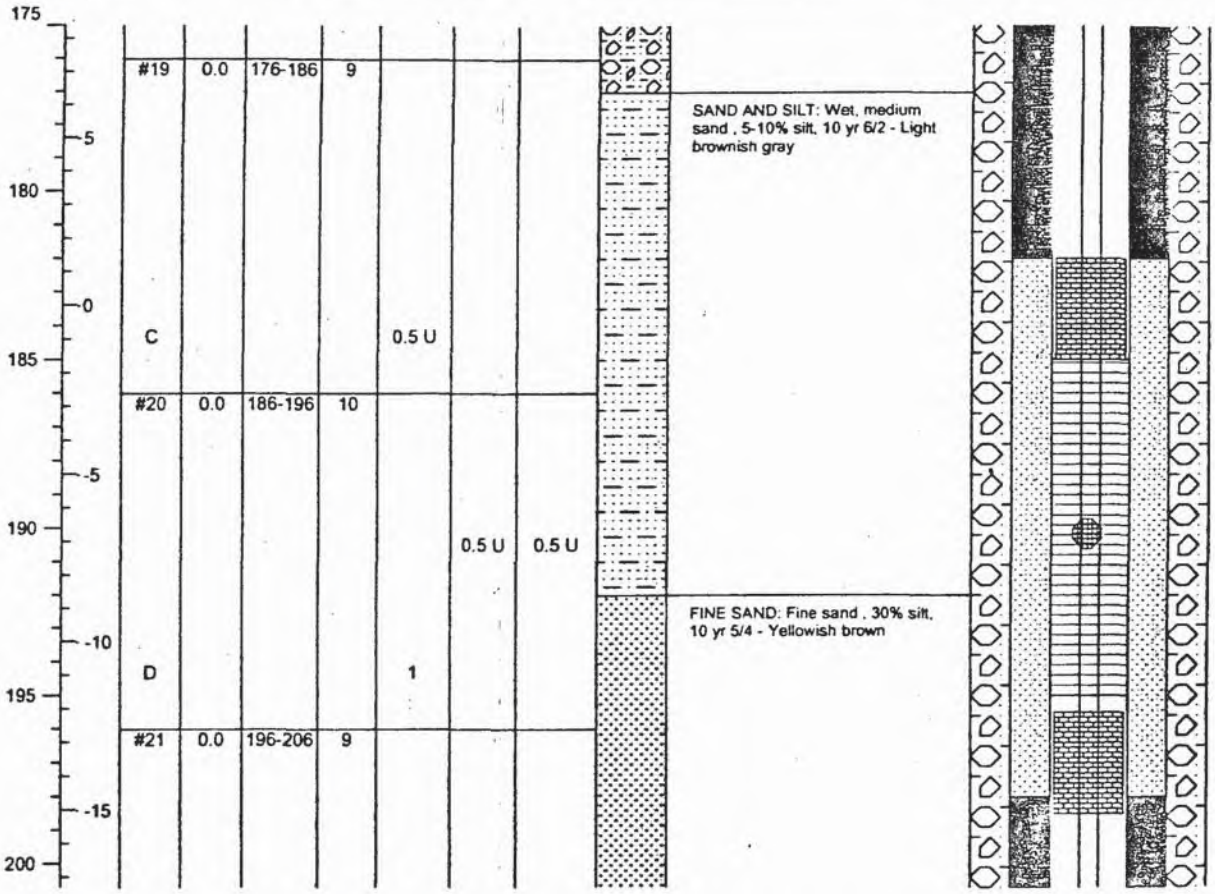
- Waterloo Sampling Port
- Concrete
- Sand Pack
- Waterloo Packer (not to scale)
- Cement/Bentonite Grout
- Natural Material
- Bentonite Seal
- 4-inch Stainless Steel Well Casing
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302335

US 00019737

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-01 **Boring Location:** Katherine St.; Port J., NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

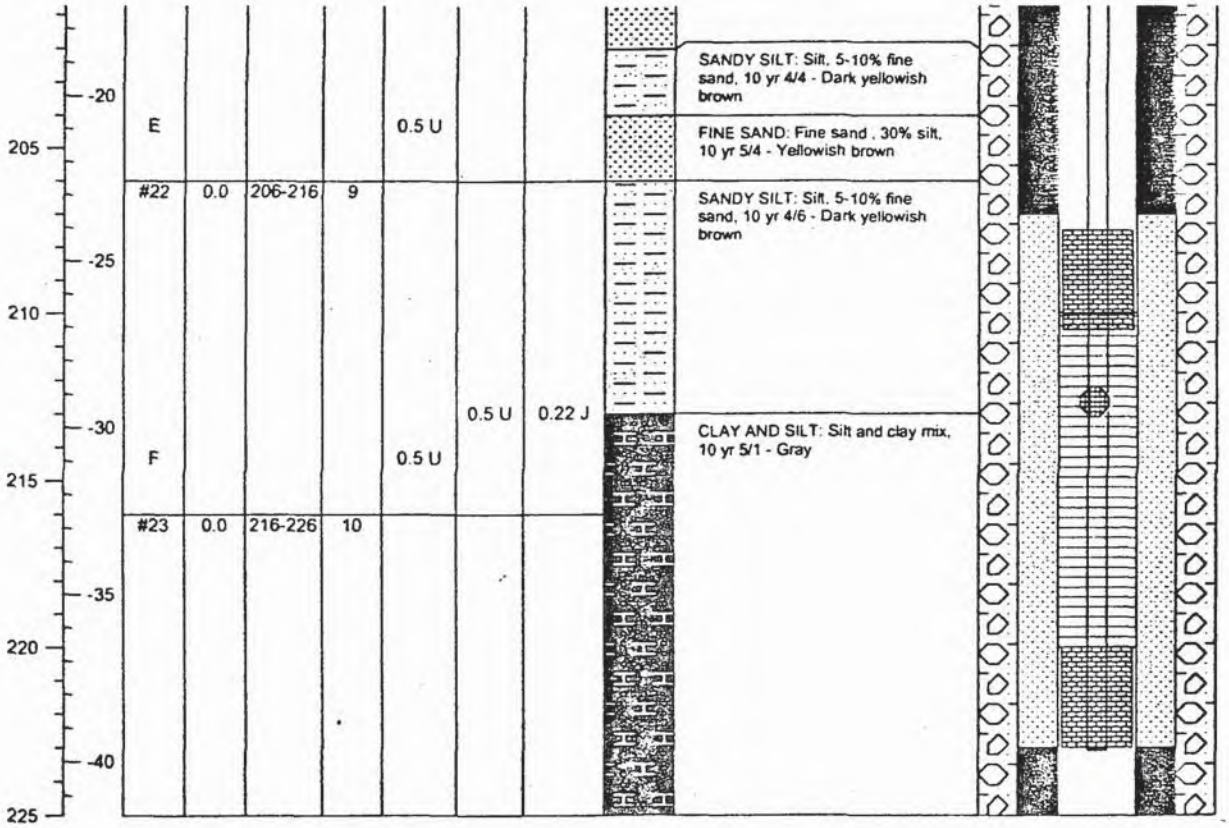
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302336

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-01 Boring Location: Katherine St.; Port J., NY
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302337

US 00019739

Waterloo System Installation Log

Client: USEPA | Borehole Ø & Depth: 4"Ø + 225 @ 0822 | Date: 2/9/05
Site: LAI | Casing Depth: N/a | Sheet No.: 1 OF 1
Borehole No.: MW-01 | Depth to Water: 141.5 @ 0822 | Approved: AA. RD

Unit	In	Depth to Top	Notes
FEET		FEET	
0.1	✓	225	BASE PLUG
	✓	220	PACKER
	✓		2' PVC Casing
	✓		5' PVC Casing
1900	✓✓✓		PORT (VWP, BP) 3
	✓		2' PVC Casing
	✓		PACKER
	✓		5' PVC Casing
	✓		2' PVC Casing
	✓		2' PVC Casing
	✓		PACKER
	✓		5' PVC Casing
1936	✓✓✓	5' PVC Casing	PORT (VWP, BP) 2
	✓		5' PVC Casing
	✓	PACKER	2' PVC Casing
	✓		2' PVC Casing
	✓		PACKER
	✓		2' PVC Casing
	✓		2' PVC Casing
1021	✓✓✓		PORT (VWP, BP) 1
	✓		5' PVC Casing
	✓		PACKER
	✓		10' PVC Casing (1)
	✓		2
	✓		3
	✓		4
	✓		5
	✓		6
	✓		7
	✓		8
	✓		9
	✓		10
	✓		11
	✓		12
	✓		13
	✓		14
	✓		10' PVC Casing 15
	✓	10'-51"	- Cut off 51" from 16 top of last 10' casing for final completion
	✓		MANIFOLD

Black, sample, short

In acceptable range? ✓ s/c

Equipment Required

Unit	#	Unit	#
10 ft Casing	16	PVC Port (Single)	0
5 ft Casing	2	PVC Port (Double)	0
2 ft Casing	8	SS Port (Single)	0
1 ft Casing	0	SS Port (Double)	3
Base Plug	1	Double Valve Pump	0
Dow Packer	6	Bladder Pump	3
Bentonite Packer	0	VW Piezometer	3
Hydraulic Packer	0	Well Head Manifold	1
~~MANIFOLD~~			
2 x 1000' Rolls of PTFE lined tubing			
STEEL CABLE: 250 ft. VWP cable			

CHECK AT WELL HEAD 0845

04- Reading Before Installation @ 0845

Zone	Piezo Serial #	Reading	Temp
1	14794 ✓	9089.7	4.3
2	14793 ✓	9262.3	4.4
3	14617 ✓	9227.5	3.7
1 ✓	Bladder pump ball valve shake ✓		
2 ✓	Bladder pump ball valve shake ✓		
3 ✓	Bladder pump ball valve shake ✓		
7			
8			

1900 2215 9215 240

Reading After Installation @ 1300

Zone	Piezo Serial #	Reading	Temp
1	14794	8387	11.4
2	14793	7860.1	11.4
3	14617	7274.8	11.3
1 ✓	DTW 165.5 - 24.07 = 141.43		
2 ✓	DTW 190 - 48.13 = 141.87		
3 ✓	DTW 212.5 - 70.73 = 141.77		
7			
8			

Head. 24.07 48.13 70.73

Borehole Water Level (after installation)	

Comments

Zone 3 xD OFFSET 0.46' + 27.4mm
Zone 2 xD OFFSET 0.46' + 27.4mm
Zone 1 xD OFFSET 0.46' + 27.4mm
DTW values are not corrected for transducer offset.

302338

Client: CDM -				**Well No:**	MPW-01	**Prepared By:**		RB		
Install Order:	9			**SWL:**	145ft			6-Dec (2004)		
Zones				3		2		1		
Drillhole Depth		225								
Base Plug at: SS Plug		223								
(SS Plug or PVC Plug)										
Depth to Top of Dual Ports				215.5		190		165.5		
(Single or Dual)										
Depth to Top of 3.83 Packers				207.5	195.5	182.5	170	157.5		
(3.83 or 3.58 or 2.86)										
Desired Stick-up		-2.5								

Interval Diff. (feet)	Depth to Top (feet)	Unit Length (feet)	Qnty.	Description of Component	Zone No.	(feet)	Monitoring Equipment: 1/2 X 3/8 Tubing OR 5/8 X 1/2 Tubing OR VWP Transducer Double Valve Pump OR Bladder Pump — Description
	225			Depth to Btm.			Manifold Type
0.1	223.0	0.1		Base Plug			Stnd Wl Hd O Tube
	220.0	3.0	X 1	Packer			
							1 Multipurge
							Pressure Sealed
	212.5		X 1 2	2' PVC Casing			
	~~218.5~~		X 1	5' PVC Casing			
4.4		0.5		Port	3	240	VWP Transducer Bladder Pump
			X 1	5' PVC Casing			04-14467/14617
							min: 90 psi
5.0	207.5	3.0	X	Packer			Stand 115 psi
			X 1	5' PVC Casing			Run @ 150 psi
			X 2	2' PVC Casing			Drive 115
9.0	195.5	3.0	X	Packer			Vent 125
			X 1	5' PVC Casing			
5.0	190.0	0.5	X	Port	2	215	VWP Transducer Bladder Pump
			X 1	5' PVC Casing			04-14793
				Packer			min. 80 psi
5.0	182.0	3.0	X				125 = 105 psi
			X 1	5' PVC Casing			Run at 150 psi
			X 2	2' PVC Casing			Drive 115, Vent 115
9.0	170.0	3.0	X	Packer			
			X 2	2' PVC Casing			
4.0	165.5	0.5	X	Port	1	190	VWP Transducer Bladder Pump
			X 1	5' PVC Casing			04-14794
							min pres to ps. Drive 9.5s
5.0	157.5	3.0	X	Packer			operating 95 psi Vent 14s
			16	10' PVC Casing			Dvd at 150 psi
							flow rate 110 ml/min
160.0	-2.5						

TOTALS					
16	10' PVC Casing	645	1/4" X 0.17" Red LDPE Tubing		
6	5' PVC Casing	645	1/4" X 0.17" Sample LDPE Tubing		
8	2' PVC casing	645	VWP Transducer Cable		
0	1' PVC casing	3	Dual 3/8" Stem Port Assembly		
1	SS Plug	3	Bladder Pump		
250	3/16" dia SS Support Cable	6	3.83 Packers		
		3	VWP Transducer		

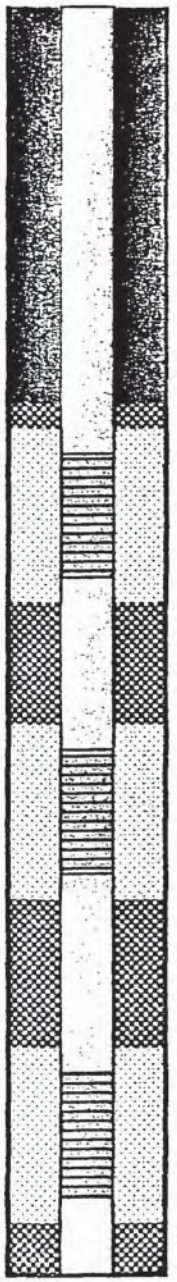
1/4/05 15:18
Macintosh HD:Desktop Folder:[401 CDM Dec6]Sum TLS

✓ Manifold, 3 psi.

NOTES BY JN DOUGHERTY 2/9/05

302339

MPW-01



ND	A
ND	B
ND	C
1	D
ND	E
ND	F

302340

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA MW-01 Zone 1

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14794

Temperature: 22.8 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.5 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Eliz

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9101	9101	9101	-0.119	-0.03	-0.012	0.00
70.0	8414	8414	8414	70.12	0.03	70.09	0.03
140.0	7732	7731	7732	139.9	-0.03	139.8	-0.07
210.0	7044	7043	7044	210.2	0.07	210.1	0.03
280.0	6361	6361	6361	280.0	0.00	280.0	-0.01
350.0	5677	5678	5678	349.9	-0.03	350.0	0.01

(kPa) Linear Gage Factor (G): 0.1022 **(kPa/ digit)** **Regression Zero:** 9100

Polynomial Gage Factors: **A:** 6.818E-08 **B:** -0.1032 **C:** 933.9

Thermal Factor (K): -0.1400 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.01483 **(psi/ digit)**

Polynomial Gage Factors: **A:** 9.88903E-09 **B:** -0.01497 **C:** 135.46

Thermal Factor (K): -0.02031 **(psi/ °C)**

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9056 Temp(T_0): 22.4 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA Zone 2 MW-01

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14793

Temperature: 22.8 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.5 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Rica

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9291	9292	9292	0.100	0.03	0.048	0.01
70.0	8609	8609	8609	70.01	0.00	70.03	0.01
140.0	7926	7927	7927	139.9	-0.02	140.1	0.02
210.0	7245	7245	7245	209.7	-0.08	209.8	-0.05
280.0	6557	6557	6557	280.2	0.06	280.2	0.07
350.0	5875	5876	5876	350.0	0.01	350.0	-0.01

(kPa) Linear Gage Factor (G): 0.1024 **(kPa/ digit)** **Regression Zero:** 9292

Polynomial Gage Factors: **A:** -6.678E-08 **B:** -0.1014 **C:** 948.1

Thermal Factor (K): -0.0102 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.01486 **(psi/ digit)**

Polynomial Gage Factors: **A:** -9.685E-09 **B:** -0.01471 **C:** 137.52

Thermal Factor (K): -0.00147 **(psi/ °C)**

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9249 Temp(T_0): 22.6 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302342

US 00019744

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA MW-01 04 Zone 3

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14617

Temperature: 22.5 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.6 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: ERica

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9237	9236	9237	0.057	0.02	-0.071	-0.02
70.0	8589	8589	8589	70.07	0.02	70.09	0.03
140.0	7944	7944	7944	139.8	-0.05	139.9	-0.03
210.0	7296	7295	7296	209.9	-0.02	210.0	-0.01
280.0	6647	6647	6647	280.1	0.02	280.1	0.02
350.0	6000	6000	6000	350.0	0.01	350.0	-0.01

(kPa) Linear Gage Factor (G): 0.1081 (kPa/ digit) Regression Zero: 9237

Polynomial Gage Factors: A: -5.298E-08 B: -0.1073 C: 995.83

Thermal Factor (K): -0.1475 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.01568 (psi/ digit)

Polynomial Gage Factors: A: -7.68455E-09 B: -0.01557 C: 144.43

Thermal Factor (K): -0.02140 (psi/ °C)

Calculated Pressures: Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$**

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9196 Temp(T_0): 22.6 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302343

US 00019745

MPW-02

302344

US 00019746

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-02 **Boring Location:** Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147
Drilling Contractor: Uni-Tech Drilling Co. **Drilling Method:** Rotasonic **Sample Method:** Vibration Extraction **Date Started:** 06/17/2004 **Date Completed:** 02/02/2005 **Logged By:** Adrian Steinhauff (P.W.GROSSER, INC.)	**Northing:** 279049.859 **Easting:** 1241241.061 **Surface Elevation (ft. above msl):** 221.02 **Total Depth (ft bgs):** 280 **Initial Depth to Water (ft bgs):** 188 **Field Screening Instrument:** PID

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
0	220	#1		0-8	8					SAND: Sand (brown), medium and fine grain, poorly sorted, 2% cobbles (small) top soil, 10 yr 4/3	
5	215									SAND AND SILT: Sand (brown), medium and fine grain, 5% silt, poorly sorted, 2% cobbles small and large (dry), 10 yr 5/3	
10	210	#2	0.0	8-18	10					SAND AND SILT: Sand (brown), medium and fine grain, poorly sorted, 2% small to large cobbles (dry), 10 yr 5/3, 2% silt	
15	205										
20	200	#3	0.0	18-28	3.6					SAND: 18% sand, medium and fine grain, poorly sorted, 15 % small to large cobbles, 2% silt, 10 yr 4/3	
25	195									PEBBLES: Sand (brown), large and fine grain, poorly sorted, 2% cobbles, top 2' wet from drilling H2O, 10 yr 5/3	
30	190	#4	0.0	28-38	5					SAND: Bottom 3' of sample moist sand (brown), medium and fine grain, 5% medium and small	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302345

US 00019747

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-02 Boring Location: Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
35	185									cobbles, (dry), 10 yr 5/3	
		#5	0.0	38-48	3.8					SILT: Top 8" of sample silt (brown) lens, well sorted (moist) ,10 yr 5/3	
40	180									SAND: Sand (light brown) or (pale yellow), 2.5 yr 7/3, well sorted (dry), 2% small cobbles	
45	175									SAND PEBBLES: Top 1' wet,10 yr 8/2 large grain sand, small cobbles (dry)	
		#6	0.0	48-58	5					SILT: Sand (pale yellow) 2 yr 7/3, fine grain, 5% silt, poorly sorted (dry)	
50	170										
55	165										
		#7	0.0	58-68	6					SAND: Sand (pale brown), 10 yr 6/3, medium and fine grain w/10% silt, poorly sorted (dry)	
60	160										
65	155									SILT: Sand (dark brown), 10 yr 5/3, fine grain, 26% silt, 2% cobbles small moist	
		#8	0.0	68-78	8					SAND: Sand (brown), 10 yr 5/4, well sorted (moist), 2% cobbles small and medium, 10% silt well sorted	
70	150										

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

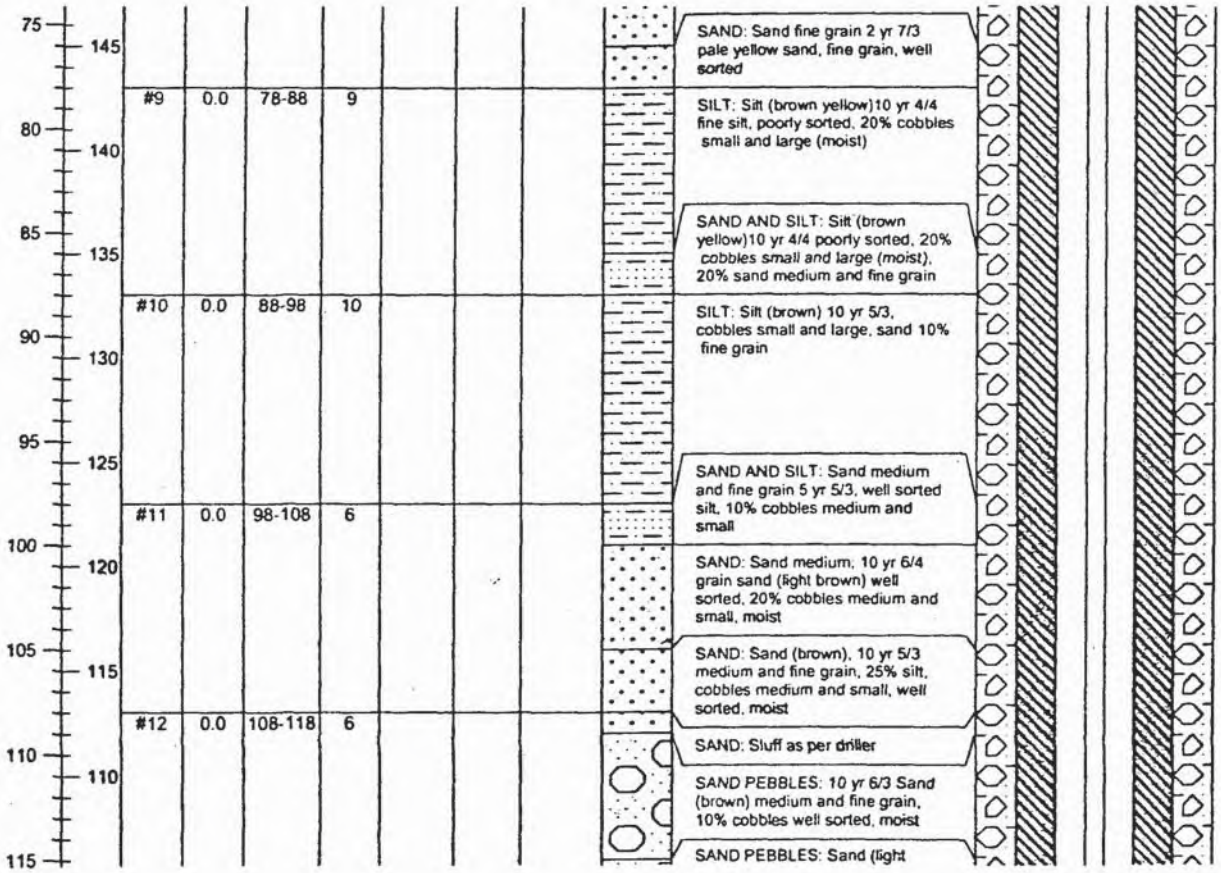
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302346

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-02 **Boring Location:** Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

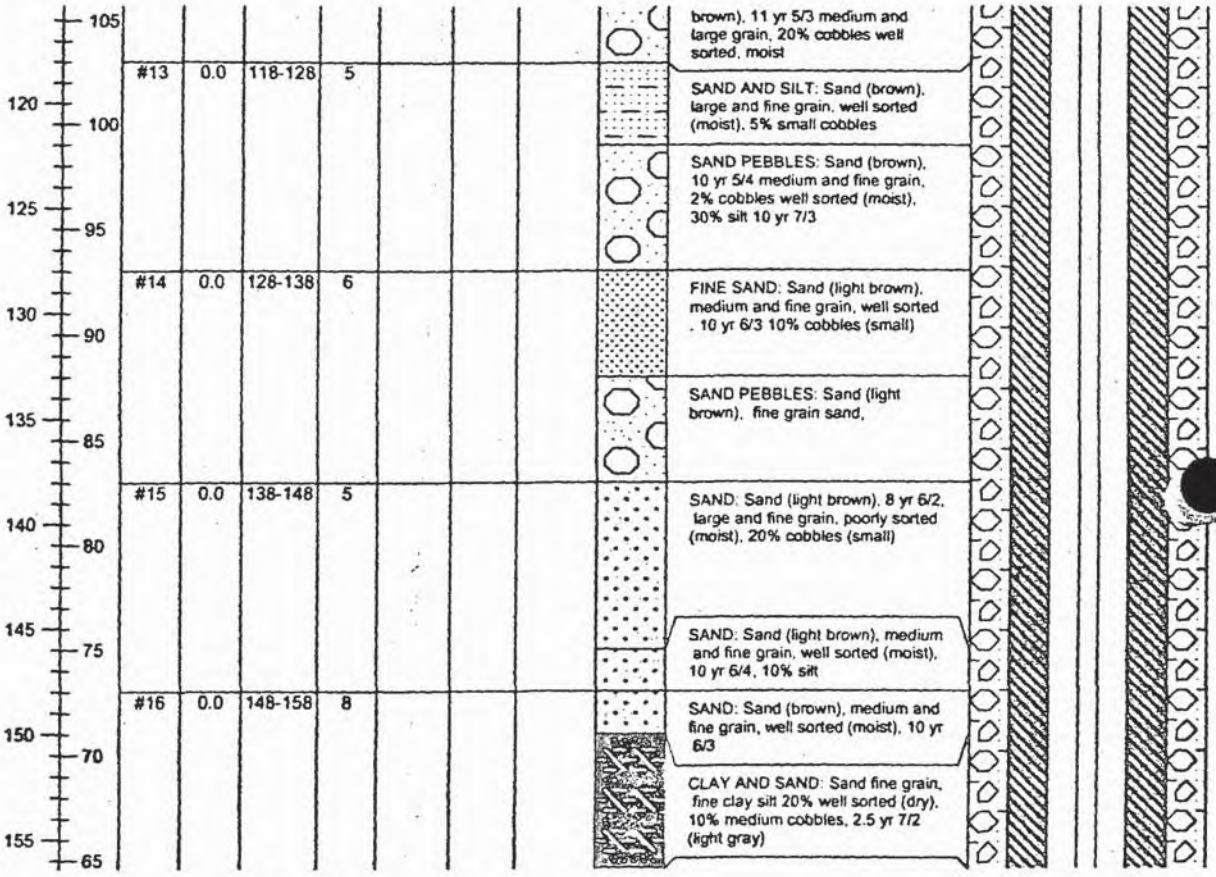
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302347

US 00019749

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-02 Boring Location: Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

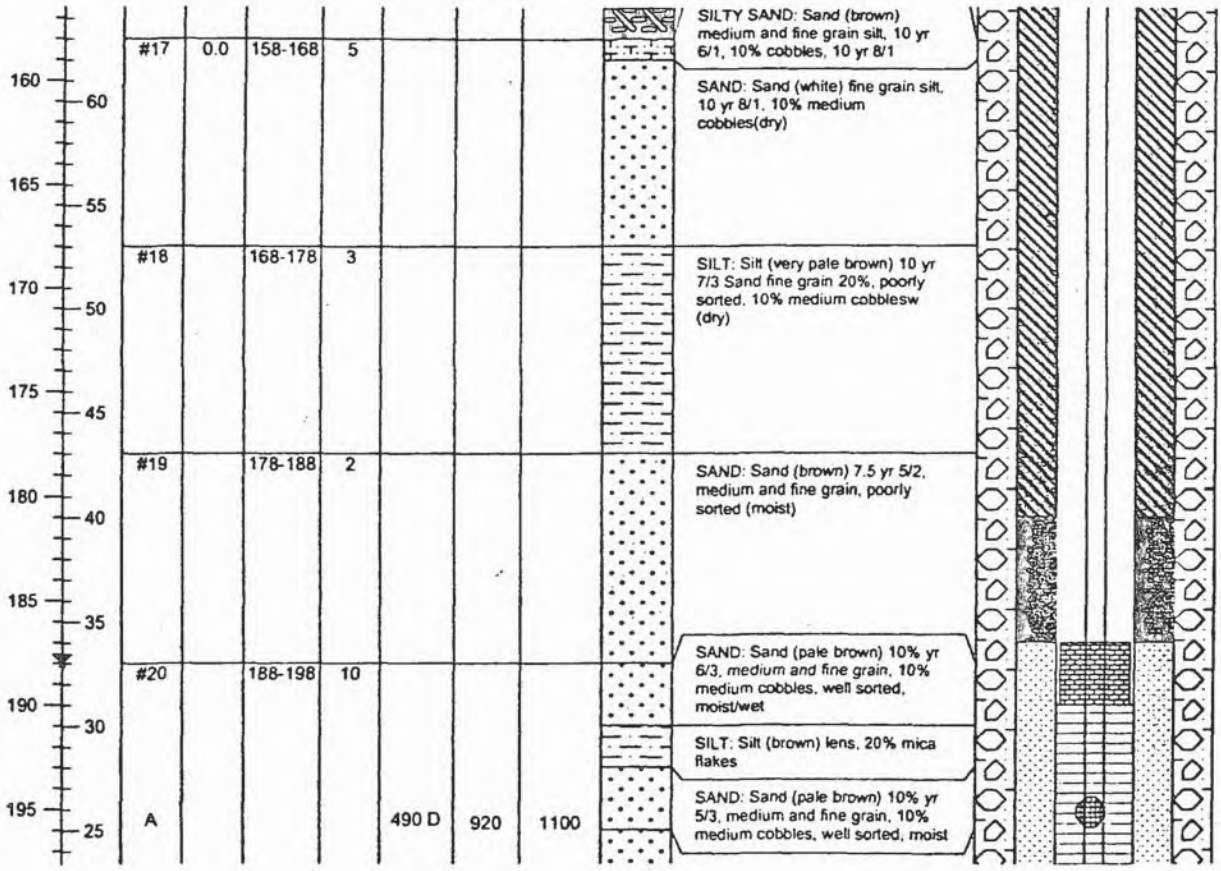
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slo

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302348

US 00019750

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-02 Boring Location: Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

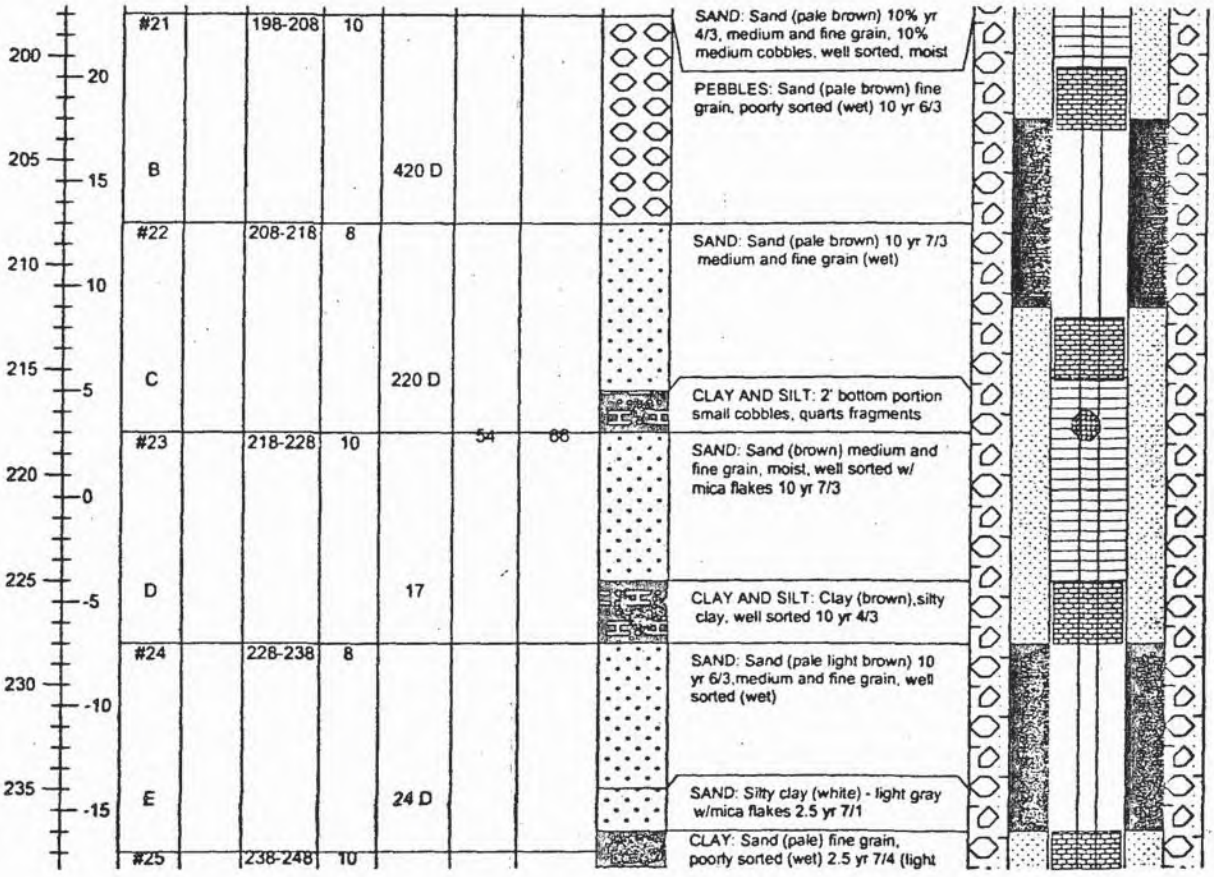
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302349

US 00019751

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-02 Boring Location: Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

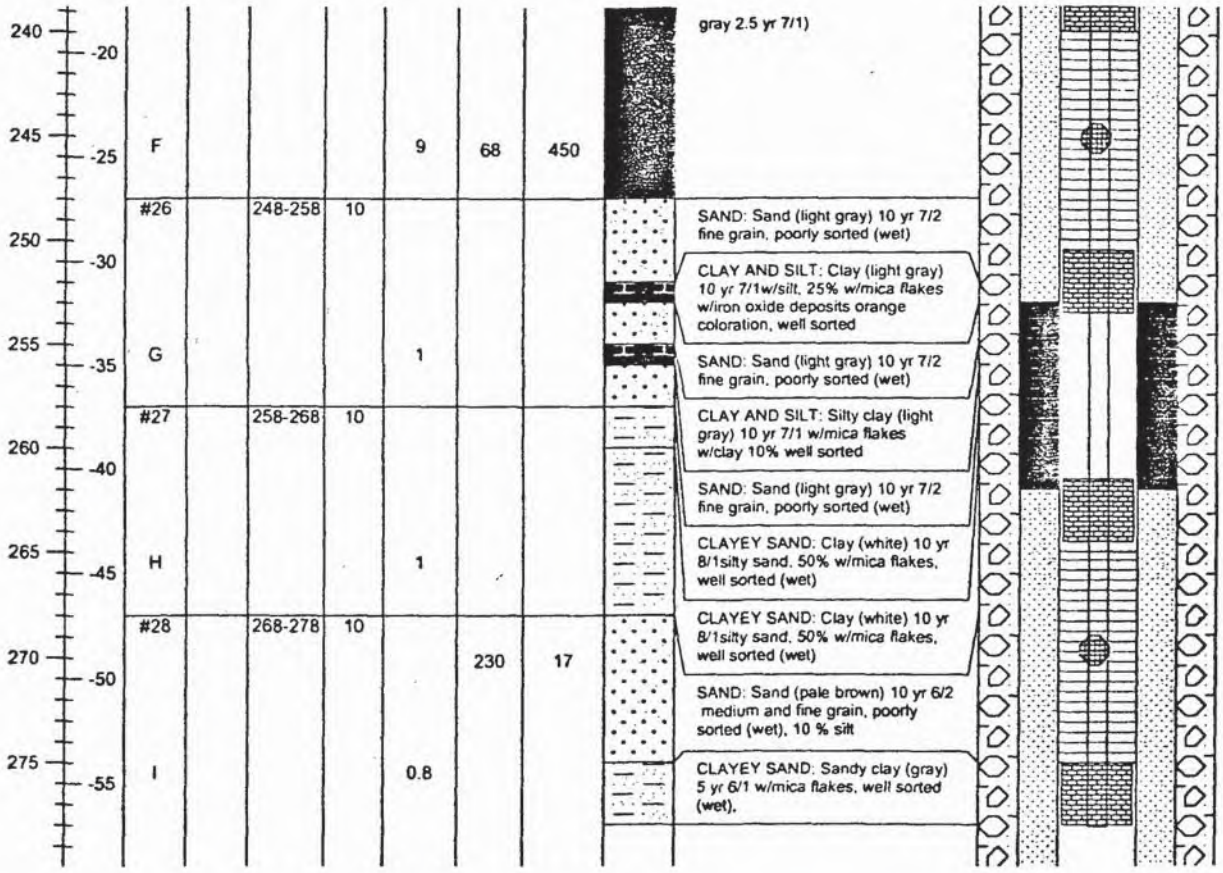
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302350

US 00019752

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-02 **Boring Location:** Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302351

US 00019753

CDM 125 Maiden Lane, 5th Floor New York, NY 10038											Boring Name: MPW-02 Boring Location: Lawrence Aviation Indust.	
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York											Project Name: Lawrence Aviation RI/FS Project Number: 3223-147	
Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log		Material Description	Well Construction
						Screening	March 2005	May 2005				

280 __

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302352

US 00019754

Time ONSITE: 0700 to 1730 = 10.5 hrs.

302353

Waterloo System Installation Log

Client: USEPA | Borehole Ø & Depth: 4" + 279.91' | Date: 2/2/05

Site: LAI | Casing Depth: n/a | Sheet No.: 1 OF 1

Borehole No.: MW-02 | Depth to Water: 185.17 ft. BGS @ 1010 | Approved: (CS) MAB

Time	Unit	In	Depth to Top	Notes
	FEET			
	0.1	✓	278	BASE PLUG
	3	✓	275	Packer
	5	✓		5' Casing
1030	0.8	✓✓	269.5	PORT (VWP, 3P) ZONE 4
	5	✓		5' Casing
	3	✓	261.5	Packer
	5	✓		5' Casing
	2	✓		2' Casing
	1	✓		1' Casing
	3	✓	250.5	Packer
	5	✓		5' Casing
1052	0.5	✓✓	248	PORT (VWP, 3P) Zone 3
	5	✓		5' Casing
	3	✓	237	# PACKER
	5	✓		5' Casing
	2+2	✓✓		2' Casing x 2
	3	✓	225	Packer
	5	✓		5' Casing
	2+2	✓		2' Casing x 2
1220	3	✓✓	217.5	PORT (VWP, 3P) (Zone 2)
	2	✓		2' Casing
	3	✓	212.5	PACKER
	5	✓		5' Casing
	2+2	✓		2' Casing x 2
	3	✓	200.5	PACKER
	5	✓		5' Casing
337	0.5	✓✓	195	PORT (VWP, 3P) (Zone 1)
	5	✓		5' Casing
	3	✓	187	PACKER
	10 (1)	✓		10' Casing
	10 (2)	✓		
	10 (3)	✓		1540, all downhole
	10 (4)	✓		
	10 (5)	✓		Zone 1 DTW 184.42
	10 (6)	✓		Zone 2 184.79
	10 (7)	✓		Zone 3 184.97
	10 (8)	✓		Zone 4 185.37
	10 (9)	✓		
	10 (10)	✓		
	10 (11)	✓		
	10 (12)	✓		
	10 (13)	✓		
	10 (14)	✓		
	10 (15)	✓		10' PVC Casing
	10 (16)	✓		
	10 (17)	✓		
	10 (18)	✓		
	10 (19)	✓		

N=3-3

OK? CHECK AGAINST FACTORY CAL

Equipment Required

Unit	#	Unit	#
10 ft Casing	19	PVC Port (Single)	/
5 ft Casing	10	PVC Port (Double)	/
2 ft Casing	5	SS Port (Single)	/
1 ft Casing	1	SS Port (Double)	4
Base Plug	1	Double Valve Pump	/
Dow Packer	8	Bladder Pump	4
Bentonite Packer	/	VW Piezometer	4
Hydraulic Packer	/	Well Head Manifold	1
SS Support Cable	310		
TRANSDUCER LINE	1040		
Teflon lined LDPE tubing	2000'		

2/2/05 TIME AM 2274

04 – Reading Before Installation

Zone	Piezo Serial #	AM Reading	1104 Temp (C)
1	14339	~~14334.8907.8~~	~~1008~~ 3.2
2	14344	8581.1	1008 1.7
3	14628	9264.4	1008 2.2
4	14640	9240.2	1008 1.6
5			
6			
7			
8			

CABLE LENGTH

225'
245'
275'
269.5
300
40
2405'

04 Reading After Installation

Zone	Piezo Serial #	Reading	Temp (C)
✓ 1	14339	8643.2	12.1
✓ 2	14344	7735.2	11.8
✓ 3	14628	7640.1	11.8
✓ 4	14640	6852	11.7
5			
6			
7			
8			

Head

10.58
32.7
60.03
84.13

Borehole Water Level (after installation)	

Comments: 2 rolls 1000' tubing
Zone 4 XO OFFSET 0.46' + 27.4mm.
Zone 3 XO OFFSET 0.45' + 27.4mm
Zone 2 XO OFFSET 0.46
Zone 1 XO OFFSET 0.46

ALL CASING IS PVC.

AM 2124 Final stickup is 35 3/4", target 36"

NOTES BY JN DOUGHERTY 2/2/05

TARGET CONTAINMENT PSI TO SURFACE

Client: CDM				Well No:		MPW-02	Prepared By:		RB	
Install Order:		2		SWL:		TBS			6-Dec (2004)	
Zones				4		3		2		1
Drillhole Depth			280							
Base Plug at:	SS Plug		278							
(SS Plug or PVC Plug)										
Depth to Top of	Dual	Ports		269.5		245		217.5		195
(Single or Dual)										
Depth to Top of	3.83	Packers								
(3.83 or 3.58 or 2.86)										
Desired Stick-up			-3							

Interval Diff. (feet)	Depth to Top (feet)	Unit Length (feet)	Qnty.	Description of Component	Zone No.	(feet)	Monitoring Equipment: 1/2 X 3/8 Tubing OR 5/8 X 1/2 Tubing OR ... VWP Transducer ... Double Valve Pump OR Bladder Pump Description
	280			Depth to Btm.			
0.1	278.0	0.1	1	Base Plug			Manifold Type
	275.0	3.0	1	Packer			
							Send WI Hd O Tube
			1	5' PVC Casing			1 Multipurge
							Pressure Sealed
5.4	269.5	0.5	1	Port	4	300	VWP Transducer Bladder Pump
			1	5' PVC Casing			
5.0	261.5	3.0	1	Packer			
			1	5' PVC Casing			
			1	2' PVC Casing			
			1	1' PVC Casing			
8.0	250.5	3.0	1	Packer			
			1	5' PVC Casing			
5.0	245.0	0.5	1	Port	3	275	VWP Transducer Bladder Pump
			1	5' PVC Casing			
	237	3	1	Packer			
5.0	~~247.0~~	~~2.5~~					
			1	5' PVC Casing			
			2	2' PVC Casing			
9.0	225.0	3.0	1	Packer			
			1	5' PVC Casing			
			1	2' PVC Casing			
7.0	217.5	0.5	1	Port	2	245	VWP Transducer Bladder Pump
			1	2' PVC Casing			
2.0	212.5	3.0	1	Packer			
			1	5' PVC Casing			
			2	2' PVC Casing			
9.0	200.5	3.0	1	Packer			
			1	5' PVC Casing			
5.0	195.0	0.5	1	Port	1	225	VWP Transducer Bladder Pump
			1	5' PVC Casing			
5.0	187.0	3.0	1	Packer			
			19	10' PVC Casing			20 onsite, 1 not used, no clamp
190.0	-3.0						

TOTALS			
19	10' PVC Casing	1045	1/4" X 0.17" Red LDPE Tubing
10	5' PVC Casing	1045	1/4" X 0.17" Sample LDPE Tubing
7	2' PVC casing	1045	VWP Transducer Cable
1	1' PVC casing	1	Dual 3/8" Stem Port Assembly
1	SS Plug	4	Bladder Pump
310	3/16" dia SS Support Cable	8	3.83 Packers
		4	VWP Transducer

1/4/05 15:18
Macintosh HD:Desktop Folder:[401 CDM Dec6]Sum TLS

110 ml/stroke Drive 205 Vent 145 140 117

110 ml/stroke Drive 185 Vent 145 130 106

110 ml/stroke Drive 165 Vent 145 120 95

110 ml/stroke Drive 165 Vent 145 110 85

10 FOOTERS
1 19

185.4' 11.7

184.9' 11.7

184.8' 11.7

184+' 12.1

2 rolls 1000' tubing used.

6 5' on hand.
4
10

302354

2/2/05 Initial Head Reading Calc. MW-02

Zone 1 S/N # 14339
8507.8 (reading at surface)
8643.2 (reading at depth)
264.6

264.6 digits x 0.01736 psi/digit = 4.58 psi

2.31 ft/psi x 4.58 psi = 10.58 ft = head.

DTW = 195' (installed depth) − 10.58' = 184.42'

Zone 2 S/N 14344
8578.4 (reading at surface)
7735.2 (reading at depth)
845.9 digits

0.01674 psi/digit x 845.9 digits = 14.16 psi

14.16 psi x 2.31 ft/psi = 32.71' above XD

DTW = 217.5 − 32.71' = 184.79
(installed depth of XD.

Zone 3 initial reading: 7264.4
reading at depth: 7640.1
1624.3

1624.3 digits x 0.01600 psi/digit = 25.99 psi

25.99 psi x 2.31 Ft/psi = 60.03' head

DTW = 245 ft (installed depth) − 60.03 = 184.97

Zone 4 initial reading: 9240.2
reading at depth: 6852
2388.2 digits

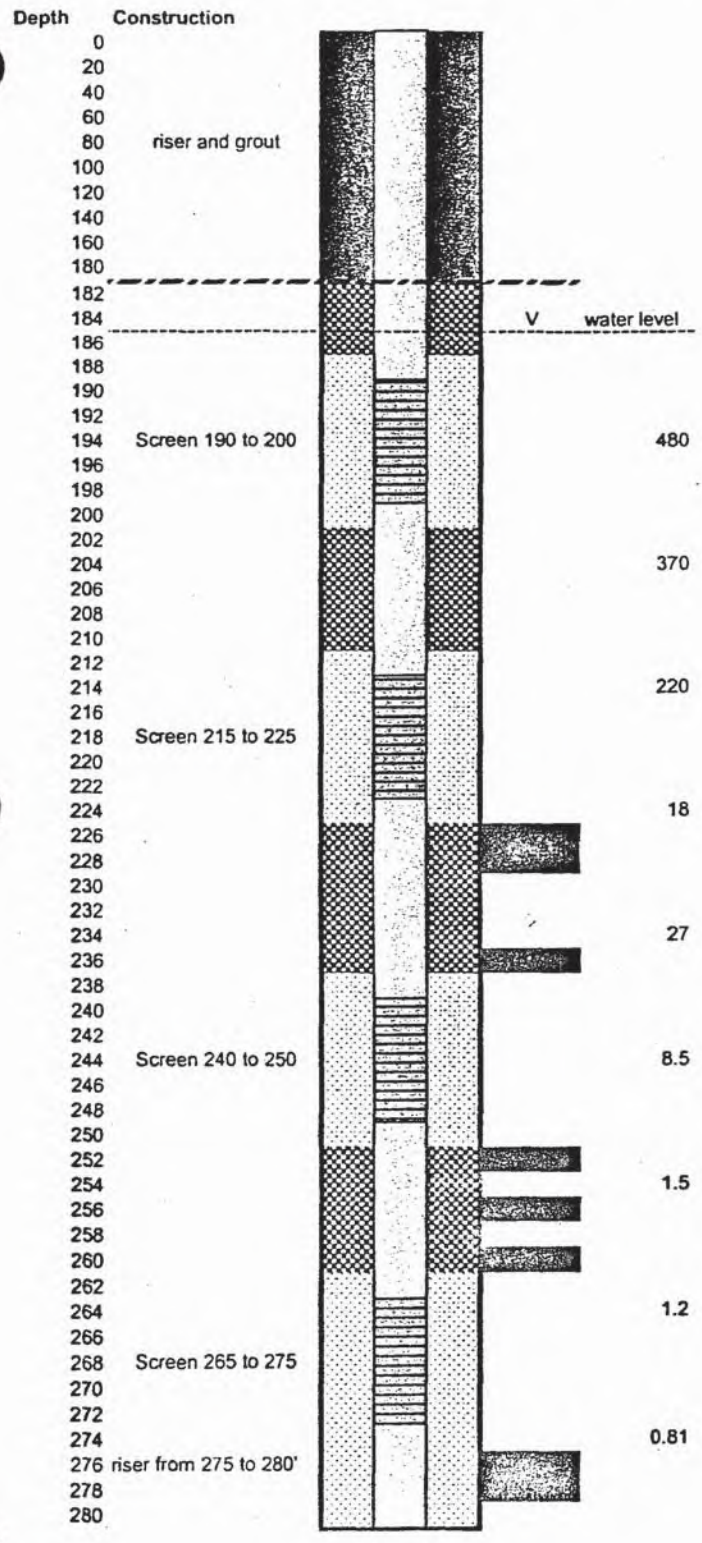
DTW = 269.5 (installed depth) − 84.13 = 185.37

2388.2 digits x 0.015525 psi/digit = 36.42 psi
36.42 psi x 2.31 ft/psi = 84.13 ft head

302355

US 00019757

MPW-02



302356

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA MW-02 Hone 1

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 7, 2004

Serial Number: 04-14339

Temperature: 22.8 °C

Pressure Range: 350 kPa

†Barometric Pressure: 998.8 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Eric

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8914	8915	8915	0.114	0.03	0.050	0.01
70.0	8330	8330	8330	70.06	0.02	70.09	0.03
140.0	7747	7749	7748	139.7	-0.08	139.9	-0.02
210.0	7160	7161	7161	210.0	0.01	210.2	0.05
280.0	6576	6576	6576	280.0	-0.01	280.0	0.00
350.0	5990	5990	5990	350.1	0.03	350.0	-0.01

a) Linear Gage Factor (G): 0.1197 **(kPa/ digit)** **Regression Zero:** 8915

Polynomial Gage Factors: **A:** -1.093E-07 **B:** -0.1180 **C:** 1061.00

Thermal Factor (K): -0.0932 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.01736 **(psi/ digit)**

Polynomial Gage Factors: **A:** -1.58479E-08 **B:** -0.01712 **C:** 153.89

Thermal Factor (K): -0.01351 **(psi/ °C)**

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 8895 Temp(T_0): 22.7 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302357

US 00019759

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

MW-02 Form 2

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 7, 2004

Serial Number: 04-14344

Temperature: 22.8 °C

Pressure Range: 350 kPa

†Barometric Pressure: 998.8 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: EPice

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8588	8588	8588	0.162	0.05	0.035	0.01
70.0	7983	7984	7984	69.93	-0.02	70.01	0.00
140.0	7377	7378	7378	139.9	-0.04	140.0	0.01
210.0	6770	6771	6771	209.9	-0.02	210.1	0.02
280.0	6163	6163	6163	280.0	0.01	280.1	0.02
350.0	5556	5556	5556	350.1	0.03	350.0	-0.01

(kPa) Linear Gage Factor (G): 0.1154 (kPa/ digit) **Regression Zero:** 8589

Polynomial Gage Factors: A: -1.036E-07 B: -0.1139 C: 986.24

Thermal Factor (K): -0.1258 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.01674 (psi/ digit)

Polynomial Gage Factors: A: -1.50326E-08 B: -0.01653 C: 143.04

Thermal Factor (K): -0.01824 (psi/ °C)

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 8571 Temp(T_0): 22.3 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA MW-02 14628

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14628

Temperature: 22.5 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.6 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: ERica

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9291	9292	9292	0.131	0.04	0.065	0.02
70.0	8658	8659	8659	69.95	-0.01	70.03	0.01
140.0	8024	8024	8024	139.9	-0.02	140.0	0.01
210.0	7390	7390	7390	209.9	-0.04	210.0	-0.01
280.0	6754	6754	6754	280.0	0.00	280.0	0.01
350.0	6118	6119	6119	350.1	0.03	350.0	0.01

Pa) Linear Gage Factor (G): 0.1103 **(kPa/ digit)** **Regression Zero:** 9293

Polynomial Gage Factors: **A:** -9.047E-08 **B:** -0.1089 **C:** 1019.70

Thermal Factor (K): -0.0802 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.01600 **(psi/ digit)**

Polynomial Gage Factors: **A:** -1.31218E-08 **B:** -0.01580 **C:** 147.90

Thermal Factor (K): -0.01163 **(psi/ °C)**

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9253 Temp(T_0): 22.8 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302359

US 00019761

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

Dec-04 MW-02 Zone 4
14640

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14640

Temperature: 22.5 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.6 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Elsa

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9296	9294	9295	-0.030	-0.01	-0.050	-0.01
70.0	8630	8630	8630	69.88	-0.04	69.86	-0.04
140.0	7962	7961	7962	140.2	0.04	140.0	0.01
210.0	7297	7295	7296	210.1	0.03	209.9	-0.02
280.0	6631	6632	6632	280.0	-0.01	280.0	0.00
350.0	5965	5967	5966	349.9	-0.02	350.1	0.03

(kPa) Linear Gage Factor (G): 0.1051 **(kPa/ digit)** **Regression Zero:** 9295

Polynomial Gage Factors: **A:** 5.721E-08 **B:** -0.1060 **C:** 980.35

Thermal Factor (K): 0.0233 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.01525 **(psi/ digit)**

Polynomial Gage Factors: **A:** 8.29833E-09 **B:** -0.01537 **C:** 142.19

Thermal Factor (K): 0.00339 **(psi/ °C)**

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9253 Temp(T_0): 22.9 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302360

MPW-03

302361

US 00019763

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-03 **Boring Location:** Keewaydin Ct.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147
Drilling Contractor: Uni-Tech Drilling Co. **Drilling Method:** Rotasonic **Sample Method:** Vibration Extraction **Date Started:** 08/09/2004 **Date Completed:** 02/03/2005 **Logged By:** Adrian Steinhauff (P.W.GROSSER, INC.)	**Northing:** 280017.573 **Easting:** 1241315.641 **Surface Elevation (ft. above msl):** 189.73 **Total Depth (ft bgs):** 250 **Initial Depth to Water (ft bgs):** **Field Screening Instrument:** PID

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
0		#1	0.0	0-7	2.0					TOPSOIL: Topsoil	
5	185									SAND PEBBLES: Medium to fine grain sand, poorly sorted, dry, 2% medium to large cobbles, 10YR 5/6 -Yellowish brown	
		#2	0.0	7-17	4.5					SAND PEBBLES: Medium to fine grain sand, poorly sorted, dry, 10% medium to large cobbles, 10YR 6/4 -Light yellowish brown	
10	180										

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302362

US 00019764

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-03 Boring Location: Keewaydin Ct.; Port J.,NY
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
15	175										
		#3	0.0	17-27	5.0					SAND PEBBLES: Medium to fine grain sand, poorly sorted, dry, 20% medium to large cobbles, 10YR 5/4 -Yellowish brown	
20	170										

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

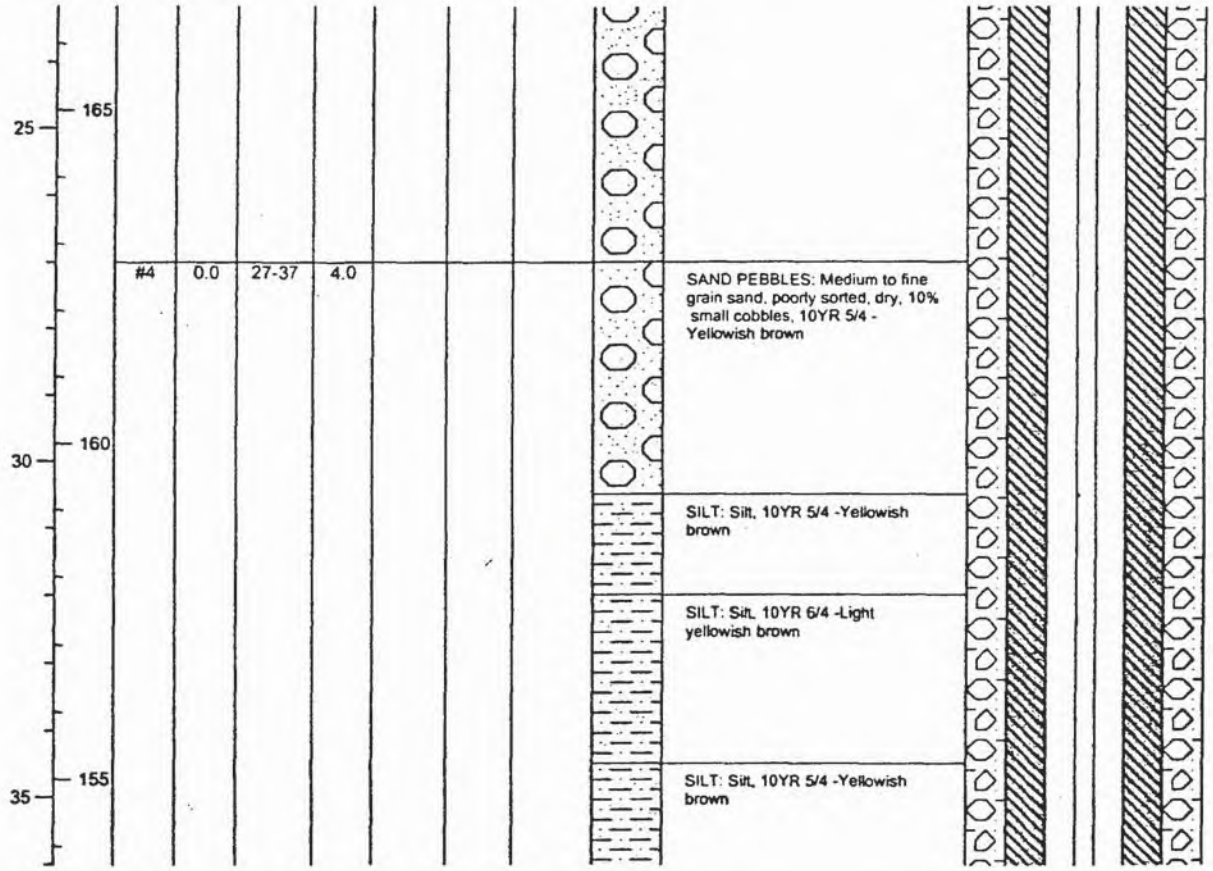
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302363

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-03
	Boring Location: Keewaydin Ct.; Port J.,NY
Client: U.S. Environmental Protection Agency	**Project Name:** Lawrence Aviation RI/FS
Site Location: Port Jefferson Station, New York	**Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302364

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-03 **Boring Location:** Keewaydin Ct.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
		#5	0.0	37-47	2.5					SAND: Medium to fine grain sand, poorly sorted, dry, 10YR 7/3 -Very pale brown	
40	150										
45	145	#6	0.0	47-57	8.0					SAND PEBBLES: Fine grain sand, poorly sorted, moist, 20% small to large cobbles, 10YR 5/4 -Yellowish brown	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

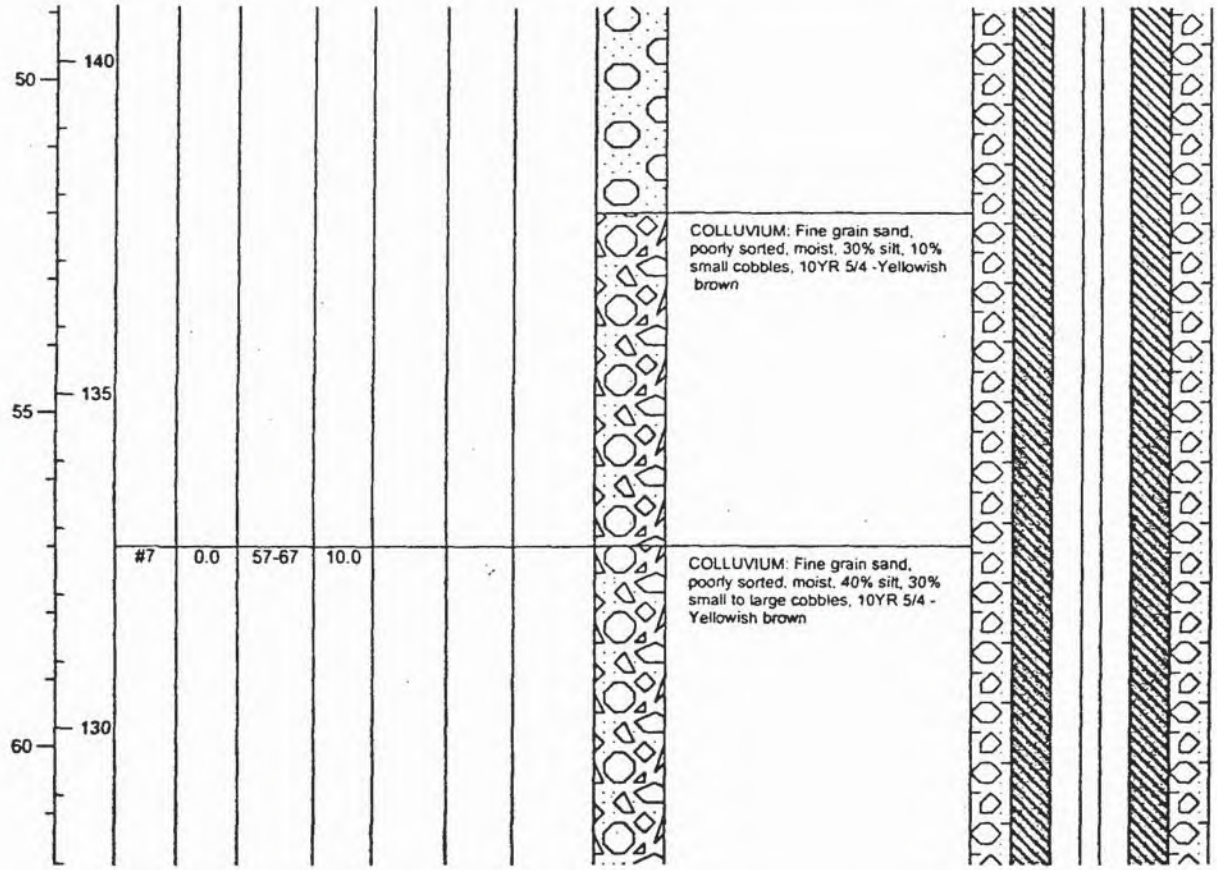
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced. In March and May 2005 groundwater samples were collected from the completed multiport wells.

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-03
Client: U.S. Environmental Protection Agency	**Boring Location:** Keewaydin Ct.; Port J.,NY
Site Location: Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS
	Project Number: 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
50	140										
										COLLUVIUM: Fine grain sand, poorly sorted, moist, 30% silt, 10% small cobbles, 10YR 5/4 -Yellowish brown	
55	135										
		#7	0.0	57-67	10.0					COLLUVIUM: Fine grain sand, poorly sorted, moist, 40% silt, 30% small to large cobbles, 10YR 5/4 - Yellowish brown	
60	130										



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302366

US 00019768

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-03 **Boring Location:** Keewaydin Ct.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
65	125										
		#8	0.0	67-77	9.0					SAND PEBBLES: Coarse to fine grain sand, well sorted, moist, 20% small to large cobbles, 10YR 8/1 - White	
70	120									SAND PEBBLES: Coarse to fine grain sand, well sorted, moist, 20% small to large cobbles, 10YR 3/6 - Dark yellowish brown	
										SAND PEBBLES: Coarse to fine	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302367

US 00019769

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-03
	Boring Location: Keewaydin Ct.; Port J.,NY
Client: U.S. Environmental Protection Agency	Project Name: Lawrence Aviation RI/FS
Site Location: Port Jefferson Station, New York	Project Number: 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
75	115									grain sand, well sorted, moist, 20% small to large cobbles, 10YR 7/2 - Light gray	
										SAND PEBBLES: Coarse to fine grain sand, well sorted, moist, 20% small to large cobbles, 10YR 4/4 - Dark yellowish brown	
		#9	0.0	77-87	7.0					SAND PEBBLES: Coarse to fine grain sand, 15% fine grain, poorly sorted, moist, 5% medium cobbles, 10YR 8/1 -White	
80	110										
										SAND PEBBLES: Coarse to fine grain sand, 15% fine grain, poorly sorted, moist, 5% medium cobbles, 10YR 5/4 -Yellowish brown	
85	105										
		#10	0.0	87-97	7.0					SAND: Medium to fine grain sand,	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302368

US 00019770

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-03 **Boring Location:** Keewaydin Ct.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
90	100									poorly sorted, moist, 10YR 8/1 - White	
95	95	#11	0.0	97-107	6.0					SAND PEBBLES: Medium to fine grain sand, poorly sorted, moist, 5% small cobbles, 10YR 6/4 -Light yellowish brown	
100	90										

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302369

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-03 **Boring Location:** Keewaydin Ct.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
105	85	#12	0.0	107-117	8.0					SAND PEBBLES: Medium to fine grain sand, poorly sorted, moist, 5% small cobbles, 10YR 6/3 -Pale brown	
110	80										

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Concrete
- Sand Pack
- Waterloo Packer (not to scale)
- Cement/Bentonite Grout
- Natural Material
- Bentonite Seal
- 4-inch Stainless Steel Well Casing
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302370

US 00019772

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-03 **Boring Location:** Keewaydin Ct.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
115	75										
		#13	0.0	117-127	5.0					SAND: Medium to fine grain sand, well sorted, moist, 10YR 6/3 -Pale brown	
										COLLUVIUM: Sand, silt, with 20% small to large cobbles, 10YR 8/3 - Very pale brown	
120	70									SAND: Medium to fine grain sand, well sorted, moist, 10YR 5/4 - Yellowish brown	
										COLLUVIUM: Sand, silt, moist, with 20% small to large cobbles, 10YR 8/3 -Very pale brown	
										SAND: Medium to fine grain sand, well sorted, moist, 10YR 5/4 - Yellowish brown	
125	65										

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302371

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-03 Boring Location: Keewaydin Ct.; Port J.,NY
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
		#14	0.0	127-137	7.0					SAND: Medium to fine grain sand, poorly sorted, moist, 10YR 6/3 - Pale brown	
130	60									SAND AND SILT: Medium to fine grain sand, 10YR 6/3 -Pale brown, interbedded with silt lenses every 2" containing mica flakes, 7.5 YR 8/1) -White	
135	55	#15	0.0	137-147	10.0					CLAY AND SILT: Silt with 20% clay, silty clay, with mica flakes, well sorted, Gley 2 7/1 -Light greenish gray to light bluish gray	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302372

US 00019774

CDM

125 Maiden Lane, 5th Floor
New York, NY 10038

Boring Name: MPW-03
Boring Location: Keewaydin Ct.; Port J.,NY

Client: U.S. Environmental Protection Agency
Site Location: Port Jefferson Station, New York

Project Name: Lawrence Aviation RI/FS
Project Number: 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches)	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
140	50									CLAY AND SILT: Silt with 20% clay, silty clay, with mica flakes, well sorted, 10YR 7/1 -Light gray	
										PT: Silt with 20% clay, silty clay, with mica flakes, well sorted, 5YR 2.5/1 -Black, organic silty with clay	
145	45									CLAY AND SILT: Silt with 30% clay, silty clay, with mica flakes, well sorted, 10YR 8/1 -White	
										PT: Silt with 30% clay, silty clay, with mica flakes, well sorted, 5YR 2.5/1 -Black, organic silt with clay	
		#16	0.0	147-157	10.0					SAND: Medium to fine grain sand, well sorted, moist 10YR 7/4 -Very pale brown	
150	40									SILTY SAND: Fine grain sand, with silt containing mica flakes, dry, 10YR 8/2 -Very pale brown	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-03
	Boring Location: Keewaydin Ct.; Port J.,NY
Client: U.S. Environmental Protection Agency	Project Name: Lawrence Aviation RI/FS
Site Location: Port Jefferson Station, New York	Project Number: 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
	155									CLAY AND SILT: Silty clay, 2.5YR 8/1 -White	
	35									SAND: Medium to fine grain sand, 10YR 4/4 - Dark yellowish brown	
										SILTY SAND: Fine grain sand, with silt containing mica flakes, dry, 10YR 8/2 -Very pale brown	
		#17	0.0	157-167	10.0					SAND: Medium to fine grain sand, poorly sorted, wet, 10YR 8/1 - White	
	160									SAND: Medium to fine grain sand, poorly sorted, wet, 10YR 7/4 -Very pale brown	
	30										

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

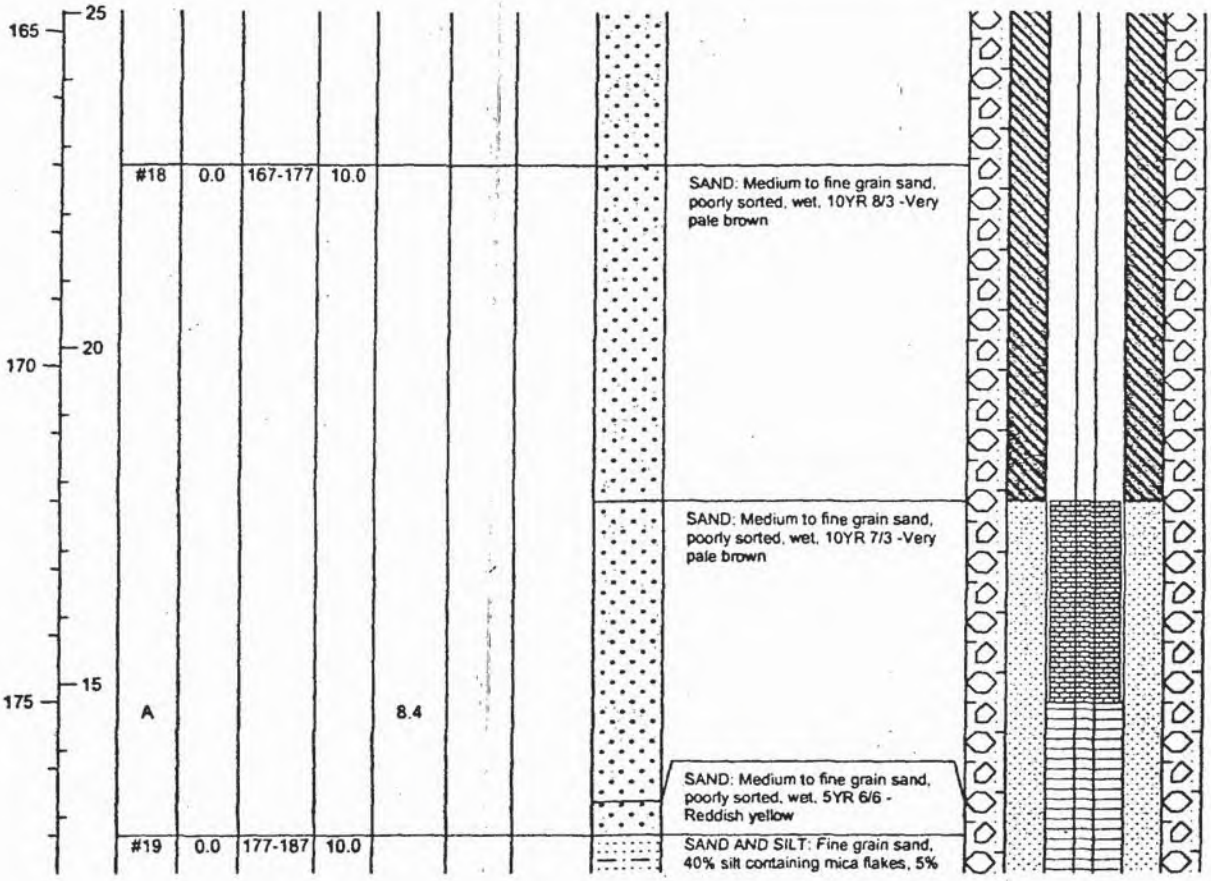
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302374

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-03 **Boring Location:** Keewaydin Ct.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302375

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-03 **Boring Location:** Keewaydin Ct.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
0	190									clay, 10YR 8/1 -White, and medium to fine grain sand, 10% silt, 10YR 5/4 -Yellowish brown, interbedded Note. Very difinitive layers every 2 - 4 inches per layer of white and yellowish brown sand to silt	
5	185	B				17	1.4	1.6			
		#20	0.0	187-197	10.0						
10	180										

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

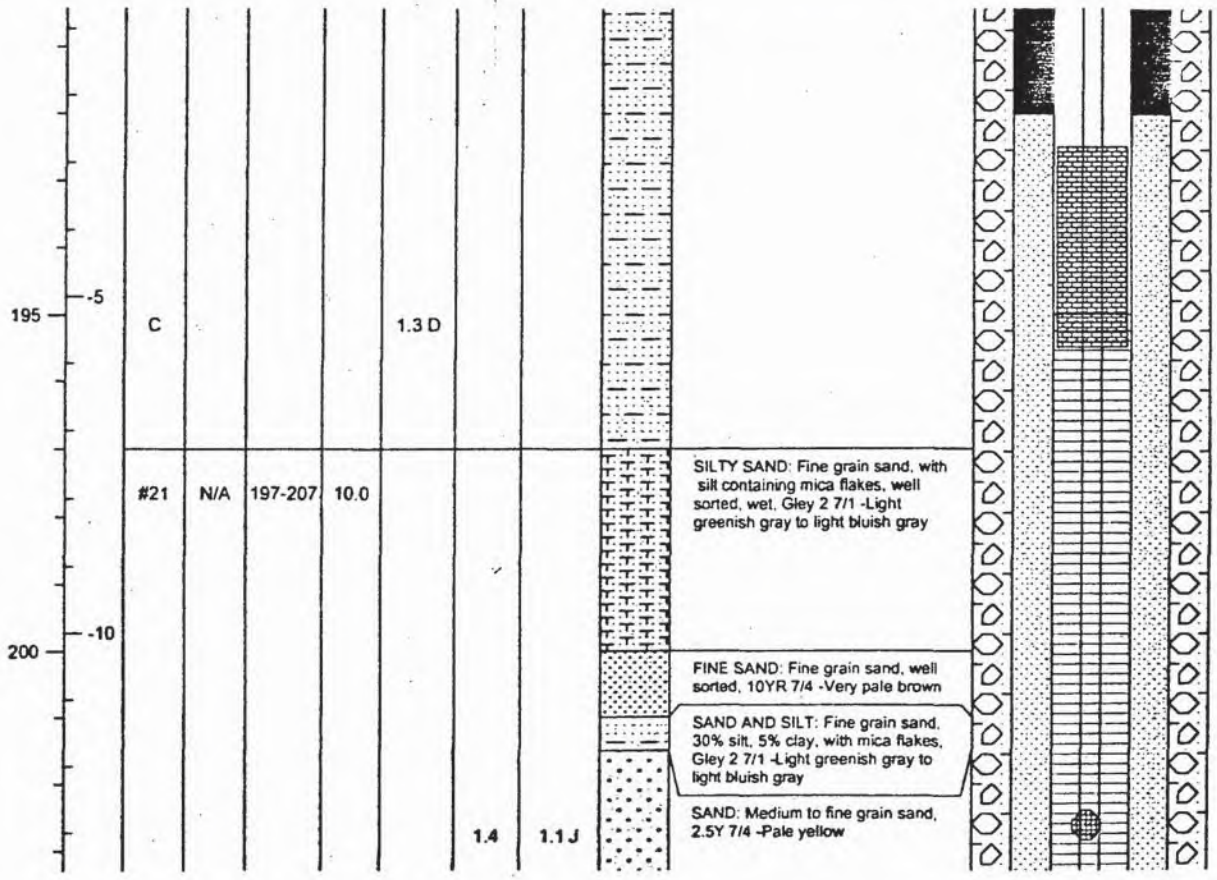
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302376

US 00019778

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-03 **Boring Location:** Keewaydin Ct.; Port J.,NY
Client: U.S. Environmental Protection Agency		**Project Name:** Lawrence Aviation RI/FS
Site Location: Port Jefferson Station, New York		**Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

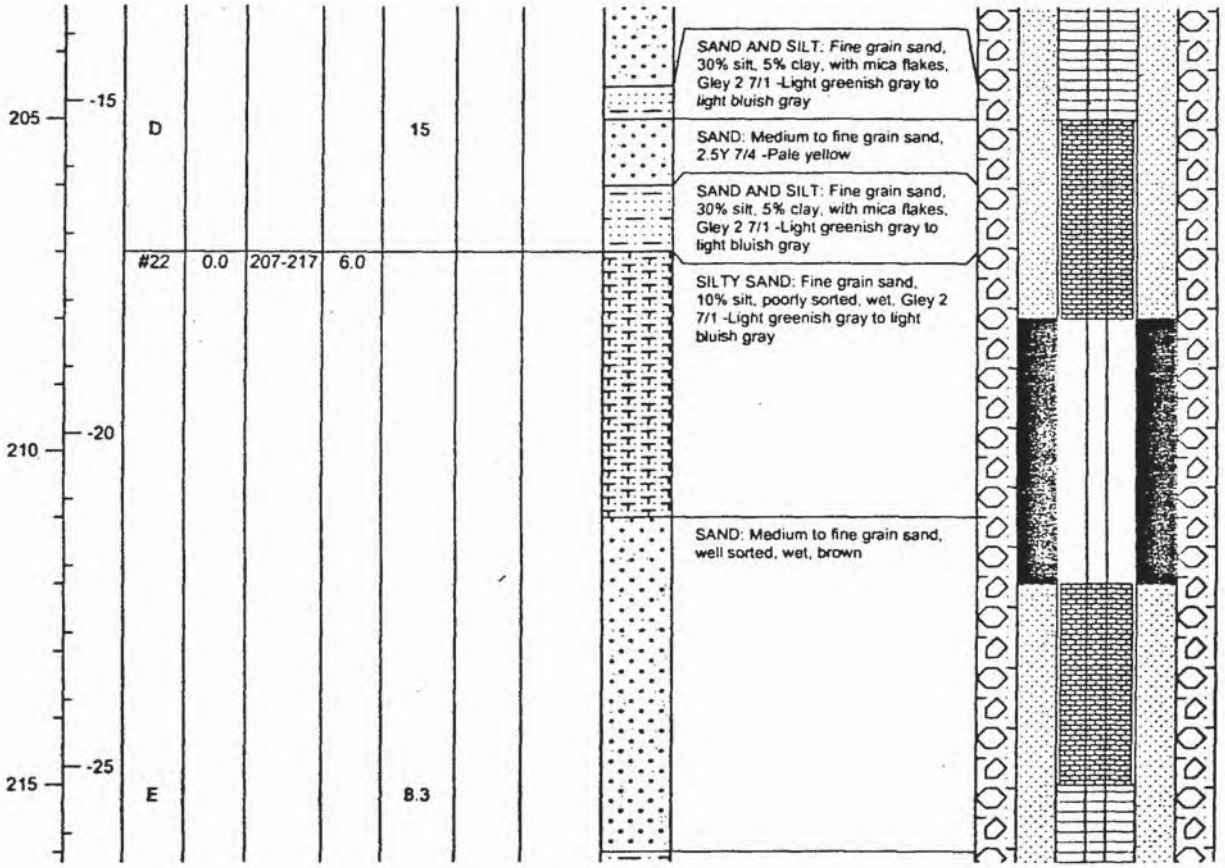
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302377

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-03 **Boring Location:** Keewaydin Ct.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

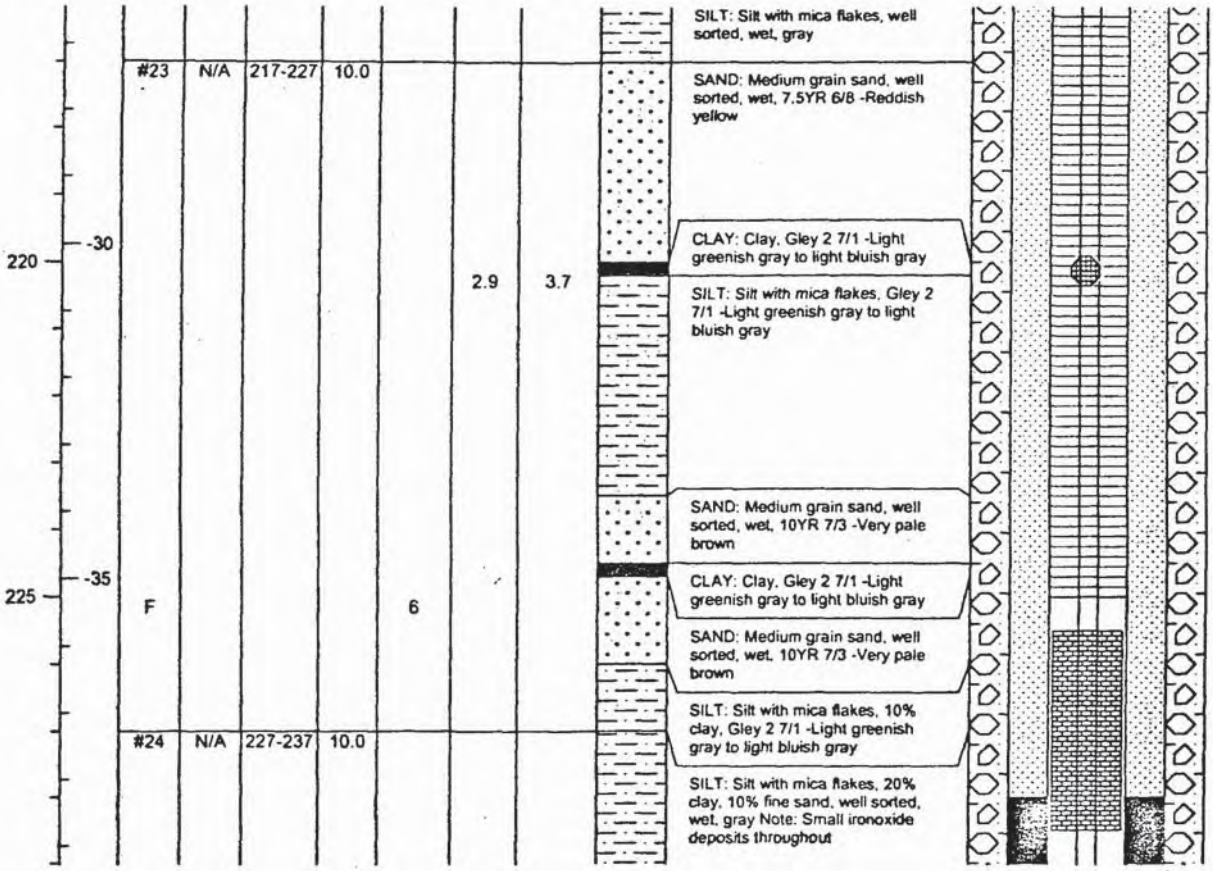
- Waterloo Sampling Port
- Concrete
- Sand Pack
- Waterloo Packer (not to scale)
- Cement/Bentonite Grout
- Natural Material
- Bentonite Seal
- 4-inch Stainless Steel Well Casing
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302378

US 00019780

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-03 **Boring Location:** Keewaydin Ct.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

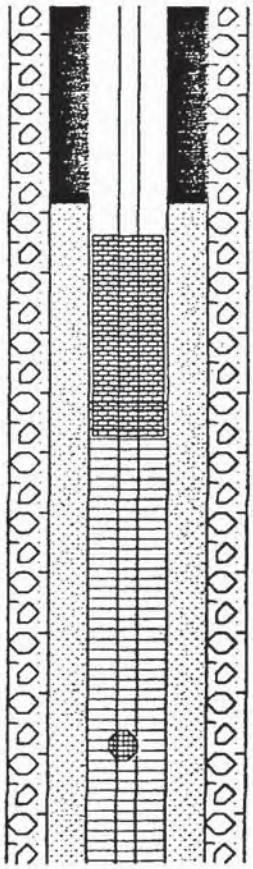
Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302379

US 00019781

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-03 **Boring Location:** Keewaydin Ct.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
230	-40										
235	-45	G				12					
		#25	N/A	237-247	10.0						
240	-50						0.54	2 J			



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Concrete
- Sand Pack
- Waterloo Packer (not to scale)
- Cement/Bentonite Grout
- Natural Material
- Bentonite Seal
- 4-inch Stainless Steel Well Casing
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302380

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-03 **Boring Location:** Keewaydin Ct.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
245	-55	H				13					
250	-60										

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302381

Time onsite: 0700 to 1720 = 10 hr.

AD 2/3/05

Waterloo System Installation Log

Client: USEPA | Borehole Ø & Depth: 4" Ø to 248.4' bgs. | Date: 2/3/0405

Site: LAI | Casing Depth: n/a | Sheet No.: 1 OF 1

Borehole No.: MW-03 | Depth to Water: 157.57 @ 0943 ftBGS. | Approved: (TS) (MD)

Unit FEET	In	Depth to Top	Notes
0.1	✓	248	Base Plug
3	✓	245	Packer
2	✓		2' PVC Casing
2	✓		2' PVC Casing
0.5	✓✓✓		PORT (VWP, BP) Zone 4
5	✓		5' PVC Casing
3	✓		PACKER
2	✓		2' PVC Casing
2	✓		2' PVC Casing
3	✓		Packer
5	✓		5' PVC Casing
0.5	✓✓✓		PORT (VWP, BP) Zone 3
5	✓		5' PVC Casing
3	✓		PACKER
2	✓		2' PVC Casing
2	✓		2' PVC Casing
3	✓		Packer
2	✓		2' PVC casing
0.5	✓✓✓		PORT (VWP, BP) Zone 2
5	✓		5' PVC Casing
2	✓		2' PVC Casing
3	✓		PACKER
2	✓		2' PVC Casing
2	✓		2' PVC Casing
3	✓		PACKER
5	✓		5' Casing, PVC
0.5	✓✓✓		PORT (VWP, BP) Zone 1
5	✓		5' PVC Casing
3	✓		Packer
10	✓		10' PVC Casing (1)
	✓		(2)
	✓		(3)
	✓		(4)
	✓		(5)
	✓		(6)
	✓		(7)
	✓		(8)
	✓		(9)
	✓		(10)
	✓		(11)
	✓		(12)
	✓		(13)
	✓		(14)
	✓		(15)
	✓		(16)
10	✓		10' PVC Casing (17)
5'			18' PVC Casing

Time: 1025, 1058, 1122

Cal. Check ok? ✓s yes

Equipment Required

Unit	#	Unit	#
10 ft Casing	17	PVC Port (Single)	1
5 ft Casing	6	PVC Port (Double)	1
2 ft Casing	10	SS Port (Single)	1
1 ft Casing	1	SS Port (Double)	4
Base Plug	1	Double Valve Pump	1
Dow Packer	8	Bladder Pump	4
Bentonite Packer		VW Piezometer	4
Hydraulic Packer	1	Well Head Manifold	1
SS Support Cable	275		
TRANSDUCER LINE	945		
Teflon Lined LDPE TUBING 7000'			

04 – Reading Before Installation @ 0926

Zone	Piezo Serial #	Reading	Temp (C)	
1	14337 ✓	9058.4	2.2	205
2	14340 ✓	9232.5	1.5	230
3	14345 ✓	8415.4	1.4	245
4	14624 ✓	8885.1	1.5	265
1 B	Bladder Pump check valve	ok.		
2 B	Bladder Pump check valve	ok.		
3 B	Bladder Pump check valve	ok.		
4 B	Bladder Pump check valve	ok.		

Head

Reading After Installation

Zone	Piezo Serial #	Reading	Temp	
1	14337	8521.5	9.2	22.1
2	14340	7956	10.3	54.9
3	14345	6704.7	10.4	66.0
4	14624	~~6284~~	10.5	88.4
B		6299		
B1	DTW's	~~182.9~~	157.9	
B2		147.52		
B3		151.91		
4		152.03		

Borehole Water Level (after installation)	n/a

Comments 2 x 1000' tubing on 2/3/05

Zone 4 XD OFFSET 0.46' + Ø 27.4mm

Zone 3 0.46' + 27.4mm.

Zone 2 0.45 + 27.4mm.

Zone 1 0.46 + 27.4mm

All in @ 1510

Installed depth is ½" high

302382

= Psi to Surface + 105psi =

= Depth of Port (ft) / 2.31 ft/psi = Psi

NOTES By J Dousharty + Zeb Mahoney 2/3/05

TARGET CONTROL PSI TO SURFACE

Drive 205 Vent 145 130 105 80

Drive 185 Vent 145 120 95

Drive 165 Vent 145 115 90

110 - 1/2" Steel Stroke 145 125 105 80

Client: CDM - Well No: MPW-03 Prepared By: RB

Install Order: 4 SWL: 163FT 6-Dec (2004)

Zones				4		3		2		1
Drillhole Depth			250							
Base Plug at:	SS Plug		248							
(SS Plug or PVC Plug)										
Depth to Top of	Dual	Ports		240.5		220		202.5		180
(Single or Dual)										
Depth to Top of	3.83	Packers								
(3.83 or 3.58 or 2.86)										
Desired Stick-up			-3							

Interval Diff. (feet)	Depth to Top (feet)	Unit Length (feet)	Qnty.	Description of Component	Zone No.	(feet)	Monitoring Equipment 1/2 x 3/8 Tubing OR 5/8 X 1/2 Tubing OR VWP Transducer Double Valve Pump OR Bladder Pump Description
	250			Depth to Btm			
0.1	248.0	0.1	✓	Base Plug			Manifold Type
	245.0	3.0	✓ 1	Packer			
							Stnd Wl Hd O Tube
			✓✓ 2	2' PVC Casing			1 Multipurge Pressure Sealed
4.4	240.5	0.5	✓	Port	4	265	VWP Transducer Bladder Pump
			✓ 1	5' PVC Casing			
5.0	232.5	3.0	✓	Packer			~~SLOT SCREEN~~
			✓✓ 2	2' PVC Casing			
4.0	225.5	3.0	✓	Packer			
			✓ 1	5' PVC Casing			
5.0	220.0	0.5	✓	Port	3	245	VWP Transducer Bladder Pump
			/ 1	5' PVC Casing			
5.0	212.0	3.0	/	Packer			~~SLOT SCREEN~~
			// 2	2' PVC Casing			
4.0	205.0	3.0	/	Packer			
			/ 1	2' PVC Casing			
2.0	202.5	0.5	/	Port	2	230	VWP Transducer Bladder Pump
			/ 1	5' PVC Casing			
			/ 1	2' PVC Casing			
7.0	192.5	3.0	/	Packer			
			/ 2	2' PVC Casing			
4.0	185.5	3.0	/	Packer			
			/ 1	5' PVC Casing			
5.0	180.0	0.5	/	Port	1	205	VWP Transducer Bladder Pump
			1	5' PVC Casing			
5.0	172.0	3.0		Packer			
			17	10' PVC Casing			
			1	5' PVC Casing			
				1' ~~2/3/05~~			
175.0	-3.0						

TOTALS			
✓17	10' PVC Casing	945	1/4" X 0.17" Red LDPE Tubing
✓7	5' PVC Casing	945	1/4" X 0.17" Sample LDPE Tubing
✓10	2' PVC casing	945	VWP Transducer Cable
0	1' PVC casing	✓1	Dual 3/8" Stem Port Assembly
✓1	SS Plug	✓4	Bladder Pump
✓275	3/16" dia SS Support Cable	✓8	3.83 Packers
		✓4	VWP Transducer

8x2' + 2 x 2'S/10

6x5' + 15' = 7x5

12x10' + 5x10

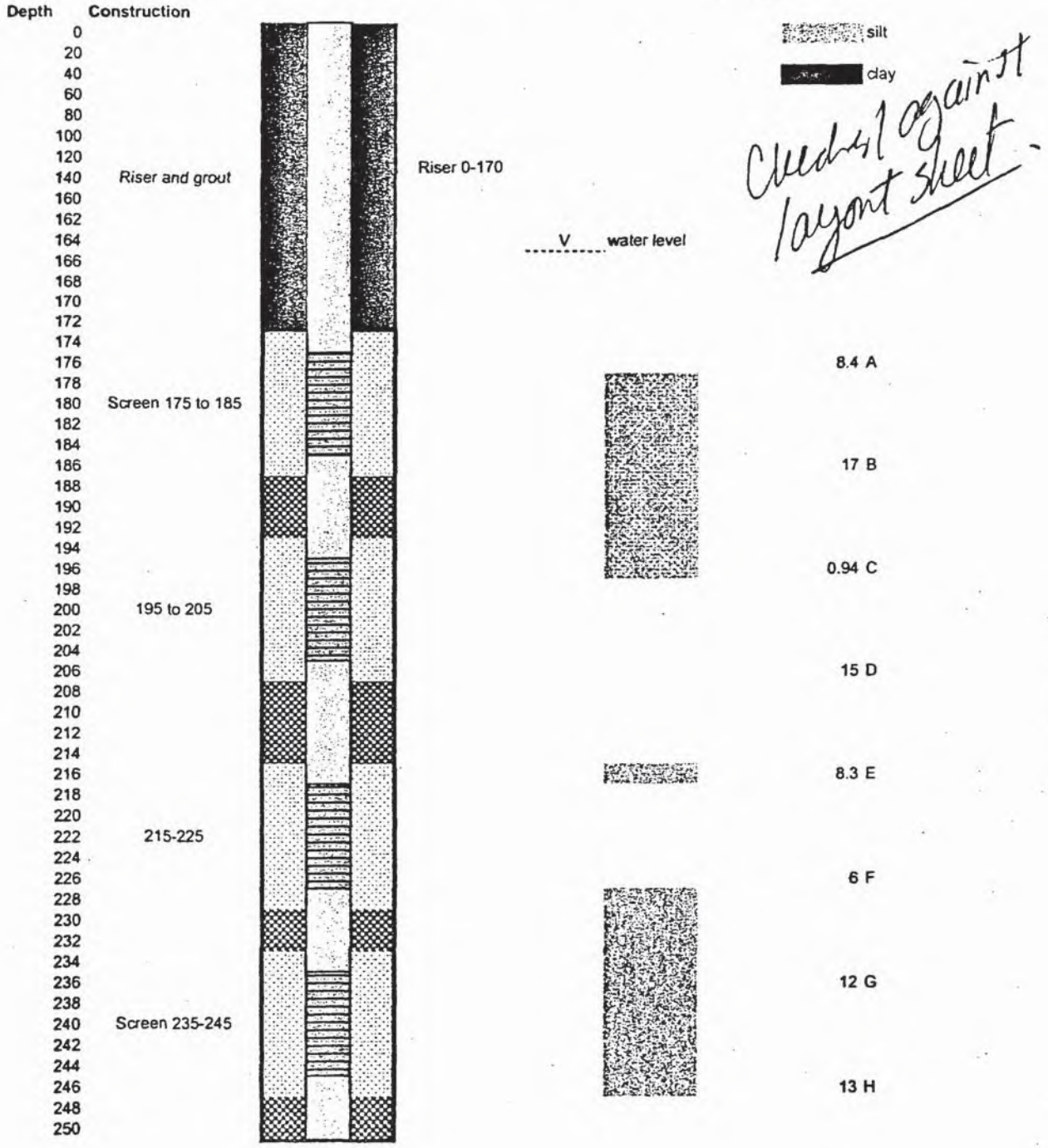
1/4/05 15:18

Macintosh HD:Desktop Folder:[401 CDM Dec6]Sum TLS

Depth to top + Unit Length checks out Ok. JP 2/3/05

302383

MPW-03 V/AM 2/2/06



Check against layout sheet.

302384

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

MW-03 Zone 1

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 7, 2004

Serial Number: 04-14337

Temperature: 22.8 °C

Pressure Range: 350 kPa

†Barometric Pressure: 998.8 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Eric

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9070	9070	9070	0.240	0.07	0.014	0.00
70.0	8503	8502	8503	69.96	-0.01	69.94	-0.02
140.0	7933	7935	7934	139.8	-0.06	140.1	0.03
210.0	7365	7364	7365	209.8	-0.07	209.9	-0.04
280.0	6792	6792	6792	280.1	0.02	280.1	0.04
350.0	6221	6222	6222	350.2	0.05	350.0	0.00

(kPa) Linear Gage Factor (G): 0.1228 **(kPa/ digit)** **Regression Zero:** 9072

Polynomial Gage Factors: **A:** -2.095E-07 **B:** -0.1196 **C:** 1102.41

Thermal Factor (K): -0.0702 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.01782 **(psi/ digit)**

Polynomial Gage Factors: **A:** -3.03897E-08 **B:** -0.01735 **C:** 159.89

Thermal Factor (K): -0.01019 **(psi/ °C)**

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9051 Temp(T_0): 22.4 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

2/3/05 S/n 04-14624

DTW check & transducer check

initial reading: 8885.1

reading at depth: 6299.0

2586.1 digits

2586.1 digits x 0.01481 psi x digit = 38.30 psi

$2.31 \frac{ft.}{psi} \times 38.30 psi = 88.47$ ft. Head.

DTW = installed depth − head

= 240.5′ − 88.47′

= 152.03′

302386

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

MW-03 Fmt 2

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 7, 2004

Serial Number: 04-14340

Temperature: 22.8 °C

Pressure Range: 350 kPa

†Barometric Pressure: 998.8 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Eric

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9245	9244	9245	0.204	0.06	-0.079	-0.02
70.0	8659	8659	8659	70.02	0.00	70.06	0.02
140.0	8074	8074	8074	139.8	-0.07	139.9	-0.02
210.0	7486	7487	7487	209.8	-0.05	210.1	0.02
280.0	6898	6898	6898	280.0	0.00	280.0	0.01
350.0	6309	6309	6309	350.2	0.06	350.0	0.00

(kPa) Linear Gage Factor (G): 0.1192 (kPa/ digit) Regression Zero: 9246

Polynomial Gage Factors: A: -1.946E-07 B: -0.1162 C: 1090.88

Thermal Factor (K): -0.0552 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.01729 (psi/ digit)

Polynomial Gage Factors: A: -2.82208E-08 B: -0.01685 C: 158.22

Thermal Factor (K): -0.00801 (psi/ °C)

Calculated Pressures: Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$**

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9227 Temp(T_0): 22.0 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302387

US 00019789

2/7/05 S/N 04-14624

Initial reading 8414.4

Reading at depth 6704.7

1710.7 digits

1710.7 digits x 0.01723 $\frac{psi}{digit}$ = 29.475 psi

2.31 $\frac{ft.}{psi}$ x 29.475 psi = 68.09 ft. head

DTW = installed depth - head

DTW = 220 - 68.09 = 151.91'

302388

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

MW-03 Zone 3

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 7, 2004

Serial Number: 04-14345

Temperature: 22.8 °C

Pressure Range: 350 kPa

†Barometric Pressure: 998.8 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Eric

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8429	8429	8429	0.362	0.10	-0.022	-0.01
70.0	7843	7843	7843	70.00	0.00	70.07	0.02
140.0	7257	7257	7257	139.6	-0.11	139.9	-0.02
210.0	6668	6667	6668	209.7	-0.09	209.9	-0.02
280.0	6076	6076	6076	280.0	-0.01	280.0	0.01
350.0	5483	5484	5484	350.4	0.11	350.0	0.01

(a) Linear Gage Factor (G): **0.1188** (kPa/ digit) Regression Zero: **8432**

Polynomial Gage Factors: A: **-3.332E-07** B: **-0.1142** C: **986.17**

Thermal Factor (K): **-0.1051** (kPa/ °C)

(psi) Linear Gage Factor (G): **0.01723** (psi/ digit)

Polynomial Gage Factors: A: **-4.83315E-08** B: **-0.01656** C: **143.03**

Thermal Factor (K): **-0.01524** (psi/ °C)

Calculated Pressures: Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$**

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 8411 Temp(T_0): 22.2 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302389

US 00019791

2/3/05 04- s/n 14340

DTW calc. & xD function check.

initial reading 9232.5

reading at depth 7956.0

1376.5 digits

1376.5 digits x 0.01729 $\frac{psi}{digit}$ = 23.8 psi

23.8 psi x 2.31 $\frac{ft}{psi}$ = 54.98 ft. Head

installed depth − head = DTW

202.5' − 54.98' = 147.52

Corrected depth to water 151.52.

302390

US 00019792

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

MW-03 Zone 4

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14624

Temperature: 22.5 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.6 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: ERica

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8909	8909	8909	0.029	0.01	-0.053	-0.02
70.0	8223	8223	8223	70.06	0.02	70.07	0.02
140.0	7538	7538	7538	140.0	0.00	140.1	0.01
210.0	6854	6853	6854	209.9	-0.04	209.9	-0.04
280.0	6167	6167	6167	279.9	-0.02	280.0	-0.01
350.0	5480	5479	5480	350.1	0.04	350.0	0.00

(kPa) Linear Gage Factor (G): 0.1021 (kPa/ digit) **Regression Zero: 8909**

Polynomial Gage Factors: A: -5.233E-08 B: -0.1013 C: 906.85

Thermal Factor (K): -0.0965 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.01481 (psi/ digit)

Polynomial Gage Factors: A: -7.58934E-09 B: -0.01470 C: 131.53

Thermal Factor (K): -0.01399 (psi/ °C)

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 8865 Temp(T_0): 22.5 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302391

US 00019793

2/3/05 Transducer S/N 04-14337

DTW Calculation + Transducer function check.

initial reading: 9058.4

reading at depth: 8521.5

536.9 digits

536.9 digits × 0.01782 psi/digit = 9.568 psi

2.31 ft./psi × 9.568 psi = 22.10 ft. of water

DTW = installed depth − head

= 200 − 22.10 = 177.9'

302392

US 00019794

MPW-04

302393

US 00019795

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-04 **Boring Location:** Greek Orthodox Church
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147
Drilling Contractor: Uni-Tech Drilling Co. **Drilling Method:** Rotasonic **Sample Method:** Vibration Extraction **Date Started:** 07/06/2004 **Date Completed:** 02/08/2005 **Logged By:** Adrian Steinhauff (P.W.GROSSER, INC.)	**Northing:** 279964.528 **Easting:** 1240440.958 **Surface Elevation (ft. above msl):** 177.23 **Total Depth (ft bgs):** 250 **Initial Depth to Water (ft bgs):** approx. 150 **Field Screening Instrument:** PID

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
0		#1	0	0-8	4.5					FINE SAND: Sand (strong brown) medium and fine grain sand, dry, well sorted, 2.5	
	175										
5											
	170										
		#2	0	8-18	4.5					PEBBLES: Sand (very pale brown), 10 yr 7/4, medium and fine grain, dry, well sorted	
10											

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

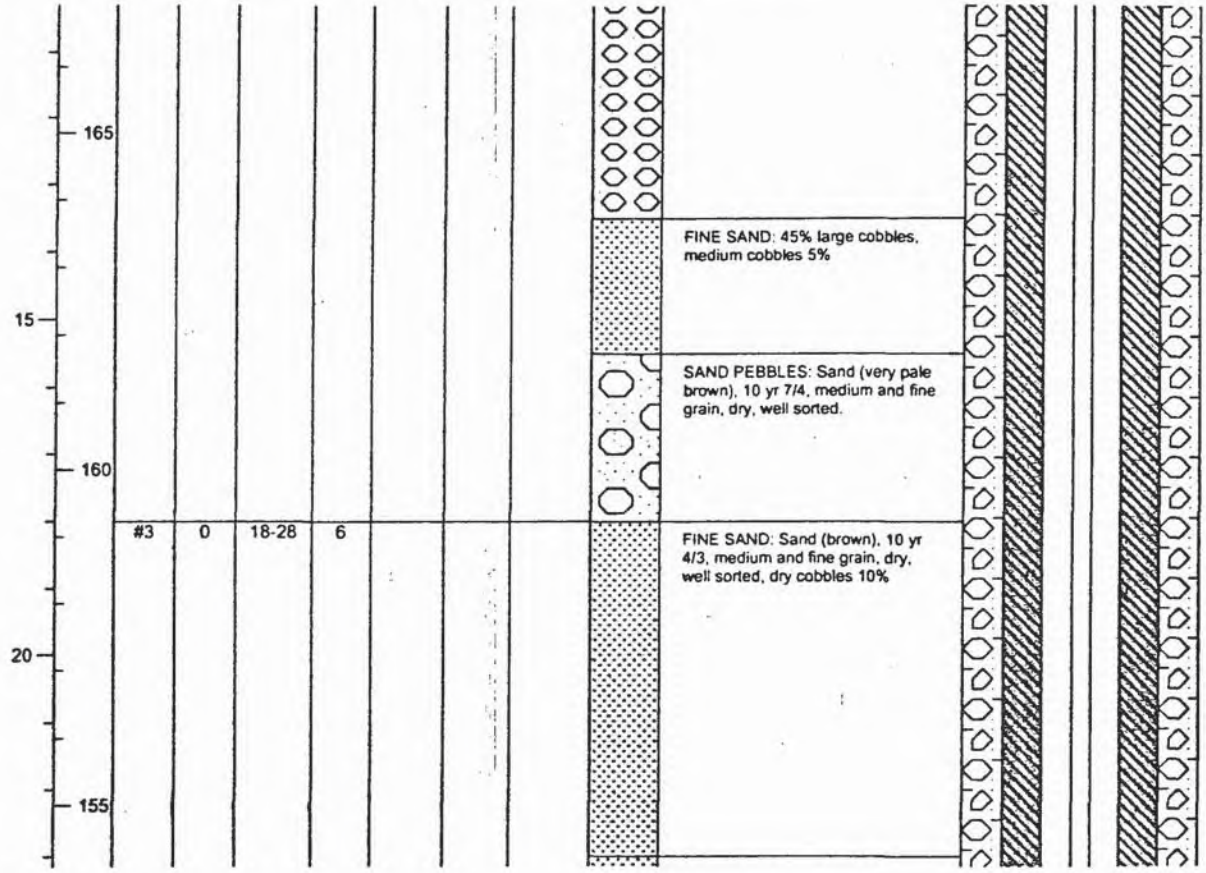
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302394

US 00019796

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-04 **Boring Location:** Greek Orthodox Church
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302395

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-04 **Boring Location:** Greek Orthodox Church
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
25										FINE SAND: Sand (light brown), medium and fine grain, dry, well sorted, 10 yr 8/2	
	150										
		#4	0.3	28-38	5					SAND PEBBLES: Sand (very pale brown), 10 yr 7/3, medium and fine grain, dry, well sorted.	
30											
	145										
35											

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

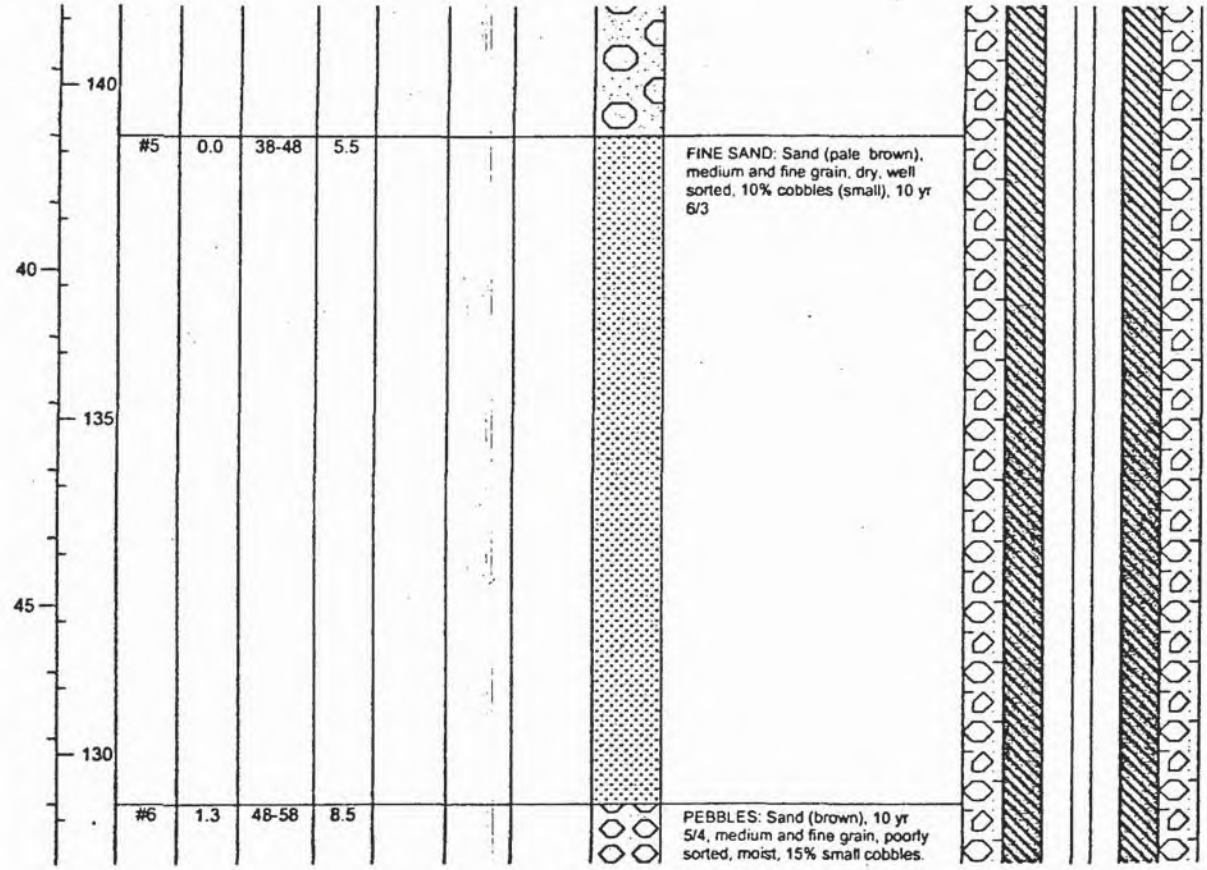
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302396

US 00019798

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-04 Boring Location: Greek Orthodox Church
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

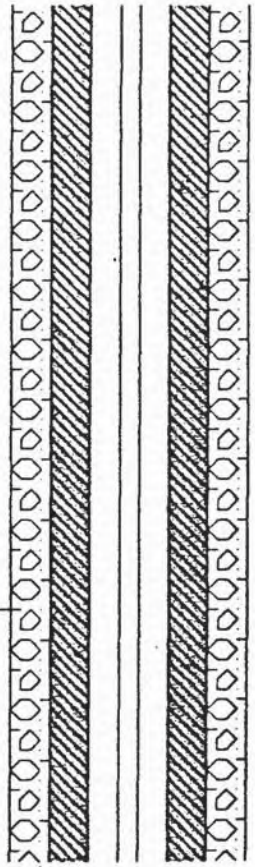
Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302397

US 00019799

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-04 **Boring Location:** Greek Orthodox Church
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / Inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
50											
	125										
55											
	120										
		#7	1.3	58-68	5					SILTY SAND: Sand (brown), 10 yr 4/3, medium and fine grain, poorly sorted, moist, 20% small cobbles.	
60											



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Concrete
- Sand Pack
- Waterloo Packer (not to scale)
- Cement/Bentonite Grout
- Natural Material
- Bentonite Seal
- 4-inch Stainless Steel Well Casing
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-04 **Boring Location:** Greek Orthodox Church
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
65	115										
	110										
		#8	0.0	68-78	10					FINE SAND: Sand (light brown), 10 yr 7/3, medium and fine grain, poorly sorted, moist, 2% cobbles.	
70											
	105										

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302399

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-04 Boring Location: Greek Orthodox Church
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
75										GRAVEL: Large cobbles.	
										SAND PEBBLES: Sand (light brown), 10 yr 7/3, medium and fine grain, poorly sorted, moist, 2% cobbles.	
100		#9	0.0	78-88	9					SILT: Sand (white), 10 yr 8/1, fine grain, silty 35%, poorly sorted, dry	
80											
95											
85											
90											

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

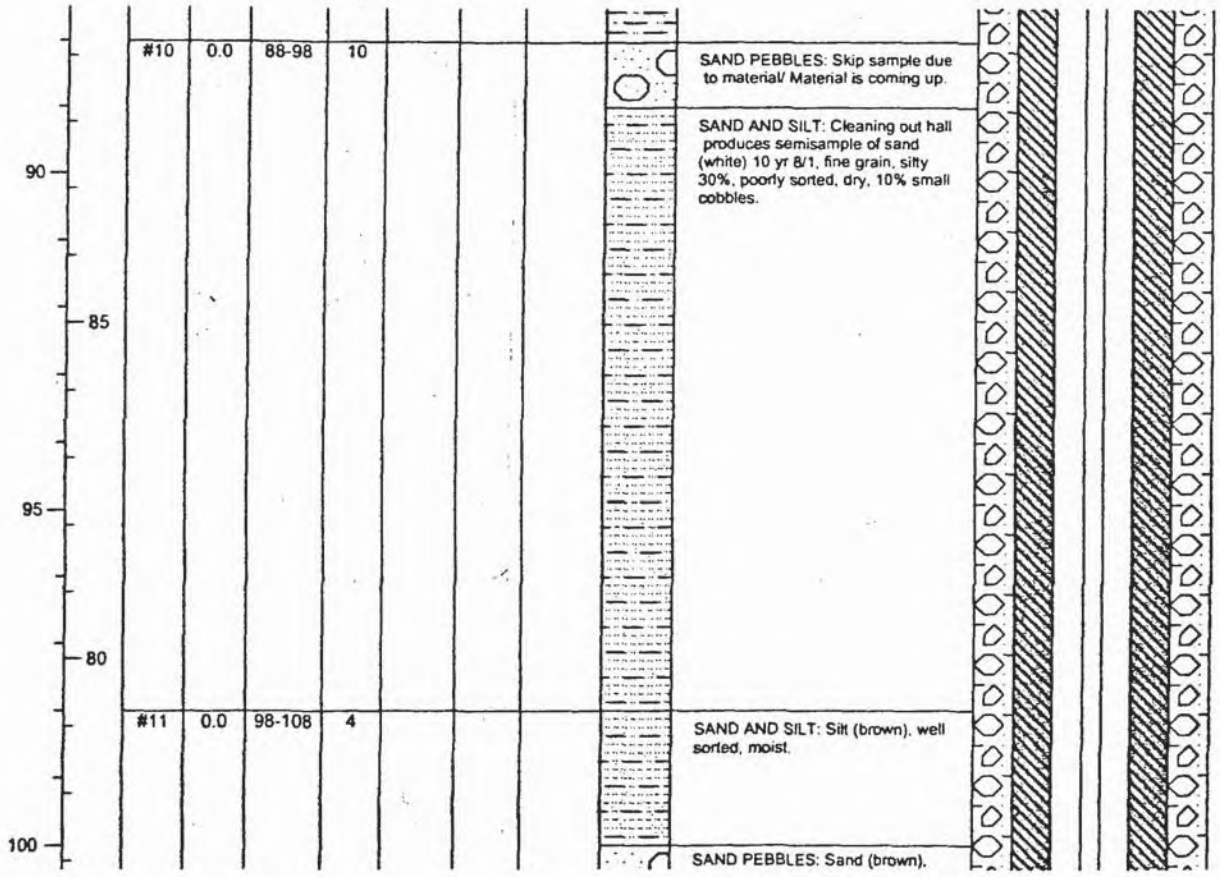
- Waterloo Sampling Port
- Concrete
- Sand Pack
- Waterloo Packer (not to scale)
- Cement/Bentonite Grout
- Natural Material
- Bentonite Seal
- 4-inch Stainless Steel Well Casing
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302400

US 00019802

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-04 Boring Location: Greek Orthodox Church
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302401

US 00019803

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-04 **Boring Location:** Greek Orthodox Church
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
	75									medium and fine grain, 2% small cobbles, well sorted, moist.	
105											
	70										
		#12	0.0	108-118	4.5					SAND AND SILT: Sand (brown), medium and fine grain, silt 20%, small cobbles 20%, poorly sorted, moist.	
110											
	65										

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

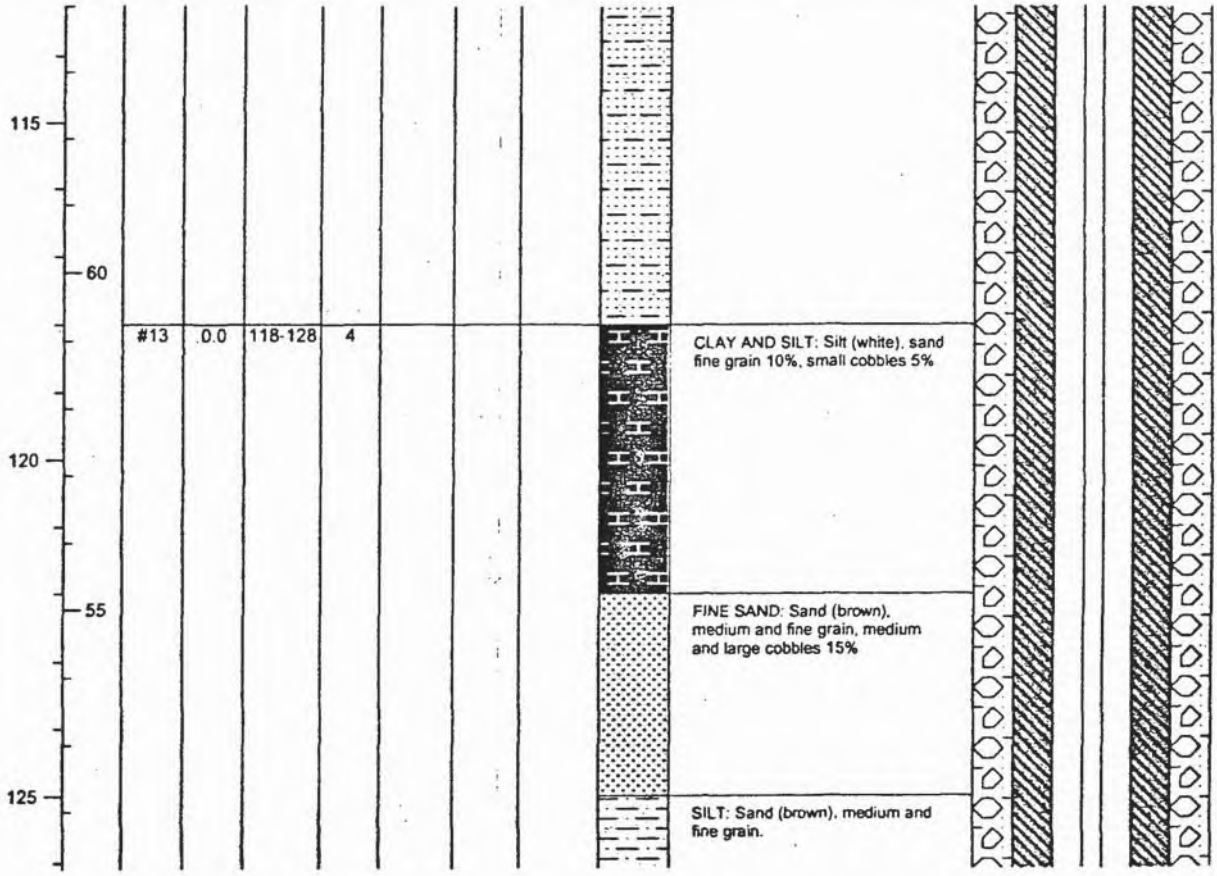
Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced. In March and May 2005 groundwater samples were collected from the completed multiport wells.

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-04 **Boring Location:** Greek Orthodox Church
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

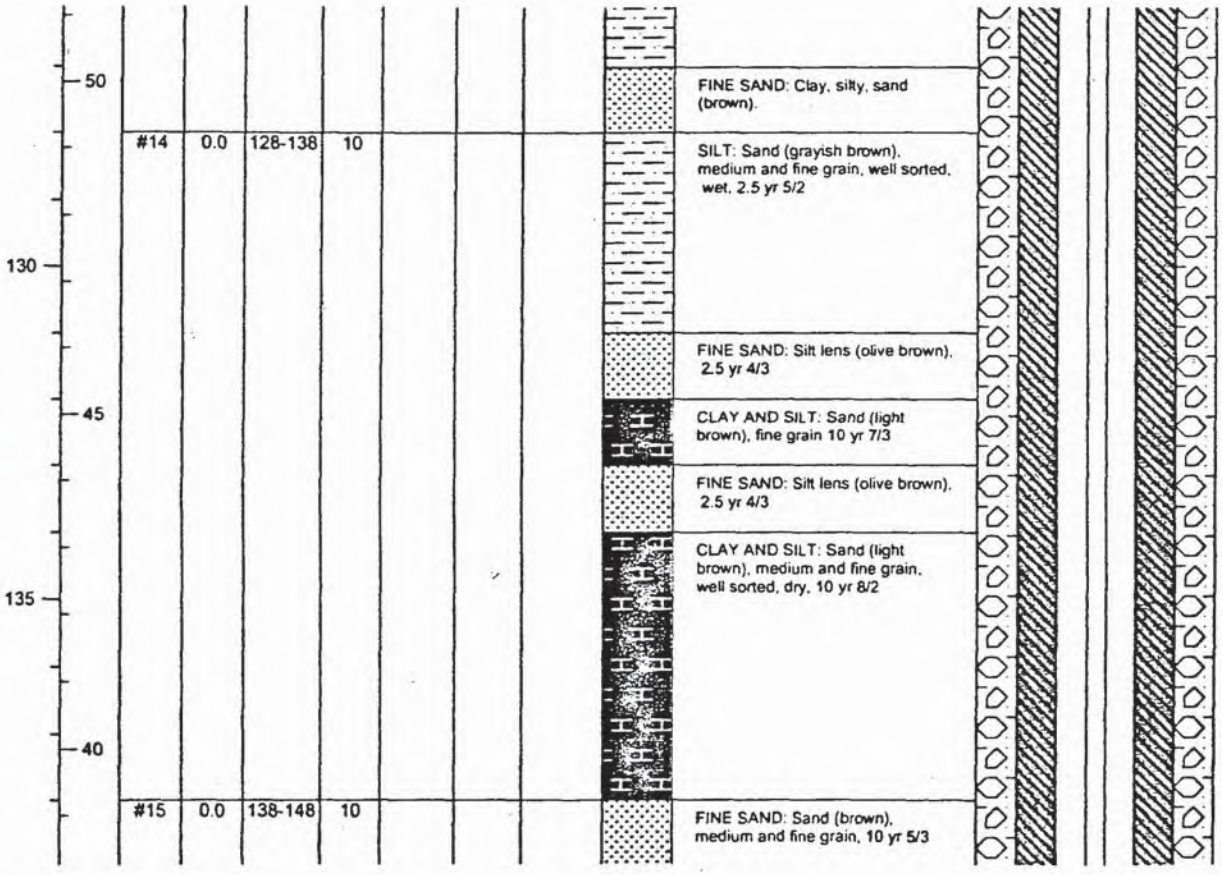
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302403

US 00019805

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-04 Boring Location: Greek Orthodox Church
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302404

US 00019806

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-04 **Boring Location:** Greek Orthodox Church
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
140										SILT: Sand (brown), fine grain, 10 yr 8/1	
										FINE SAND: Sand (brown), fine grain w/silt 10%, cobbles (small) 20%, 10 yr 5/3	
										SAND: Sand (light brown), medium grain, 10 yr 6/3	
35										SAND AND SILT: Sand (brown), medium and fine grain, 20% silts, 10 yr 5/3	
										CLAY AND SILT: Silty clay lens (gray), 10 yr 5/2 w/mica flakes.	
145										SAND: Sand (light brown), medium and fine grain, 10% silt, 10 yr 6/3	
										CLAY AND SILT: Silty clay lens (gray), 10 yr 5/2 w/mica flakes.	
										SAND: Sand (orange), medium and fine grain, 7.5 yr 6/1	
30										SILT: Silt (black), organic lens 10 yr 2/1	
		#16	0.0	148-158	10					SAND: Sand (yellow brown), medium and fine grain, 10 yr 7/8	
										SAND: Sand (brown), medium and fine grain, 2% silt, wet, well sorted 10 yr 6/8	
150											

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302405

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-04 Boring Location: Greek Orthodox Church
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
25											
155							15	18			
20											
		#17	0.0	158-168	10					SAND: Sand (very pale brown), medium to fine grain, wet, well sorted, 10YR 7/3	
160											
15											

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

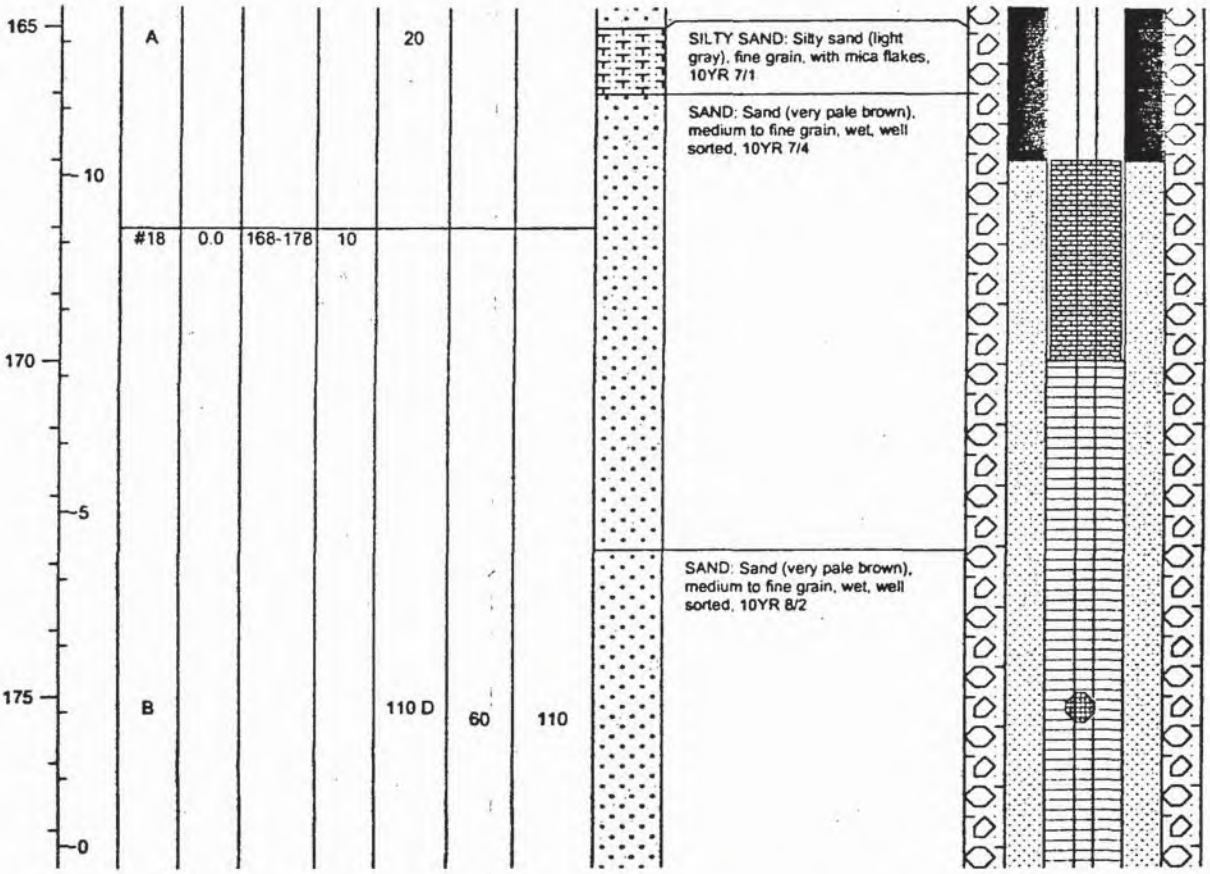
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced. In March and May 2005 groundwater samples were collected from the completed multiport wells.

302406

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-04 **Boring Location:** Greek Orthodox Church
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

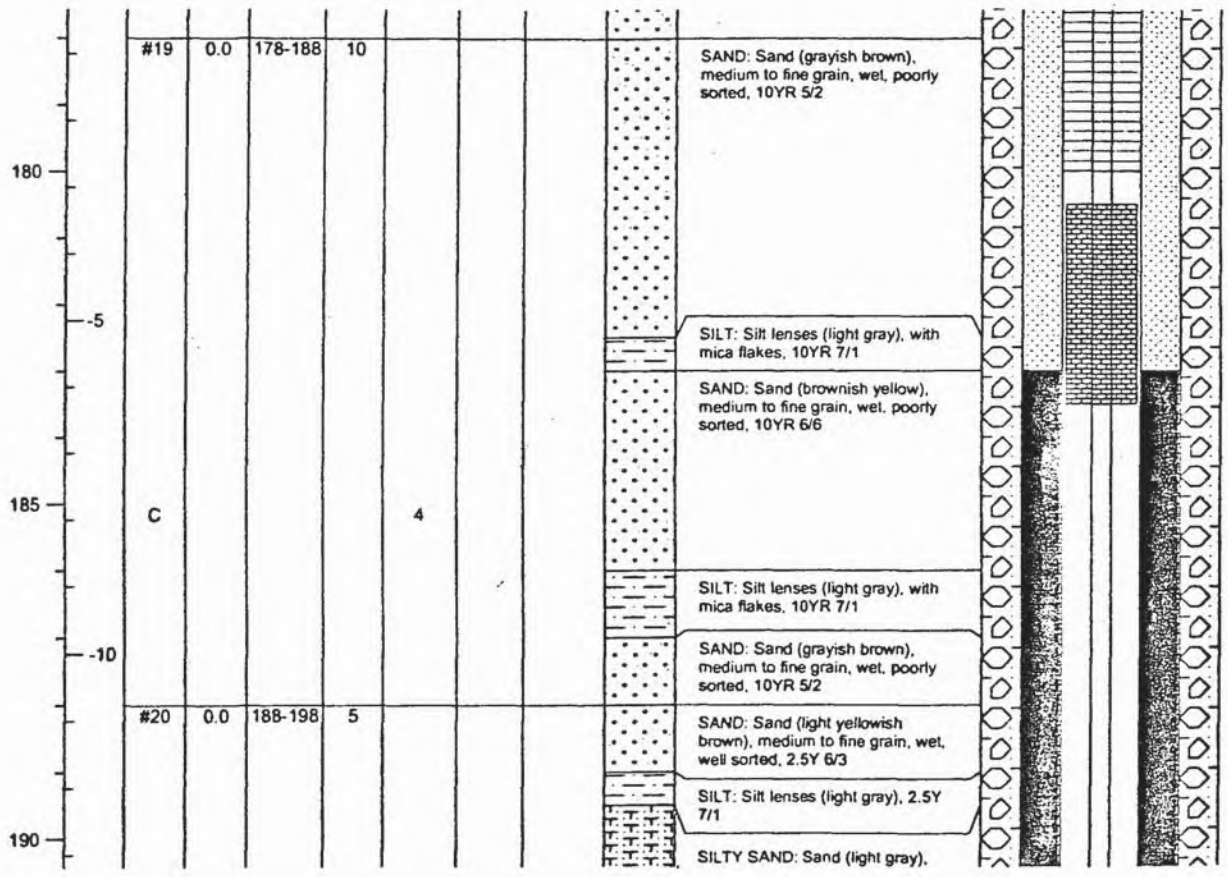
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302407

US 00019809

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-04 Boring Location: Greek Orthodox Church
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302408

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-04 **Boring Location:** Greek Orthodox Church
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches)	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
	-15									medium to fine grain, 20% silt (light gray), wet, poorly sorted, 2.5Y 7/2	
195		D				3				SAND AND SILT: Sand (light gray), fine grain, 50% silt (light gray), wet, well sorted, with mica flakes, 2.5Y 7/2	
	-20									SAND: Sand (very pale brown), medium to fine grain, wet, poorly sorted, 10YR 7/4	
										CLAY: Clay (white), 2.5Y 8/1	
		#21	0.0	198-208	8.5					SILTY SAND: Sand (light brownish gray), medium to fine grain, 20% silt, wet, well sorted, 10YR 6/2	
200											
	-25									SILTY SAND: Sand (light gray), medium to fine grain, 20% silt, wet, well sorted, 2.5Y 7/2	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

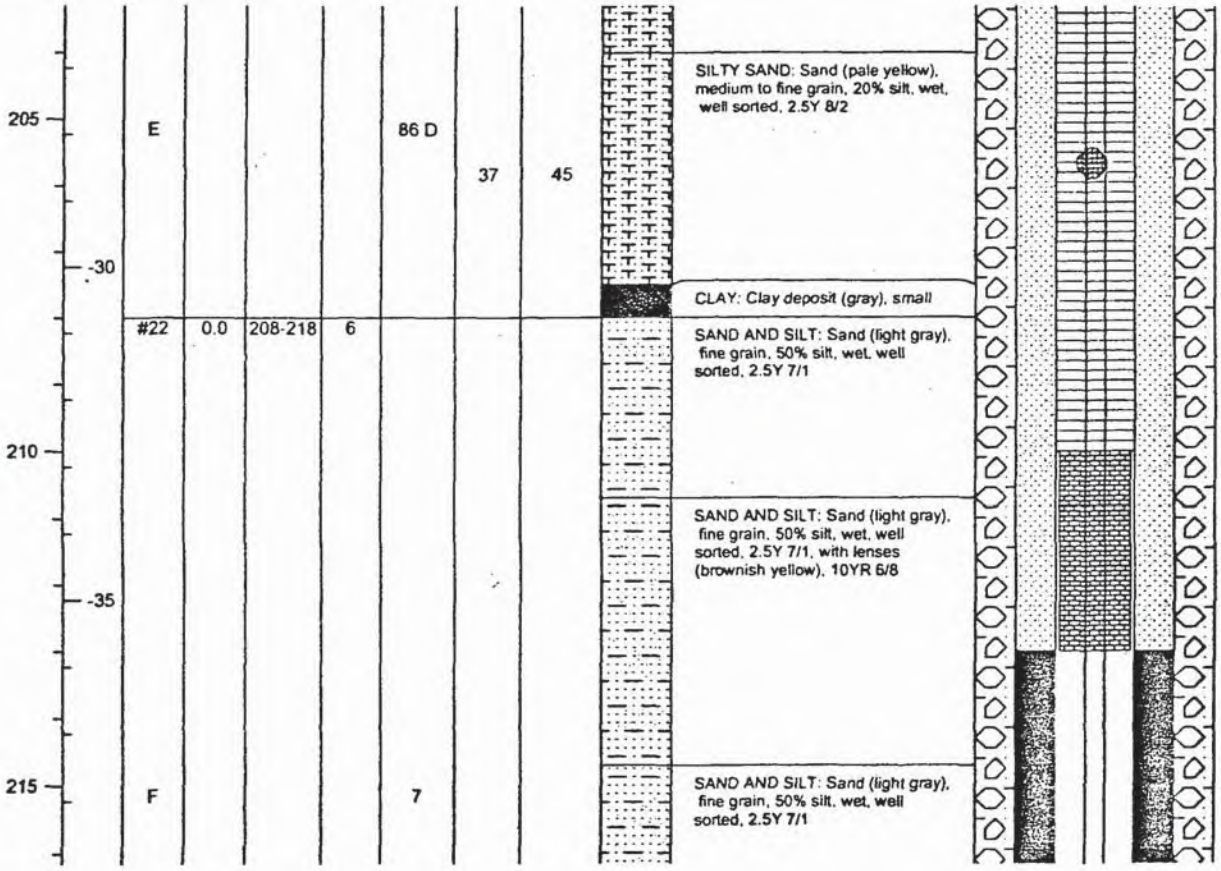
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302409

US 00019811

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-04 **Boring Location:** Greek Orthodox Church
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

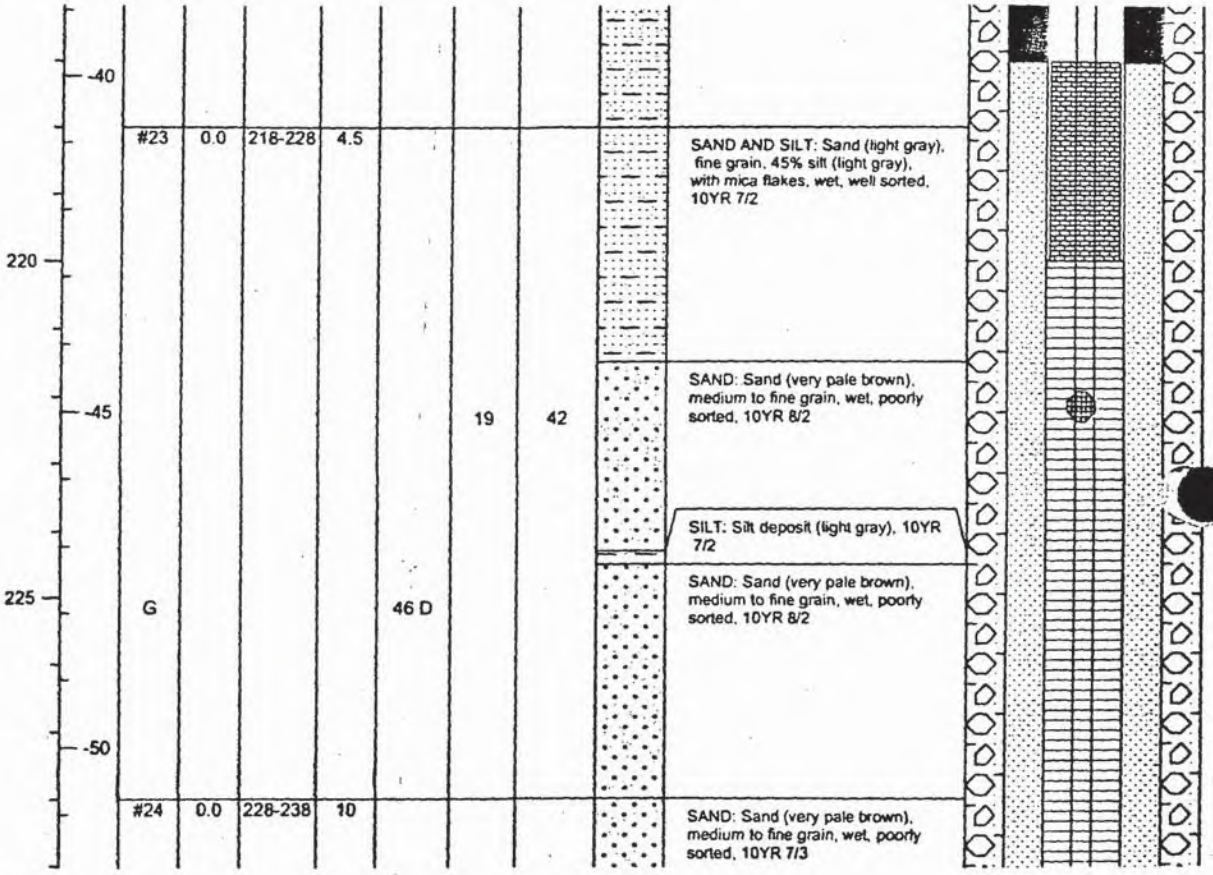
Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Concrete
- Sand Pack
- Waterloo Packer (not to scale)
- Cement/Bentonite Grout
- Natural Material
- Bentonite Seal
- 4-inch Stainless Steel Well Casing
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-04 Boring Location: Greek Orthodox Church
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

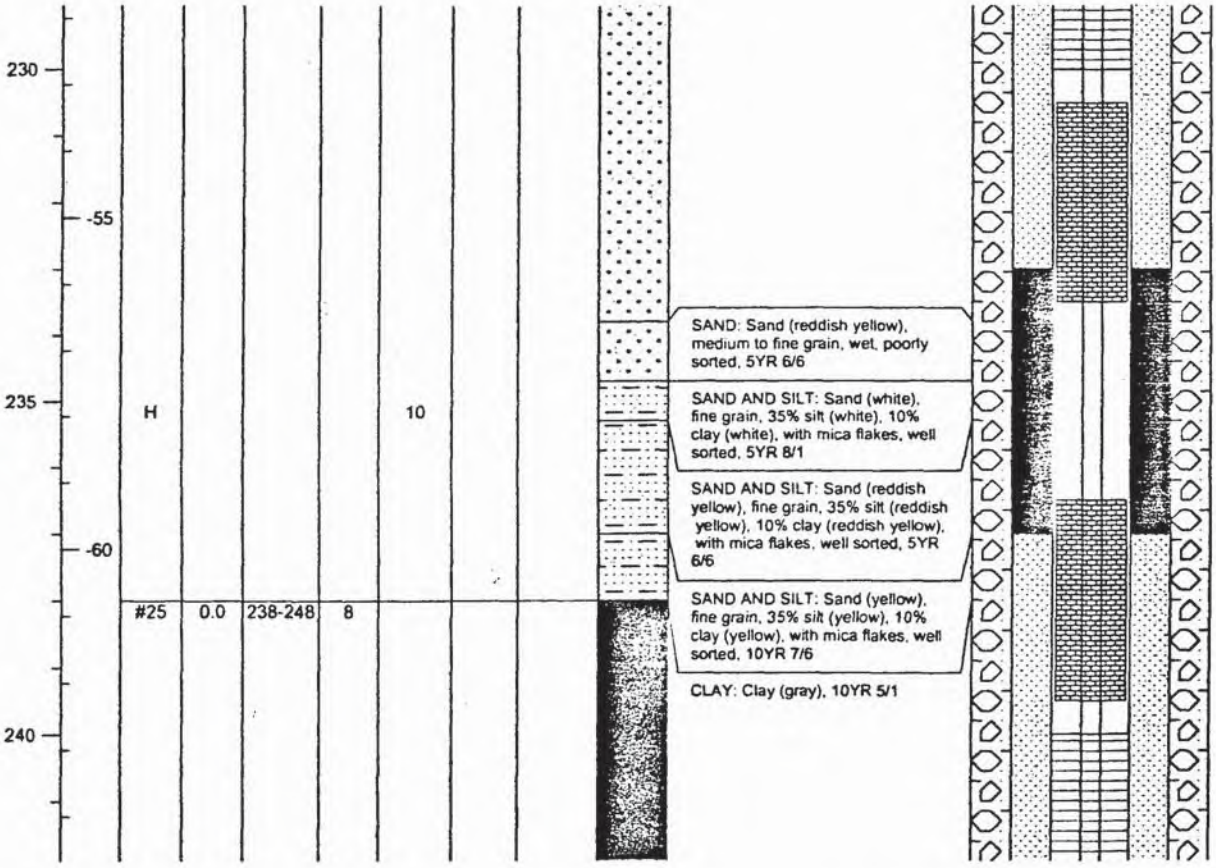
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slo

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302411

US 00019813

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-04
	Boring Location: Greek Orthodox Church
Client: U.S. Environmental Protection Agency	**Project Name:** Lawrence Aviation RI/FS
Site Location: Port Jefferson Station, New York	**Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

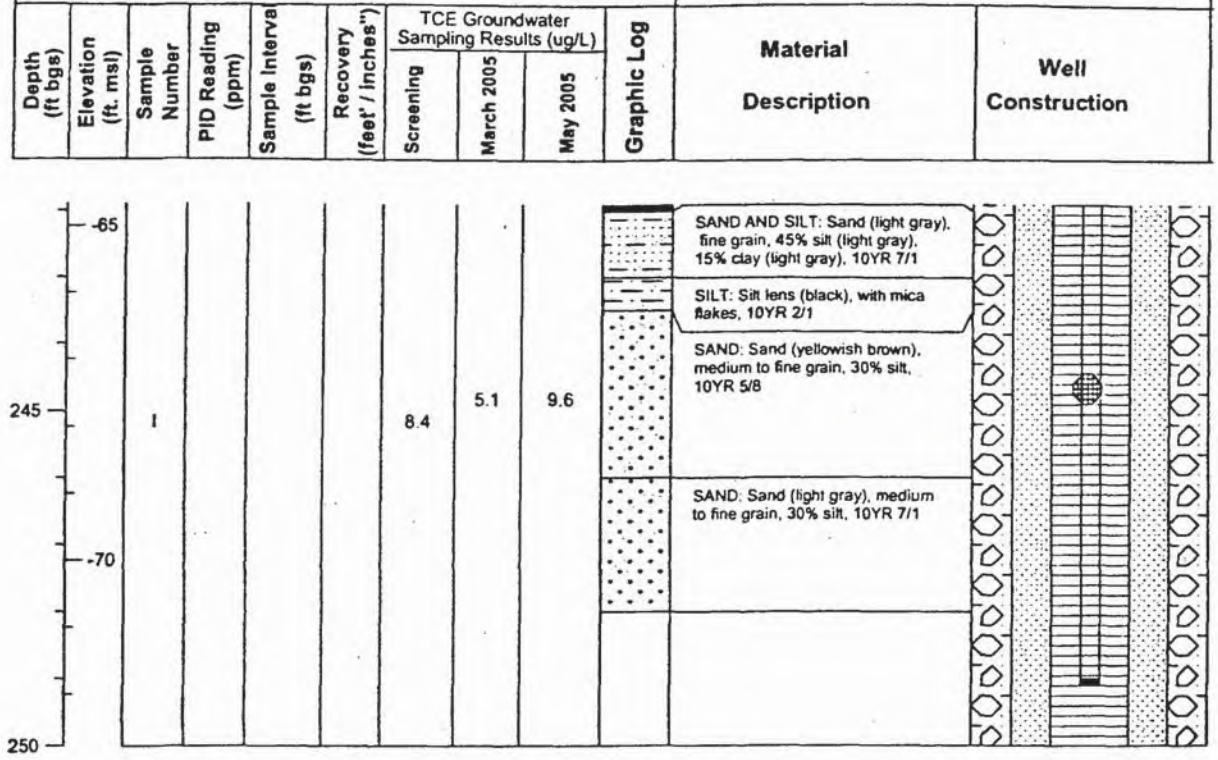
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302412

US 00019814

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-04 Boring Location: Greek Orthodox Church
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302413

Time on site: 0720 to 1655 = 9.5 hrs. JN Doughtery

Waterloo System Installation Log

Client: USEPA | Borehole Ø & Depth: 4" Ø 251.8 'bgs @0915 | Date: 2/7/05

Site: LAJ | Casing Depth: n/a | Sheet No.: 1 OF 2

Borehole No.: MW-04 | Depth to Water: 145.86 'bgs @0917 | Approved: JA KB

Unit	In	Depth to Top	Notes
FEET		FEET	
0.1	✓		Base Plug
2	✓		2' PVC Casing
2	✓		2' PVC Casing
0.5	✓	245.5	PORT (VWP, BP) 5
5	✓		5' PVC Casing
3	✓	236.5	PACKER
2	✓		2' PVC Casing
1	✓		1' PVC Casing
3	✓	230.5	PACKER
5	✓		5' PVC Casing
2	✓		2' PVC Casing
1	✓		1' PVC Casing
0.5	✓	222	PORT (VWP) (BP) 4
2	✓		2' PVC Casing
3	✓	217	PACKER
2	✓		2' PVC Casing
2	✓		2' PVC Casing
3	✓	210	PACKER
2	✓		2' PVC Casing
2	✓		2' PVC Casing
0.5	✓	205.5	PORT (VWP, BP) 3
5	✓		5' PVC Casing
3	✓	197.5	PACKER
10	✓		10' PVC Casing
2	✓		2' PVC Casing
2	✓		2' PVC Casing
3	✓	180.6	PACKER
5	✓		5' PVC Casing
0.5	✓	175	PORT (VWP, BP) 2
5	✓		5' PVC Casing
3	✓	167	PACKER
2	✓		2' PVC Casing
2	✓		2' PVC Casing
3	✓	160	PACKER
2	✓		2' PVC Casing
2	✓		2' PVC Casing
0.5	✓	155.5	PORT (VWP, BP) (1)
5	✓		5' PVC Casing
3	✓	147.5	PACKER
150	✓	-2.5	10' PVC Casing x 15
—	—		Top 10' cut 43" off for
—	—		for final stickup.
	✓		MANIFOLD

DTW 146.42 — DTW 146.03 — DTW 146.27 — DTW 145.89 — DTW=145.54

Check against cal sheets.

Equipment Required

Unit	#	Unit	#
10 ft Casing	16	PVC Port (Single)	0
5 ft Casing	6	PVC Port (Double)	0
2 ft Casing	15	SS Port (Single)	0
1 ft Casing	2	SS Port (Double)	5
Base Plug	1	Double Valve Pump	0
Dow Packer	9	Bladder Pump	5
Bentonite Packer	0	VW Piezometer	5
Hydraulic Packer	0	Well Head Manifold	1
Tubing 1130 x 2 = 2260			
Transducer Cable = 1130			
Steel Cable = 275			

Cable per Leda

MW-04 Reading Before Installation @0945

Zone	Piezo Serial #	Reading	Temp(C)	
✓ 1	14333 ✓	8761.2	5.9	180
✓ 2	14336 ✓	8928.3	6.0	200
✓ 3	14341 ✓	8997.7	4.4 5.1	230
✓ 4	14346 ✓	8725.5	5.1	250
✓ 5	14627 ✓	8959.5	8.5	270
1 8	Bladder Pump: Ok			
2 7	Bladder Pump: Ok			
3 8	Bladder Pump: Ok			

4 Bladder Pump OK 5: Bladder pump ok

MW-04 Reading After Installation @1508

Head

Zone	Piezo Serial #	Reading	Temp	
1	14333	8465.4	12.4	9.96
2	14336	8178.1	12.7	27.11
3	14341	7509.5	12.4	59.23
4	14346	6930.7	12.2	75.9
5	14627	5865	12.3	98.08
6				
7				
8				

Borehole Water Level (after installation)	

Comments

Zone 5 XD OFFSET 0.46' +27.4mm
4 0.48 +27.4mm.
3 0.46 +27.4mm
2 6.45 +27.4mm.
1 0.45 +27.4mm.

1445 All in at the well

302414

Hours onsite: 0700-1530 = 8.5 hrs.

Solinst gm. Randy Blackburn, Waterloo

Waterloo System Installation Log

Client: U.S. EPA
Site: LAE
Borehole No.: MW-04
Borehole Ø & Depth: 4" Ø + 241.86' bgs
Casing Depth: n/a
Depth to Water: 145.86 on 2/7/05 @ 0915
Date: 2/8/04
Sheet No.: 2 of 3
Approved:

Unit	In	Depth to Top	Notes
Zone 5		DTW	146.8 @ ~1430
Zone 4			146.4
Zone 3			146.6
Zone 2			146.3
Zone 1			145.9

Out 2/4/05

On 2/8/05

Equipment Required

Unit	#	Unit	#
10 ft Casing		PVC Port (Single)	
5 ft Casing		PVC Port (Double)	
2 ft Casing		SS Port (Single)	
1 ft Casing		SS Port (Double)	
Base Plug		Double Valve Pump	
Dow Packer		Bladder Pump	
Bentonite Packer		VW Piezometer	
Hydraulic Packer		Well Head Manifold	

04- Reading Before Installation @ 0945 on 2/4

Zone	Piezo Serial #	Reading	Temp
1	14333	8761.2	5.9
2	14336	8928.3	6.0
3	14341	8997.7	5.1
4	14346	8725.5	~~6.5~~ 5.1
5	143627	8959.5	8.5
6			
7			
8			

04- Reading After Installation @ 1445 2/8

Zone	Piezo Serial #	Reading	Temp
1	14333	8476.5	12.4
~~2~~	~~14336~~	~~2861.4~~	~~12.7~~
~~3~~	~~14341~~	~~2741.5~~	~~12.4~~
4	14346	6939.8	12.2
5	14627	5876.8	12.1
2	14336	8188.3	12.6
3	14341	7516.5	12.4
8			

Borehole Water Level (after installation)	

Comments

- WLMS removed to Zone 3. Sample line replaced on Zone 3, reinstalled system. Tested all pumps + trans. all ok.

302415

US 00019817

JV Loudoun 2/7/05 (B)

Client: CDM - Well No: CDM-04 Prepared By: BB
Install Order: 6 Stick: 165ft Date Prepared: 6-Dec (2004)

Zones				5		4		3		2		1
Drillhole Depth			250									
Base Plug at:	SS Plug		249									
(SS Plug or PVC Plug)												
Depth to Top of	Dual	Ports		244.5		222		205.5		175		155.5
(Single or Dual)												
Depth to Top of	3.83	Packers										
(3.83 or 3.58 or 2.85)												
Desired Stick-up			-2.5									

Interval Diff. (feet)	Depth to Top (feet)	Unit Length (feet)	Qnty.	Description of Component	Zone No.	(feet)
	250			Depth to Btm		
0.1	249	0.1		Base Plug		
		2	2	2' PVC Casing		
4.4	244.5	0.5		Port	5	270
		5	1	5' PVC Casing		
5	236.5	3		Packer		
		2	1	2' PVC Casing		
		1	1	1' PVC Casing		
3	230.5	3		Packer		
		5	1	5' PVC Casing		
		2	1	2' PVC Casing		
		1	1	1' PVC Casing		
8	222	0.5		Port	4	250
			1	2' PVC Casing		
2	217	3		Packer		
			2	2' PVC Casing		
4	210	3		Packer		
			2	2' PVC Casing		
4	205.5	0.5		Port	3	230
			1	5' PVC Casing		
5	197.5	3		Packer		
			1	10' PVC Casing		
			2	2' PVC Casing		
14	180.5	3		Packer		
			1	5' PVC Casing		
5	175	0.5		Port	2	200
			1	5' PVC Casing		
5	167	3		Packer		
			2	2' PVC Casing		
4	160	3		Packer		
			2	2' PVC Casing		
4	155.5	0.5		Port	1	180
			1	5' PVC Casing		
5	147.5	3		Packer		
			15	10' PVC Casing		
150	-2.5					

Monitoring Equipment
1/2 x 3/8 Tubing OD & 1/2 x 1/2 Tubing OD
VCP Transducer
Double Valve Pump OD Bladder Pump
Description

Manifold Type: Stnd Vol Hd O Tube
1 Multipurge
Pressure Sealed

PVCP Transducer Bladder Pump
Min 105
Std 130
ran @ 150
Drive 14s
Vent 14s

VWP Transducer Bladder Pump
Min 96
Std 125
ran @ 150
Drive 12s
Vent 12s

VWP Transducer Bladder Pump
Min 90 psi
Std 115 psi
ran @ 150
Drive 11s
Vent 13s

VWP Transducer Bladder Pump
Min 75, Std 100
ran @ 150 psi
Drive 10s
Vent 14s

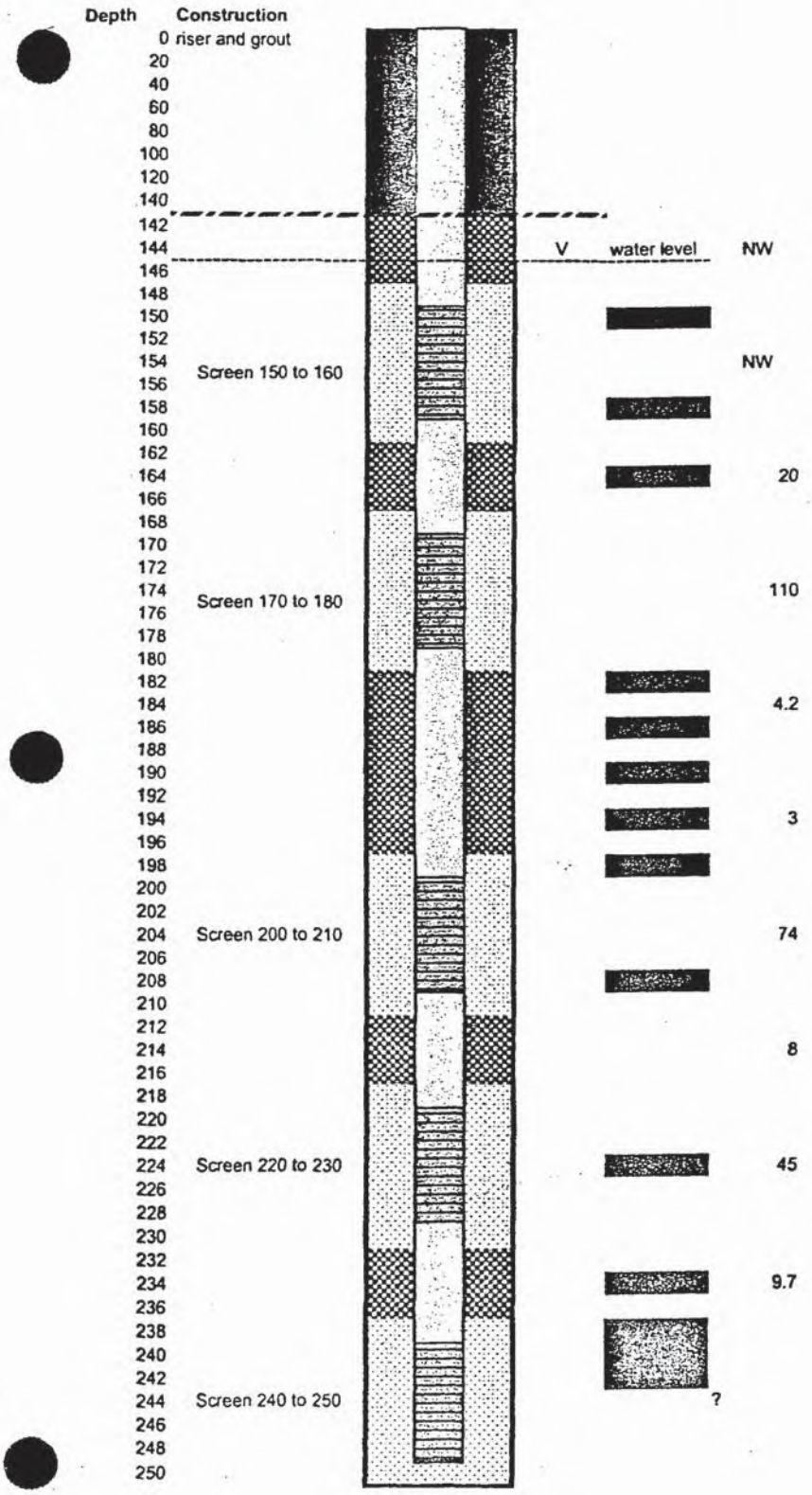
VWP Transducer Bladder Pump
Min 70 psi
ran @ 150
Drive 9s
Vent 18s

TOTALS		
16	10' PVC Casing	1130 1/4" X 0.17" Red LDPE Tubing
8	5' PVC Casing	1130 1/4" X 0.17" Sample LDPE Tubing
15	2' PVC casing	1130 VWP Transducer Cable
2	1' PVC casing	5 Dual 3/8" Stem Port Assembly
1	SS Plug	5 Bladder Pump
275	3/16" dia SS Support Cable	8 3.83 Packers
		5 VWP Transducer

1/4/05 15:18
Macintosh HD:Desktop Folder:[401 CDM Dec6]Sum TLS

302416

MPW-04



302417

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

Zone 1 CMW-04

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 7, 2004

Serial Number: 04-14333

Temperature: 22.8 °C

Pressure Range: 350 kPa

†Barometric Pressure: 998.8 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Elice

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8765	8765	8765	0.199	0.06	0.017	0.00
70.0	8070	8071	8071	70.02	0.01	70.11	0.03
140.0	7378	7378	7378	139.6	-0.10	139.8	-0.06
210.0	6679	6678	6679	210.0	-0.01	210.1	0.02
280.0	5981	5982	5982	280.0	0.01	280.1	0.04
350.0	5285	5284	5285	350.1	0.03	349.9	-0.03

(kPa) Linear Gage Factor (G): 0.1005 (kPa/ digit) Regression Zero: 8767

Polynomial Gage Factors: A: -1.130E-07 B: -0.0990 C: 876.00

Thermal Factor (K): -0.1068 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.01458 (psi/ digit)

Polynomial Gage Factors: A: -1.63824E-08 B: -0.01435 C: 127.05

Thermal Factor (K): -0.01549 (psi/ °C)

Calculated Pressures: Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$**

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 8748 Temp(T_0): 22.6 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

2/7/05 S/N 04-14333 Zone 1

Initial DTW + transducer function check.

Initial reading: 8766.2
reading at depth: 8466.4
295.8 digits

PSI = 295.8 digits × 0.01458 $\frac{PSI}{digit}$

= 4.31 psi

Ft. H_2O = 4.31 psi × 2.31 $\frac{ft}{psi}$ = 9.96 ft.

DTW = deployed depth − head (ft. H_2O)

= 155.5 − 9.96 = 145.54'

Jason Dougherty 2/7/05

302419

US 00019821

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

Fme 2 e MW-04

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 7, 2004

Serial Number: 04-14336

Temperature: 22.8 °C

Pressure Range: 350 kPa

†Barometric Pressure: 998.8 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Elice

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8929	8928	8929	0.210	0.06	-0.093	-0.03
70.0	8325	8326	8326	70.06	0.02	70.17	0.05
140.0	7724	7724	7724	139.7	-0.07	139.9	-0.02
210.0	7121	7120	7121	209.7	-0.10	209.8	-0.06
280.0	6511	6513	6512	280.1	0.04	280.3	0.09
350.0	5907	5908	5908	350.2	0.05	350.0	0.00

(kPa) Linear Gage Factor (G): 0.1158 (kPa/ digit) Regression Zero: 8930

Polynomial Gage Factors: A: -2.012E-07 B: -0.1129 C: 1023.67

Thermal Factor (K): -0.0893 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.01680 (psi/ digit)

Polynomial Gage Factors: A: -2.91887E-08 B: -0.01637 C: 148.47

Thermal Factor (K): -0.01296 (psi/ °C)

Calculated Pressures: Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$**

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 8911 Temp(T_0): 22.5 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302420

US 00019822

2/7/05 S/N 04-14336 Zone 2

initial reading 8928.3
reading at depth: 8178.1
750.2

PX = 750.2 digits × 0.01680 psi/digit

= 12.60 psi

Ft. H2O = 12.60 psi × 2.31 ft/psi = 29.11 ft. H2O

DTW = Deployed depth − head (ft. H2O)

= 175 − 29.11

= 145.87'

John Donaghy 2/7/05

302421

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

Zone 3 @ MW-04

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 7, 2004

Serial Number: 04-14341

Temperature: 22.8 °C

Pressure Range: 350 kPa

†Barometric Pressure: 998.8 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Elica

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9009	9010	9010	0.198	0.06	0.092	0.03
70.0	8423	8422	8423	69.91	-0.02	69.89	-0.03
140.0	7833	7834	7834	139.9	-0.04	140.1	0.02
210.0	7244	7244	7244	209.9	-0.04	210.0	0.00
280.0	6653	6654	6654	280.0	0.00	280.1	0.03
350.0	6063	6063	6063	350.1	0.04	350.0	-0.01

(kPa) Linear Gage Factor (G): 0.1188 (kPa/ digit) Regression Zero: 9011

Polynomial Gage Factors: A: -1.435E-07 B: -0.1166 C: 1062.21

Thermal Factor (K): -0.0299 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.01723 (psi/ digit)

Polynomial Gage Factors: A: -2.08073E-08 B: -0.01691 C: 154.06

Thermal Factor (K): -0.00433 (psi/ °C)

Calculated Pressures: Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$**

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 8991 Temp(T_0): 22.4 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

2/7/05 S/N 04-14341 Zone 3

DTW Calculation & function Check.

Initial reading: 8997.7
Reading at depth: 7509.5
1488.2 digits

PSI = 1488.2 digits x 0.01723 $\frac{psi}{digits}$

= 25.64 psi

Head = 25.64 psi x 2.31 $\frac{ft}{psi}$ = 59.23 ft. h_2o

DTW = Depth / Depth – Ft. h_2o

= 205.5 – 59.23 = 146.27

JA Daugherty 2/7/05

302423

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

Zone 4 @ MW-04

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 7, 2004

Serial Number: 04-14346

Temperature: 22.8 °C

Pressure Range: 350 kPa

†Barometric Pressure: 998.8 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Elica

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8727	8727	8727	0.229	0.07	0.018	0.01
70.0	8175	8175	8175	69.94	-0.02	69.99	0.00
140.0	7622	7622	7622	139.8	-0.06	140.0	-0.01
210.0	7068	7066	7067	209.9	-0.03	209.9	-0.02
280.0	6512	6512	6512	280.0	-0.01	280.0	0.00
350.0	5956	5956	5956	350.2	0.05	350.0	-0.01

(kPa) Linear Gage Factor (G): 0.1263 (kPa/ digit) **Regression Zero: 8729**

Polynomial Gage Factors: A: -2.056E-07 B: -0.1233 C: 1091.51

Thermal Factor (K): -0.0332 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.01832 (psi/ digit)

Polynomial Gage Factors: A: -2.98138E-08 B: -0.01788 C: 158.31

Thermal Factor (K): -0.00482 (psi/ °C)

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 8715 Temp(T_0): 22.2 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302424

2/7/05 s/n 04-14346 Zone 4

Initial DTW + Transducer CHECK

Initial reading: 7" 7725.5

Reading at depth: 6930.7

1795.2 digits

PSI = 1795.2 digits × 0.01832 psi/digits

= 32.89 psi

Head = 32.89 psi × 2.31 ft/psi = 75.97 ft. H2O

DTW = deployed depth − head

= 222' − 75.97'

= 146.03'

J N Doughterty 2/7/05

302425

US 00019827

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

Jones @ MW-05

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14627

Temperature: 22.5 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.6 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Erica

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8999	8998	8999	0.223	0.06	-0.018	-0.01
70.0	8261	8260	8261	70.02	0.01	70.01	0.00
140.0	7526	7524	7525	139.6	-0.12	139.6	-0.10
210.0	6780	6781	6781	210.0	0.00	210.2	0.06
280.0	6039	6040	6040	280.1	0.02	280.2	0.05
350.0	5299	5299	5299	350.1	0.03	349.9	-0.02

(kPa) Linear Gage Factor (G): 0.0946 **(kPa/ digit)** **Regression Zero:** 9001

Polynomial Gage Factors: **A:** -1.064E-07 **B:** -0.0931 **C:** 846.00

Thermal Factor (K): -0.0802 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.01372 **(psi/ digit)**

Polynomial Gage Factors: **A:** -1.54277E-08 **B:** -0.01350 **C:** 122.70

Thermal Factor (K): -0.01163 **(psi/ °C)**

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 8954 Temp(T_0): 23.1 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302426

US 00019828

Zone 5 S/N 04-14627

DTW check + transducer function check.

Initial reading: 8959.5

Reading at depth: 5865.0

3094.5

$PSI = 3094.5\ \text{digit} \times 0.01372\ \frac{PSI}{\text{digit}}$

$= 42.46\ PSI$

$\text{Head (ft. H}_2\text{O)} = 42.46\ PSI \times 2.31\ \frac{ft.}{PSI}$

$= 98.08\ \text{ft. H}_2\text{O}$

$DTW = 244.5 - 98.08$

$= 146.42$

John Dougherty 2/7/05

302427

MPW-05

302428

US 00019830

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-05 **Boring Location:** Hawthorne St.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147
Drilling Contractor: Uni-Tech Drilling Co. **Drilling Method:** Rotasonic **Sample Method:** End of boring at 240' bgs **Date Started:** 09/08/2004 **Date Completed:** 02/10/2005 **Logged By:** Adrian Steinhauff (P.W.GROSSER, INC.)	**Northing:** 282879.48 **Easting:** 1239723.031 **Surface Elevation (ft. above msl):** 156.80 **Total Depth (ft bgs):** 240 **Initial Depth to Water (ft bgs):** **Field Screening Instrument:** PID

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
0	155	#1	0.0	0-8	4					SAND PEBBLES: Sand, light brown, medium to fine grain, 20% cobbles (quartz), medium to small, well sorted, dry, 10yr (7/3) to 10yr (8/1).	
5	150	#2	0.0	8-18	10					SAND PEBBLES: Sand, light brown, fine grain, 30% cobbles (quartz), medium to small, well sorted, dry, 10yr (7/3).	
10											

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

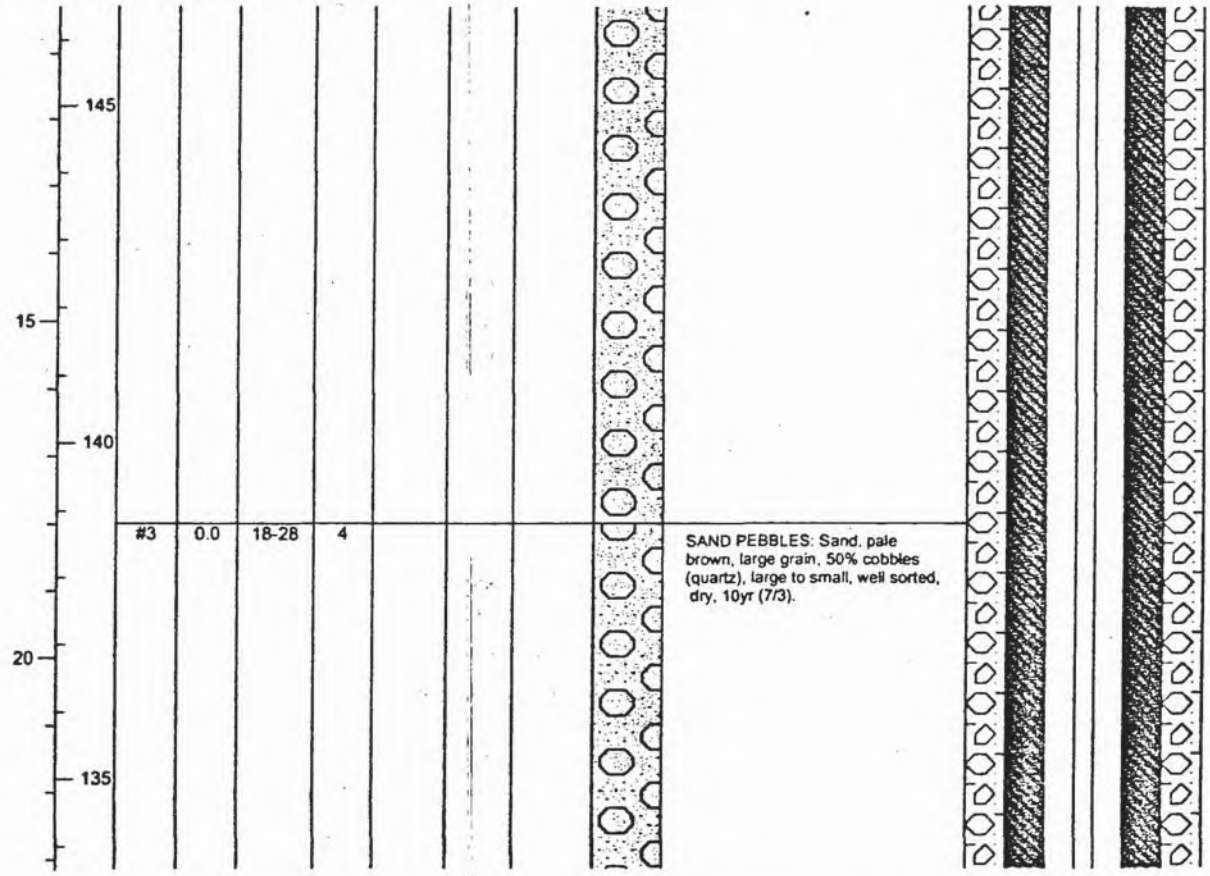
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302429

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-05 **Boring Location:** Hawthorne St.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

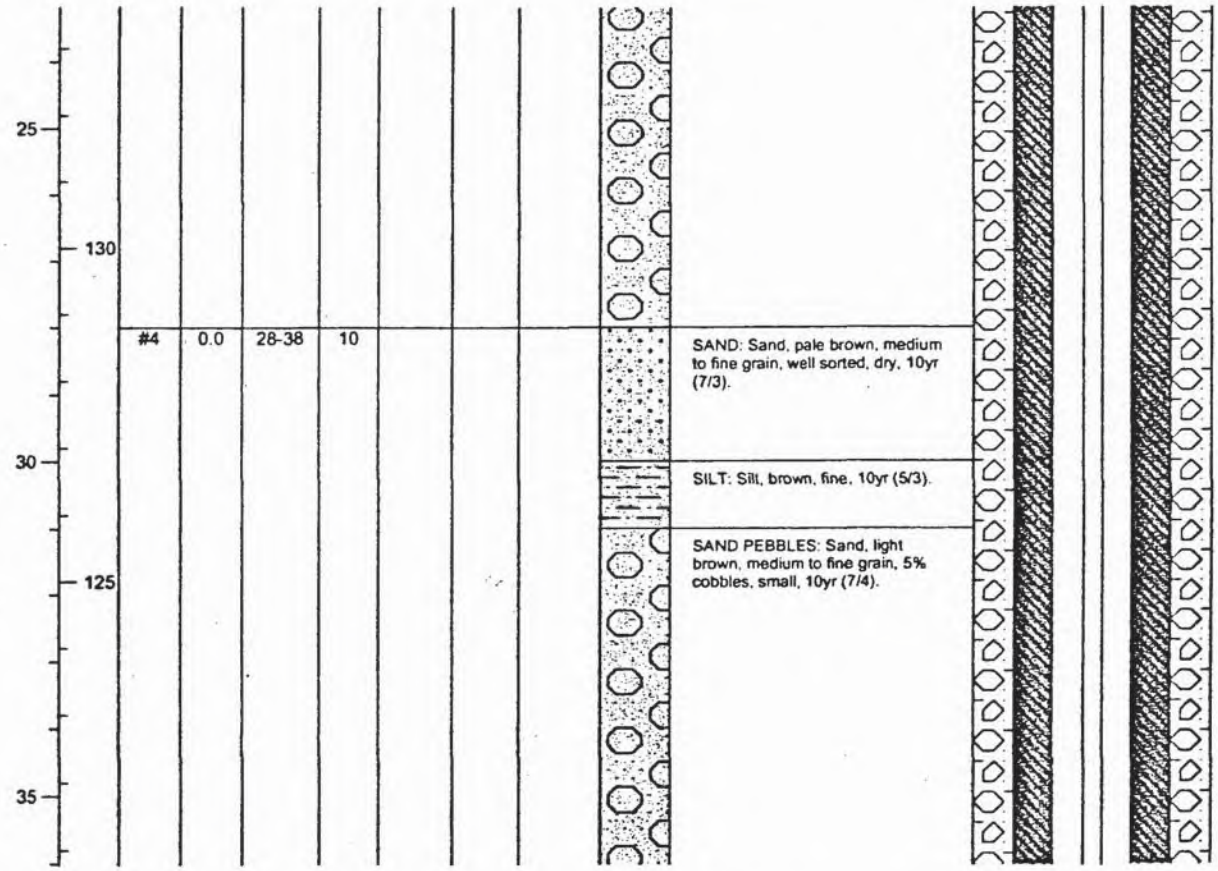
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302430

US 00019832

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-05 Boring Location: Hawthorne St.; Port J.,NY
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

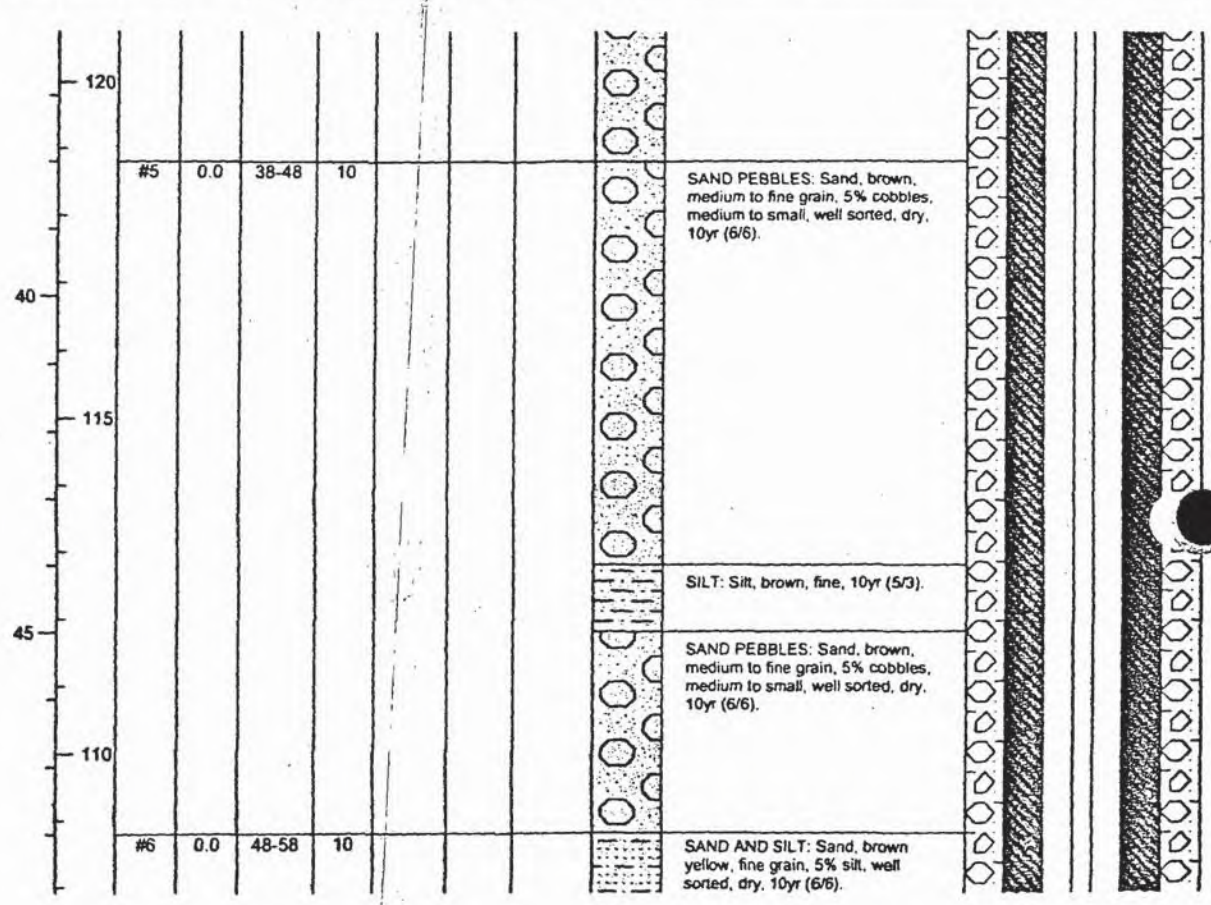
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Concrete
- Sand Pack
- Waterloo Packer (not to scale)
- Cement/Bentonite Grout
- Natural Material
- Bentonite Seal
- 4-inch Stainless Steel Well Casing
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302431

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-05 **Boring Location:** Hawthorne St.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

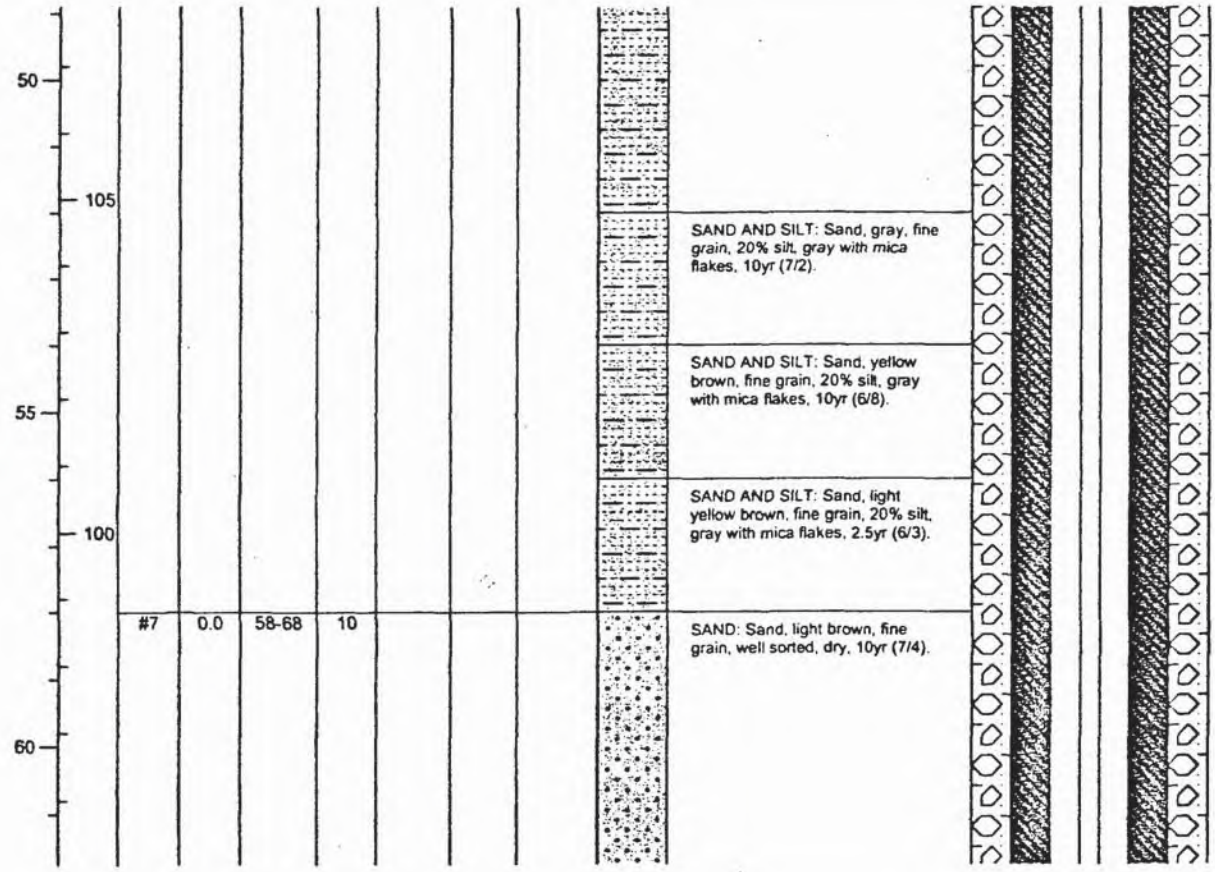
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slc

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302432

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-05 Boring Location: Hawthorne St.; Port J.,NY
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302433

US 00019835

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-05 Boring Location: Hawthorne St.; Port J.,NY
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
65	95										
70	90	#8	0.0	68-78	10					SAND: Sand, pale brown, medium to fine grain,well sorted, dry, 10yr (8/2).	
	85									SAND: Sand, strong brown, medium to fine grain,well sorted, dry, 2.5yr (5/8).	
										SAND: Sand, pale brown, medium to fine grain,well sorted, dry, 10yr (7/4).	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

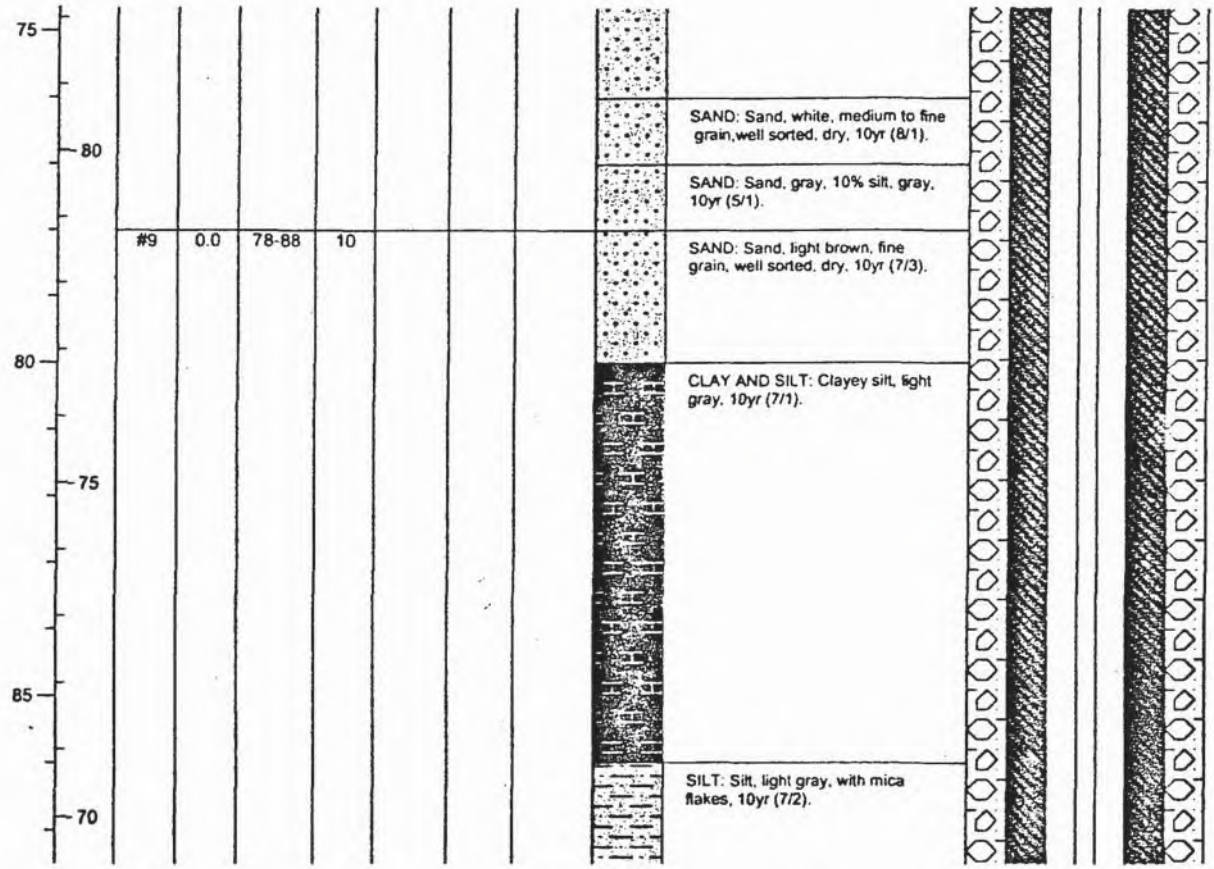
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302434

US 00019836

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-05 **Boring Location:** Hawthorne St.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Concrete
- Sand Pack
- Waterloo Packer (not to scale)
- Cement/Bentonite Grout
- Natural Material
- Bentonite Seal
- 4-inch Stainless Steel Well Casing
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302435

US 00019837

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-05 **Boring Location:** Hawthorne St.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
		#10	0.0	88-98	10					SILT: Silt, light gray, 10% sand fine grain with mica flakes, well sorted, dry,10yr (7/2).	
90											
	65									SILT: Silt, brown yellow, 10% sand fine grain with mica flakes, well sorted, dry,10yr (6/6).	
										SILT: Silt, light gray, 10% sand fine grain with mica flakes, well sorted, dry,10yr (7/2).	
95										SILT: Silt, brown, 10% sand fine grain with mica flakes, well sorted, dry,10yr (2/1), 1/16th. inch lenses.	
	60										
		#11	0.0	98-108	10					SILT: Silt, gray, 5% sand fine grain, well sorted, dry,10yr (7/1).	
100										SILT: Silt, very dark yellowish	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302436

US 00019838

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-05 **Boring Location:** Hawthorne St.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / Inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
	55									brown, 5% sand fine grain, well sorted, dry,10yr (3/2), organic.	
										SILT: Silt, gray, 5% sand fine grain, well sorted, dry,10yr (6/2) to 10yr (8/1). 1/16th. inch lenses.	
										SILT: Silt, light gray, 5% sand fine grain, well sorted, dry,10yr (7/2).	
										SAND: 5% sand fine grain, brownish yellow, well sorted, dry,10yr (6/6).	
105										SILT: Silt, light gray, 5% sand fine grain, well sorted, dry,10yr (7/2).	
										SILT: Silt, light gray, 5% sand fine grain, well sorted, dry, 2.5yr (7/1).	
	50									SAND: Sand, fine grain, brown yellow, well sorted, dry,10yr (6/6).	
										SILT: Silt, light gray, 5% sand fine grain, well sorted, dry,2.5yr (7/1).	
		#12	0.0	108-118	4					SILT: Silt, light gray, with mica flakes, 10% sand (gray) fine grain.	
110											
	45										

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

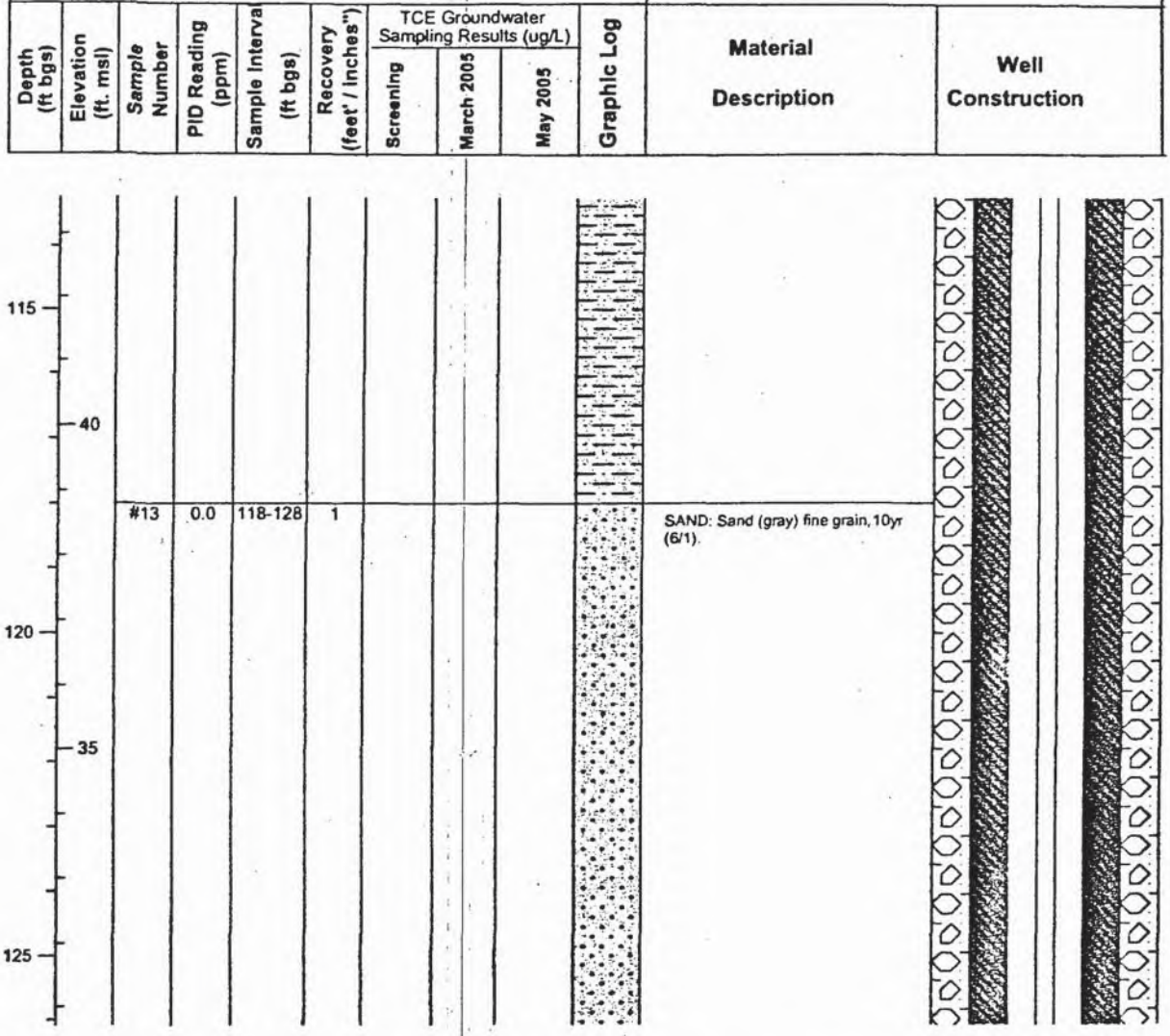
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302437

US 00019839

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-05 **Boring Location:** Hawthorne St.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302438

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-05 **Boring Location:** Hawthorne St.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches)	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
30											
		#14	0.0	128-138	10					SAND: Sand, pale yellow, medium to fine grain, well sorted, moist, 2.5yr (7/4).	
130											
25											
135											
20											
		#15	0.0	138-148	10					SAND: Sand, yellow, medium to fine grain, well sorted, wet, 10yr (7/6).	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

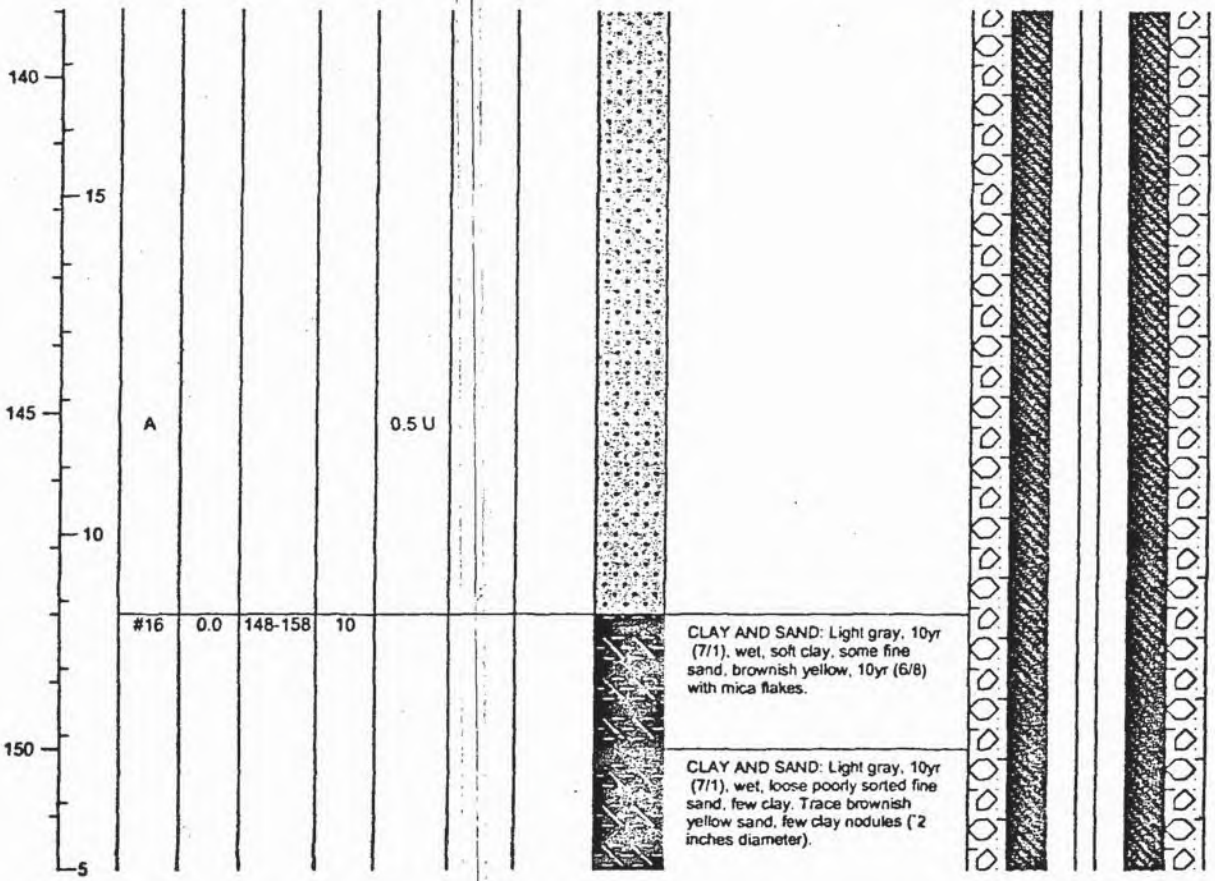
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302439

US 00019841

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-05 **Boring Location:** Hawthorne St.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-05 **Boring Location:** Hawthorne St.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
155										SAND: Brownish yellow 10yr (6/8) wet loose poorly sorted fine sand.	
0											
		#17	0.0	158-168	5					SAND: Yellowish brown 10yr (6/4) wet loose poorly sorted fine to medium sand.	
160											
-5											

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302441

CDM

125 Maiden Lane, 5th Floor
New York, NY 10038

Boring Name: MPW-05
Boring Location: Hawthorne St.; Port J.,NY

Client: U.S. Environmental Protection Agency
Site Location: Port Jefferson Station, New York

Project Name: Lawrence Aviation RI/FS
Project Number: 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
165		B				2 U	0.53	0.5 U		CLAY AND SAND: Yellowish brown 10yr (6/4) wet loose poorly sorted fine to medium sand with few clay, light gray, 10yr (7/1).	
-10										SAND: Yellowish brown 10yr (6/4) wet loose poorly sorted fine to medium sand.	
		#18	0.0	168-178	10					SAND AND SILT: Sand, light gray, fine grain, 20% silt, gray, poorly sorted, wet, 10yr (7/1), 5% iron oxide deposits.	
170											
-15										CLAY: Clay, white gray, 10yr (8/1).	
										SAND: Sand, light gray, medium to fine,10yr (7/1), sand, brown yellow, medium to fine 10yr (6/6), 10% small clay deposits, 5% silt.	
										CLAY: Clay, white gray, lens,10yr (8/1).	
175		C				0.5 U				CLAY AND SILT: Clayey silt with iron oxide deposits.	
-20										SAND: Sand, brownish yellow, medium to fine grain,10yr (6/8).	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Concrete
- Sand Pack
- Waterloo Packer (not to scale)
- Cement/Bentonite Grout
- Natural Material
- Bentonite Seal
- 4-inch Stainless Steel Well Casing
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302442

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-05 **Boring Location:** Hawthorne St.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
		#19	0.0	178-188	8					SAND: Sand, pale brown, medium to fine grain, poorly sorted, wet, 10yr (7/3).	
	180										
	-25										
	185	D				1.3				CLAY AND SILT: Silty clay lens with mica flakes (white), 10yr (8/1).	
										SAND: Sand, pale brown, medium to fine grain, poorly sorted, wet, 10yr (7/3).	
	-30										
		#20	0.0	188-198	8					SAND: Sand, pale yellow, medium to fine grain, poorly sorted, wet, 2.5yr (7/3).	
	190										

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

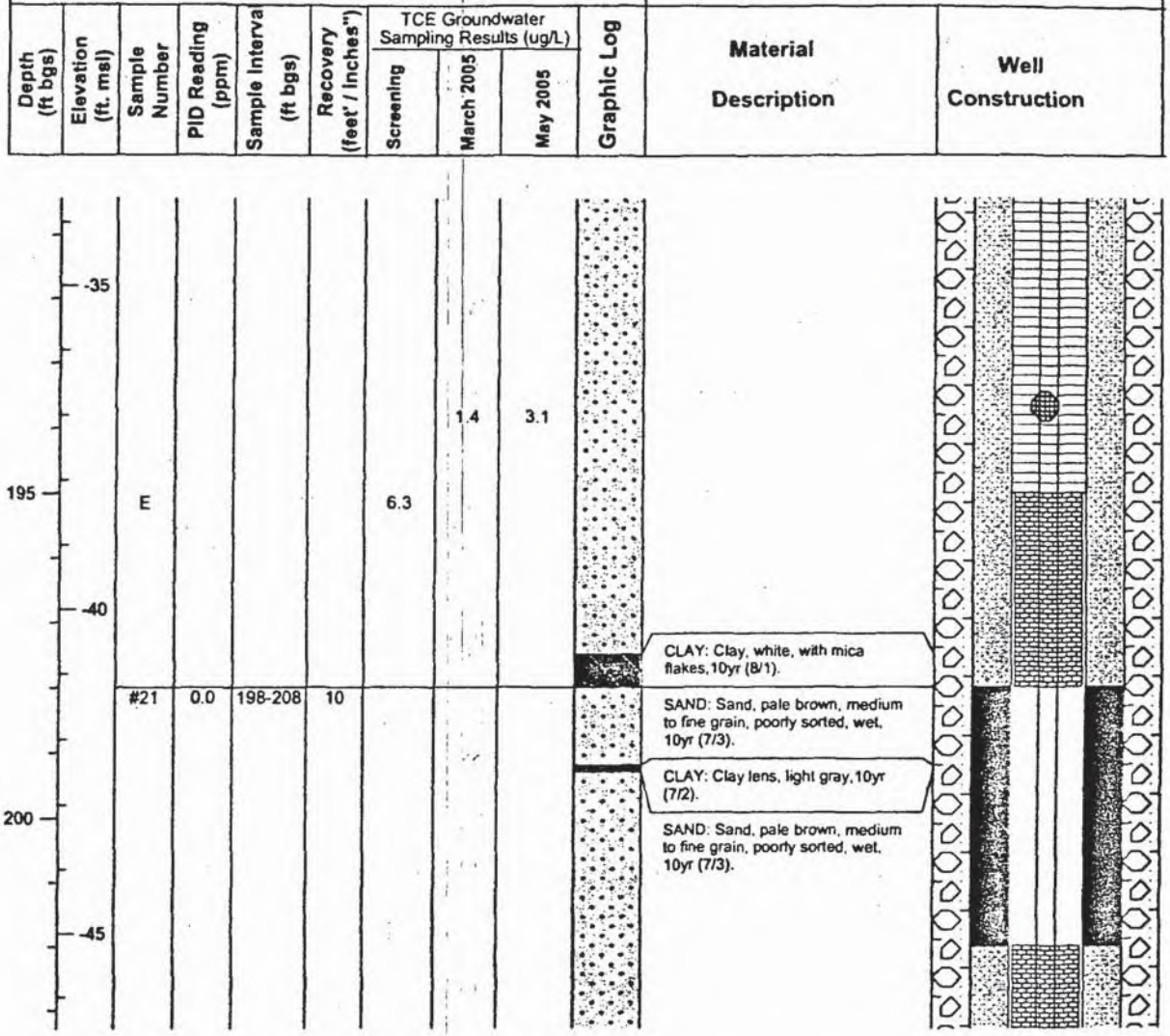
- Waterloo Sampling Port
- Concrete
- Sand Pack
- Waterloo Packer (not to scale)
- Cement/Bentonite Grout
- Natural Material
- Bentonite Seal
- 4-inch Stainless Steel Well Casing
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302443

US 00019845

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-05 **Boring Location:** Hawthorne St.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

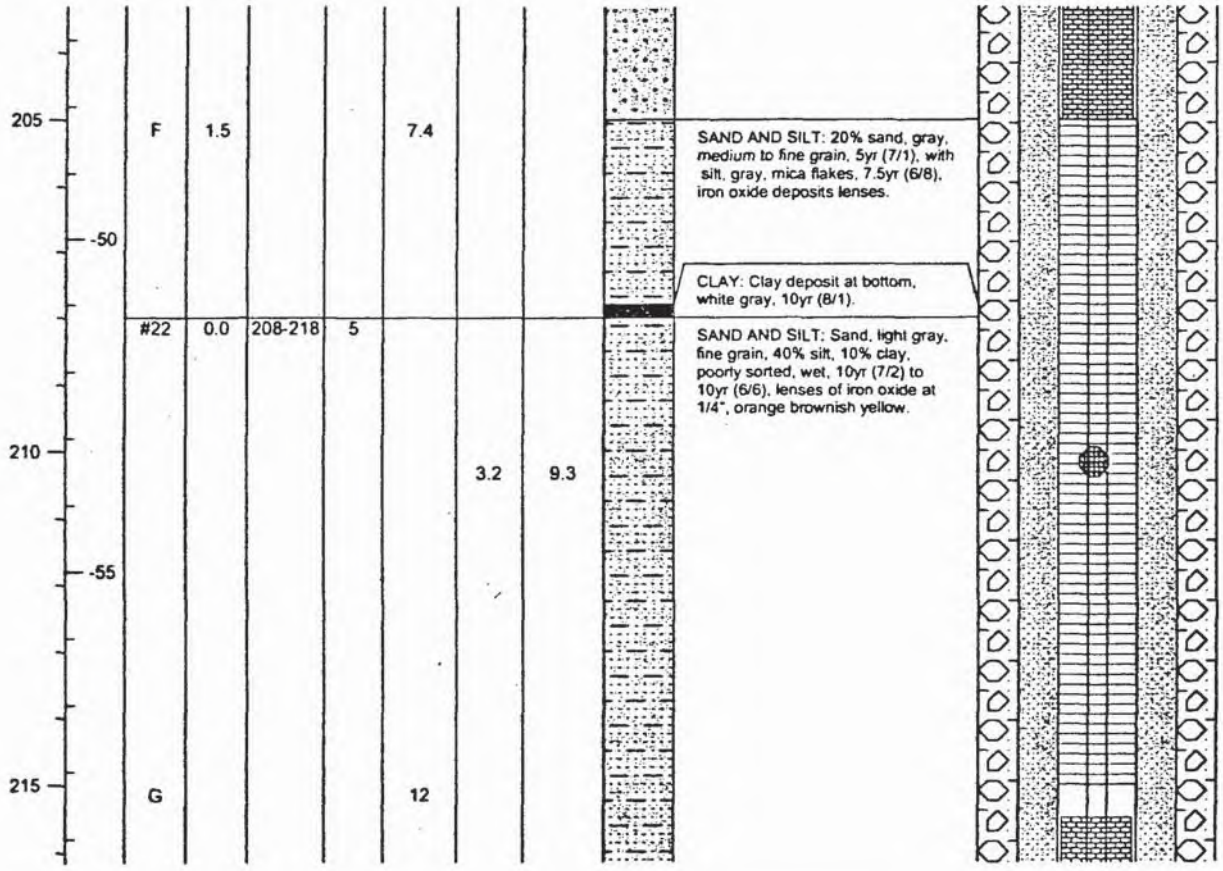
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302444

US 00019846

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-05
	Boring Location: Hawthorne St.; Port J.,NY
Client: U.S. Environmental Protection Agency	Project Name: Lawrence Aviation RI/FS
Site Location: Port Jefferson Station, New York	Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302445

US 00019847

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-05
	Boring Location: Hawthorne St.; Port J.,NY
Client: U.S. Environmental Protection Agency	Project Name: Lawrence Aviation RI/FS
Site Location: Port Jefferson Station, New York	Project Number: 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
	-60										
		#23	0.0	218-228	10					SAND AND SILT: Sand, light gray, fine grain, 40% silt, 10% clay, well sorted, wet, with mica flakes,10yr (7/2), lenses of iron oxide at 1/4", orange brownish yellow, 10yr (6/6).	
220											
	-65									SAND AND SILT: Iron deposits at 224', 1" diameter.	
225		H				10 D				SAND: Sand, light gray, fine grain, 40% silt, 10% clay, well sorted, wet, with mica flakes,10yr (7/2), lenses of iron oxide at 1/4", orange brownish yellow, 10yr (6/6).	
	-70										
		#24	0.0	228-238	10		2.4	8.9		SILT: Sand, light gray, fine grain, 30% silt, light gray, 5% iron deposits with mica flakes, poorly	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

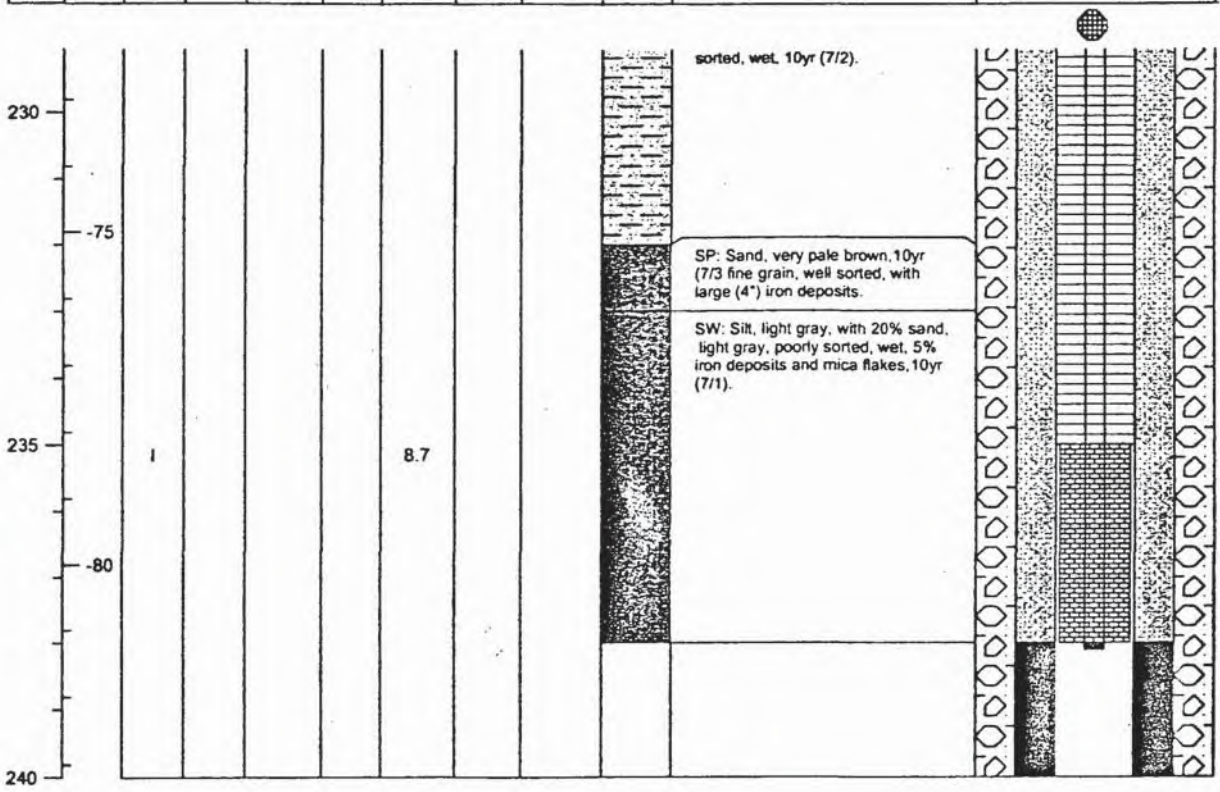
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302446

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-05 Boring Location: Hawthorne St.; Port J.,NY
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302447

US 00019849

Waterloo System Installation Log

302448

Client: USEPA
Site: LAI
Borehole No.: MW-05
Borehole Ø & Depth: 4" Ø 239.9' bgs
Casing Depth: n/a'
Depth to Water: 2 134.91
Date: 2/10/05
Sheet No.: 1 OF 1
Approved: [illegible]

Unit	In	Depth to Top	Notes
FEET		FEET	
	✓		BASE PLUG
3	✓		PACKER (4B)
5	✓		5' PVC casing
1	✓		1' PVC Casing
0.5	✓		PORT (VWP, BP) 4
2	✓		2' PVC Casing
1	✓		1' PVC Casing
3	✓		PACKER (4A)
2	✓		2' PVC Casing
2	✓		2' PVC Casing
3	✓		PACKER (3B)
5	✓		5' PVC Casing
6.5	✓		PORT (VWP, BP) 3
5	✓		5' PVC Casing
3	✓		PACKER (3A)
2	✓		2' PVC Casing
2	✓		2' PVC Casing
3	✓		PACKER (2B)
1	✓		1' PVC casing
0.5	✓		PORT (VWP, BP) 2
5	✓		5' PVC Casing
2	✓		2' PVC Casing
1	✓		1' PVC Casing
3	✓		PACKER (2A)
5	✓		5' PVC Casing
2	✓		2', PVC
2	✓		2' PVC
3	✓		PACKER (1B)
5	✓		5' PVC Casing
0.5	✓		PORT (VWP 1
5	✓		5' PVC Casing
3	✓		PACKER (1A)
10	✓		10' PVC casing (1)
10	✓		(2)
10	✓	Final depth	of top (3)
10	✓	of grey PVC	is (4)
10	✓	0.75 above	(5)
10	✓	4" steel +	1.15' (6)
10	✓	595' which	is on (7)
10	✓	target per	design. (8)
10	✓		(9)
10	✓		(10)
10	✓		(11)
10	✓		(12)
10	✓		(13)
10	✓		(14)
10	✓		(15)

DTW: 134.95 HEAD: 58.05
DTW: 135.18 HEAD: 29.82
10' - 4.15" = 5.85' (14)

← TRANSDUCERS OK PER CAL. SHEET.
HEAD: 83.3
DTW: 135.52
HEAD: 74.48
DTW: 135.52

Equipment Required

Unit	#	Unit	#
10 ft Casing	16	PVC Port (Single)	0
5 ft Casing	7	PVC Port (Double)	0
2 ft Casing	8	SS Port (Single)	0
1 ft Casing	4	SS Port (Double)	4
Base Plug	1	Double Valve Pump	0
Dow Packer	8	Bladder Pump	4
Bentonite Packer	0	VW Piezometer	4
Hydraulic Packer	0	Well Head Manifold	1
2 x 1000' POLY TUBING, PTFE lined			
TRANSDUCER WIRE 900'			
S.S. CABLE 265 ft			

8492.4

04- Reading Before Installation C.0906

Zone	Piezo Serial #	Reading	Temp	
1	14335 ✓	~~8492.4~~	3.8	190
2	14338 ✓	8678.7	4.5	220
3	14343 ✓	9343.7	4.3	235
4	14622 ✓	9258.6	3.7	255
1B	Bladder pump check valve shake dr.			
2B	Bladder pump check valve shake dr.			
3A	Bladder pump check valve shake dr.			
4B	Bladder pump check valve shake dr.			

Reading After Installation C.1241

Zone	Piezo Serial #	Reading	Temp
1	14335	7627.9	10.5
2	14338	7264.5	10.5
3	14343	7542.4	10.5
4	14622	6505.5	10.1
5			
6			
7			
8			

Depth to Water (DTW) uncorrected)

Borehole Water Level (after installation)	n/a

Comments

Zone	OFFSET	Pressure Port Opening to Top of Port
4	0.46 + 27.4 kPa	0.18
3	0.45	0.17
2	0.45	0.17
1	0.45	0.17

Cut off 4.15' from last 10' length of casing for final completion depth.

TRANSDUCER INITIAL READINGS WERE ALL CLOSE TO BUT ABOVE the TOP VALUE in CALC. SHEET OK PER RANDY

Client: CDM -				Well No:	MPW-05	Prepared By:	RB		
Install Order:	1			SWL:	145FT		6-Dec (2004)		
Zones				4		3	2		1
Drillhole Depth			240						
Base Plug at:	SS Plug		238						
(SS Plug or PVC Plug)									
Depth to Top of	Dual	Ports		228.5		210	193.5		165
(Single or Dual)									
Depth to Top of	3.83	Packers							
(3.83 or 3.58 or 2.86)									
Desired Stick-up			-3						

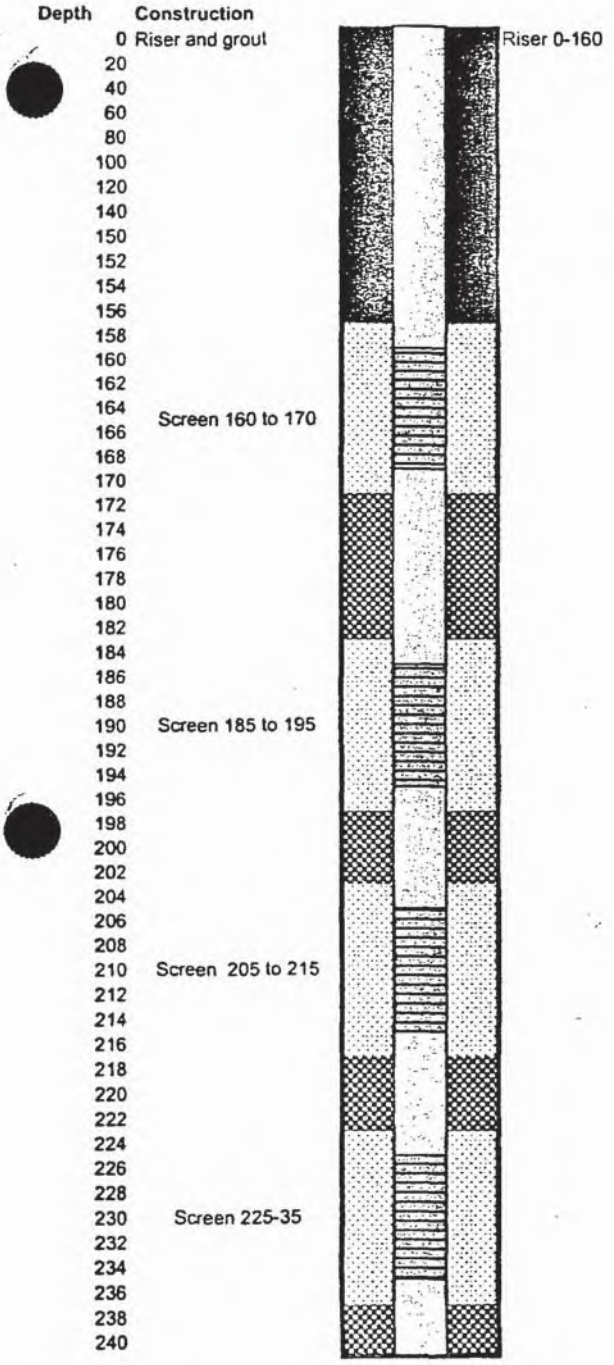
Interval Diff. (feet)	Depth to Top (feet)	Unit Length (feet)	Qnty.	Description of Component	Zone No.	(feet)	Monitoring Equipment: 1/2 X 3/8 Tubing OR 5/8 X 1/2 Tubing OR MWP Transducer OR Double Valve Pump OR Bladder Pump Description
	240			Depth to Btm.			
0.1	238.0	X 0.1		Base Plug			Manifold Type
	235.0	X 3.0	1	Packer			
							Stnd Wt Hd O Tube
			1	5' PVC Casing			1 Multipurge
							Pressure Sealed
		X	1	1' PVC Casing			
6.4	228.5	X 0.5		Port	4	255	VWP Transducer Bladder Pump
							04-14622 ✓
		X	1	2' PVC Casing			
		X	1	1' PVC Casing			
3.0	222.5	X 3.0		Packer			
		XX	2	2' PVC Casing			
4.0	215.5	X 3.0		Packer			
		X	1	5' PVC Casing			
5.0	210.0	X 0.5		Port	3	235	VWP Transducer Bladder Pump
		X	1	5' PVC Casing			04-14622 AM 2/11/05
		X		Packer			04-14343
5.0	202.0	3.0					
		XX	2	2' PVC Casing			
4.0	195.0	X 3.0		Packer			
		X	1	1' PVC Casing			
1.0	193.5	X 0.5		Port	2	220	VWP Transducer Bladder Pump
		X	1	5' PVC Casing			04-14338
		X	1	2' PVC Casing			
		X	1	1' PVC Casing			
8.0	182.5	X 3.0		Packer			
		X	1	5' PVC Casing			
		XX	2	2' PVC Casing			
9.0	170.5	X 3.0		Packer			
		X	1	5' PVC Casing			
5.0	165.0	X 0.5		Port	1	190	VWP Transducer Bladder Pump
		X	1	5' PVC Casing			04-14335
5.0	157.0	X 3.0		Packer			
			16	10' PVC Casing			
160.0	-3.0						

TOTALS				
	16	10' PVC Casing	900	1/4" X 0.17" Red LDPE Tubing
	7	5' PVC Casing	900	1/4" X 0.17" Sample LDPE Tubing
	8	2' PVC casing	900	VWP Transducer Cable
	4	1' PVC casing	4	Dual 3/8" Stem Port Assembly
	1	SS Plug	4	Bladder Pump
	265	3/16" ss SS Support Cable	8	3.83 Packers
			4	VWP Transducer

1/4/05 15:18
Macintosh HD:Desktop Folder:[401 CDM Dec6]Sum TLS

302449

MPW-05



silt

clay

V water level 145

A	ND	145
B	ND	165
	Toluene	39
C	ND	175
D	1.2	185
E	6.3	195
F	7.4	205
G	12	215
H	11	225
I		235

302450

US 00019852

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA MW-04 Zone 3

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 7, 2004

Serial Number: 04-14343

Temperature: 22.8 °C

Pressure Range: 350 kPa

†Barometric Pressure: 998.8 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Elice

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9326	9327	9327	0.200	0.06	0.038	0.01
70.0	8761	8761	8761	70.00	0.00	70.05	0.01
140.0	8195	8195	8195	139.9	-0.04	140.0	0.01
210.0	7629	7630	7630	209.7	-0.10	209.9	-0.03
280.0	7059	7059	7059	280.1	0.02	280.1	0.04
350.0	6491	6491	6491	350.2	0.05	350.0	-0.01

(kPa) Linear Gage Factor (G): 0.1234 (kPa/ digit) Regression Zero: 9328

Polynomial Gage Factors: A: -2.091E-07 B: -0.1201 C: 1138.50

Thermal Factor (K): -0.0450 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.01790 (psi/ digit)

Polynomial Gage Factors: A: -3.03283E-08 B: -0.01742 C: 165.13

Thermal Factor (K): -0.00653 (psi/ °C)

Calculated Pressures: Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$**

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9308 Temp(T_0): 22.5 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA MW-05 -04-Zone 4

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14622

Temperature: 22.5 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.6 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Elica

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9254	9253	9254	-0.019	-0.01	-0.031	-0.01
70.0	8562	8560	8561	70.02	0.00	69.91	-0.03
140.0	7870	7870	7870	139.9	-0.03	139.9	-0.04
210.0	7175	7175	7175	210.2	0.05	210.2	0.04
280.0	6485	6485	6485	280.0	-0.01	280.0	-0.01
350.0	5793	5793	5793	350.0	-0.01	350.0	0.00

(kPa) Linear Gage Factor (G): 0.1011 **(kPa/ digit)** **Regression Zero:** 9253

Polynomial Gage Factors: **A:** 2.449E-08 **B:** -0.1015 **C:** 937.17

Thermal Factor (K): -0.1171 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.01467 **(psi/ digit)**

Polynomial Gage Factors: **A:** 3.55272E-09 **B:** -0.01472 **C:** 135.93

Thermal Factor (K): -0.01698 **(psi/ °C)**

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9212 Temp(T_0): 22.2 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302452

US 00019854

MPW-06

302453

US 00019855

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-06 **Boring Location:** P.J. H.S Parking Lot
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147
Drilling Contractor: Uni-Tech Drilling Co. **Drilling Method:** Rotasonic **Sample Method:** Vibration Extraction **Date Started:** 08/25/2004 **Date Completed:** 02/04/2005 **Logged By:** Adrian Steinhauff (P.W.GROSSER, INC.)	**Northing:** 282627.237 **Easting:** 1241197.553 **Surface Elevation (ft. above msl):** 57.29 **Total Depth (ft bgs):** 175 **Initial Depth to Water (ft bgs):** 45 **Field Screening Instrument:** PID

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / Inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
0		#1	0	0-8	5					ASPHALT: Asphalt.	
										PEBBLES: Cobbles medium/bed for asphalt.	
	55									CLAY AND SAND: Sand (orange), medium and fine grain, dry, poorly sorted, 7.5yr (7/6).	
5										SAND AND SILT: Sand (red), medium and fine grain, 15% silt with mica flakes, 5yr (4/6).	
	50									SAND AND SILT: Sand (pale brown), medium and fine grain, 15% silt with mica flakes, 5yr (6/4).	
		#2	0	8-18	10					SAND AND SILT: Sand (gray), fine grain, 15% silt with mica flakes, well sorted, dry, 10yr (7/2).	
10											

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

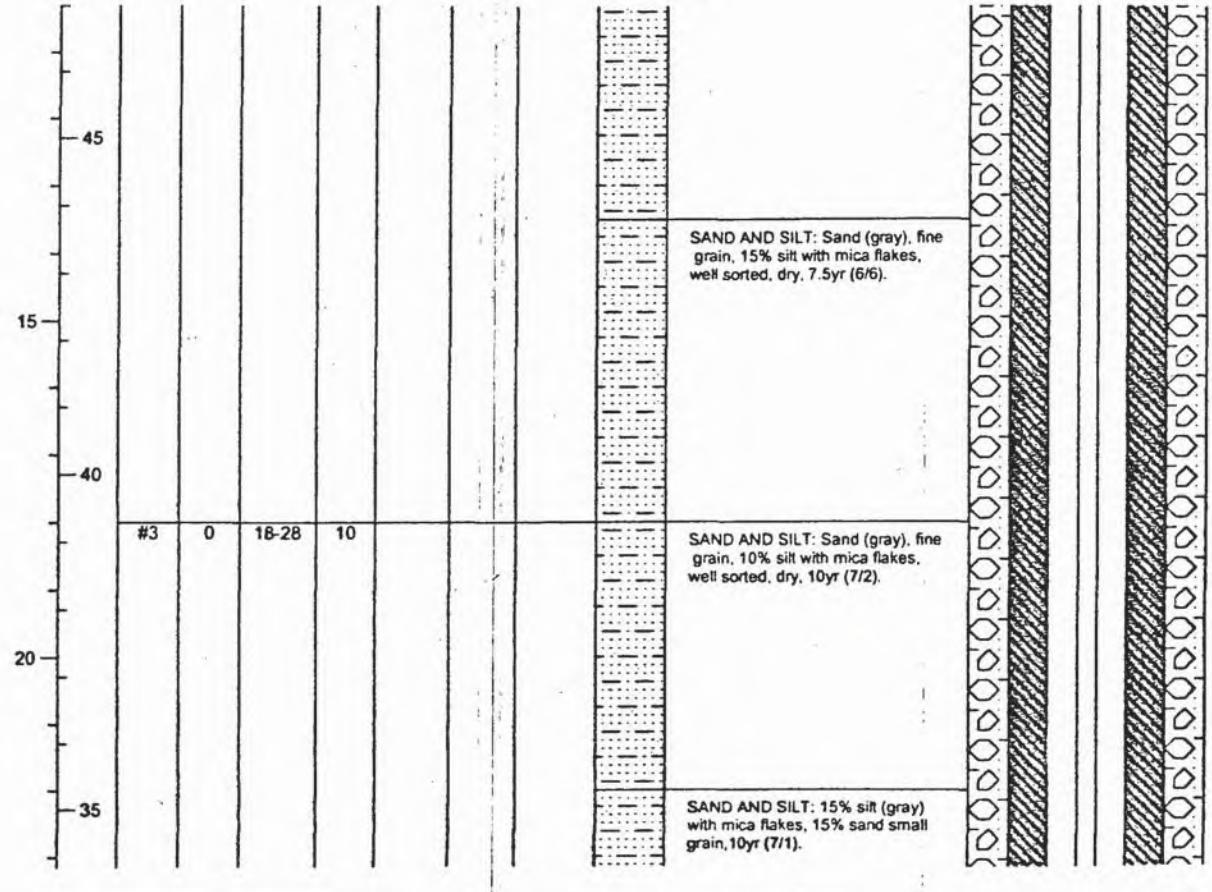
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302454

US 00019856

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-06 Boring Location: P.J. H.S Parking Lot
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

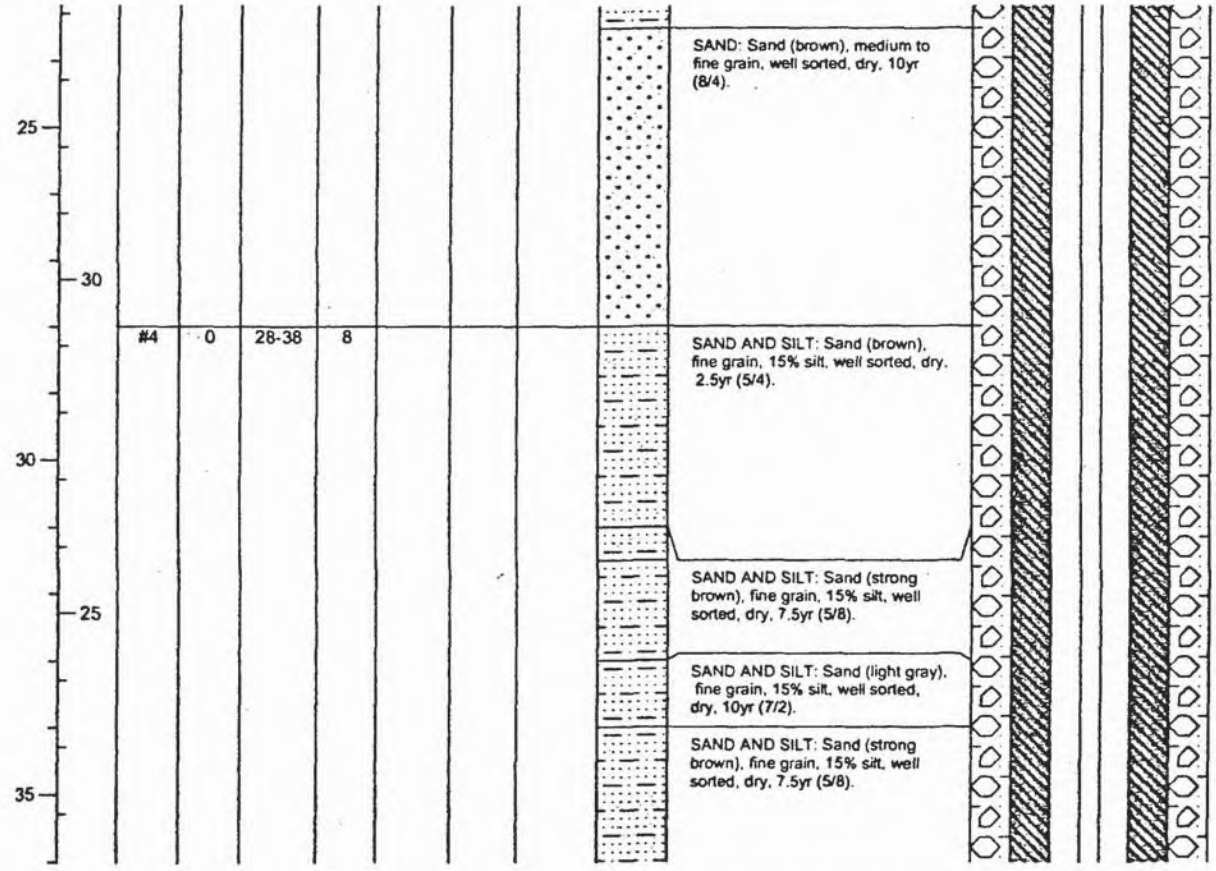
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302455

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-06
	Boring Location: P.J. H.S Parking Lot
Client: U.S. Environmental Protection Agency	Project Name: Lawrence Aviation RI/FS
Site Location: Port Jefferson Station, New York	Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

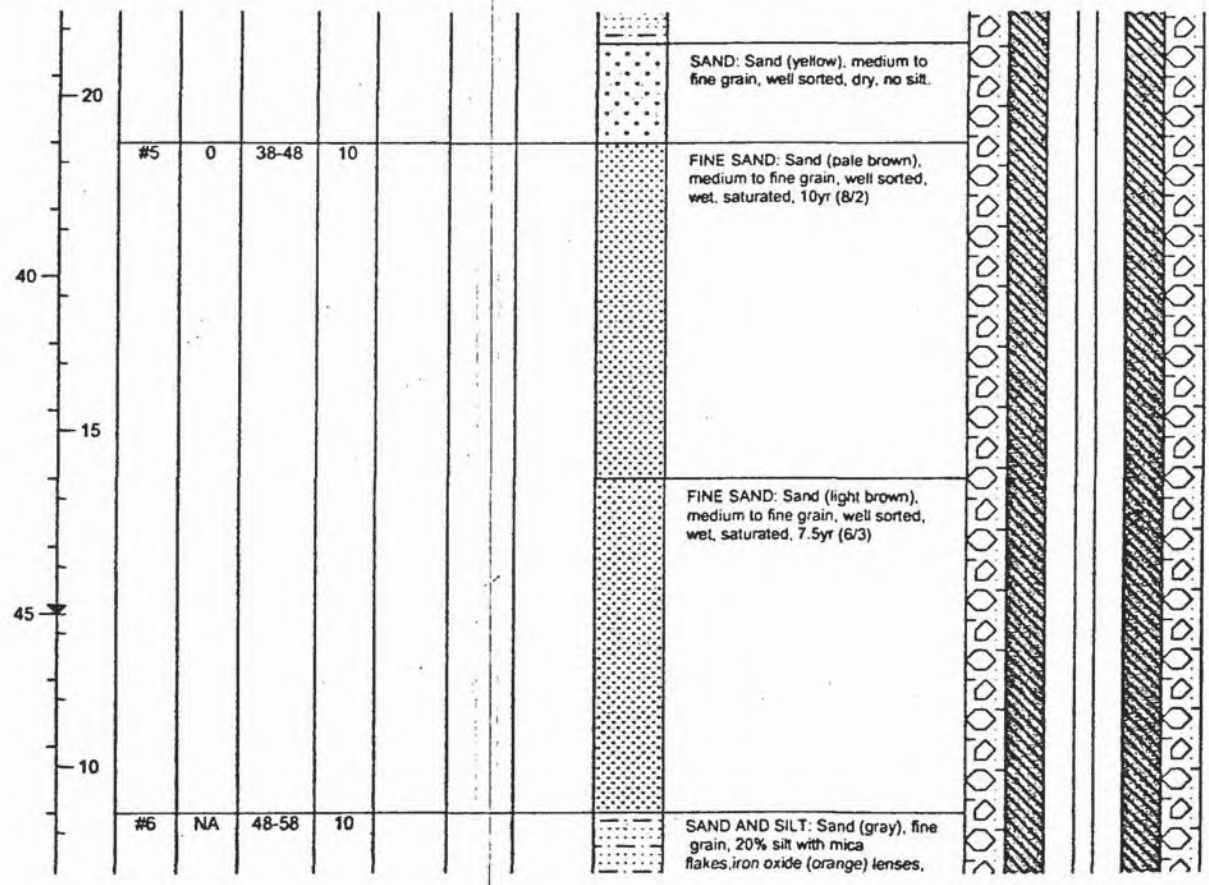
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302456

US 00019858

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-06 Boring Location: P.J. H.S Parking Lot
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302457

US 00019859

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-06 Boring Location: P.J. H.S Parking Lot
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
50										well sorted, wet, 10yr (7/2).	
55		A				0.5 U				SAND: Sand (brown), fine grain, well sorted, wet,10yr (6/6).	
										SAND AND SILT: Sand (gray), fine grain, 20% silt with mica flakes,iron oxide (orange) lenses, well sorted, wet, 10yr (7/2).	
0										SAND: Sand (brown), medium grain, wet,7.5yr (6/8).	
		#7	NA	58-68	10					SAND: Sand (yellow brown), medium to fine grain, well sorted, wet, 10yr (7/8).	
60										SAND AND SILT: Sand (gray), fine grain with 20% silt with mica flakes, 10yr (7/2).	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302458

US 00019860

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-06 Boring Location: P.J. H.S Parking Lot
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
-5										SAND: Sand (yellow brown), medium to fine grain, well sorted, wet, 10yr (7/8).	
65		B				0.5 U					
-10											
		#8	NA	68-78	10					SAND: Sand (brown), medium to fine grain, poorly sorted, wet, 10yr (8/3).	
70							1.2	1.2			
-15											

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

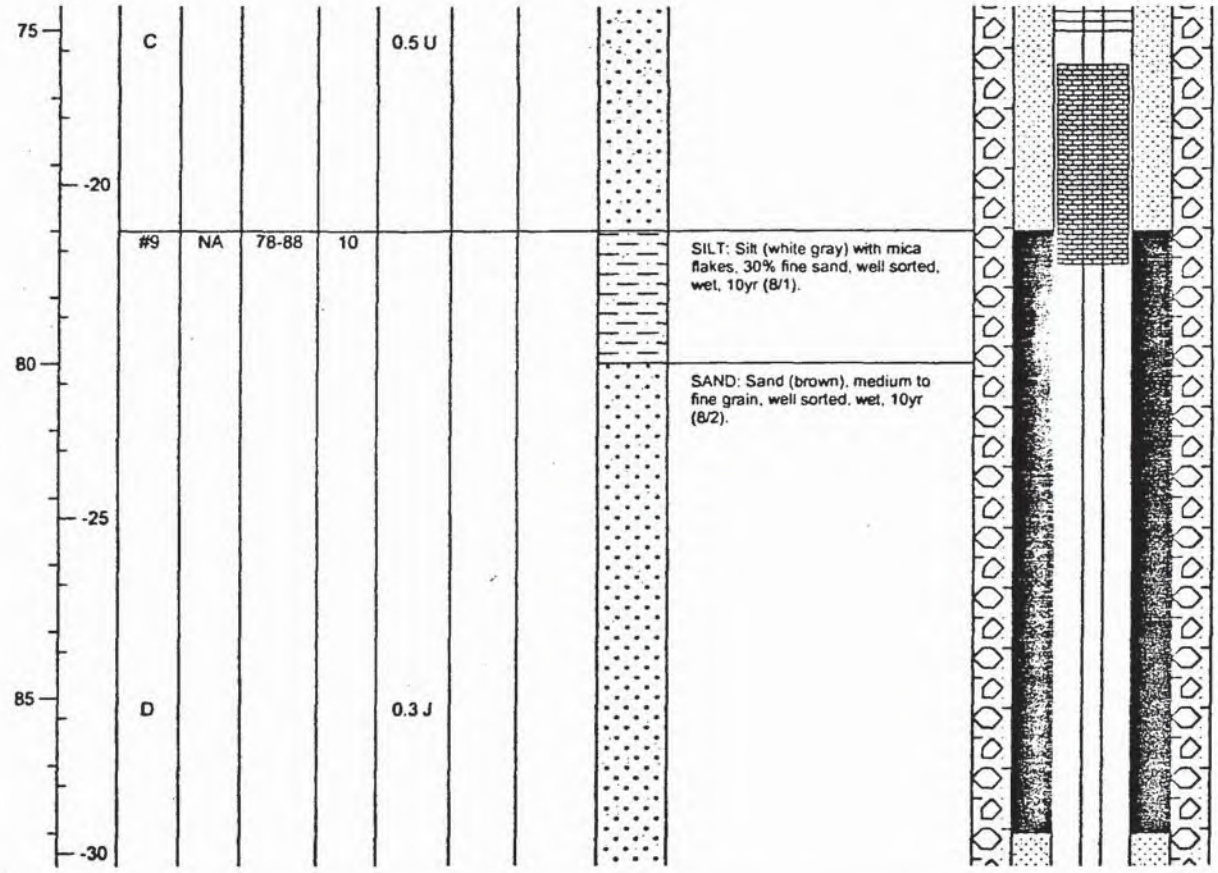
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302459

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-06 **Boring Location:** P.J. H.S Parking Lot
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

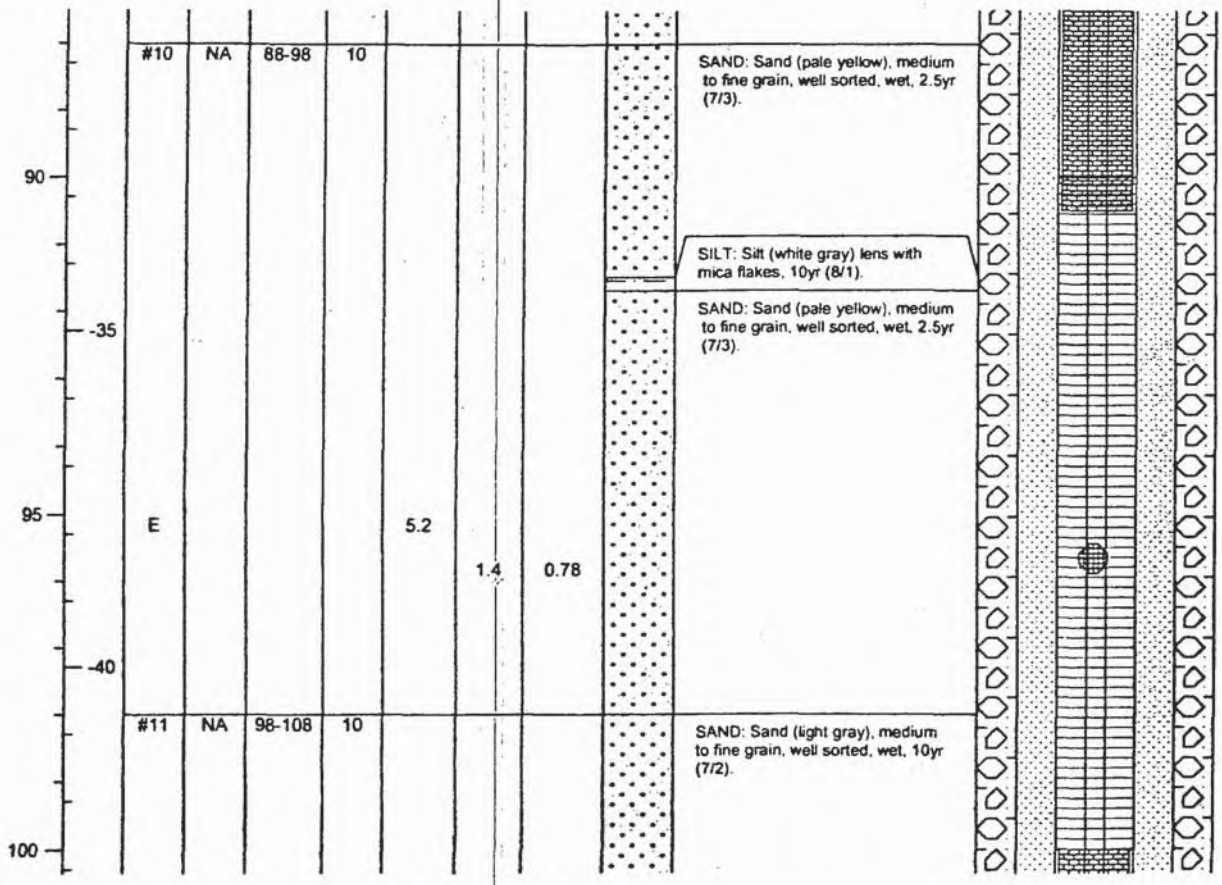
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302460

US 00019862

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-06 Boring Location: P.J. H.S Parking Lot
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

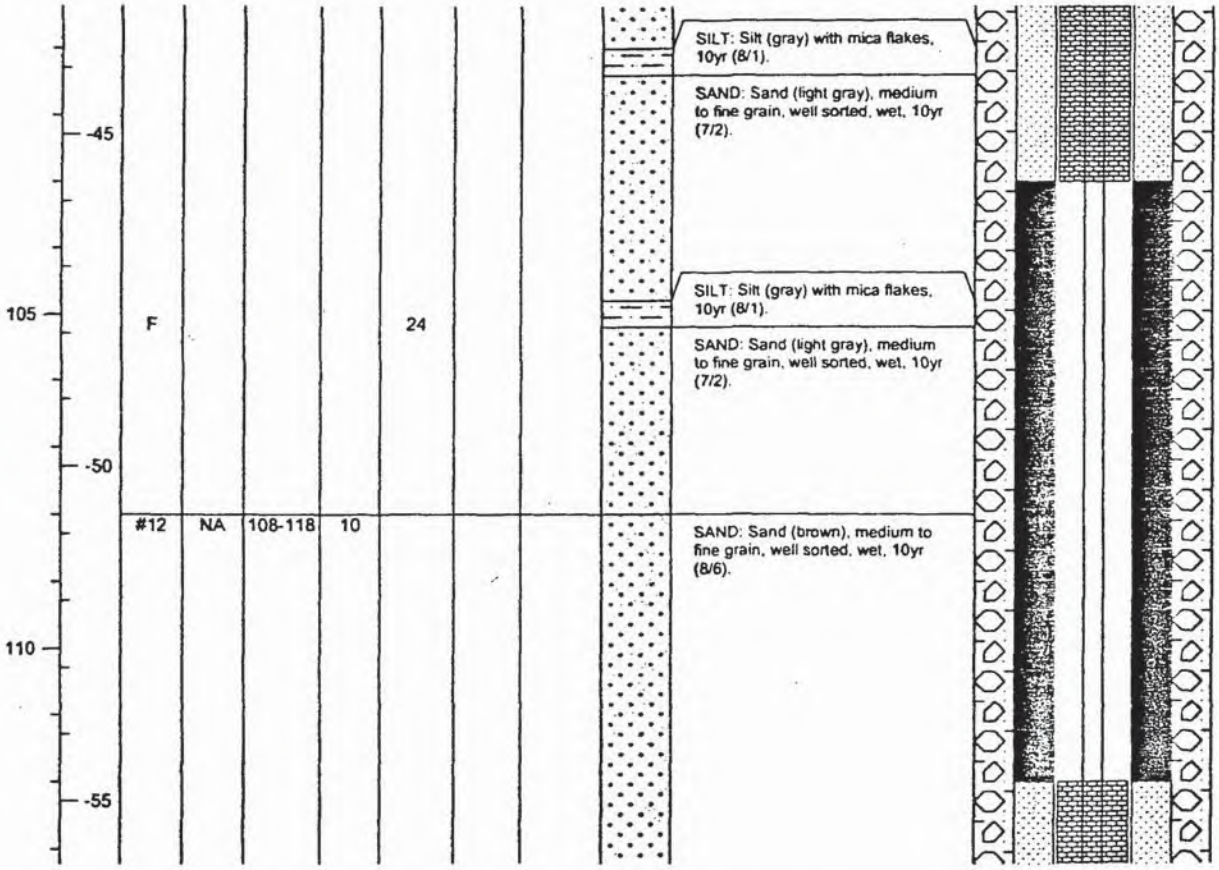
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302461

US 00019863

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-06 Boring Location: P.J. H.S Parking Lot
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

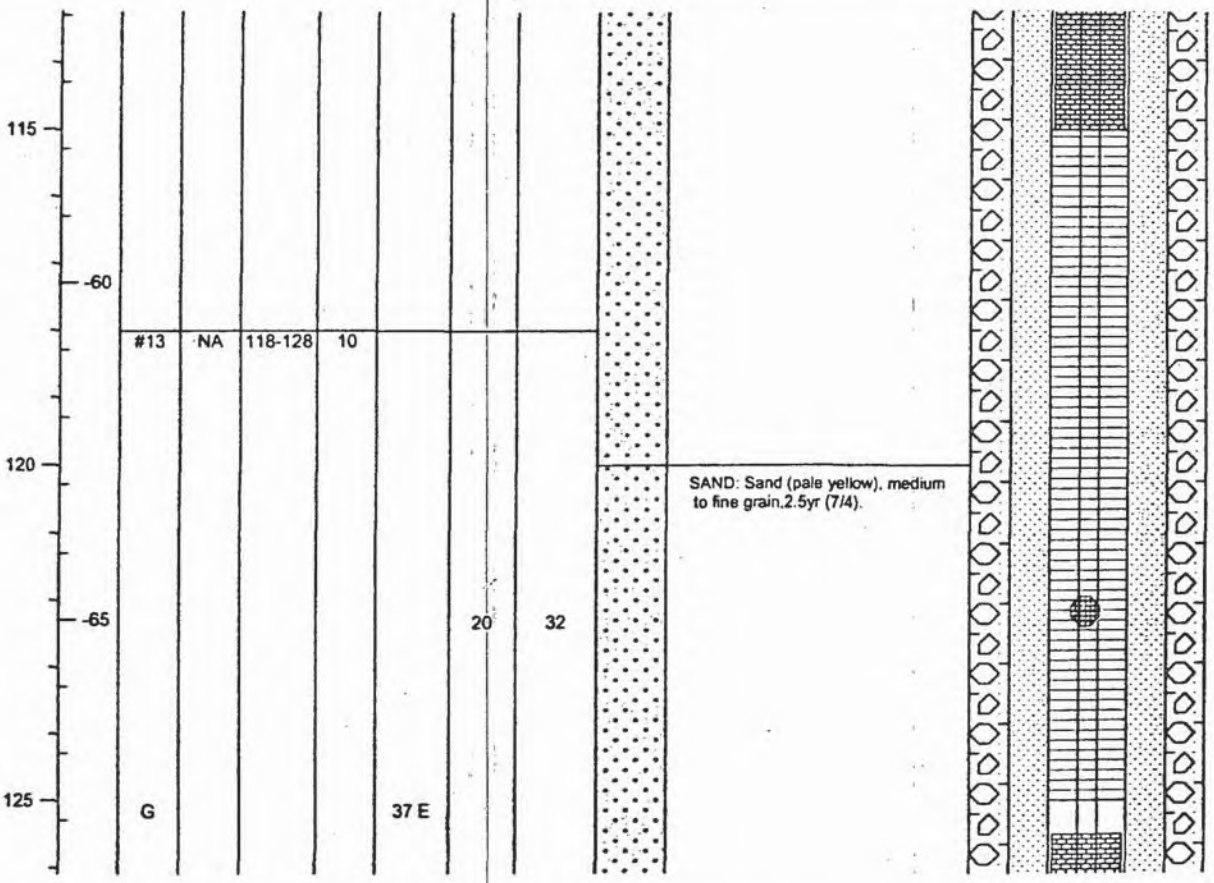
- Waterloo Sampling Port
- Concrete
- Sand Pack
- Waterloo Packer (not to scale)
- Cement/Bentonite Grout
- Natural Material
- Bentonite Seal
- 4-inch Stainless Steel Well Casing
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302462

US 00019864

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-06 **Boring Location:** P.J. H.S Parking Lot
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-06 **Boring Location:** P.J. H.S Parking Lot
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / Inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
	-70										
		#14	NA	128-138	9					FINE SAND: Sand (gray), fine grain, 5% silt, well sorted, wet, 10yr (7/1).	
130											
	-75										
135		H				16					
	-80										
		#15	NA	138-148	10					SAND AND SILT: Silt (gray) with mica flakes, 10% sand (gray), fine grain, well sorted, wet. Small iron	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302464

US 00019866

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-06 **Boring Location:** P.J. H.S Parking Lot
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
140										*oxide deposits.*	
	-85										
145											
	-90										
		#16	NA	148-158	10					SAND AND SILT: Silt (gray) with mica flakes, 10% sand (gray), fine grain, well sorted, wet. Small iron *oxide deposits.*	
150											

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = *microgram per liter*

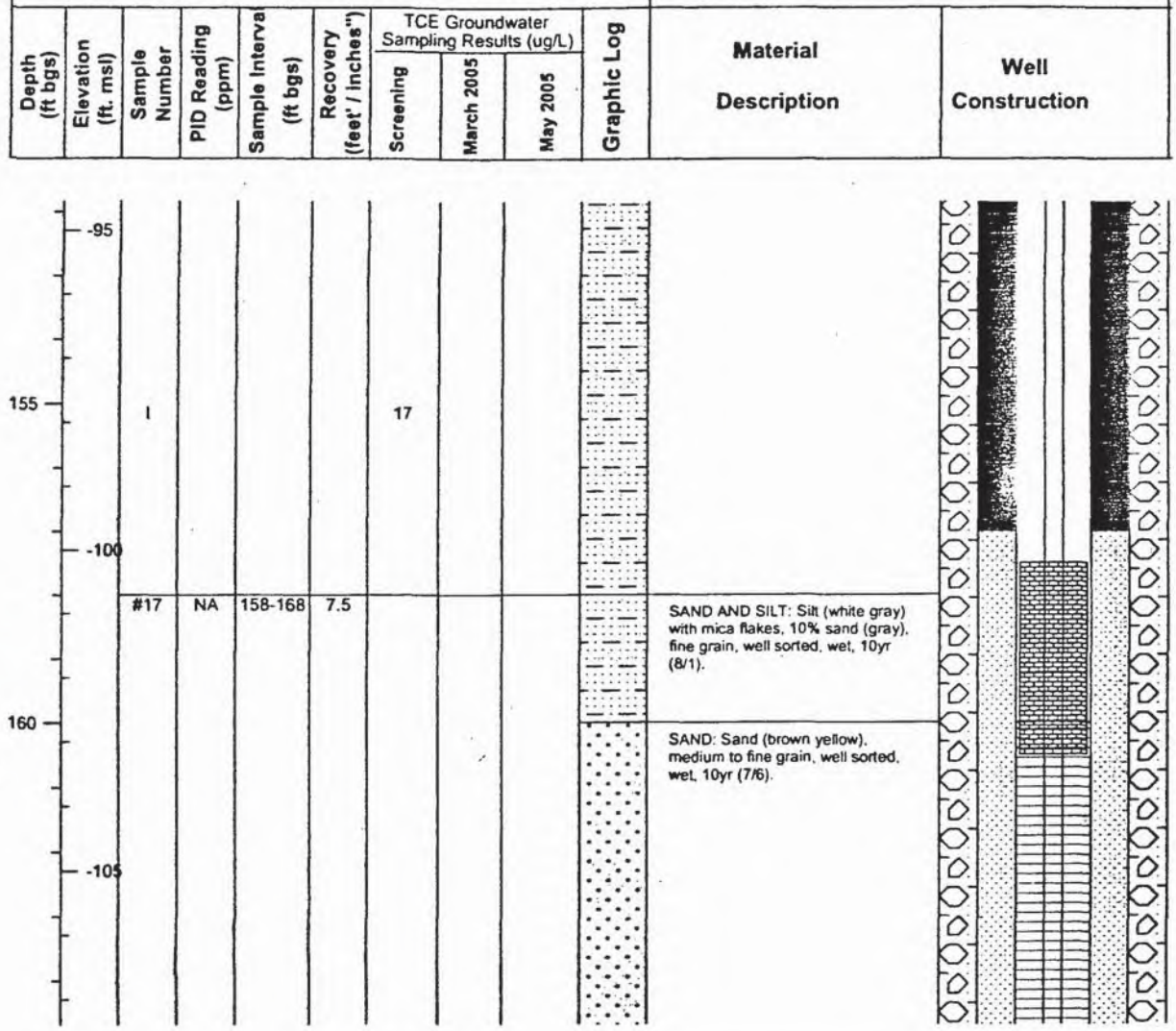
Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = *parts per million*

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-06
	Boring Location: P.J. H.S Parking Lot
Client: U.S. Environmental Protection Agency	Project Name: Lawrence Aviation RI/FS
Site Location: Port Jefferson Station, New York	Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302466

US 00019868

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-06 **Boring Location:** P.J. H.S Parking Lot
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
165		J				6	3.6	3.3			
	-110										
170											
	-115										
175											

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302467

NOTES: John Dougherty 2/4/05 0715-1720 = 10h.

302468

Waterloo System Installation Log

Client: USEPA | Borehole Ø & Depth: 4"ϕ 174.7' bgs | Date: 2/4/05

Site: LAA | Casing Depth: n/a | Sheet No.: 1 of 1

Borehole No.: MW-06 | Depth to Water: 34.17' bgs @ 0815 | Approved: JD. MG

Unit	In	Depth to Top	Notes
FEET			
0.1	✓	173	BASE PLUG
3	✓	170	PACKER
2	✓		2' PVC Casing
2	✓		2' PVC Casing
0.5	✓		PORT (VW/P, BP) 4
5	✓		5' Casing, PVC
3	✓		PACKER
10	✓		10' PVC Casing
10	✓		10' PVC Casing
5	✓		5' PVC Casing
2	✓		2' PVC Casing
2	✓		2' PVC Casing
3	✓		PACKER
2	✓		2' PVC Casing
1	✓		1' PVC Casing
			~~2' PVC Casing~~
			~~PACKER~~
			~~2' PVC Casing~~
			~~2' PVC Casing~~ 3
0.5	✓		PORT (VW/P, BP) 3
5	✓		5' PVC Casing. 2nd 2/4/05
2	✓		2' PVC Casing + 5' PVC
~~3~~	✓		~~5' Casing~~ PACKER + 5' PVC casing
2	✓	2/4/05	+2' PVC Casing
2	✓		+2' PVC Casing
0.5	✓		PORT (VW/P, BP) 2
5	✓		5' Casing
3	✓		PACKER
5	✓		5' PVC Casing
2	✓		2' PVC Casing
2	✓		2' PVC Casing
3	✓		PACKER
5	✓		5' PVC Casing
0.5	✓		PORT (VW/P, BP) 1
5	✓		5' PVC Casing
3	✓		PACKER
10	✓		10' PVC Casing
	✓		
	✓		
	✓		
	✓		
10	✓		10' PVC Casing
~~5~~ 1	✓		15' PVC Casing

← Transducer check ok?

5' PVC Casing

PACKER, 2' PVC Casing, 2' PVC Casing

1300 Drillers offsite

Equipment Required

Unit	#	Unit	#
10 ft Casing	8	PVC Port (Single)	/
5 ft Casing	8	PVC Port (Double)	/
2 ft Casing	12	SS Port (Single)	/
1 ft Casing	2	SS Port (Double)	4
Base Plug	1	Double Valve Pump	/
Dow Packer	8	Bladder Pump	4
Bentonite Packer	/	VW Piezometer	4
Hydraulic Packer	/	Well Head Manifold	1
Tubing: 2000 ft.			
Transducer Cable: 530 ft.			
SS Support Cable 195 ft.			

04- Reading Before Installation @ 0855

Zone	Piezo Serial #	Reading	Temp (C)	
1	14629 ✓	9345.5	2.5	90
2	14625 ✓	9272.4	2.1	115
3	14621 ✓	9158.6	2.6	140
4	14620 ✓	9787.9	2.9	185'
1B	DTW =	34.8/34.81	@ 1226	
2B	DTW =	34.8/34.78	@ 1219	
3B	DTW =	34.8/34.79	@ 1218	
4B	DTW =	34.8/34.76	@ 1217	

04- Reading After Installation

Zone	Piezo Serial #	Reading	Temp	Head
1	14629	8446.6	4.5	35.14
2	14625	7501.2	4.8	60.72
3	14621	6694.2	7.1, 6.1	87.21
4	14620	5696.7	8.7	130.74
B1	Bladder Pump Valve check ok			OD
B2				
B3				
B4				

Borehole Water Level (after installation)	n/a.

Zone

Comments

XD OFFSET 0.45' + 27.4mm S/N 14620 4

0.45 14621 3

0.46 14625 2

0.45 14629 1

Top of Gray PVC is 16" bgs which is Correct. System is in position

Notes by John Dougherty 2/4/05

2/4/05

Client: CDM	Well No: CPW-06	Prepared By: RB
Install Order: 6	SWL: 50FT	6-Dec (2004)

Zones				4		3	2		1
DrillHole Depth			175						
Base Plug at: SS Plug (SS Plug or PVC Plug)			173						
Depth to Top of Dual (Single or Dual) Ports				165.5		122	95.5		70
Depth to Top of 3.83 (3.83 or 3.58 or 2.86) Packers									
Desired Stick-up			-3						

Interval Diff. (feet)	Depth to Top (feet)	Unit Length (feet)	Qnty.	Description of Component	Zone No.	(feet)	Monitoring Equipment: 1/2" & 3/8" Tubing OR 3/4" & 1/2" Tubing OR Vibrating Wire Transducer, Double Valve Pump OR Bladder Pump Description
	175			Depth to Btm			
0.1	173.0	0.1	X	Base Plug			Manifold Type
	170.0	3.0	X	Packer			Stnd W Hd O Tube
			X 2	2' PVC Casing			1 Multipurge
							Pressure Seated
4.4	165.5	0.5	X	Port	4	185	VWP Transducer Bladder Pump
			X 1	5' PVC Casing			
5.0	157.5	3.0	X	Packer			
			X 2	10' PVC Casing			
			X 1	6' PVC Casing			
			X 2	4' PVC Casing			
29.0	125.5	3.0	X	Packer			
			X 1	2' PVC Casing			
			X 1	1' PVC Casing			
3.0	122.0	0.5	X	Port	3	140	VWP Transducer Bladder Pump
			X 1	5' PVC Casing			
			X 1	2' PVC Casing			
			X	Packer			
7.0	112.0	3.0	X 1	6' PVC Casing			
			X 2	2' PVC Casing			
9.0	100.0	3.0	X	Packer			
			X 2	2' PVC Casing			
4.0	95.5	0.5	X	Port	2	115	VWP Transducer Bladder Pump
			X 1	5' PVC Casing			
5.0	87.5	3.0	X	Packer			
			X 1	5' PVC Casing			
			X 2	2' PVC Casing			
9.0	75.5	3.0	X	Packer			
			X 1	5' PVC Casing			
6.0	70.0	0.5	X	Port	1	90	VWP Transducer Bladder Pump
			1	5' PVC Casing			
5.0	62.0	3.0		Packer			
			6	10' PVC Casing			
			1	5' PVC Casing			
65.0	-3.0						

TOTALS				
8	10' PVC Casing	530	1/4" X 0.17" Red LDPE Tubing	
5	5' PVC Casing	530	1/4" X 0.17" Sample LDPE Tubing	
12	2' PVC casing	530	VWP Transducer Cable	
2	1' PVC casing	4	Dual 3/8" Stem Port Assembly	
1	SS Plug	1	Bladder Pump	
193	3/16" dia SS Support Cable	5	3.83 Packers	
		4	VWP Transducer	

1/4/05 15:18
Macintosh HD:Desktop Folder:[401 CDM Dec6]Sum TLS

Essential: 71psi
Design: 95psi
Flow 110ml/c
Drive 165
Vent 105

Essential: 52psi
Design: 80psi
Flow 110ml/c
Drive 125
Vent 105

Essential 41psi
Design 65psi
Flow 110ml/c
Drive 125
Vent 105

Essential 30psi
Design 55psi
Flow 110ml/c.
Drive 125, Vent 105

77.5

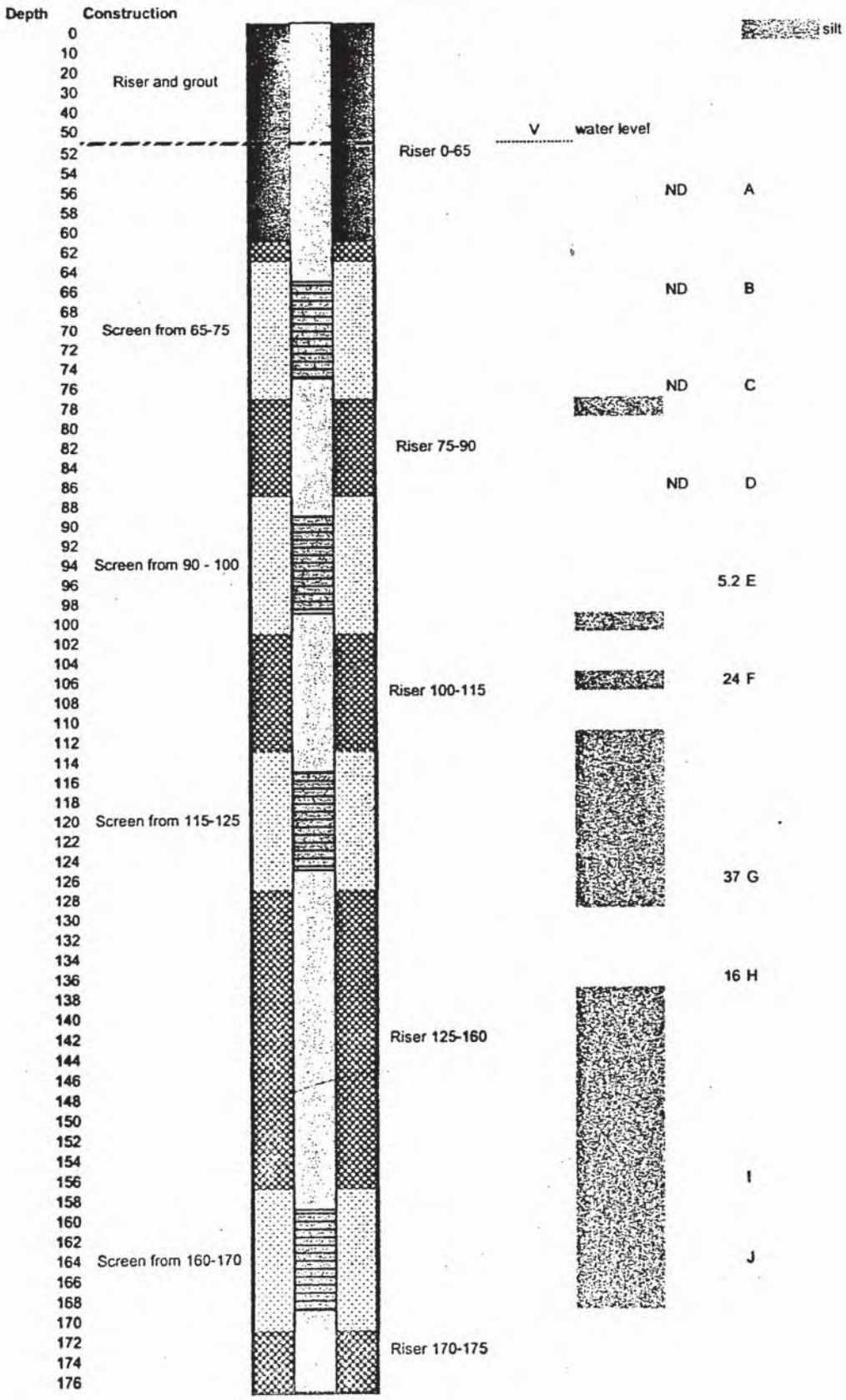
72

64

Ground surface to top of 4" casing: 25"
Transducers soaking at 0830

302469

MPW-06



302470

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

MW-06 Zone 1

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14629

Temperature: 22.5 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.6 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Erica

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9376	9376	9376	0.307	0.09	0.028	0.01
70.0	8777	8777	8777	69.89	-0.03	69.95	-0.01
140.0	8176	8175	8176	139.8	-0.07	139.9	-0.02
210.0	7573	7572	7573	209.8	-0.05	210.0	0.00
280.0	6969	6969	6969	279.9	-0.02	280.0	0.00
350.0	6363	6364	6364	350.3	0.08	350.1	0.01

(kPa) Linear Gage Factor (G): 0.1162 (kPa/ digit) Regression Zero: 9379

Polynomial Gage Factors: A: -2.314E-07 B: -0.1125 C: 1075.44

Thermal Factor (K): -0.0593 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.01685 (psi/ digit)

Polynomial Gage Factors: A: -3.3561E-08 B: -0.01632 C: 155.98

Thermal Factor (K): -0.00860 (psi/ °C)

Calculated Pressures: Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$**

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9340 Temp(T_0): 23.1 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302471

US 00019873

2/4/05 S/N 04-14629 Zone 1

Transducer function check & initial DTW reading.

Initial reading: 9349.5

reading at depth: 8446.6

902.9 digits

$902.9 \text{ digits} \times 0.01685 \frac{\text{psi}}{\text{digit}} = 15.21 \text{ psi}$

$15.21 \text{ psi} \times 2.31 \frac{\text{ft.}}{\text{psi}} = 35.135 \text{ ft. of Head.}$

DTW = Installed depth − head

= 70′ − 35.14′ = 34.86′

302472

US 00019874

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

MW-06 Zone 2

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14625

Temperature: 22.5 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.6 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Erica

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9294	9294	9294	-0.097	-0.03	-0.091	-0.03
70.0	8607	8608	8608	70.13	0.04	70.18	0.05
140.0	7923	7924	7924	140.1	0.03	140.1	0.04
210.0	7242	7241	7242	209.9	-0.04	209.8	-0.05
280.0	6556	6557	6557	279.9	-0.02	280.0	0.00
350.0	5871	5871	5871	350.1	0.02	350.1	0.02

(kPa) Linear Gage Factor (G): 0.1023 (kPa/ digit)

Regression Zero: 9293

Polynomial Gage Factors: A: 3.938E-09 B: -0.1024 C: 950.87

Thermal Factor (K): -0.0859 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.01484 (psi/ digit)

Polynomial Gage Factors: A: 5.71123E-10 B: -0.01485 C: 137.91

Thermal Factor (K): -0.01246 (psi/ °C)

Calculated Pressures: Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$**

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9248 Temp(T_0): 22.6 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

2/4/05 TMW
S/N 04-14625

Initial XD function check @ DTW.

Initial reading 9272.4

Reading at depth 7501.2

1771.2

1771.2 digits × 0.01484 psi/digit

= 26.28 psi

2.31 ft./psi × 26.28 psi = 60.72' head

DTW = installed depth − head.

= 95.5' − 60.72'

= 37.78' BGS

302474

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

MW-06 Fmc K3

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14621

Temperature: 22.5 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.6 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Erica

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9186	9187	9187	0.350	0.10	0.058	0.02
70.0	8527	8528	8528	69.97	-0.01	70.10	0.03
140.0	7868	7869	7869	139.6	-0.12	139.9	-0.02
210.0	7204	7204	7204	209.8	-0.06	210.1	0.02
280.0	6540	6540	6540	280.0	-0.01	280.0	0.01
350.0	5874	5874	5874	350.3	0.09	350.0	-0.01

(kPa) Linear Gage Factor (G): 0.1057 (kPa/ digit) **Regression Zero: 9190**

Polynomial Gage Factors: A: -2.364E-07 B: -0.1021 C: 957.81

Thermal Factor (K): -0.0435 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.01532 (psi/ digit)

Polynomial Gage Factors: A: -3.42822E-08 B: -0.01481 C: 138.92

Thermal Factor (K): -0.00631 (psi/ °C)

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9146 Temp(T_0): 22.4 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302475

US 00019877

2/4/05 Zone 3

S/N 04-14621

initial reading 9158.6

readings at depth 6694.2

2464.4 digits

PSI = 2464.4 digits x 0.01532 $\frac{\text{PSI}}{\text{digit}}$

= 37.75 psi

Head = 37.75 PSI x 2.31 $\frac{\text{ft.}}{\text{PSI}}$

= 87.21 ft.

DTW = Installed Depth − head

= 122' − 87.21'

= 39.79'

302476

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

MW-04 Zone 4

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14620

Temperature: 22.5 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.6 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Elice

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9312	9312	9312	0.326	0.09	-0.003	0.00
70.0	8671	8672	8672	69.91	-0.02	70.03	0.01
140.0	8028	8027	8028	139.9	-0.03	140.1	0.03
210.0	7387	7387	7387	209.5	-0.15	209.7	-0.08
280.0	6737	6736	6737	280.1	0.04	280.2	0.04
350.0	6091	6091	6091	350.3	0.08	349.9	-0.02

(kPa) Linear Gage Factor (G): 0.1086 (kPa/ digit) Regression Zero: 9315

Polynomial Gage Factors: A: -2.385E-07 B: -0.1050 C: 998.17

Thermal Factor (K): -0.0101 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.01576 (psi/ digit)

Polynomial Gage Factors: A: -3.45959E-08 B: -0.01522 C: 144.77

Thermal Factor (K): -0.00146 (psi/ °C)

Calculated Pressures: Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$**

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9276 Temp(T_0): 22.6 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302477

US 00019879

S/N 04-14620 2/4/05

DTW check & xd transducer function check

initial reading: 9287.9
reading at depth: 5696.7
3591.2

PSI = 3591.2 digits × 0.01576 $\frac{PSI}{digit}$ = 56.60 psi

Ft. head = 56.60 psi × 2.31 $\frac{ft}{psi}$ = 130.74 ft. head

DTW = installed depth − head
= 165.5 − 130.74
~~= 37.76'~~ ans
= 34.76'

302478

US 00019880

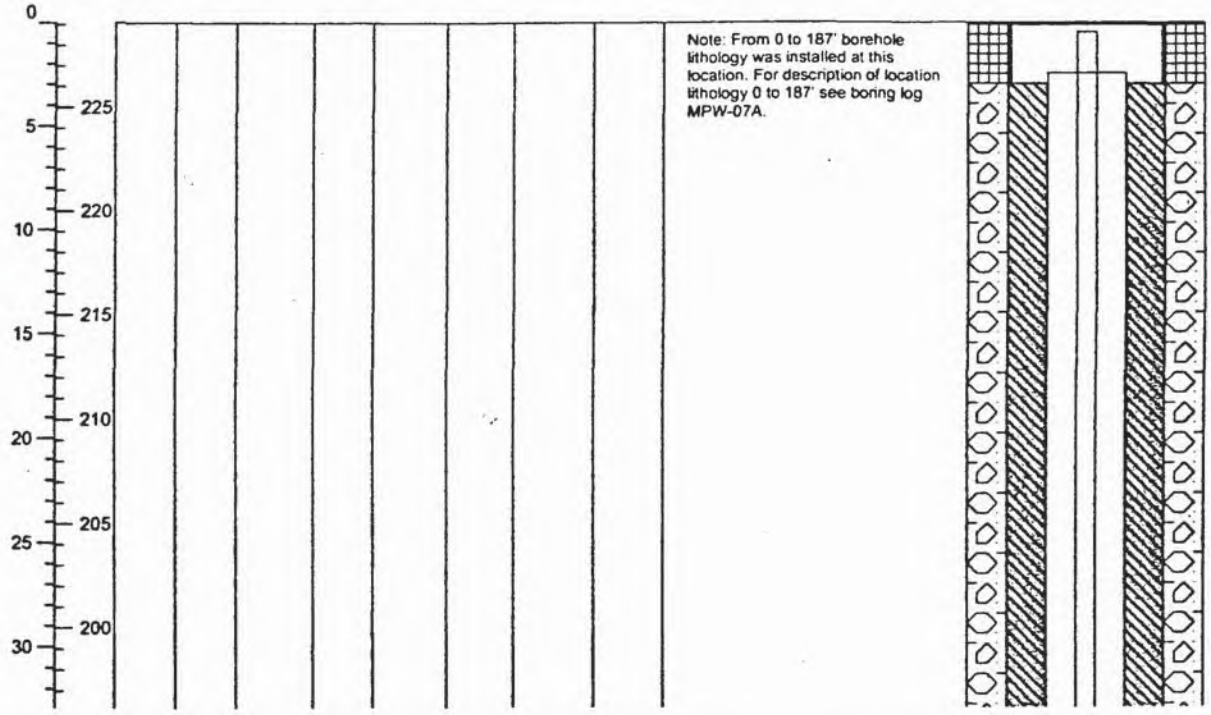
MPW-07

302479

US 00019881

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-7 **Boring Location:** Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147
Drilling Contractor: Uni-Tech Drilling Co. **Drilling Method:** Rotasonic **Sample Method:** Vibration Extraction **Date Started:** 07/23/2004 **Date Completed:** 02/01/2005 **Logged By:** Adrian Steinhauff (P.W.GROSSER, INC.)	**Northing:** 278813.286 **Easting:** 1241498.444 **Surface Elevation (ft. above msl):** 229.11 **Total Depth (ft bgs):** 270 **Initial Depth to Water (ft bgs):** approx. 200 **Field Screening Instrument:** PID

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches)	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

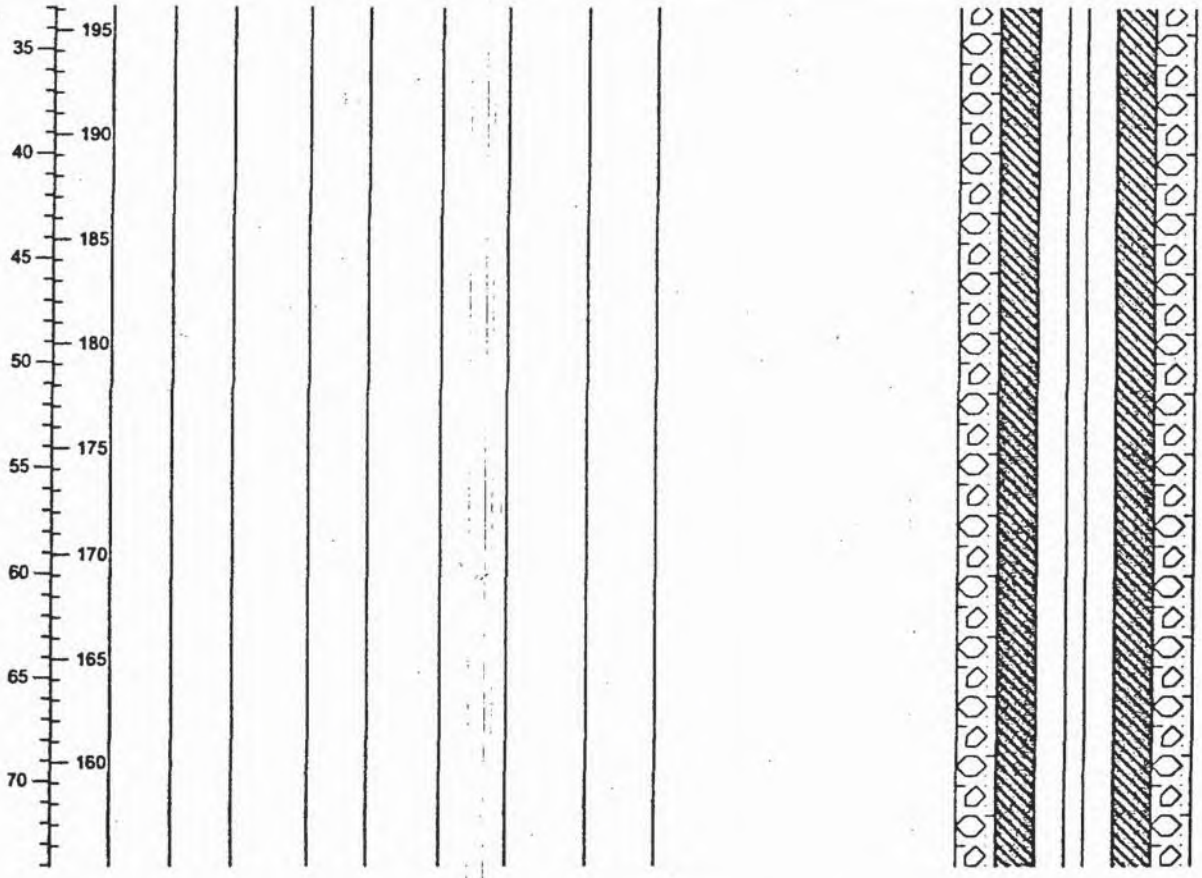
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.
Installed well, MPW-07 is the relocation of well MPW-07A in between buildings: "10X Chem Mill" and "G"

302480

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-7 **Boring Location:** Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

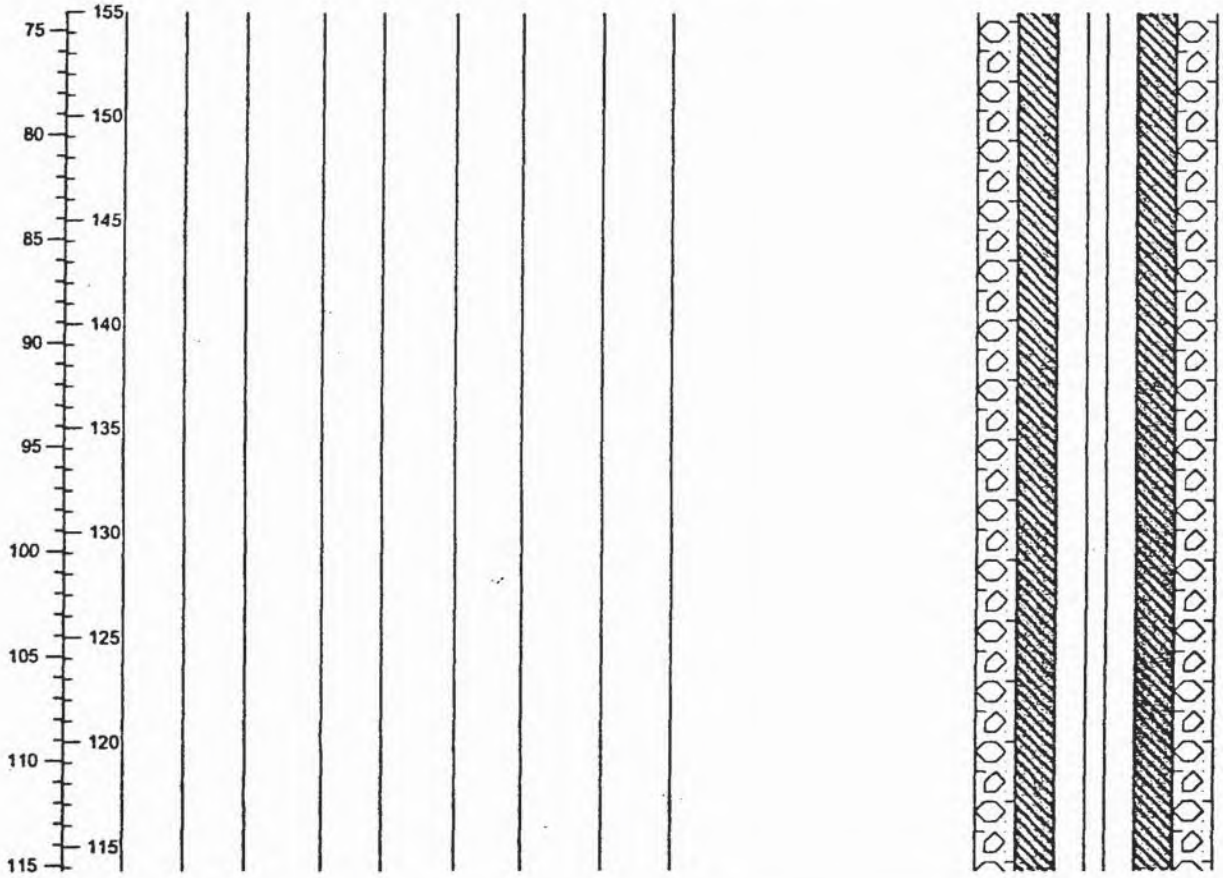
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.
Installed well, MPW-07 is the relocation of well MPW-07A in between buildings: "10X Chem Mill" and "G"

302481

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-7 Boring Location: Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches)	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

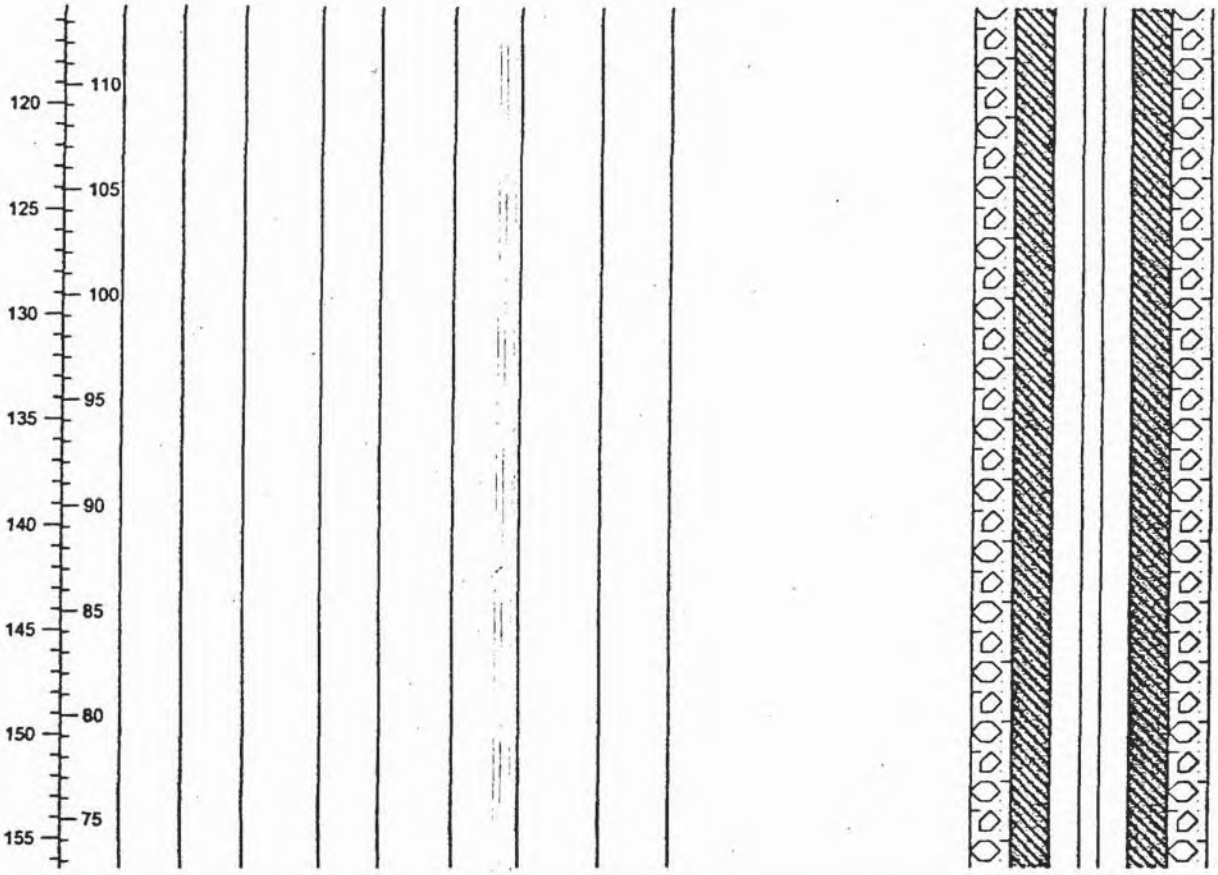
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.
Installed well, MPW-07 is the relocation of well MPW-07A in between buildings: "10X Chem Mill" and "G"

302482

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-7 **Boring Location:** Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches)	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

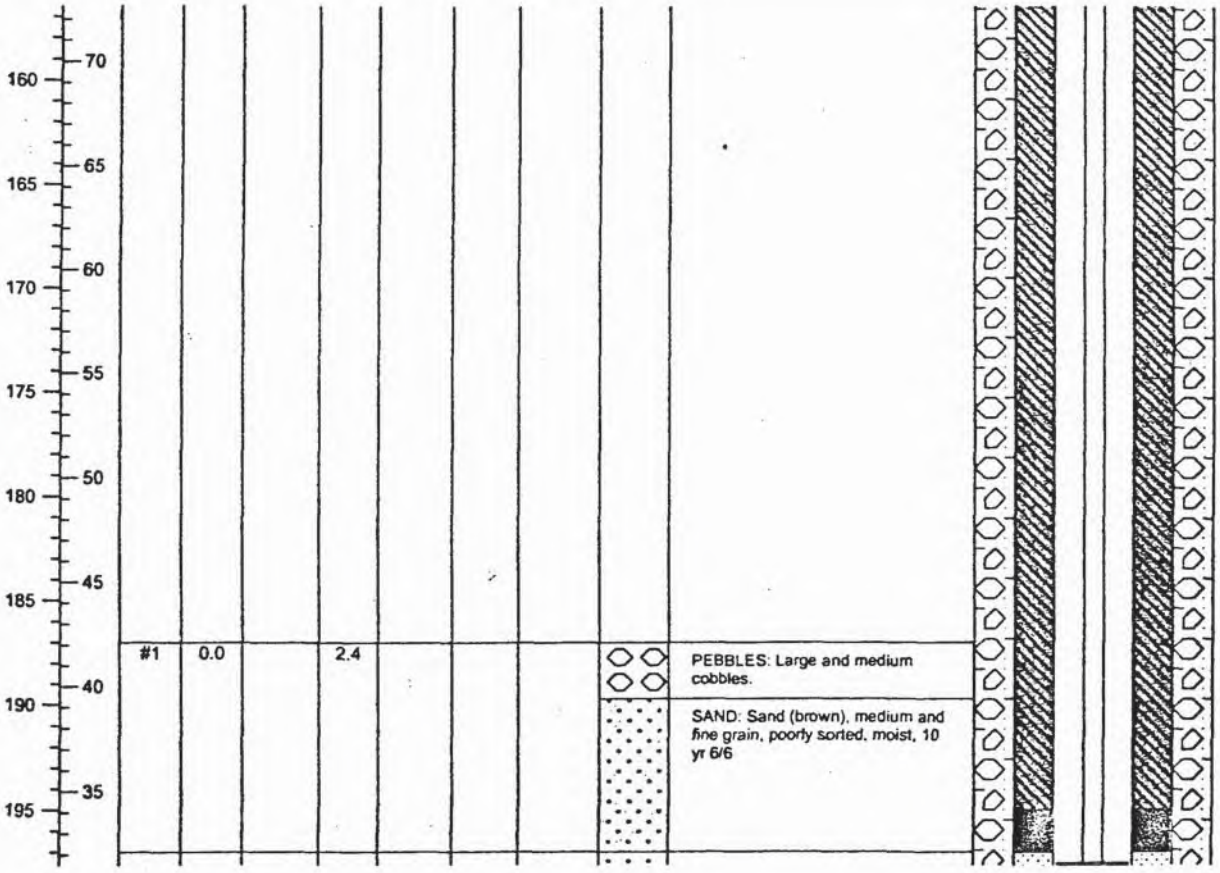
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.
Installed well, MPW-07 is the relocation of well MPW-07A in between buildings: "10X Chem Mill" and "G"

302483

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-7
Client: U.S. Environmental Protection Agency	**Boring Location:** Lawrence Aviation Indust.
Site Location: Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS
	Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.
Installed well, MPW-07 is the relocation of well MPW-07A in between buildings: "10X Chem Mill" and "G"

302484

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-7 **Boring Location:** Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
200	30	#2	0.0		5					SAND: Sand (brown), medium and fine grain, well sorted, wet, 10 yr 6/6	
										SILT: Silt (brown) lens, well sorted w/mica flakes.	
205	25	A				950 E				SAND AND SILT: Sand (brown), fine grain, 10% silt, 10 yr 6/6	
		#3	0.0		0		1200	850		SAND AND SILT: Sand (gray), fine grain, 10% silt.	
210	20									No sample.	
215	15	B				63 D					
220	10	#4	0.0		10					SAND AND SILT: Sand (brown), fine grain, 10% silt (brown), poorly sorted, wet, 10 yr6/3	
										SAND AND SILT: Sand (brown), fine grain, 45% silt (brown), poorly sorted, wet, 10 yr 6/3, 10% mica flakes.	
225	5	C				2.5	320	700		SAND AND SILT: Sand (brown), fine grain, 45% silt (brown), poorly sorted, wet, 10 yr 6/3	
		#5	0.4		10					SAND AND SILT: Sand (brown), fine grain, 30% silt (brown), poorly sorted, wet, 10 yr 6/3	
230	0										
235	-5	D				0.99					
		#6	3.5		10					SAND AND SILT: Sand (brown), fine grain, 30% silt (brown), 5%	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

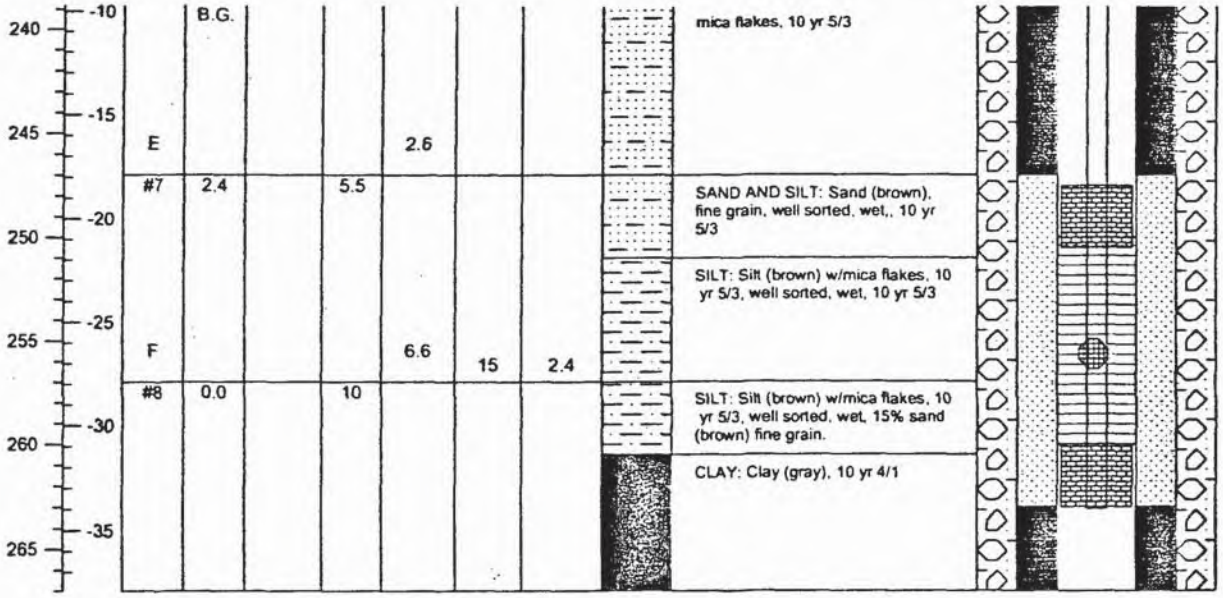
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.
Installed well, MPW-07 is the relocation of well MPW-07A in between buildings: "10X Chem Mill" and "G"

302485

US 00019887

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-7 **Boring Location:** Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.
Installed well, MPW-07 is the relocation of well MPW-07A in between buildings: "10X Chem Mill" and "G"

302486

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-07A **Boring Location:** Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147
Drilling Contractor: Uni-Tech Drilling Co. **Drilling Method:** Rotasonic **Sample Method:** Vibration Extraction **Date Started:** 06/23/2004 **Date Completed:** 07/23/2004 **Logged By:** Tom Melia (P.W.GROSSER, INC.)	**Northing:** 278574.552 **Easting:** 1241678.303 **Surface Elevation (ft. above msl):** 226.56 **Total Depth (ft bgs):** 286 **Initial Depth to Water (ft bgs):** **Field Screening Instrument:** PID

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
0	225	#1	0	0-6	5					SAND AND SILT: Medium + Fine Sand, 10-15% silt, 10-15% gravel, Dry 10 yr 4/6	
5	220	#2	3.2 6.4	6-16	6						
10			3.2								

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

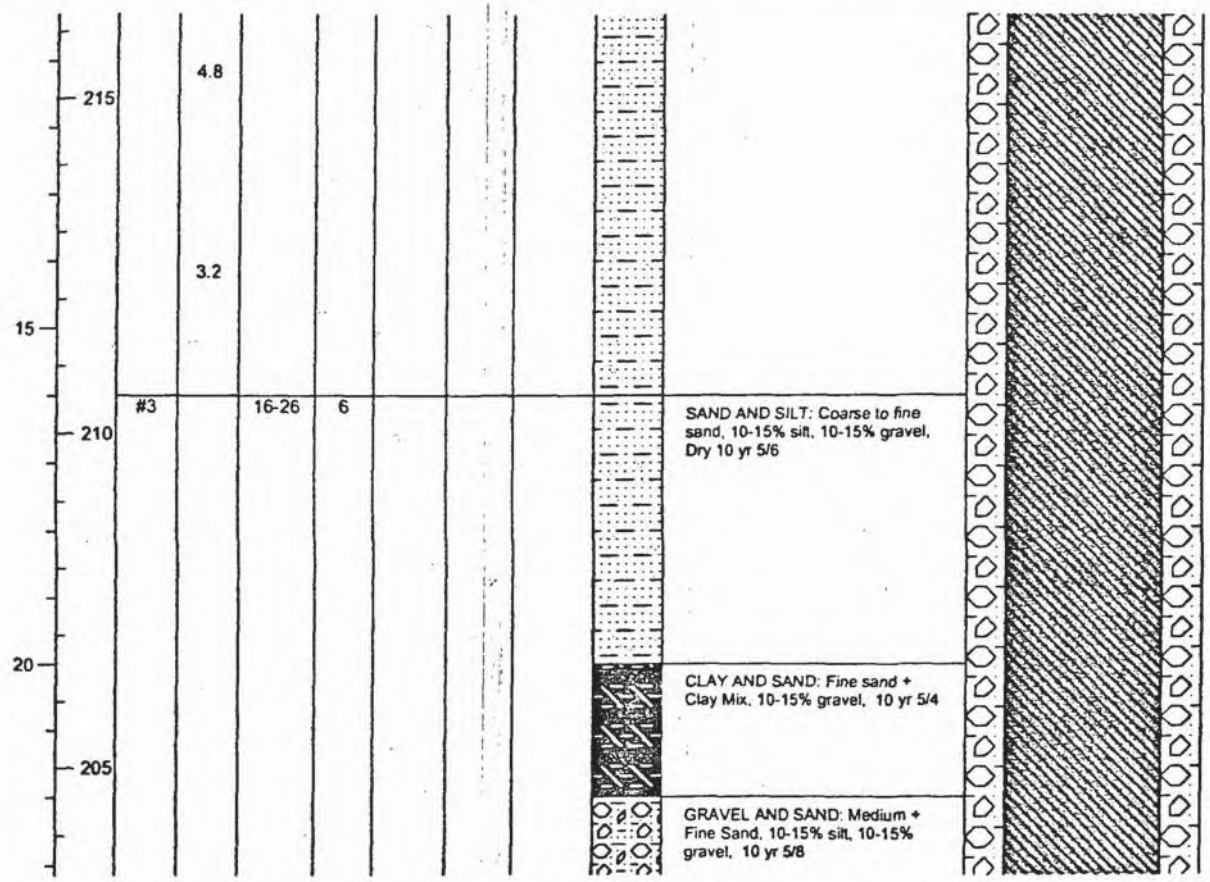
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole was advanced.
Boring abandoned at 286' bgs following unsuccessful attempt by driller to retrieve drill string. Well MPW-07 was moved to a location between Lawrence Aviation Industries Building 10X Chem Mill and G.

302487

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-07A Boring Location: Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

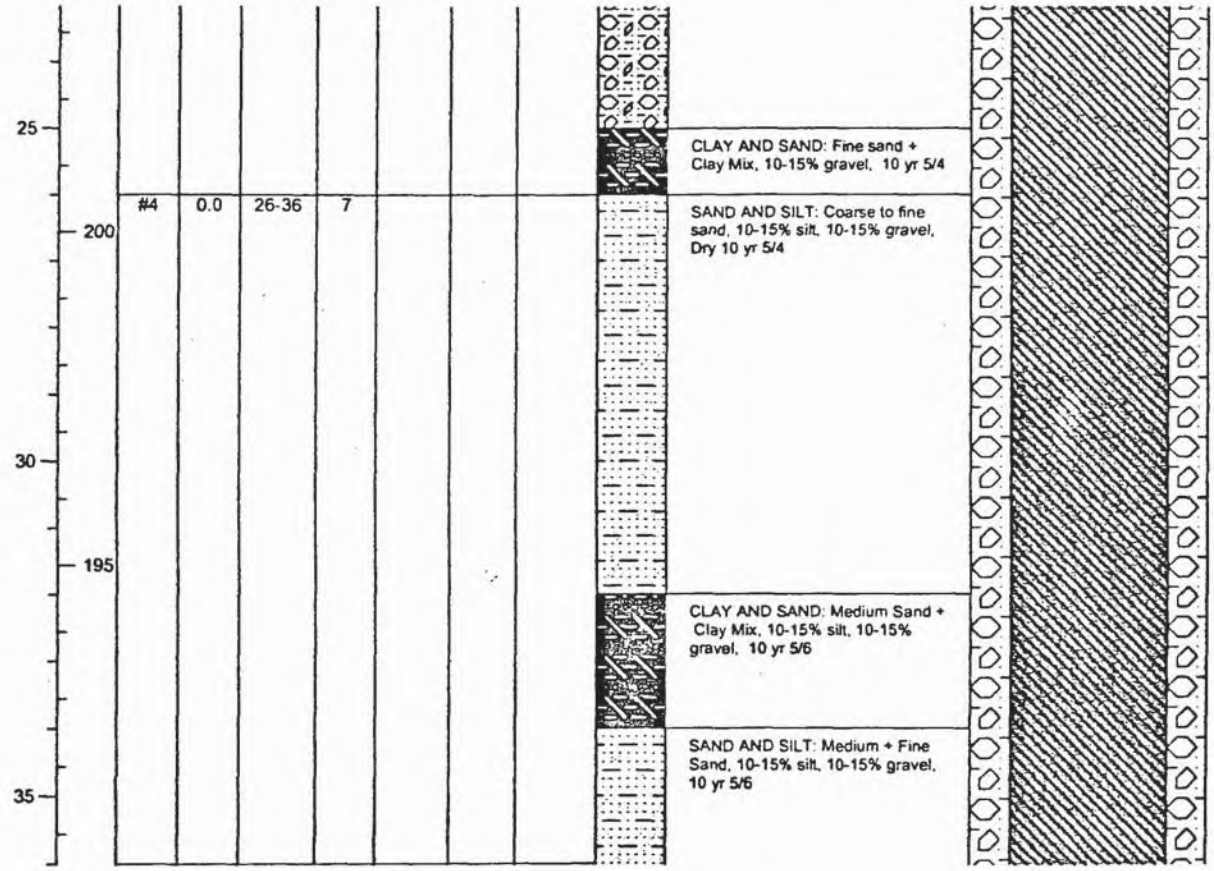
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole was advanced.
Boring abandoned at 286' bgs following unsuccessful attempt by driller to retrieve drill string. Well MPW-07 was moved to a location between Lawrence Aviation Industries Building 10X Chem Mill and G.

302488

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-07A **Boring Location:** Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

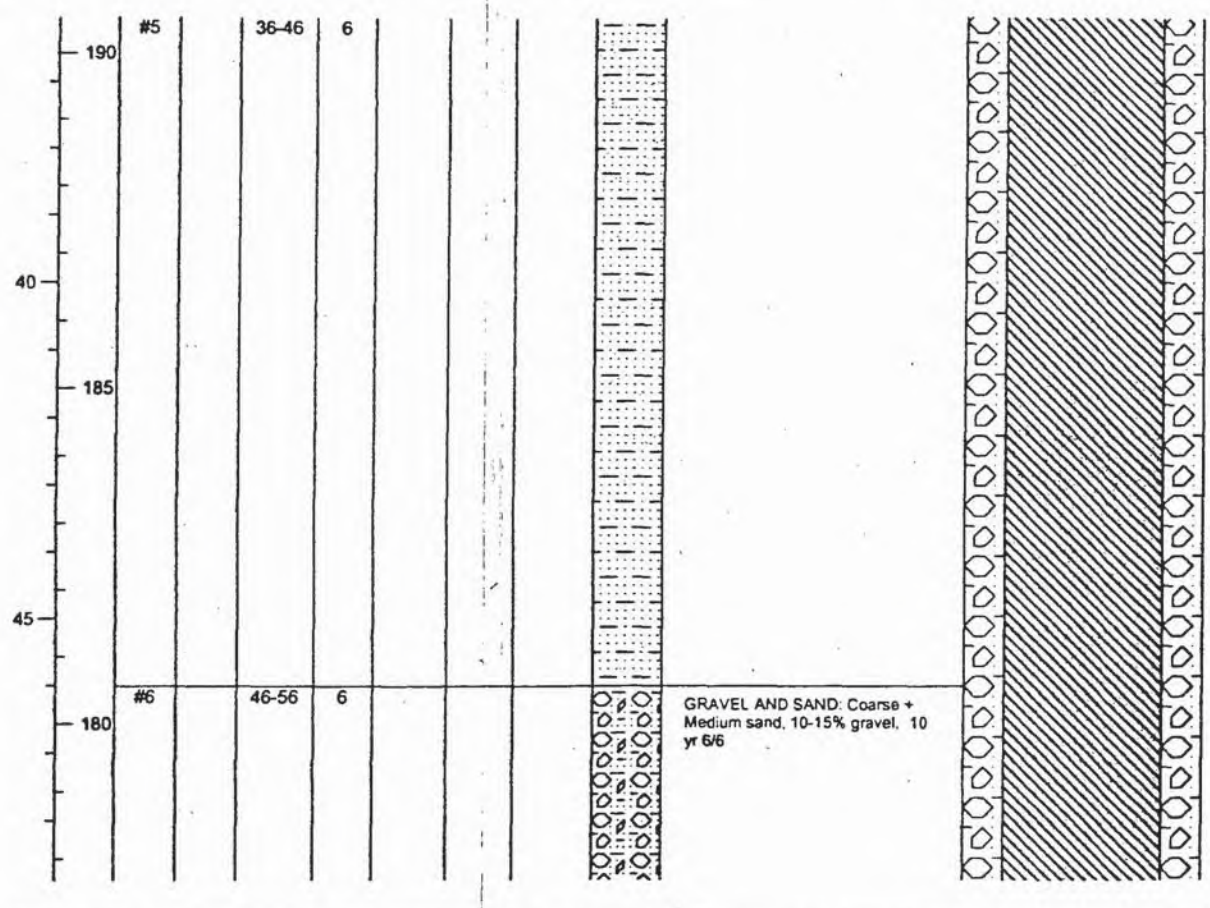
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole was advanced.
Boring abandoned at 286' bgs following unsuccessful attempt by driller to retrieve drill string. Well MPW-07 was moved to a location between Lawrence Aviation Industries Building 10X Chem Mill and G.

302489

US 00019891

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-07A Boring Location: Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

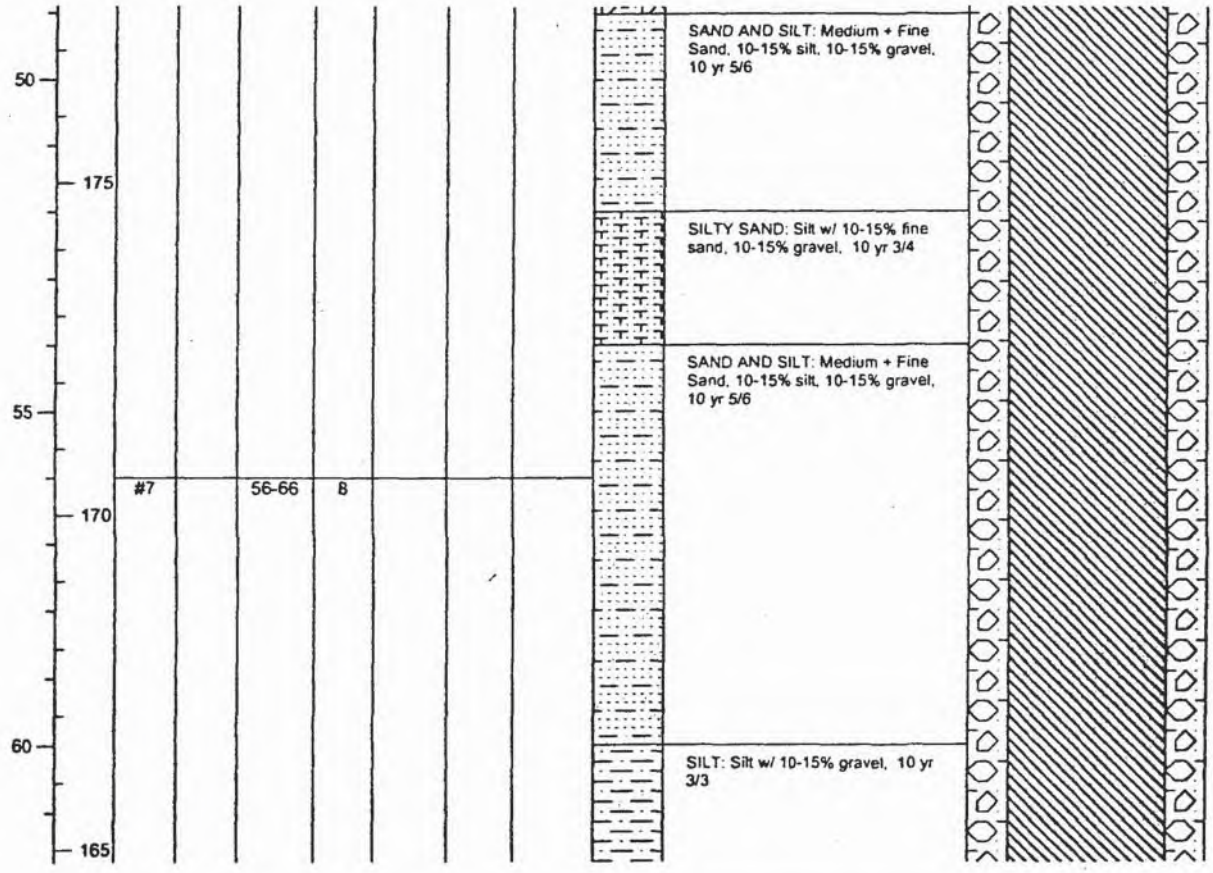
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole was advanced.
Boring abandoned at 286' bgs following unsuccessful attempt by driller to retrieve drill string. Well MPW-07 was moved to a location between Lawrence Aviation Industries Building 10X Chem Mill and G.

302490

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-07A **Boring Location:** Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole was advanced.
Boring abandoned at 286' bgs following unsuccessful attempt by driller to retrieve drill string. Well MPW-07 was moved to a location between Lawrence Aviation Industries Building 10X Chem Mill and G.

302491

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-07A **Boring Location:** Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
65										GRAVEL AND SAND: Coarse + Medium sand, 10-15% gravel, 10 yr 6/2	
										SAND AND SILT: Fine - Medium sand, 10-15% silt, 10-15% gravel, 10 yr 4/4	
	160	#8		66-76	6						
70										GRAVEL AND SAND: Coarse + Medium sand, 10-15% gravel, Poorly sorted, 10 yr 7/2	
	155										

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

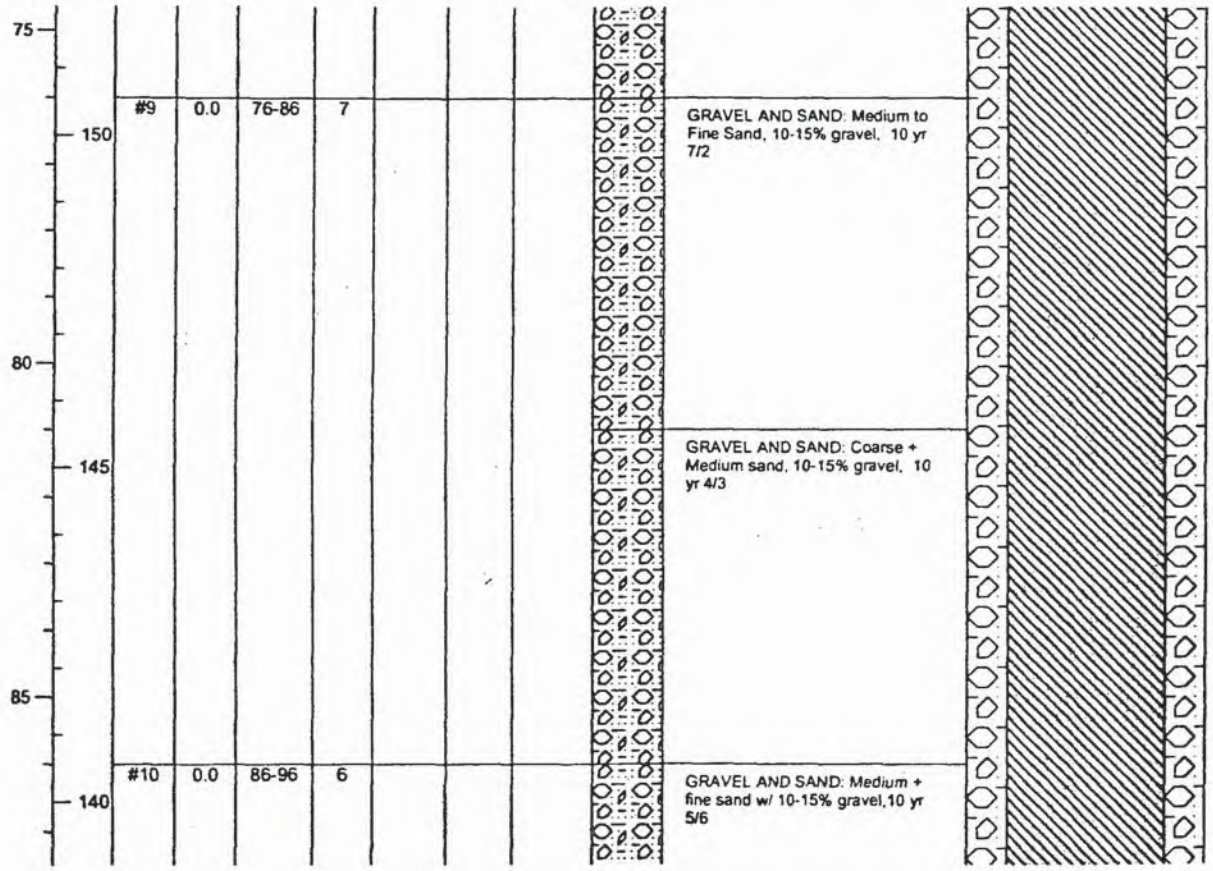
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole was advanced.
Boring abandoned at 286' bgs following unsuccessful attempt by driller to retrieve drill string. Well MPW-07 was moved to a location between Lawrence Aviation Industries Building 10X Chem Mill and G.

302492

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-07A Boring Location: Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

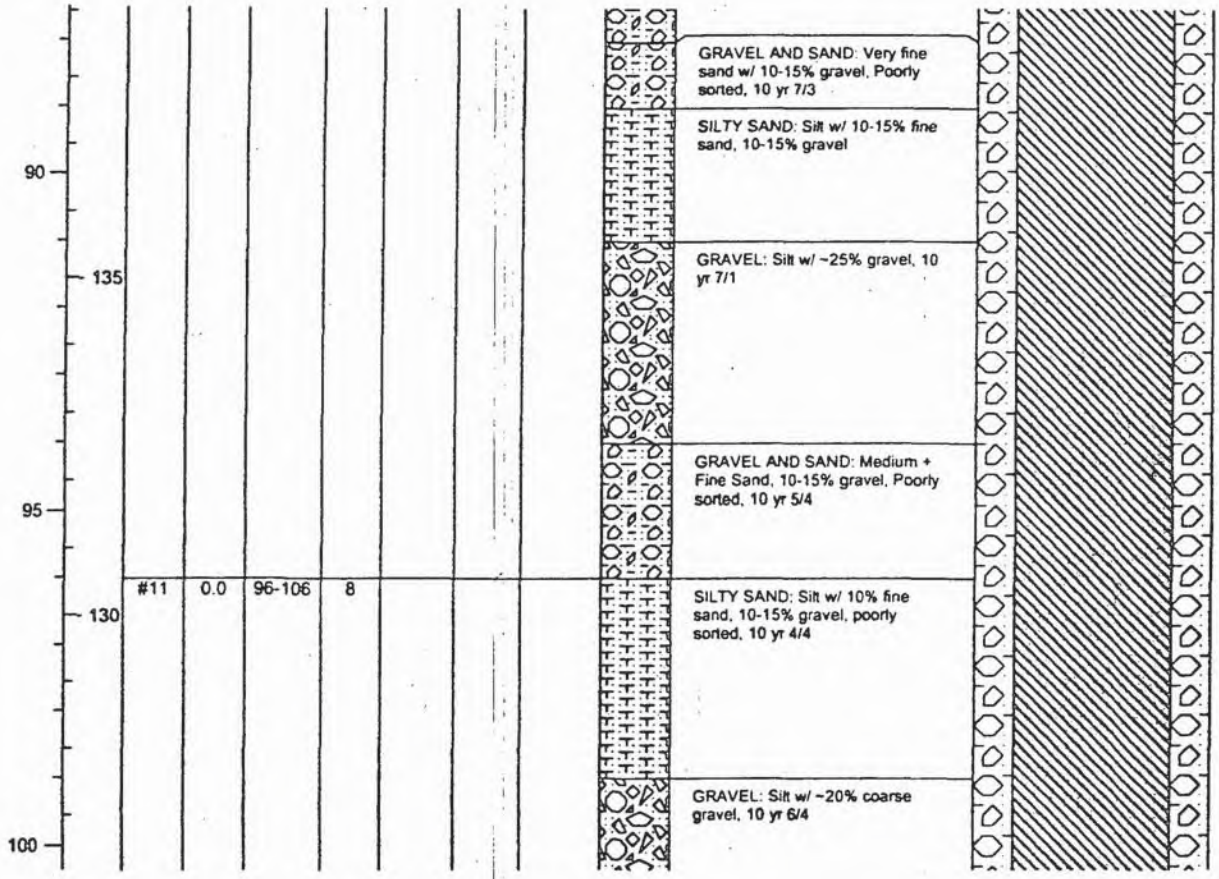
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole was advanced.
Boring abandoned at 286' bgs following unsuccessful attempt by driller to retrieve drill string. Well MPW-07 was moved to a location between Lawrence Aviation Industries Building 10X Chem Mill and G.

302493

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-07A **Boring Location:** Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD-88
Units: feet bgs
ppm = parts per million

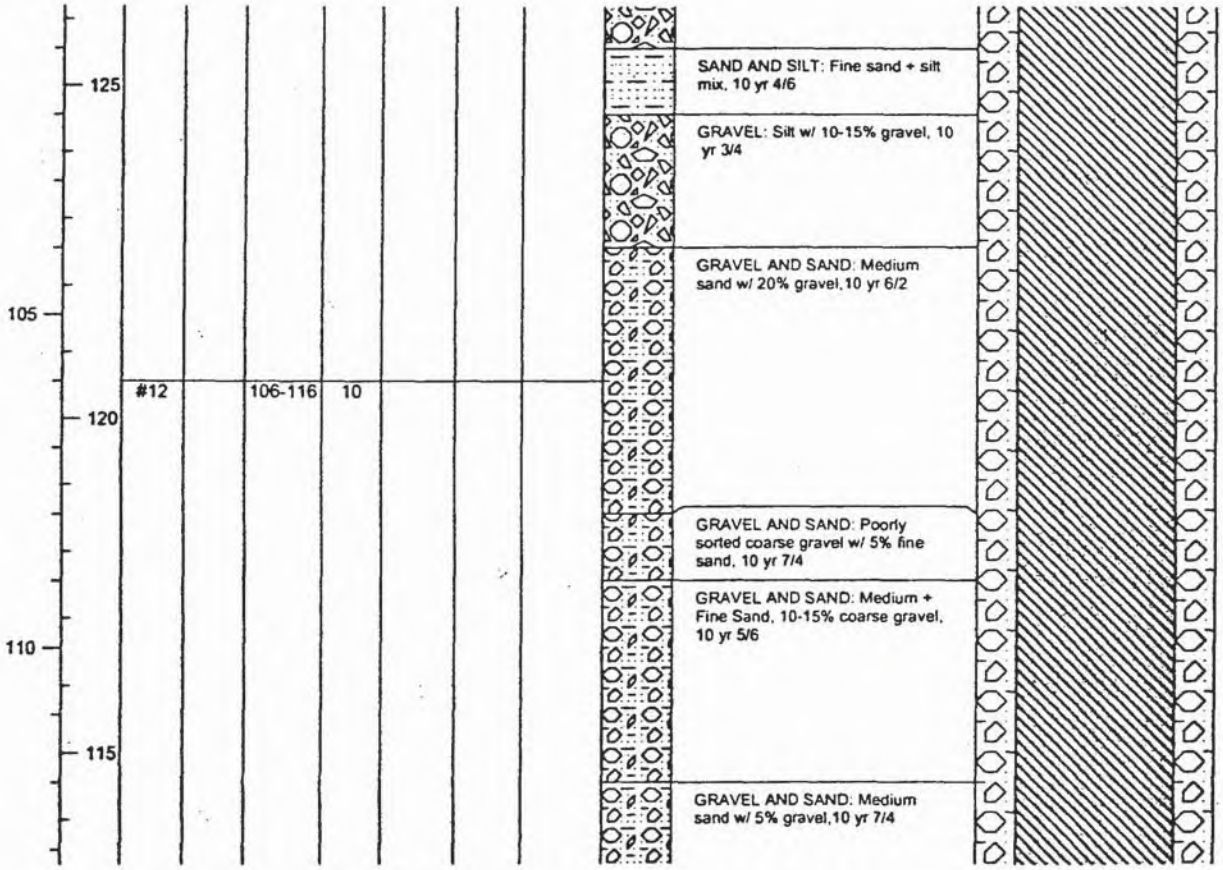
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole was advanced.
Boring abandoned at 286' bgs following unsuccessful attempt by driller to retrieve drill string. Well MPW-07 was moved to a location between Lawrence Aviation Industries Building 10X Chem Mill and G.

302494

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-07A **Boring Location:** Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

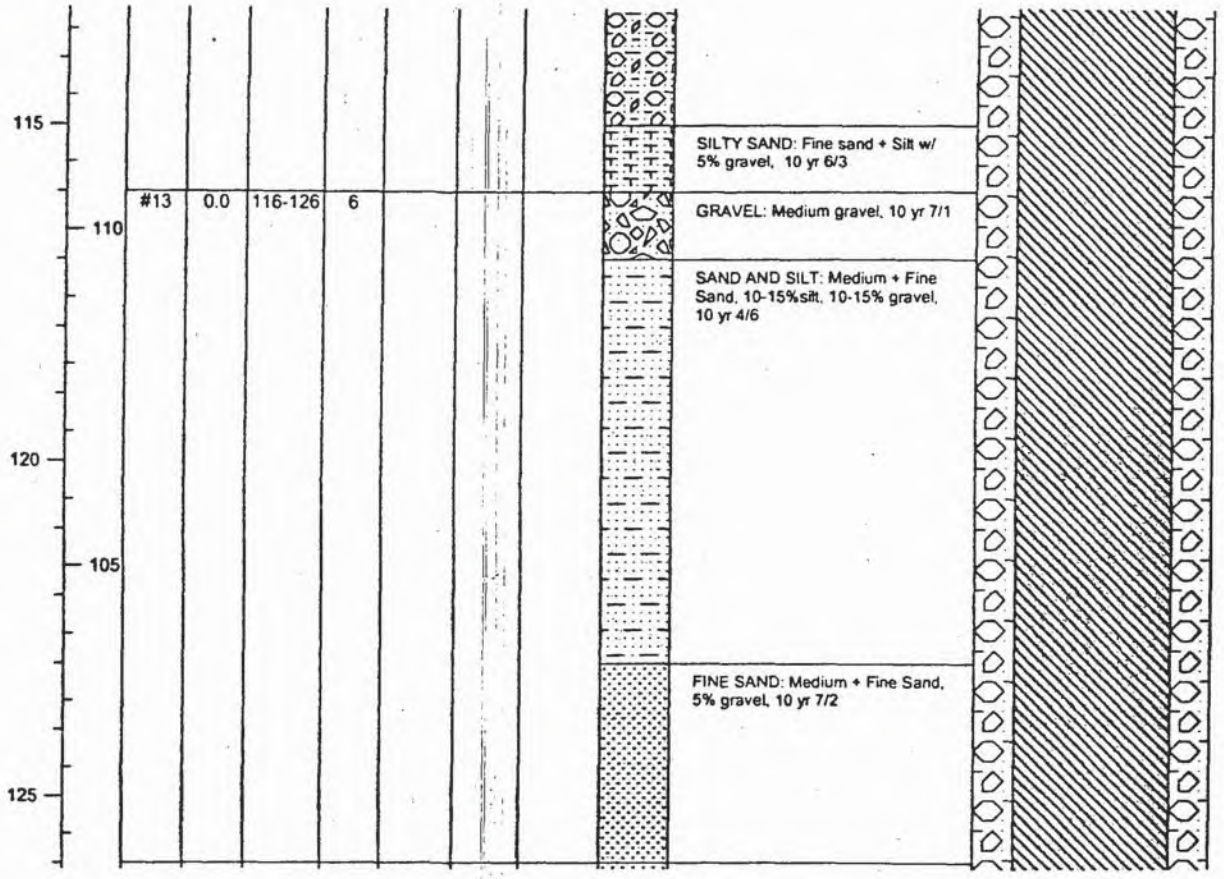
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole was advanced.
Boring abandoned at 286' bgs following unsuccessful attempt by driller to retrieve drill string. Well MPW-07 was moved to a location between Lawrence Aviation Industries Building 10X Chem Mill and G.

302495

US 00019897

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-07A **Boring Location:** Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

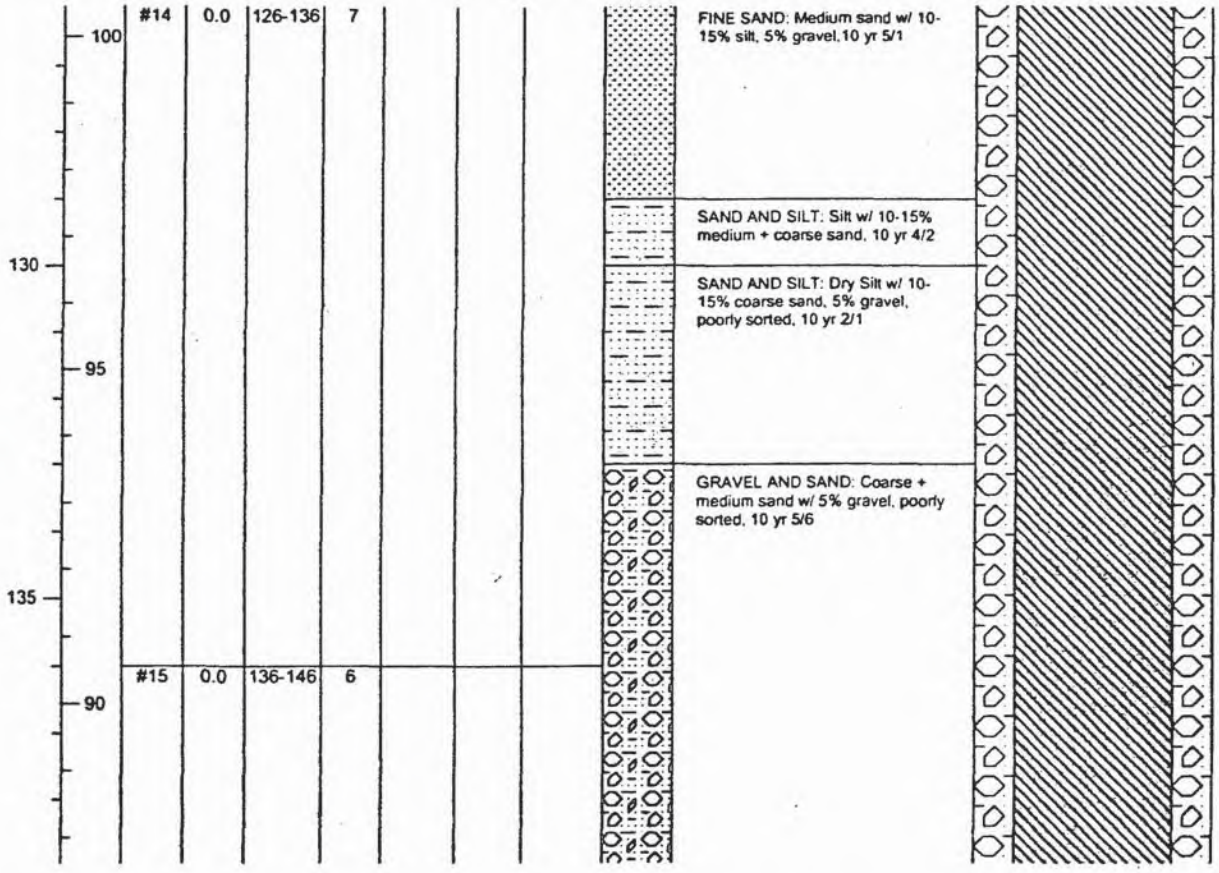
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole was advanced.
Boring abandoned at 286' bgs following unsuccessful attempt by driller to retrieve drill string. Well MPW-07 was moved to a location between Lawrence Aviation Industries Building 10X Chem Mill and G.

302496

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-07A Boring Location: Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

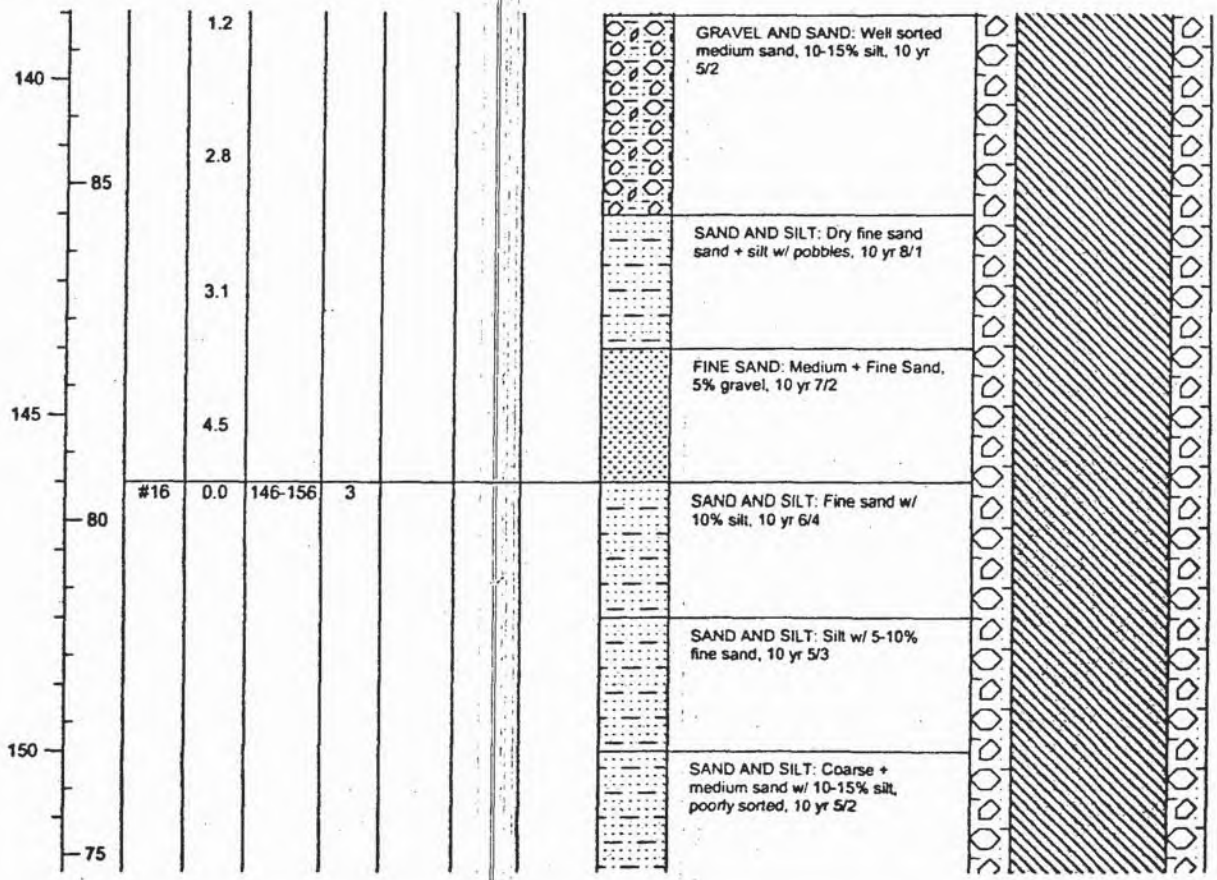
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole was advanced.
Boring abandoned at 286' bgs following unsuccessful attempt by driller to retrieve drill string. Well MPW-07 was moved to a location between Lawrence Aviation Industries Building 10X Chem Mill and G.

302497

US 00019899

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-07A Boring Location: Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

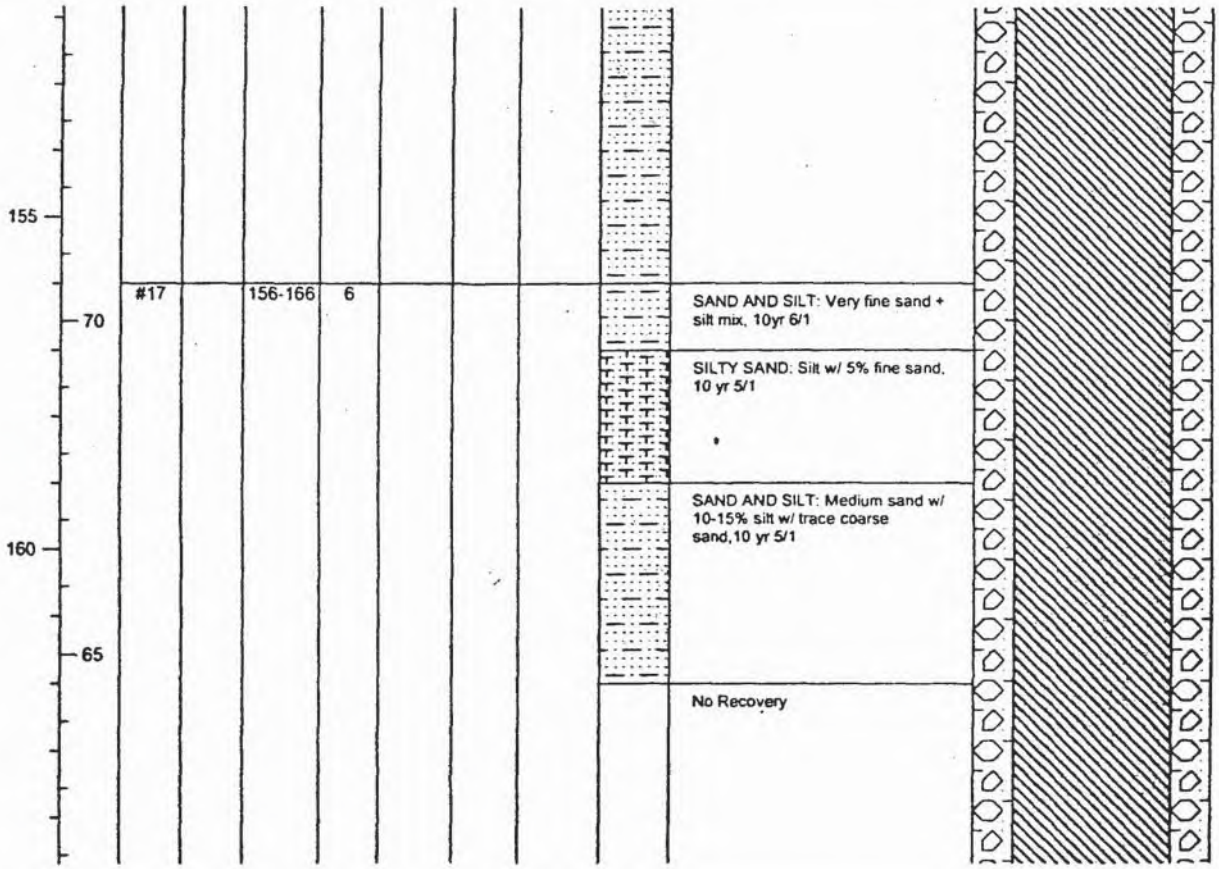
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole was advanced.
Boring abandoned at 286' bgs following unsuccessful attempt by driller to retrieve drill string. Well MPW-07 was moved to a location between Lawrence Aviation Industries Building 10X Chem Mill and G.

302498

US 00019900

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-07A **Boring Location:** Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole was advanced.
Boring abandoned at 286' bgs following unsuccessful attempt by driller to retrieve drill string. Well MPW-07 was moved to a location between Lawrence Aviation Industries Building 10X Chem Mill and G.

302499

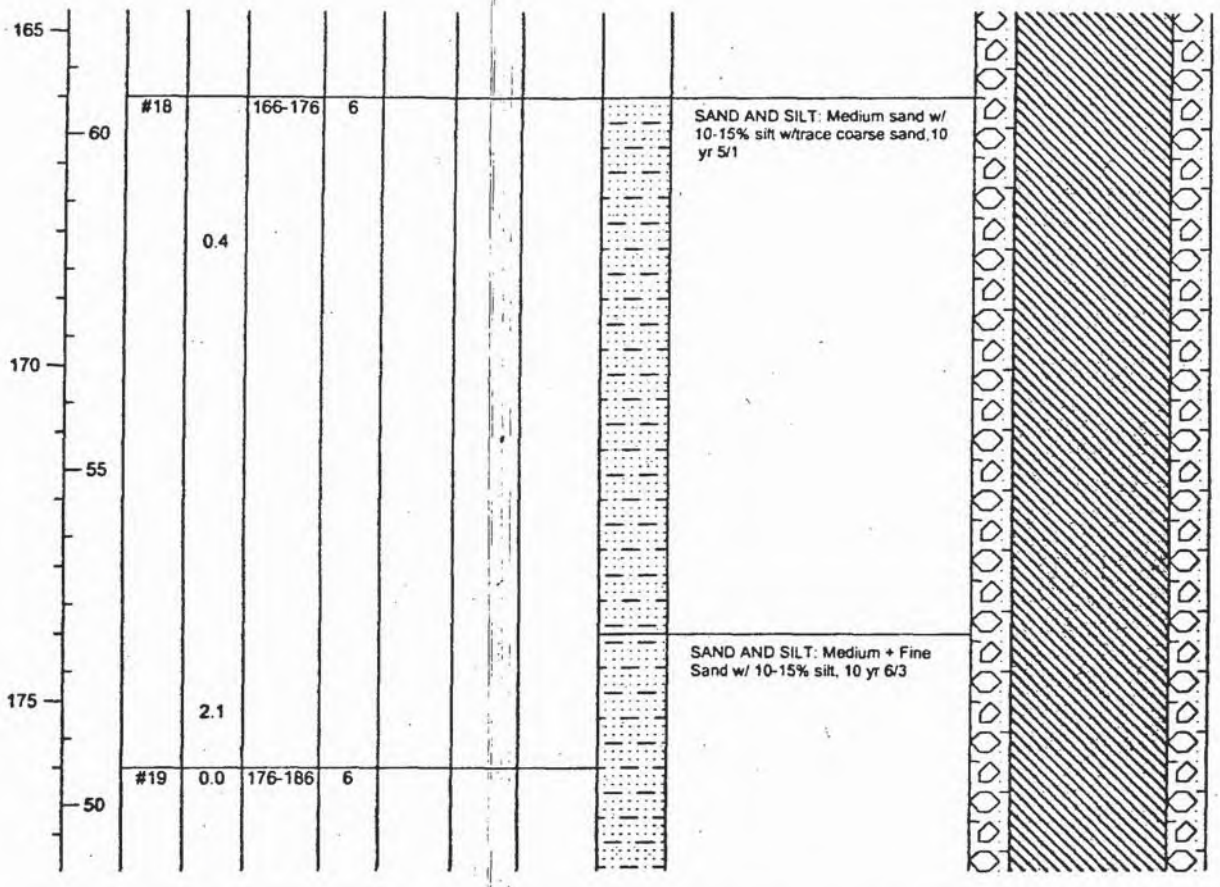
CDM

125 Maiden Lane, 5th Floor
New York, NY 10038

Boring Name: MPW-07A
Boring Location: Lawrence Aviation Indust.

Client: U.S. Environmental Protection Agency
Site Location: Port Jefferson Station, New York

Project Name: Lawrence Aviation RI/FS
Project Number: 3223-147



Note:
ft = feet, estL = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

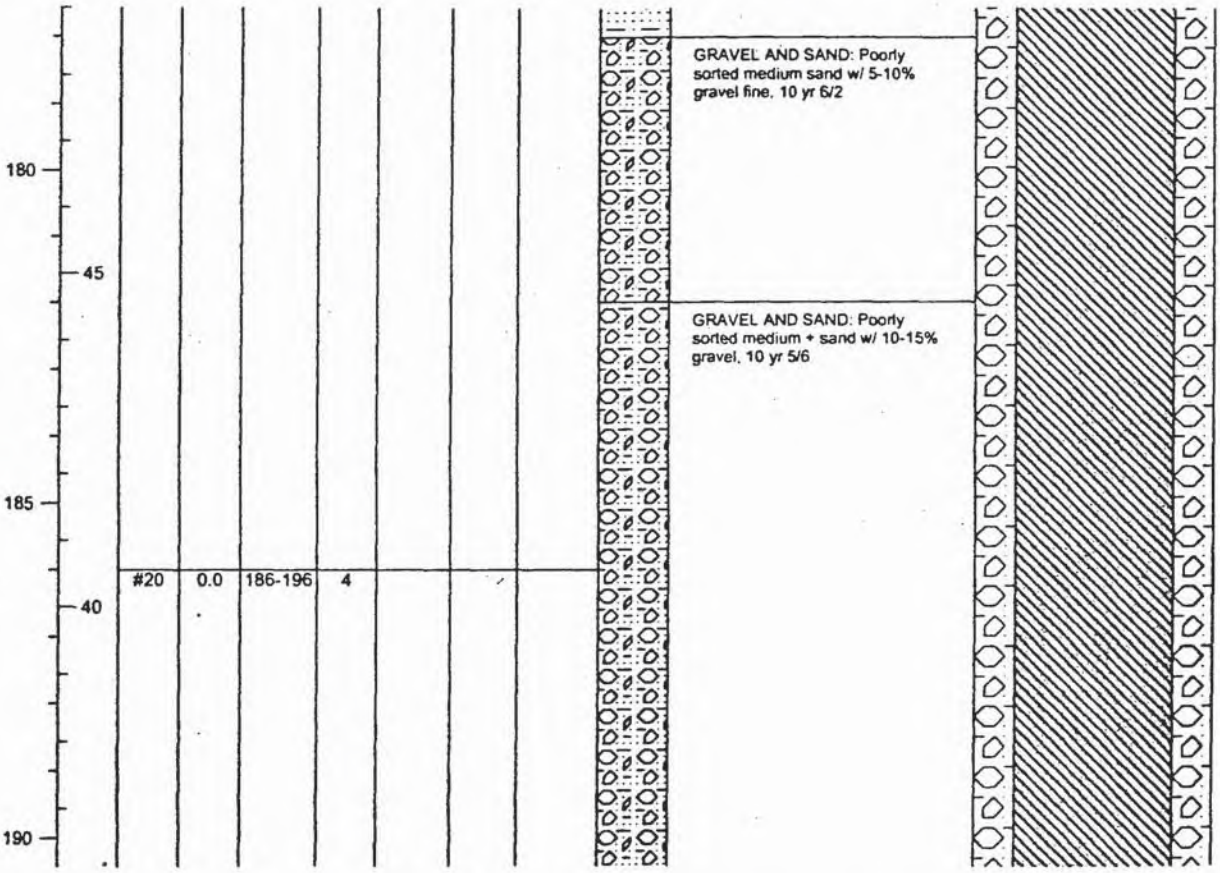
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole was advanced.
Boring abandoned at 286' bgs following unsuccessful attempt by driller to retrieve drill string. Well MPW-07 was moved to a location between Lawrence Aviation Industries Building 10X Chem Mill and G.

302500

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-07A **Boring Location:** Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole was advanced.
Boring abandoned at 286' bgs following unsuccessful attempt by driller to retrieve drill string. Well MPW-07 was moved to a location between Lawrence Aviation Industries Building 10X Chem Mill and G.

302501

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-07A **Boring Location:** Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches)	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
	35									SAND AND SILT: Medium + Fine Sand w/ 25-30% silt, 10 yr 6/2	
	195										
		#21	0.0	196-206	10						
	30										
	200										
	25										

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

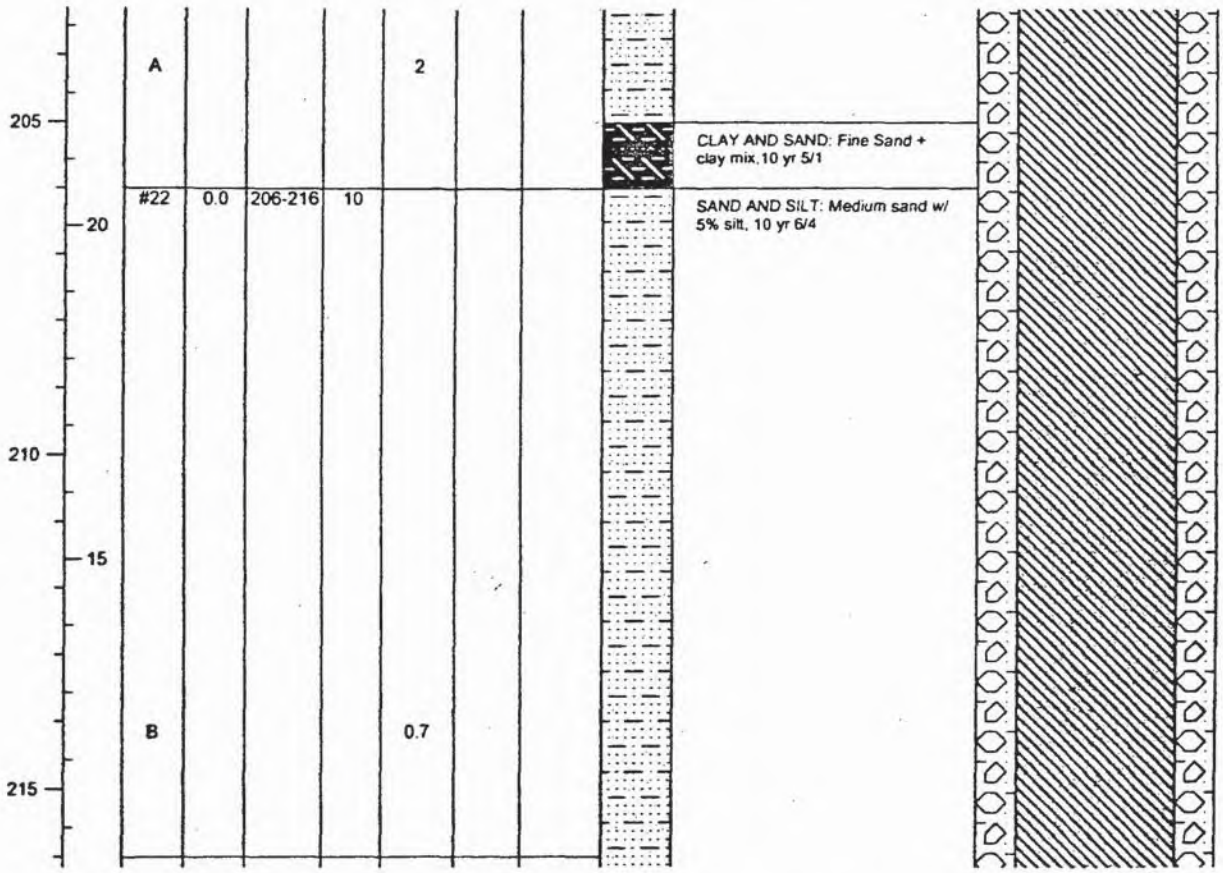
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole was advanced.
Boring abandoned at 286' bgs following unsuccessful attempt by driller to retrieve drill string. Well MPW-07 was moved to a location between Lawrence Aviation Industries Building 10X Chem Mill and G.

302502

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-07A **Boring Location:** Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole was advanced.
Boring abandoned at 286' bgs following unsuccessful attempt by driller to retrieve drill string. Well MPW-07 was moved to a location between Lawrence Aviation Industries Building 10X Chem Mill and G.

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-07A Boring Location: Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
10		#23	0.0	216-226	10						
220											
5											
		C				1					
225											
		#24	0.0	226-236	10						
0											

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Concrete
- Sand Pack
- Waterloo Packer (not to scale)
- Cement/Bentonite Grout
- Natural Material
- Bentonite Seal
- 4-inch Stainless Steel Well Casing
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole was advanced.
Boring abandoned at 286' bgs following unsuccessful attempt by driller to retrieve drill string. Well MPW-07 was moved to a location between Lawrence Aviation Industries Building 10X Chem Mill and G.

302504

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-07A **Boring Location:** Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
0	230										
5	-5										
10	235	D				1					
		#25	0.0	236-246	10						
15	-10										
20	240										
	-15										

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

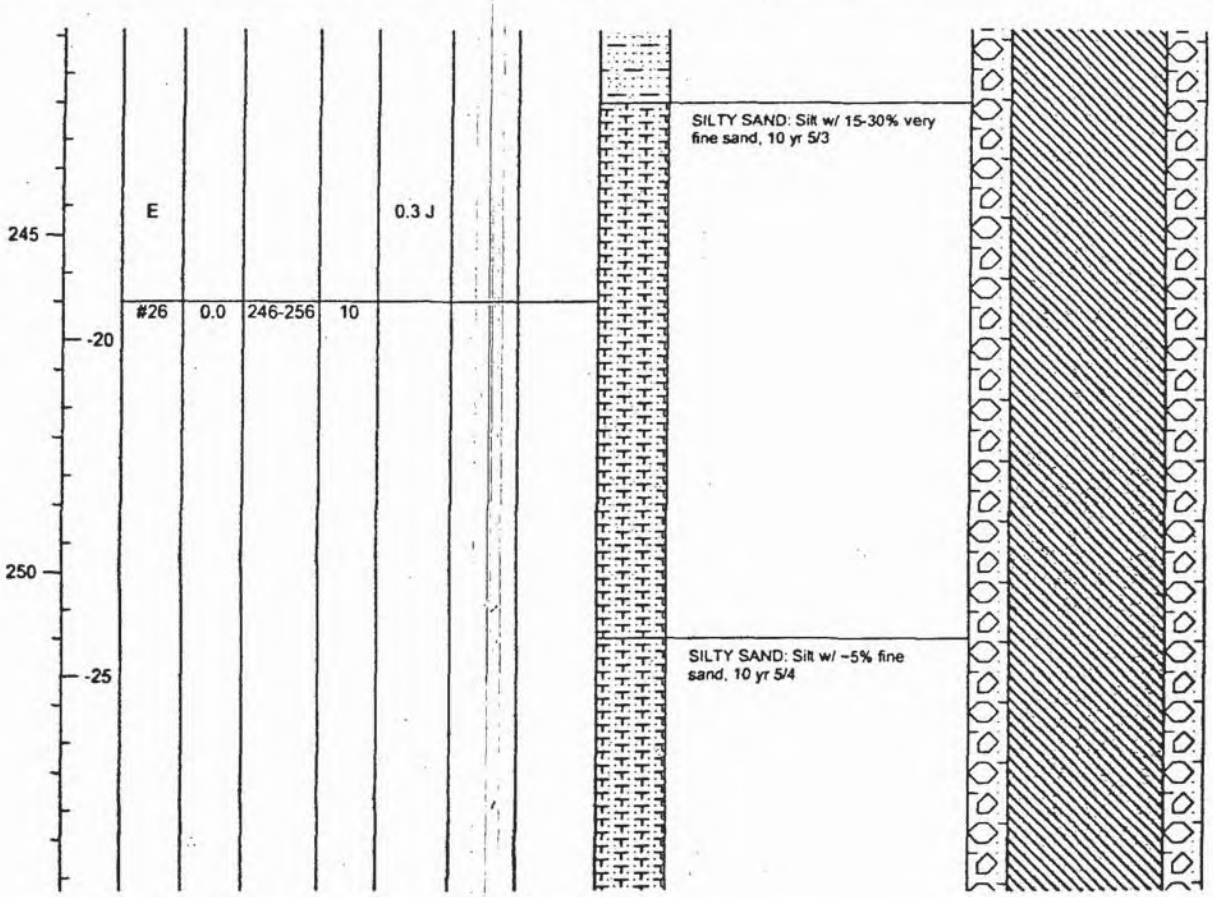
Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole was advanced.
Boring abandoned at 286' bgs following unsuccessful attempt by driller to retrieve drill string. Well MPW-07 was moved to a location between Lawrence Aviation Industries Building 10X Chem Mill and G.

302505

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-07A Boring Location: Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole was advanced.
Boring abandoned at 286' bgs following unsuccessful attempt by driller to retrieve drill string. Well MPW-07 was moved to a location between Lawrence Aviation Industries Building 10X Chem Mill and G.

302506

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-07A **Boring Location:** Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
255		F				0.4 J					
	-30	#27	0.0	256-266	10						
260											
	-35										
		G				1					
265											
	-40	#28	0.0	266-276	10						

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole was advanced.
Boring abandoned at 286' bgs following unsuccessful attempt by driller to retrieve drill string. Well MPW-07 was moved to a location between Lawrence Aviation Industries Building 10X Chem Mill and G.

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-07A **Boring Location:** Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
270											
	-45										
275		H				0.4 J					
		#29	0.0	276-286	10						
	-50										
280											

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole was advanced.
Boring abandoned at 286' bgs following unsuccessful attempt by driller to retrieve drill string. Well MPW-07 was moved to a location between Lawrence Aviation Industries Building 10X Chem Mill and G.

302508

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-07A **Boring Location:** Lawrence Aviation Indust.
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
-55										CLAY AND SILT: Silt w/ ~30% clay + 5% very fine sand, 10 yr 5/2	
285											

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole was advanced.
Boring abandoned at 286' bgs following unsuccessful attempt by driller to retrieve drill string. Well MPW-07 was moved to a location between Lawrence Aviation Industries Building 10X Chem Mill and G.

302509

TIME ONSITE 0715 – 1830 = 11.25

Waterloo System Installation Log

Client: USEPA | Borehole Ø & Depth: 4" + 269.73ft. | Date: 2/1/05

Site: LAI | Casing Depth: n/a | Sheet No.: 1 OF 1

Borehole No.: MW-07 | Depth to Water: 191.10 ft. | Approved: CB MD.

Time	Unit	In	Depth to Top	Notes
	Feet			
	0.1	✓	263	BASE PLUG
	3	✓	260	PACKER
	2	✓		2' PVC CASING
	2	✓		2' PVC CASING
1145	0.5	✓✓	255.5	PORT/VWP/BP(PORT 3)
	5	✓		5' PVC CASING
	3	✓	247.5	PACKER
	2	✓		2' PVC CASING
	2	✓		2' PVC CASING
	10	✓		10' PVC CASING
	3	✓	230.5	PACKER
	5	✓		5' PVC CASING
1245	0.5	✓✓	225	PORT/VWP/BP(PORT 2)
	5	✓		5' PVC CASING
	3	✓	217	PACKER
	2	✓		2' PVC CASING
	2	✓		2' PVC CASING DP
	3	✓	210	PACKER/~~VWP/BP~~ 2 TUBES
	2	✓		2' PVC CASING
	1	✓		1' PVC CASING
1345	0.5	✓✓	206.5	PORT/VWP/BP(PORT 1)
	5	✓		5' PVC CASING
	1	✓		1' PVC CASING
	3	✓	197.5	PACKER
	205	✓		10' PVC CASING
				MANIFOLD
217				> ZONE 1 FLOWTEST
			140 psi	~110 ml/stroke
				12S COMPRESS, 12S VENT
				= 24S CYCLE @ 275 ml/min
				RAN FOR 5 MIN.
				ZONE 1 DTW = 191.2'
				ZONE 2 DTW = 191.35
				ZONE 3 DTW = 191.9
			150 psi	> ZONE 2 FLOWTEST
				14S DRIVE, 14S VENT
				14, 31S CYCLE.
				~110ml/cycle. RAN
				FOR 5 MIN.
1748				> ZONE 3 FLOWTEST
				DRIVE 15S, VENT 18S
				110ml PRESSURE @ 160 psi

Equipment Required

Unit	#	Unit	#
10 ft Casing //	21	PVC Port (Single)	/
5 ft Casing ///	4	PVC Port (Double)	/
2 ft Casing ~~////~~ //	7	SS Port (Single)	/
1 ft Casing //	2	SS Port (Double) ///	3
Base Plug	1	Double Valve Pump	/
Dow Packer ~~////~~ /	6	Bladder Pump ///	3
Bentonite Packer	/	VW Piezometer ///	3
Hydraulic Packer	/	Well Head Manifold	1
SS Support Cable 290'			
Teflon Lined LDPE Tubing 2000'			
Transducer Cable 775			

04- Reading Before Installation

Zone	Piezo Serial #	Reading	Temp	
✓ 1	14342	8,827.6	2.2C	235'
✓ 2	14623	9,209.8	2.2C	255'
✓ 3	14639	9,180.4	2.0C	285'
4				
5				
6				
7				
8				

04- Reading After Installation

Zone	Piezo Serial #	Reading	Temp	
1	14342	8,402.6	12.1	15.3
2	14623	8,285.1	11.7	33.7
3	14639	7,568.9	11C	63.6
4				
5				
6				
7				
8				

PR. HEAD

Borehole Water Level (after installation)	n/a

Comments

VWP = Vibrating wire transducer
BP = Bladder Pump.
Zone 3 offset 0.44' + 27.4mm
Zone 2 offset. 0.46' + 27.4mm
Zone 1 offset. 0.46 + 27.4mm.

USED 2 1000' ROLLS OF TUBING

06/00

302510

Installed 1430 2/1/05 JD Dorsett, CDM

Client: CDM -		Well No: MPW-07	Prepared By: RB
Install Order: 3		SWL: 198FT	6-Dec (2004)

Zones			3		2		1			
Drillhole Depth		270								
Base Plug at:	SS Plug	263								
(SS Plug or PVC Plug)										
Depth to Top of	Dual	Ports	255.5		225		206.5			
(Single or Dual)										
Depth to Top of	3.83	Packers								
(3.83 or 3.58 or 2.86)										
Desired Stick-up		-2.5								

Interval Diff. (feet)	Depth to Top (feet)	Unit Length (feet)	Qnty.	Description of Component	Zone No.	(feet)	Monitoring Equipment: 1/2 X 3/8 Tubing OR 5/8 X 1/2 Tubing OR VWP Transducer; Double Valve Pump OR Bladder Pump Description
	270			Depth to Btm.			Manifold Type
0.1	263.0	0.1	X	Base Plug			Stnd WI Hd O Tube
	260.0	3.0	X 1	Packer			
							1 Multipurge
							Pressure Sealed
			X 2	2' PVC Casing			
4.4	255.5	0.5	X	Port	3	285	VWP Transducer Bladder Pump
			X 1	5' PVC Casing			15 125 drive, Vent 185 @160 psi
5.0	247.5	3.0	X	Packer			
			2 X X	1' PVC Casing			
			X 2 1	2' PVC Casing			
				10			
14.0	230.5	3.0	X	Packer			
			X 1	5' PVC Casing			
5.0	225.0	0.5	X	Port	2	255	VWP Transducer Bladder Pump
			X 1	5' PVC Casing			175 drive vent 145 drive @150 psi
			X	Packer			
5.0	217.0	3.0					
			X 2	2' PVC Casing			
4.0	210.0	3.0	X	Packer			
			X 1	2' PVC Casing			
			X 1	1' PVC Casing			
3.0	206.5	0.5	X	Port	1	235	VWP Transducer Bladder Pump
			X 1	5' PVC Casing			125 drive, 125 vent @140 psi
			X 1	1' PVC Casing			
6.0	197.5	3.0	X	Packer			
			X 20	10' PVC Casing			
200.0	-2.5						

TOTALS				
	21	10' PVC Casing	775	1/4" X 0.17" Red LDPE Tubing
	4	5' PVC Casing	775	1/4" X 0.17" Sample LDPE Tubing
	7	2' PVC casing	775	VWP Transducer Cable
	2	1' PVC casing	3	Dual 3/8" Stem Port Assembly
	1	SS Plug	3	Bladder Pump
	290	3/16" dia SS Support Cable	6	3.83 Packers
			3	VWP Transducer

1/4/05 15:18
Macintosh HD:Desktop Folder:[401 CDM Dec6]Sum TLS

302511

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

MW-07 Zone 1

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 7, 2004

Serial Number: 04-14342

Temperature: 22.8 °C

Pressure Range: 350 kPa

†Barometric Pressure: 998.8 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Eric

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8836	8837	8837	0.095	0.03	0.066	0.02
70.0	8186	8186	8186	70.02	0.01	70.04	0.01
140.0	7537	7537	7537	139.8	-0.06	139.9	-0.04
210.0	6883	6884	6884	210.0	0.01	210.2	0.04
280.0	6232	6233	6233	280.0	0.00	280.1	0.02
350.0	5581	5581	5581	350.0	0.01	350.0	-0.01

Pa) Linear Gage Factor (G): 0.1075 **(kPa/ digit)** **Regression Zero:** 8837

Polynomial Gage Factors: **A:** -5.884E-08 **B:** -0.1066 **C:** 947.00

Thermal Factor (K): -0.1044 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.01559 **(psi/ digit)**

Polynomial Gage Factors: **A:** -8.5344E-09 **B:** -0.01547 **C:** 137.35

Thermal Factor (K): -0.01514 **(psi/ °C)**

Calculated Pressures: **Linear,** $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$**

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 8817 Temp(T_0): 22.4 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302512

US 00019914

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

MW-07 Fm 2

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14623

Temperature: 22.5 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.6 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Erica

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9233	9232	9233	0.158	0.05	-0.039	-0.01
70.0	8590	8590	8590	70.00	0.00	70.03	0.01
140.0	7949	7948	7949	139.7	-0.07	139.8	-0.06
210.0	7303	7302	7303	210.0	-0.01	210.0	0.01
280.0	6658	6658	6658	280.0	0.01	280.1	0.02
350.0	6013	6014	6014	350.1	0.03	350.0	0.00

(kPa) Linear Gage Factor (G): 0.1087 **(kPa/ digit)** **Regression Zero:** 9234

Polynomial Gage Factors: **A:** -1.030E-07 **B:** -0.1071 **C:** 997.96

Thermal Factor (K): -0.1597 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.01577 **(psi/ digit)**

Polynomial Gage Factors: **A:** -1.49398E-08 **B:** -0.01554 **C:** 144.74

Thermal Factor (K): -0.02316 **(psi/ °C)**

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9192 Temp(T_0): 22.8 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302513

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA MW-07 Zone 3

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14639

Temperature: 22.5 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.6 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Elisa

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9217	9219	9218	0.252	0.07	0.056	0.02
70.0	8625	8626	8626	70.07	0.02	70.19	0.05
140.0	8035	8034	8035	139.7	-0.08	139.9	-0.03
210.0	7441	7440	7441	209.7	-0.09	209.9	-0.03
280.0	6845	6844	6845	279.9	-0.02	279.9	-0.02
350.0	6248	6246	6247	350.3	0.10	349.9	-0.03

(kPa) Linear Gage Factor (G): 0.1178 (kPa/ digit) **Regression Zero: 9220**

Polynomial Gage Factors: A: -2.682E-07 B: -0.1137 C: 1070.68

Thermal Factor (K): -0.0476 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.01709 (psi/ digit)

Polynomial Gage Factors: A: -3.89044E-08 B: -0.01649 C: 155.29

Thermal Factor (K): -0.00691 (psi/ °C)

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9180 Temp(T_0): 23.2 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302514

MPW-08

302515

US 00019917

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-08 **Boring Location:** Caroline Ave.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147
Drilling Contractor: Uni-Tech Drilling Co. **Drilling Method:** Rotasonic **Sample Method:** Vibration Extraction **Date Started:** 11/01/2004 **Date Completed:** 02/10/2005 **Logged By:** Adrian Steinhauff (P.W.GROSSER, INC.)	**Northing:** 284605.552 **Easting:** 1240764.773 **Surface Elevation (ft. above msl):** 17.08 **Total Depth (ft bgs):** 130 **Initial Depth to Water (ft bgs):** 14 **Field Screening Instrument:** PID

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
0		#1	0.0	0-8	8.0					TOPSOIL: Topsoil	
										SAND: Medium to fine grain sand, 1% medium to small cobbles, poorly sorted, moist, 10YR 5/6 - Yellowish brown	
15											
5											
10		#2	0.0	8-18	8.0					SAND: Coarse to fine grain sand, 1% small cobbles, poorly sorted, moist, 10YR 6/6 -Brownish Yellow	
10			2.4								

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302516

US 00019918

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-08 Boring Location: Caroline Ave.; Port J.,NY
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
5											
15			0.0							SAND: Coarse to fine grain sand, 1% small cobbles, poorly sorted, wet, 10YR 5/2 -Grayish brown	
										SAND: Coarse to fine grain sand, 1% small cobbles, poorly sorted, moist, 10YR 6/6 -Brownish Yellow	
0		A				0.5 U				PEAT: Peat, highly organic, with inclusions of straw and shell fragments, 10YR 2/1 -Black	
		#3	1.8	18-28	10.0					PEAT: Peat, highly organic, 2.5Y 3/1 -Very dark gray	
20			0.0								
-5										SAND PEBBLES: Coarse to fine grain sand, 10% small cobbles, poorly sorted, wet, 10YR 5/4 - Yellowish brown	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

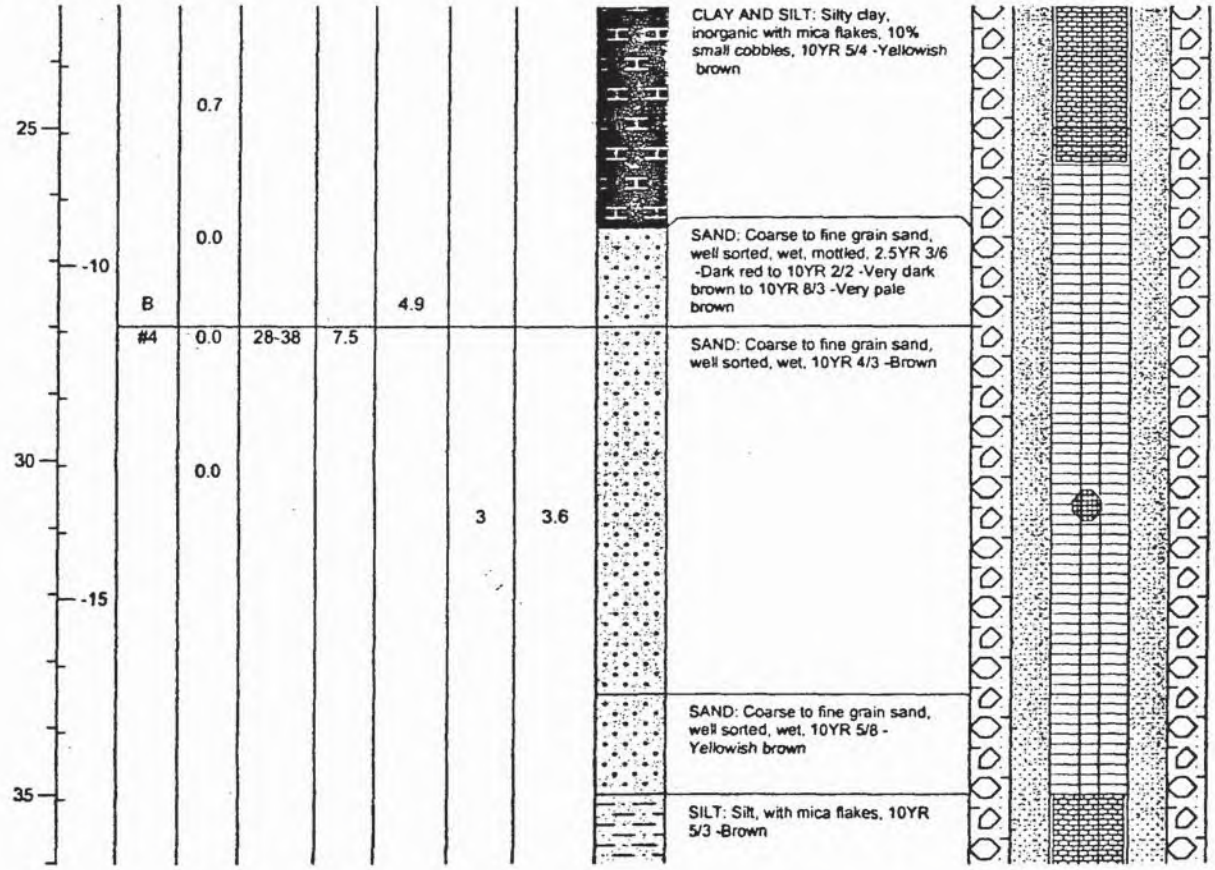
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302517

US 00019919

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-08 **Boring Location:** Caroline Ave.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

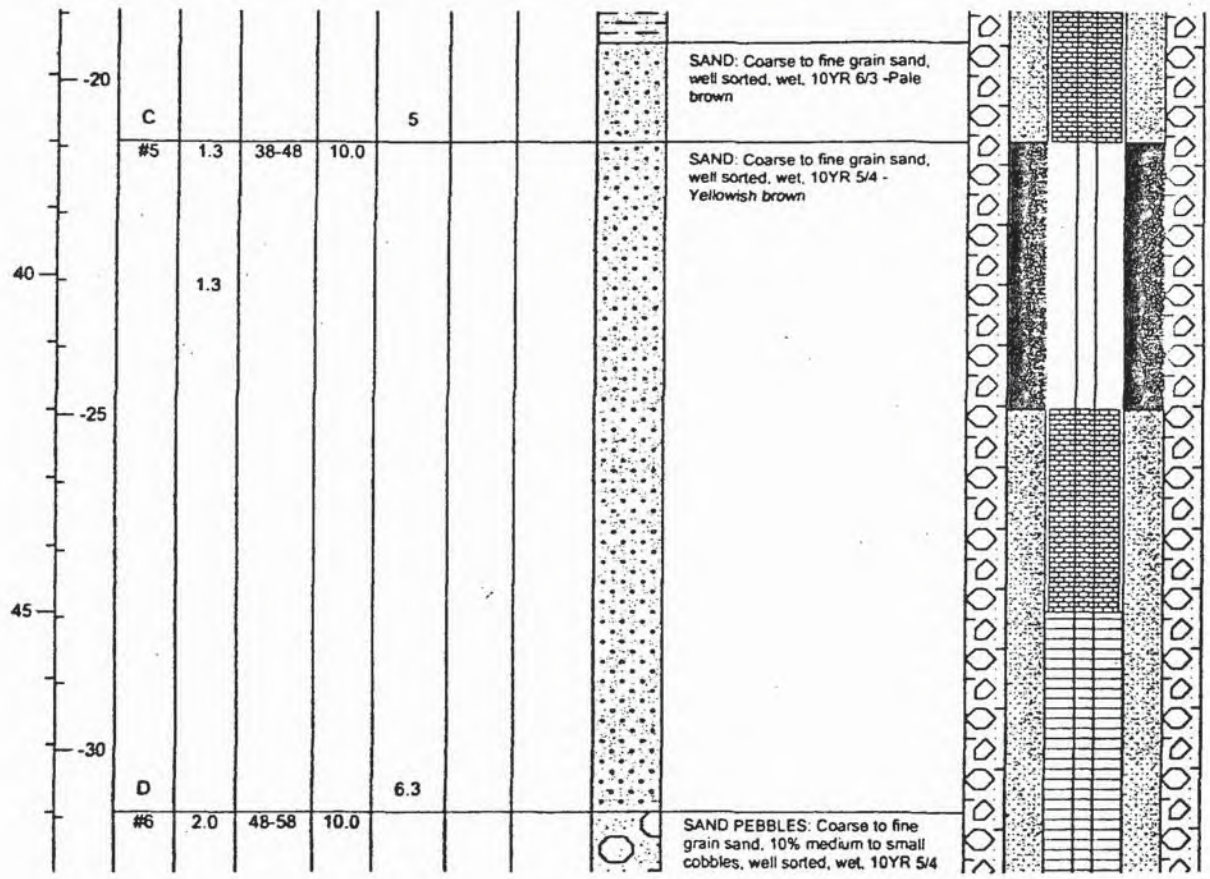
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302518

US 00019920

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-08 Boring Location: Caroline Ave.; Port J.,NY
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302519

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-08 Boring Location: Caroline Ave.; Port J.,NY
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
50			2.0				4.6	4.9		-Yellowish brown	
	-35									SAND: Coarse to fine grain sand, well sorted, wet, 10YR 5/4 - Yellowish brown	
										SILTY SAND: Fine grain silty sand, with mica flakes, wet, 10YR 4/3 to 5/3 -Brown	
55											
	-40	E				4.2					
		#7	6.3	58-68	10.0					SAND: Medium to fine grain sand, poorly sorted, wet, 10YR 6/4 -Light yellowish brown	
60			6.3								

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302520

US 00019922

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-08 **Boring Location:** Caroline Ave.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
	-45									GRAVEL: Medium to small cobbles	
										SILT: Silt, with mica flakes, 10YR 4/4 -Dark yellowish brown	
			5.2							SILTY SAND: Fine grain silty sand, with mica flakes, 10YR 6/4 -Light yellowish brown	
65			5.1								
	-50	F				3.4					
		#8	6.3	68-78	9.5					SAND: Medium to fine grain sand, poorly sorted, wet, 10YR 6/4 -Light yellowish brown	
70			5.2								
	-55										
			6.4							SILT: Silt, with mica flakes, 10YR 5/3 -Brown	
										GRAVEL: Medium to small cobbles	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302521

US 00019923

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-08 **Boring Location:** Caroline Ave.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
75										FINE SAND: Fine grain sand, with mica flakes, poorly sorted, wet, 10YR 5/6 -Yellowish brown	
	-60	G				8					
		#9	4.2	78-88	10.0					SAND: Medium to fine grain sand, well sorted, wet, 10YR 4/6 -Dark yellowish brown	
80			4.1				11	23			
										SILT: Silt, with mica flakes, 7.5YR 4/6 -Strong brown	
	-65		0.0							SAND: Medium to fine grain sand, poorly sorted, wet, 10YR 5/4 - Yellowish brown	
85											
										SILT: Silt, with mica flakes, 7.5YR 4/6 -Strong brown	
	-70									SAND: Medium to fine grain sand,	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

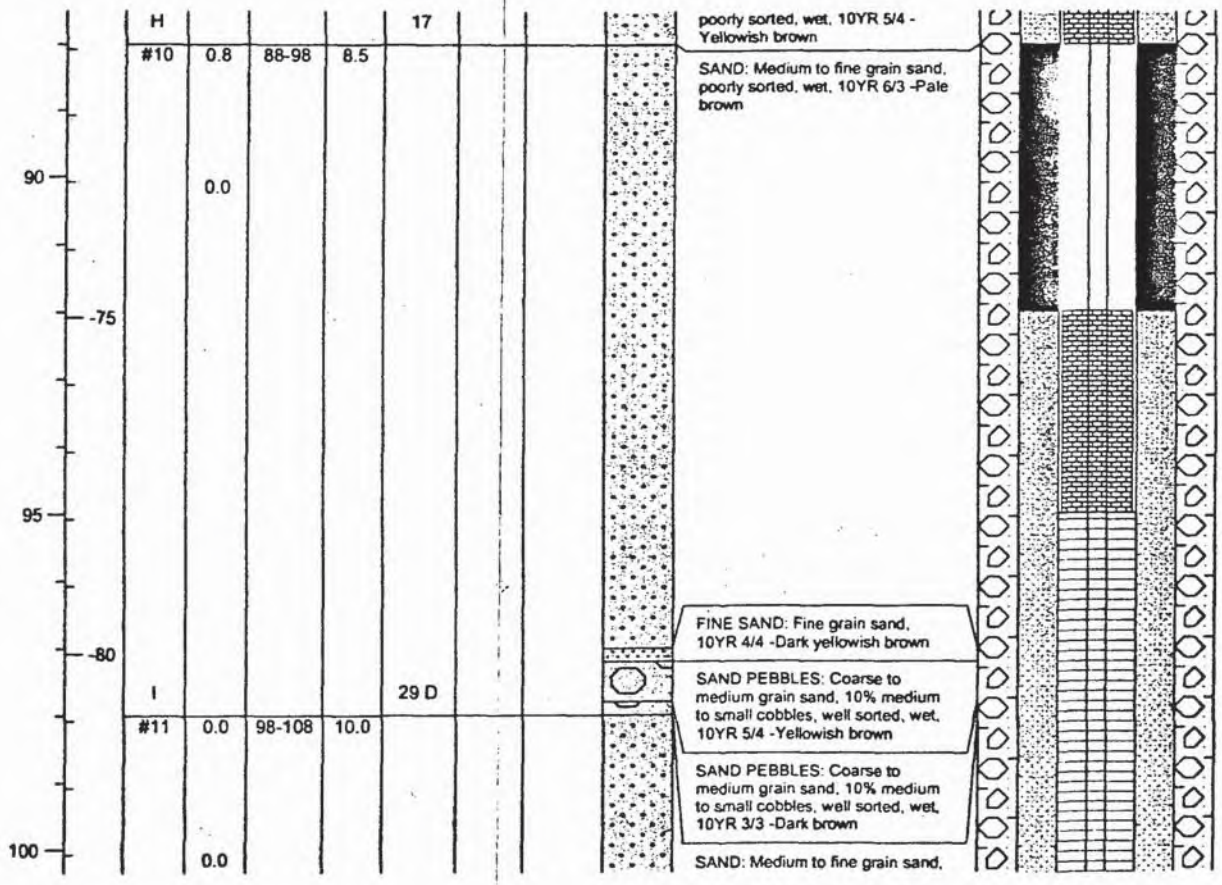
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302522

US 00019924

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-08 **Boring Location:** Caroline Ave.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

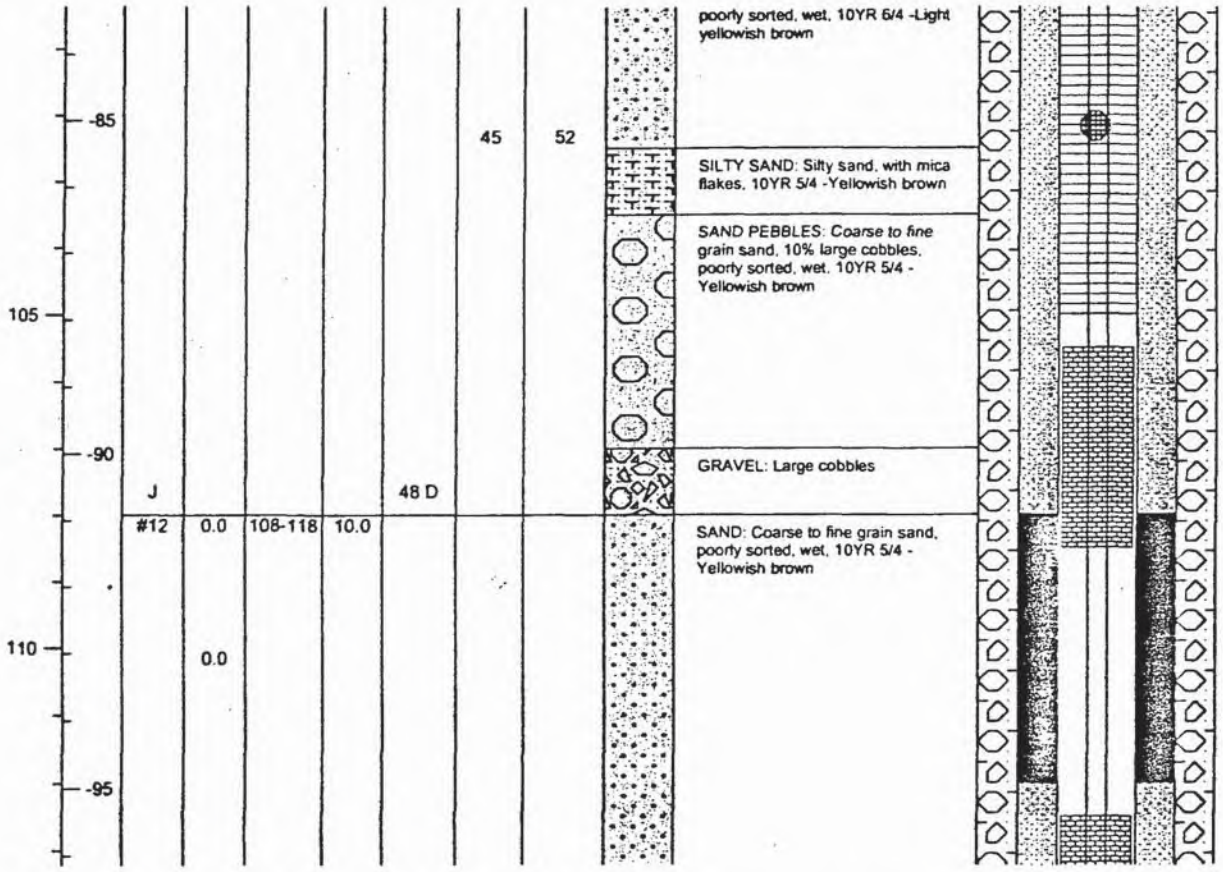
Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-08 **Boring Location:** Caroline Ave.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302524

US 00019926

CDM 125 Maiden Lane, 5th Floor New York, NY 10038		**Boring Name:** MPW-08 **Boring Location:** Caroline Ave.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
115										SAND: Coarse to fine grain sand, poorly sorted, wet, 10YR 4/4 -Dark yellowish brown	
	-100	K				100 D					
		#13	1.2	118-128	10.0						
120			0.0				9.5	22			
	-105									SILT: Silt, 10YR 5/3 -Brown	
125										SAND: Coarse to fine grain sand, poorly sorted, wet, 10YR 6/3 -Pale brown	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

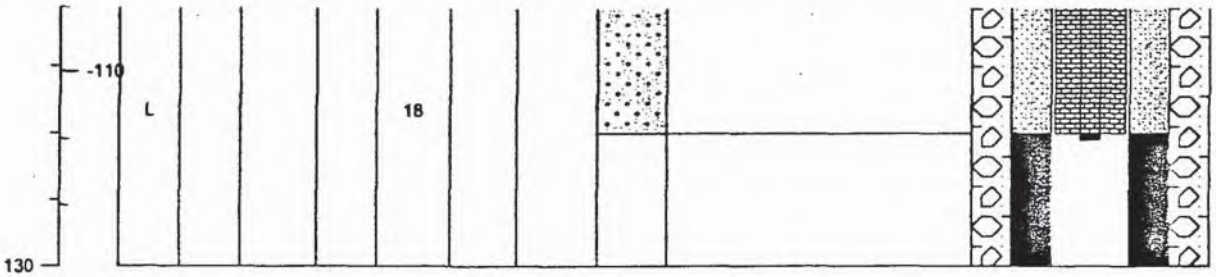
Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302525

US 00019927

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-08 **Boring Location:** Caroline Ave.; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302526

Waterloo System Installation Log

H.bgs

Client: USEPA | Borehole Ø & Depth: 4"ø + 125.75 | Date: 2/10/05

Site: LAI | Casing Depth: N/A | Sheet No.: 1 OF 1

Borehole No.: MW-08 | Depth to Water: 6.1 | Approved: JND.

Unit	In	Depth to Top	Notes
0.81	✓	PACKER →	Base Plug
3+5	✓		5' PVC
0.5	✓✓		PORT (VWP, BP) 5
2	✓		2' PVC Casing
2	✓		2' PVC Casing
3	✓		PACKER
2	✓		2' PVC Casing
2	✓		2' PVC Casing
3	✓		PACKER
2	✓		2' PVC Casing
1	✓		1' PVC Casing
0.5	✓✓		PORT (VWP, BP) 4
5	✓		5' PVC Casing
2	✓		2' PVC Casing
3	✓		PACKER
2	✓		2' PVC Casing
2	✓		2' PVC Casing
3	✓		PACKER
2	✓		2' PVC Casing
2	✓		2' PVC Casing
~~1635~~ 0.7	✓		PORT (VWP, BP) 3
5	✓		5' PVC Casing
3	✓		PACKER
10+4	✓	✓ 2' PVC	10' PVC casing
3	✓	2' PVC →	PACKER
1635 5	✓	✓	5' PVC Casing
~~1635~~ 0.5	✓		PORT (VWP, BP) 2
5	✓		5' PVC
3	✓	ON 1/13	PACKER
2+2	✓✓	2 1/2" 2	5' PVC Casing x 2
3	✓		PACKER
2	✓		2' PVC Casing
2	✓		2' PVC Casing
1705 0.5	✓✓		PORT (VWP, BP) 1
5	✓		5' PVC Casing
3	✓		PACKER
10	✓		10' PVC Casing
10	✓		10' ~~FLT~~ PVC Casing
5	✓	1.42	5' PVC Casing
			less 3.92' (47")
			Final stickup
			0.75' above s.s.
			casing.

← TRANSDUCERS IN ACCEPTABLE RA

Equipment Required			
Unit	#	Unit	#
10 ft Casing	3	PVC Port (Single)	0
5 ft Casing	7	PVC Port (Double)	0
2 ft Casing	16	SS Port (Single)	0
1 ft Casing	1	SS Port (Double)	5
Base Plug	1	Double Valve Pump	0
Dow Packer	10	Bladder Pump	5
Bentonite Packer	0	VW Piezometer	5
Hydraulic Packer	0	Well Head Manifold	1
TUBING 2 x 450			
Cable, VW Transducer 450			
145' S.S. Cable.			

8778.5 JND 2/10/05 DTW

04- Reading Before Installation @ 1510

Zone	Piezo Serial #	Reading	Temp	
1	14634	~~8777.6~~	~~4.0~~ 3.5	45
2	14638 DN	~~9355~~ 9372.4	3.6	65
3	14632	8779.7	3.8	95
4	14631	9140.1	3.8	115
5	14630	9121.8	3.9	130
6	* BLADDER PUMPS FOR ALL			
7	5 zones were given a shake			
8	test + all were ok.			

04- Reading After Installation DTW

Zone	Piezo Serial #	Reading	Temp	
1	14634	8136.5	6.2	7.0
2	14638	8286.6	6.2	6.9
3	14632	6828.5	10.6	7.1
4	14631	6547.3	10.4	7.4
5	14630	5746.3	10.1	6.7
6				
7				
8				

Borehole Water Level (after installation)	n/a

Comments

Zone #	OFFSET	BLADDER CHECK
5	0.45 + 27.4mm	5 ✓
4	0.45 + 27.4mm	4 ✓
3	0.45 + 27.4mm	3 ✓
2	0.45 + 27.4mm.	2 ✓
1	0.45 + 27.4mm.	1 ✓

Final gray PVC stickup is 1.42' bgs which is on target for intended construction or design

TOP OF PORT to INLET = 0.17'

06/00

302527

Client: CDM - Well No: MPW-Old Prepared By: RB

Install Order: 7 SWL: 15FT Date Prepared: 6-Dec (2004)

Zones			5		4		3		2		1
Drillhole Depth		130									
Base Plug at:	SS Plug	128									
(SS Plug or PVC Plug)											
Depth to Top of	Dual	Ports	115.5		102		80.5		50		30.5
(Single or Dual)											
Depth to Top of	3.83	Packers									
(3.83 or 3.58 or 2.88)											
Desired Stick-up		-2.5									

Interval Diff. (feet)	Depth to Top (feet)	Unit Length (feet)	Qnty.	Description of Component	Zone No.	(feet)	Monitoring Equipment / Description
	130			Depth to Btm			
0.1	128	0.1	X	Base Plug			Manifold Type: Stnd Wt Hd O Tube
	125	3	X	Packer			1 Multipurge
			X 1	5' PVC Casing			Pressure Sealed
	✓115.5		~~X 1~~	~~2' Pre-Sealing~~			
9.4	~~115.5~~	0.5	X	Port	5	130	~~VWP Transducer~~ Bladder Pump
			X 2	2' PVC			04-14630
0	✓ 112.5	3	X	Packer			
			X 2	2' PVC Casing			
4	105.5	3	X	Packer			
			X 1	2' PVC Casing			
			X 1	1' PVC Casing			
3	102	0.6	X	Port	4	115	VWP Transducer Bladder Pump
			X 1	5' PVC Casing			
			X 1	2' PVC Casing			04-14631
			X	Packer			
7	92	3					
			X 2	2' PVC Casing			
4	85	3	X	Packer			
			X 2	2' PVC Casing			
4	80.5	0.5	X	Port	3	95	VWP Transducer Bladder Pump
			X 1	5' PVC Casing			04-14632
5	72.5	3	X	Packer			
			X 1	10' PVC Casing			
			X 2	2' PVC Casing			
14	55.5	3	X	Packer			
			X 1	5' PVC Casing			
5	50	0.5	X	Port	2	65	VWP Transducer Bladder Pump
			X 1	5' PVC Casing			04-14633
5	42	3	X	Packer			
			X 2	2' PVC Casing			
4	35	3	X	Packer			
			X 2	2' PVC Casing			
4	30.5	0.5	X	Port	1	45	VWP Transducer Bladder Pump
			X 1	5' PVC Casing			04-14634
5	22.5	3	X	Packer			
			2	10' PVC Casing			
			1	5' PVC Casing			
25	-2.5						

TOTALS			
~~1527~~	/3	10' PVC Casing	450 1/4" X 0.17" Red LDPE Tubing
	/7	5' PVC Casing	450 1/4" X 0.17" Sample LDPE Tubing
	/16	2' PVC casing	/50 VWP Transducer Cable
	/1	1' PVC casing	/5 Dual 3/8" Stem Port Assembly
	/1	SS Plug	/5 Bladder Pump
	/145	3/16" dia SS Support Cable	/10 3.83 Packers
			/5 VWP Transducer

1/4/05 15:18
Macintosh HD:Desktop Folder:[401 CDM Dec6]Sum TLS

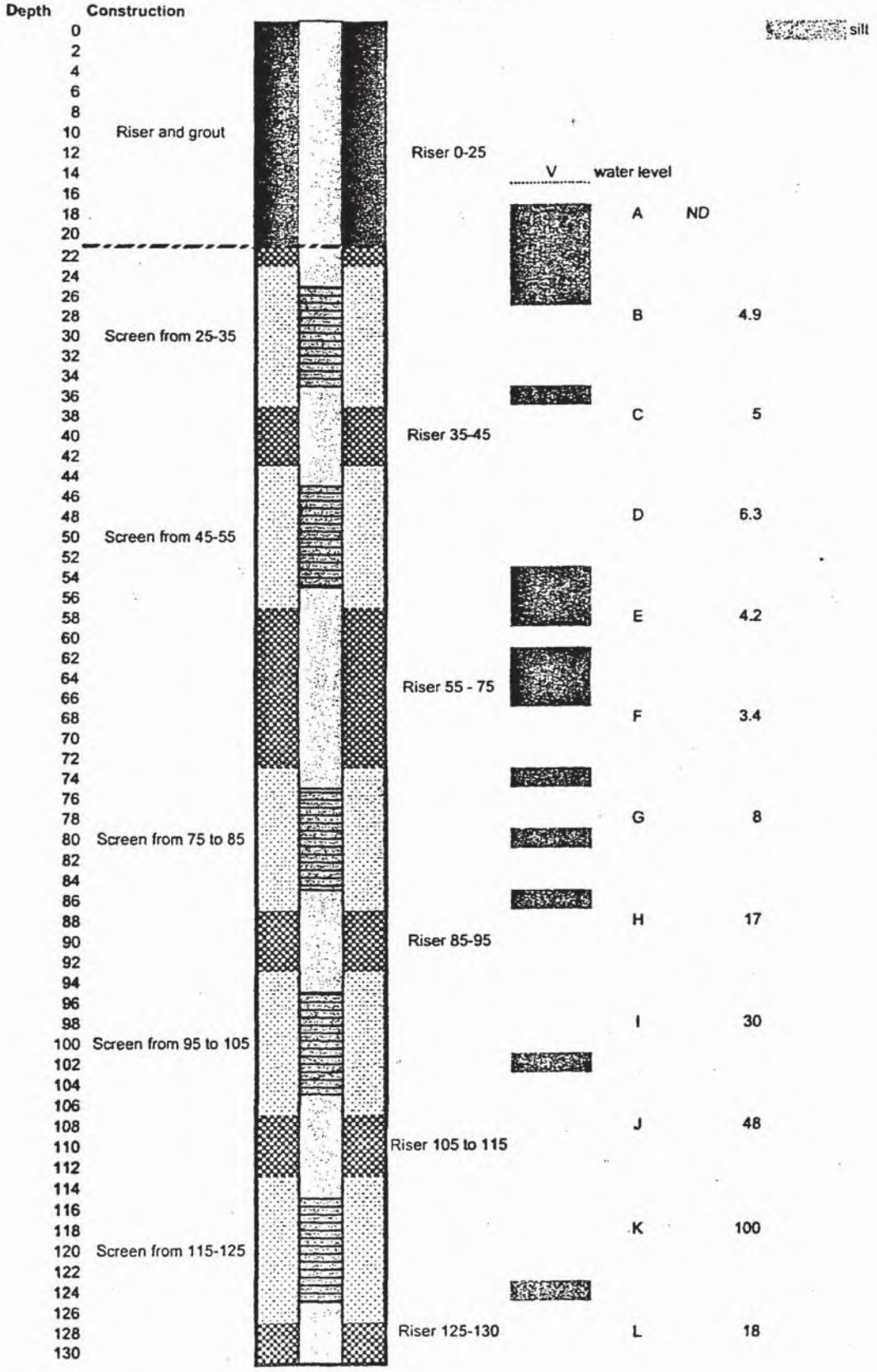
✓ Manifold.

14631

302528

US 00019930

MPW-08



302529

US 00019931

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA MW-08 Zone 1

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14634

Temperature: 22.5 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.6 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Elva

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8793	8794	8794	0.364	0.10	0.037	0.01
70.0	8155	8156	8156	69.99	0.00	70.12	0.04
140.0	7517	7518	7518	139.6	-0.11	140.0	-0.01
210.0	6876	6875	6876	209.7	-0.09	209.9	-0.02
280.0	6231	6232	6232	280.0	-0.01	280.1	0.03
350.0	5587	5586	5587	350.4	0.10	349.9	-0.02

(kPa) Linear Gage Factor (G): 0.1091 **(kPa/ digit)** **Regression Zero:** 8797

Polynomial Gage Factors: **A:** -2.795E-07 **B:** -0.1051 **C:** 945.94

Thermal Factor (K): -0.0332 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.01583 **(psi/ digit)**

Polynomial Gage Factors: **A:** -4.05358E-08 **B:** -0.01525 **C:** 137.20

Thermal Factor (K): -0.00481 **(psi/ °C)**

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 8755 Temp(T_0): 23.0 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302530

US 00019932

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA MW-08 Zone 2

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14638

Temperature: 22.5 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.6 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: EBira

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9392	9392	9392	0.350	0.10	0.037	0.01
70.0	8805	8805	8805	69.89	-0.03	69.95	-0.01
140.0	8216	8215	8216	139.7	-0.08	139.9	-0.03
210.0	7624	7624	7624	209.8	-0.06	210.0	0.01
280.0	7032	7031	7032	280.0	-0.01	280.0	-0.01
350.0	6438	6438	6438	350.3	0.08	350.0	-0.01

(kPa) Linear Gage Factor (G): 0.1185 **(kPa/ digit)** **Regression Zero:** 9395

Polynomial Gage Factors: **A:** -2.696E-07 **B:** -0.1142 **C:** 1096.31

Thermal Factor (K): -0.0979 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.01718 **(psi/ digit)**

Polynomial Gage Factors: **A:** -3.90994E-08 **B:** -0.01656 **C:** 159.01

Thermal Factor (K): -0.01420 **(psi/ °C)**

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9356 Temp(T_0): 23.0 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302531

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

MW-08 Zone 3

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14632

Temperature: 22.5 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.6 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: ERica

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9003	9002	9003	-0.002	0.00	-0.111	-0.03
70.0	8315	8313	8314	70.13	0.04	70.04	0.01
140.0	7630	7628	7629	139.9	-0.02	139.9	-0.04
210.0	6944	6942	6943	209.8	-0.06	209.7	-0.07
280.0	6253	6252	6253	280.1	0.04	280.1	0.03
350.0	5567	5566	5567	350.0	0.01	349.9	-0.03

Pa) Linear Gage Factor (G): 0.1019 **(kPa/ digit)** **Regression Zero:** 9002

Polynomial Gage Factors: **A:** -3.661E-08 **B:** -0.1013 **C:** 915.18

Thermal Factor (K): -0.0424 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.01477 **(psi/ digit)**

Polynomial Gage Factors: **A:** -5.30998E-09 **B:** -0.01470 **C:** 132.74

Thermal Factor (K): -0.00616 **(psi/ °C)**

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 8960 Temp(T_0): 23.1 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA MW-08 Zone 4

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14631

Temperature: 22.5 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.6 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: ERica

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9167	9167	9167	0.189	0.05	-0.031	-0.01
70.0	8526	8525	8526	70.06	0.02	70.04	0.01
140.0	7886	7885	7886	139.8	-0.07	139.9	-0.03
210.0	7243	7243	7243	209.7	-0.08	209.9	-0.03
280.0	6597	6597	6597	280.1	0.03	280.1	0.04
350.0	5954	5953	5954	350.2	0.05	349.9	-0.03

(kPa) Linear Gage Factor (G): 0.1089 **(kPa/ digit)** **Regression Zero:** 9169

Polynomial Gage Factors: **A:** -1.601E-07 **B:** -0.1065 **C:** 989.61

Thermal Factor (K): -0.0330 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.01580 **(psi/ digit)**

Polynomial Gage Factors: **A:** -2.32207E-08 **B:** -0.01545 **C:** 143.53

Thermal Factor (K): -0.00479 **(psi/ °C)**

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9128 Temp(T_0): 23.2 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302533

US 00019935

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

MW-08 Zone 5

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14630

Temperature: 22.5 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.6 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Erica

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9124	9125	9125	-0.114	-0.03	-0.055	-0.02
70.0	8419	8419	8419	70.21	0.06	70.21	0.06
140.0	7719	7719	7719	140.0	0.00	140.0	-0.01
210.0	7018	7018	7018	209.9	-0.04	209.9	-0.04
280.0	6314	6314	6314	280.0	0.01	280.0	0.01
350.0	5612	5612	5612	350.0	0.00	350.0	0.01

(kPa) Linear Gage Factor (G): 0.0997 (kPa/ digit) Regression Zero: 9123

Polynomial Gage Factors: A: 5.537E-09 B: -0.0998 C: 909.71

Thermal Factor (K): -0.0840 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.01446 (psi/ digit)

Polynomial Gage Factors: A: 8.03138E-10 B: -0.01447 C: 131.94

Thermal Factor (K): -0.01218 (psi/ °C)

Calculated Pressures: Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$**

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9080 Temp(T_0): 22.9 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

MPW-09

302535

US 00019937

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-09 **Boring Location:** Old Mill Pond; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147
Drilling Contractor: Uni-Tech Drilling Co. **Drilling Method:** Rotasonic **Sample Method:** Vibration Extraction **Date Started:** 11/11/2004 **Date Completed:** 02/17/2005 **Logged By:** Adrian Steinhauff (P.W.GROSSER, INC.)	**Northing:** 284384.575 **Easting:** 1240317.248 **Surface Elevation (ft. above msl):** 9.66 **Total Depth (ft bgs):** 140 **Initial Depth to Water (ft bgs):** 8 **Field Screening Instrument:** PID

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
0	5	#1	0.0	0-8	4.5					PEAT: Organic Peat with SAND; fine grain (very dark brown) 10YR 2/2	
										SAND: SAND (yellowish brown) 10YR 5/4, Coarse to fine grain, poorly sorted, moist, wet at 8 feet	
10	0	#2	3.1	8-18	10	660 D				SAND: SAND (light yellowish brown) 10YR 6/4, coarse to medium grain, well sorted; wet, 30% cobbles medium to small	
			5.1							PEAT: ORGANIC PEAT (BLACK) 10YR 2/1, 30% sand medium to fine grain (very dark brown) 10YR 2/2	
15	-5		3.2				150	68			
		#3	3.0	18-28	10	71 D				SAND: SAND (very pale brown) 10YR 8/3, medium to fine grain, poorly sorted, wet	
20	-10		3.1							SAND: SAND (light yellowish brown) 10YR 6/4 medium to fine grain, poorly sorted	
			3.1								
25	-15		3.1							SILTY SAND: SILTY SAND (light blueish grey) 2 for Gley 8/1, 40% SAND fine grain, poorly sorted, wet, with mica flakes	
		#4	0.0	28-38	10	5.6				SILTY SAND: SILTY SAND (light blueish-grey) 2 for Gley 8/1, 40% SAND, fine grain, poorly sorted, wet, with mica flakes	
30	-20		0.0							SAND: SAND (pale yellow) 2.5Y	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

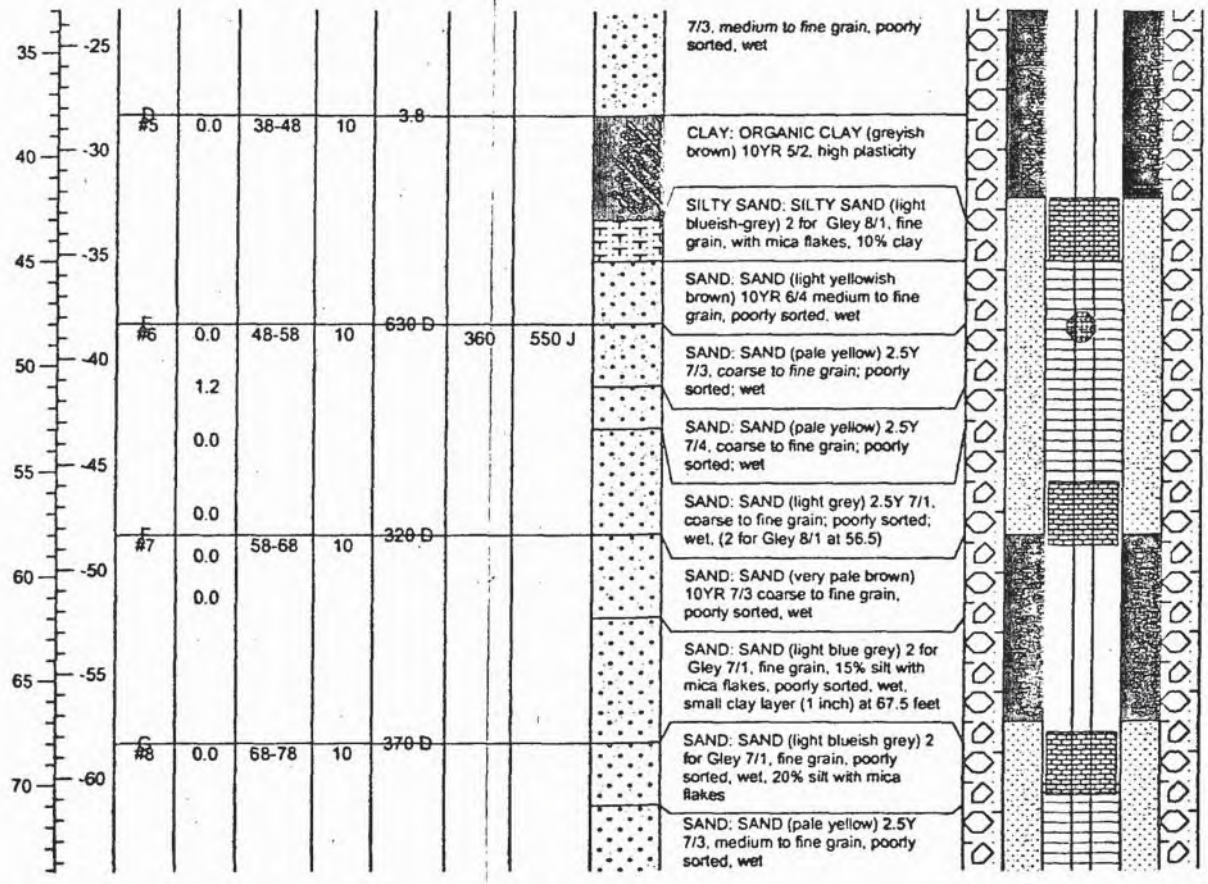
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced. In March and May 2005 groundwater samples were collected from the completed multiport wells.

302536

US 00019938

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-09
	Boring Location: Old Mill Pond; Port J.,NY
Client: U.S. Environmental Protection Agency	Project Name: Lawrence Aviation RI/FS
Site Location: Port Jefferson Station, New York	Project Number: 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302537

US 00019939

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-09 **Boring Location:** Old Mill Pond; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
75	-65									SAND: SAND (light blueish grey) 2 for Gley 7/1, fine grain, poorly sorted, wet, 10% silt with mica flakes, Iron deposit at 76 and 76.5 feet, (red) 2.5YR 4/6	
80	-70	#9	6.4	78-88	10	770 D	580	760		SAND: SAND (light grey) 10YR 7/2 medium to fine grain, poorly sorted, wet 15% silt with mica flakes	
85	-75		3.2 10.4							SILT: SILT with mica flake (light blueish grey) 2 for Gley 7/1, iron oxide deposits (red) 2.5YR 4/6, trace clay	
90	-80	#10	0.0	88-98	10	93 D				SAND: SAND (light grey) 10YR 7/2 medium to fine grain, poorly sorted, wet 15% silt with mica flakes	
95	-85									SILT: SILT with mica flake (light blueish grey) 2 for Gley 7/1, iron oxide deposits (red) 2.5YR 4/6, trace clay	
100	-90	#11	0.0	98-108	10	850 D	390	870		SAND: SAND (light grey) 10YR 7/2 medium to fine grain, poorly sorted, wet 15% silt with mica flakes	
105	-95									SILT: SILT with mica flake (light blueish grey) 2 for Gley 7/1, iron oxide deposits (red) 2.5YR 4/6, trace clay	
110	-100	#12	0.0	108-118	10					SAND: SAND (light grey) 10YR 7/2 medium to fine grain, poorly sorted, wet 15% silt with mica flakes	
115	-105									SAND: SAND (light grey) 10YR 7/2, medium to fine grain, poorly sorted, wet 15% silt	
										SILT: SILT with mica flakes (light	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302538

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-09 **Boring Location:** Old Mill Pond; Port J.,NY
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
120	-110	#13	0.0	118-128	10					blueish grey) 2 for Gley 7/1, iron oxide deposits (red) 2.5YR 4/6	
										SAND: SAND (yellow) 10YR 7/8 medium to fine grain poorly sorted, wet with mica flakes; at 95.3 (pale yellow) 2.5Y 7/3	
125	-115									CLAY: INORGANIC CLAY, low plasticity, dry, (brown) 10YR 5/3	
										CLAY: ORGANIC CLAY, low plasticity, dry, (black) 10YR 2/1	
		#14	0.0	128-138	10	42 D				CLAY: INORGANIC CLAY, low plasticity, dry, (brown) 10YR 5/3	
130	-120						59	81		CLAY: ORGANIC CLAY, low plasticity, dry, (black) 10YR 2/1	
										CLAY AND SILT: CLAYEY SILTS with slight plasticity with mica flakes, moist (light grey) 10YR 7/1	
135	-125	M			10	14				SILTY SAND: SILTY SAND (light grey) 10YR 7/1 30% sand fine grain, wet with mica flakes; small clay deposits at 116.5 to 117.5 feet (white) 10YR 8/1	
										SAND: SAND (brownish yellow) 10YR 6/6, coarse to fine grain, iron deposits, poorly sorted, wet	
										SAND: SAND (light blueish grey) 2 for Gley 7/1, medium to fine grain, 30% silt with mica flakes, wet	
140	-130									SAND: SAND (light blueish grey) 2 for Gley 7/1, medium to fine grain, 20% silt with mica flakes; with bands of (pale yellow) 2.5Y 7/4 at 131, 132.5, and 133.5 feet	
										SAND: SAND (yellowish brown) 10YR 5/8, medium to fine grain,	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302539

US 00019941

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	Boring Name: MPW-09 Boring Location: Old Mill Pond; Port J.,NY
Client: U.S. Environmental Protection Agency Site Location: Port Jefferson Station, New York	Project Name: Lawrence Aviation RI/FS Project Number: 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
										20% silt with mica flakes	
										SAND: SAND (red) 2.5YR 5/6, medium to fine grain, 20% silt with mica flakes; with iron deposits (red) 2.5YR 4/6 at 136 feet	
										SAND: SAND (yellowish brown) 10YR 5/8, medium to fine grain, 20% silt with mica flakes	
										SAND: SAND (pale yellow) 2.5Y 7/4, medium to fine grain, 20% silt with mica flakes	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302540

Waterloo System Installation Log

+ 2/17/05

Client: USEPA | Borehole Ø & Depth: 4" ø 140.4 BGS | Date: 2/14/05 + 2/16/05
Site: LAI | Casing Depth: N/a CGS05 | Sheet No.: 1 OF 2 + 3 DW 2/24/05
Borehole No.: MW-09 | Depth to Water: ~~ARTESIAN FLOW~~ | Approved: DW

Unit	In	Depth to Top	Notes
FEET		FEET.	
	✓		
0.1	✓	138	BASE PLUG
3	✓	135	PACKER (5B)
5	✓		5' PVC casing
0.5	✓✓	129.5	PORT (VWP, BP) 5
5	✓		5'
3	✓	121.5	PACKER (5A)
10	✓		10' PVC casing
5	✓		5'
2	✓		2'
1	✓		1'
3	✓	100.5	PACKER (4B)
2	✓		2'
0.5	✓✓	98	PORT (VWP, BP) 4
5	✓		5' PVC casing
2	✓		2'
1	✓		1'
3	✓	87	PACKER ~~(4A)(3B)(4A)~~
2	✓		2' PVC casing
2	✓		2' "
3	✓	80	PACKER ~~(4A)(3A)~~ (3B)
1	✓		1' PVC
0.5	✓✓	78.5	PORT (VWP, BP) 3
5	✓		5' PVC casing
2	✓		2'
1	✓		1'
3	✓	67.5	PACKER (3A)
5	✓		5' PVC casing
2	✓		2'
2	✓		2'
3	✓	55.5	PACKER (2B)
5	✓		5' PVC casing
2	✓		2' "
0.5	✓	48	PORT (VWP, BP) 2
2	✓		2' PVC casing
1	✓		1' "
3	✓	42	PACKER (2A)
10	✓		10' PVC casing
5	✓		5'
2	✓		2'
2	✓		2'
3	✓	20	PACKER (1B)
5	✓		5' PVC casing
			~~2' DW 2/14/05~~

Equipment Required 1 pressure fitting

Unit	#	Unit	#
10 ft Casing	2	PVC Port (Single)	0
5 ft Casing	10	PVC Port (Double)	0
2 ft Casing + 2 for pressure fitting	14	SS Port (Single)	0
1 ft Casing	6	SS Port (Double)	5
Base Plug	1	Double Valve Pump	0
Dow Packer	10	Bladder Pump	5
Bentonite Packer	/	VW Piezometer	5
Hydraulic Packer	/	Well Head Manifold	1
1000 ft. Poly Tubing, PTFE lined.			
450 ft. transducer cable.			
155 ft. steel cable		6" SEGMENTS	2

2 x 05' PVC casing

OK?

SEE PAGE 2.30 (1) 2/14/05 2/14/05 DW 2/14/05

04- → Reading Before Installation @ 1030

Zone	Piezo Serial #	Reading	Temp	
1	14790	9329.1	3.7	30
2	14633	9248.3	3.7	65
3	~~14637~~	~~9295.4~~	~~2 73.3~~	95
4	~~14636~~	9197.5	NO READ.	115
5	14635	9200.5	3.3	145
6		~~9315.6~~		
~~13~~				
~~8~~				

2/17/05 (HEAD DTW 2/16/05 2/17/05

04- Reading After Installation ~~2/16/05~~

Zone	Piezo Serial #	Reading	Temp	
1	14790	8.51	1.89	
2	14633	41.53	2.37	
3	14637	72.49	1.91	
4	~~14636~~	~~92.37~~	~~1.53~~	2/17/05
5	14636	123.93	1.47	
~~84~~	13137	92.37	1.53	
7				
8				

Borehole Water Level (after installation)	N/a

Comments

Transducer 04-14636: temperature probe not working.
2/14/05: STOP INSTALL PROCESS, ORDER NEW UNIT TO REPLACE BAD TRANSDUCER
2/16/05: INSTALL MANIFOLD ON MW-02.

302541

Waterloo System Installation Log

Client: USEPA | Borehole Ø & Depth: 4"Ø | Date: 2/16/05
Site: LAI | Casing Depth: n/a | Sheet No.: 2 of 2 ~~3~~
Borehole No.: MW-09 | Depth to Water: — | Approved: AD.

Unit	In	Depth to Top	Notes
FEET			
~~0.5~~		~~14.5~~	~~PORT (MW-09) 1~~
~~2~~			~~2' PVC CASING~~
~~2~~			~~2' PVC CASING~~
~~3~~		~~7.5~~	~~PACKER 2nd~~
~~10~~			~~10' PVC CASING~~
			2/23/05

refer to readings on 2/17/05

refer to readings on 2/17/05

Equipment Required

Unit	#	Unit	#
10 ft Casing		PVC Port (Single)	
5 ft Casing		PVC Port (Double)	
2 ft Casing		SS Port (Single)	
1 ft Casing		SS Port (Double)	
Base Plug		Double Valve Pump	
Dow Packer		Bladder Pump	
Bentonite Packer		VW Piezometer	
Hydraulic Packer		Well Head Manifold	

2/16/05

04 **Reading Before Installation** @1110

Zone	Piezo Serial #	Reading	Temp	
1	14790	9348.6	15.2	30
2	~~14633~~	~~9278.79.5~~	~~12 13.4~~	~~65~~
3	14637	9335.7	14	95
~~4~~	~~14636~~	——— do	2/16/05	~~45~~
5	14635	9225.3	16	1
~~6 8~~	~~13137~~			1
7	14633	9277.3	14.3	65
8				

04 **Reading After Installation** 2/16/05

Zone	Piezo Serial #	Reading	Temp
1	14790		
2	14633		
3	14637		
~~4~~	~~14636~~ do 2/16/05		
5	14635		
~~6~~ 4	~~13137~~		
7			
8			

Borehole Water Level (after installation)	

Comments START XD SOAK @ 1045
Abandoned effort to install WMLS in MW-09 on 2/16 on AT 1530 because replacement transducer did not arrive on site.

06/00

302542

US 00019944

Waterloo System Installation Log

Client: USEPA | Borehole Ø & Depth: 4" Ø 140.4 bgs @ 0905 | Date: 2/17/05
Site: LAI | Casing Depth: NA | Sheet No.: 3 OF 3
Borehole No.: MW-09 | Depth to Water: artesian flow | Approved: JAF

Unit	In	Depth to Top	Notes
FEET		Ft. BGS	
0.5	✓	14.5	PORT (DWP, BP) 1
2	✓		2' PVC Casing
2	✓		2' PVC Casing
3	✓	7.5	PACKER
40.5	✓	5	40.5' PVC Casing
1	✓	1.52	1' PVC (7" above 4" steel casing)
	✓	WELL SEAL.	
TEMPORARY SETUP (to pressurize well.)			
			2' PVC Casing
			2'
			0.5
			0.5
At 1434 DII done at MPW-09.			
Pressurized to 40 psi			
- check pressure, top to 40psi			
- Take Temp. Casing not # last 1" (7" soak hrs.)			
- Top of water to 3' of below Top of Casing			
- Install manifold.			
3/4/05 Final Completion.			
0.5		1.02	6" Section of casing
0.25		0.77	3" Section of Casing
AMD 3/4/05			MANIFOLD INSTALLED
Zone		BLADDER PUMP SHAKE dk	
5		✓	
4		✓	
3		✓	
2		✓	
1		✓	

CHECK TRANSDUCER OK

Equipment Required

Unit	#	Unit	#
10 ft Casing		PVC Port (Single)	
5 ft Casing		PVC Port (Double)	
2 ft Casing		SS Port (Single)	
1 ft Casing		SS Port (Double)	
Base Plug		Double Valve Pump	
Dow Packer		Bladder Pump	
Bentonite Packer		VW Piezometer	
Hydraulic Packer		Well Head Manifold	

04 **Reading Before Installation** 2/17/05 @ 0850

Zone	Piezo Serial #	Reading	Temp	
1	14790	9342.3	3.4	30
2	14633	9268.2.9	3.8	65
3	14637	9329.8	3.7	95
4	13137	8866.2	4.1	115
5	14635	9216.0	4.0	145
6				
7				
8				

04 **Reading After Installation** 2/17/05 @ 1227

Zone	Piezo Serial #	Reading	Temp
1	14790	9124	10
2	14633	8090	10.3
3	14637	7231	10.
4	13137	6290.4	10.1
5	14635	5620	10
6			
7			
8			

Borehole Water Level (after installation)	n/a

Comments

0815 START XD SOAK.
0835 Check XDs.

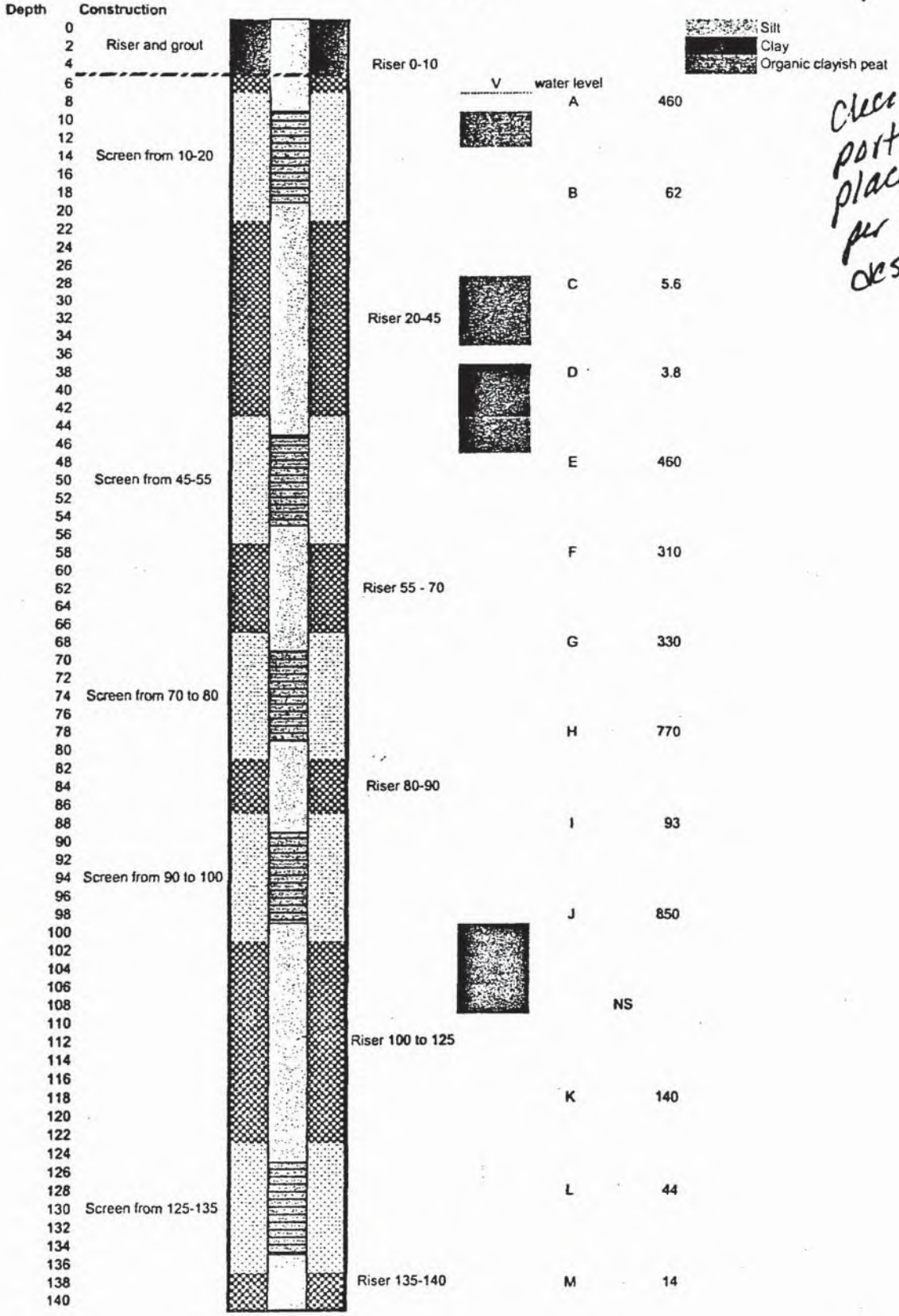
Zone	OFFSET
5	0.45 (assumed)
4	0.47
3	0.45
2	0.45
1	0.44

06/00

302543

US 00019945

MPW-09



Check port placement per Solinst design.

302544

Client: CDM - Well No: MPW-09 Prepared By: RB

Install Order: 8 SWL: 6FT Date Prepared: 6-Dec (2004)

Interval Diff. (feet)	Depth to Top (feet)	Unit Length (feet)	Qnty.	Description of Component	Zone No.	(feet)	Monitoring Equipment / Description
				Zones 5 4 3 2 1			
	140			Drillhole Depth 140			
				Base Plug at: SS Plug 138 (SS Plug or PVC Plug)			
				Depth to Top of Dual Ports 129.5 98 78.5 48 12.5 (Single or Dual)			
				Depth to Top of 3.83 Packers (3.83 or 3.56 or 2.86)			
				Desired Stick-up -2.5			
0.1	138	0.1	X	Base Plug			Manifold Type: Stnd Wt Hd O Tube
	135	3	X	Packer			
			X 1	5' PVC Casing			1 Multipurge Pressure Sealed
5.4	129.5	0.5	X	Port	5	145	VWP Transducer: Bladder Pump
			X 1	5' PVC Casing			14635
5	121.5	3	X	Packer			
			X 1	10' PVC Casing			
			X 1	5' PVC Casing			
			X 1	2' PVC Casing			
			X 1	1' PVC Casing			
18	100.5	3	X	Packer			
			X 1	2' PVC Casing			
2	98	0.5	X	Port	4	115	VWP Transducer: Bladder Pump
			X 1	5' PVC Casing			
			X 1	2' PVC Casing			
			X 1	1' PVC Casing			
				Packer			
8	87	3	X				
			X 2	2' PVC Casing			
4	80	3	X	Packer			
			X 1	1' PVC Casing			
1	78.5	0.5	X	Port	3	95	VWP Transducer: Bladder Pump
			X 1	5' PVC Casing			
			X 1	2' PVC Casing			
			X 1	1' PVC Casing			
8	67.5	3	X	Packer			
			X 1	5' PVC Casing			
			X 2	2' PVC Casing			
9	55.5	3	X	Packer			
			X 1	5' PVC Casing			
			X 1	2' PVC Casing			
7	48	0.5	X	Port	2	65	VWP Transducer: Bladder Pump
			X 1	2' PVC Casing			
			X 1	1' PVC Casing			
3	42	3	X	Packer			
			X 1	10' PVC Casing			
			X 1	5' PVC Casing			
			X 2	2' PVC Casing			
19	20	3	X	Packer			
			X 1	5' PVC Casing			
	14.5			~~10' PVC Casing~~			
7	~~14.5~~	0.5	X	Port	1	30	VWP Transducer: Bladder Pump
			2 X	2' PVC Casing			
2	7.5	3		Packer			
			1	10' PVC Casing		5 + 1	
10	-2.5						

TOTALS			
3	10' PVC Casing	450	1/4" X 0.17" Red LDPE Tubing
9	5' PVC Casing	450	1/4" X 0.17" Sample LDPE Tubing
14	2' PVC casing	450	VWP Transducer Cable
5	1' PVC casing	5	Dual 3/8" Stem Port Assembly
1	SS Plug	5	Bladder Pump
155	3/16" dia SS Support Cable	10	3.83 Packers
		5	VWP Transducer

1/4/05 15:18
Macintosh HD:Desktop Folder:[401 CDM Doc6]Sum TLS

/MANIFOLD.

Lengths checked out ok. JW 2/14/05

0910 x10 Soaking

302545

US 00019947

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA MW-09 Zone 1

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14790

Temperature: 22.8 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.5 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Erica

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9363	9364	9364	0.250	0.07	0.059	0.02
70.0	8765	8765	8765	69.95	-0.01	70.00	0.00
140.0	8165	8165	8165	139.8	-0.05	140.0	0.01
210.0	7565	7565	7565	209.7	-0.08	209.9	-0.03
280.0	6961	6961	6961	280.0	0.01	280.1	0.03
350.0	6358	6359	6359	350.2	0.06	350.0	0.01

(kPa) Linear Gage Factor (G): 0.1165 **(kPa/ digit)** **Regression Zero:** 9366

Polynomial Gage Factors: **A:** -2.073E-07 **B:** -0.1132 **C:** 1078.1

Thermal Factor (K): -0.0471 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.01689 **(psi/ digit)**

Polynomial Gage Factors: **A:** -3.00638E-08 **B:** -0.01642 **C:** 156.37

Thermal Factor (K): -0.00683 **(psi/ °C)**

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9326 Temp(T_0): 22.9 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302546

Zone 1 MW-09.

2/17/05 DTW + Initial Transducer Check.

DIGITS: initial – reading at depth.

9342
9124
218 digits

PSI = 218 digits x 0.01689 psi/digit
= 3.68 psi

Ft. H2O: 3.68 psi x 2.31 ft H2O/psi
= 8.51 ft H2O

DTW: ~~14.5' – 8.51 = 5.99~~
(14.5 – 4.1) – 8.51 = 1.89

Actual DTW is about 1.68 ft. bgs.

JM Daugherty

302547

US 00019949

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA MW-09 Zone 2

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14633

Temperature: 22.5 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.6 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Elisa

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9298	9298	9298	0.216	0.06	-0.060	-0.02
70.0	8637	8637	8637	70.09	0.03	70.15	0.04
140.0	7979	7978	7979	139.7	-0.09	139.9	-0.04
210.0	7316	7316	7316	209.7	-0.08	210.0	-0.01
280.0	6652	6651	6652	280.0	-0.01	280.0	0.00
350.0	5987	5986	5987	350.3	0.08	349.9	-0.02

(kPa) Linear Gage Factor (G): 0.1057 (kPa/ digit) **Regression Zero: 9300**

Polynomial Gage Factors: A: -1.893E-07 B: -0.1028 C: 972.29

Thermal Factor (K): 0.0012 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.01533 (psi/ digit)

Polynomial Gage Factors: A: -2.74626E-08 B: -0.01491 C: 141.02

Thermal Factor (K): 0.00018 (psi/ °C)

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9259 Temp(T_0): 23.1 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302548

2/17/05 Zone 2

Instal – final

9262.9

8050.0

1172.9 digits

Psi

11729 x 0.01533 = 17.98 psi

Ft. H20

17.98 x 2.31 = 41.53

DTW installed depth

(48 – 4.1) ~~89~~ 43.9

41.53

2.37

OK

AP 2/17/05

302549

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

AM 2/14/05 TRANSDUCER OK ~~BAD TRANSDUCER, TEMP. SENSOR~~ ~~WOULD NOT READ.~~

AM 2/2/05

9 Vibrating Wire Pressure Transducer Calibration Report

New-OB Zone 3

AM 2/14/05

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14637

Temperature: 22.5 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.6 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Elisa

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9348	9346	9347	0.069	0.02	-0.261	-0.07
70.0	8666	8666	8666	70.25	0.07	70.30	0.09
140.0	7991	7991	7991	139.8	-0.05	140.0	0.00
210.0	7314	7314	7314	209.6	-0.12	209.8	-0.06
280.0	6631	6631	6631	280.0	0.00	280.0	0.01
350.0	5950	5948	5949	350.3	0.08	349.9	-0.02

(kPa) Linear Gage Factor (G): 0.1031 **(kPa/ digit)** **Regression Zero:** 9348

Polynomial Gage Factors: **A:** -1.473E-07 **B:** -0.1008 **C:** 954.97

Thermal Factor (K): -0.1193 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.01495 **(psi/ digit)**

Polynomial Gage Factors: **A:** -2.13696E-08 **B:** -0.01462 **C:** 138.51

Thermal Factor (K): -0.01731 **(psi/ °C)**

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9303 Temp(T_0): 23.3 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302550

US 00019952

2/17/05 Zone 3

DTW + Initial Function check

Initial 9329.8
final 7231

2098.8 lg

PSi 2098.8 lg | 0.0145 psi / 1 lg |

2098.8
.01495
104940
188892
8395200
20988000
31.377080 psi

Ft. H2O

31.38 psi | 2.31 ft / 1 psi | = 72.49 ft

DTW Installed − ft. H2O

Installed = (78.5 − 41) − 72.49 =

1.91 ft DTW (bgs)

JW

John Daugherty
2/17/05

302551

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA MW-09 Zone 4

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: November 2, 2004

Serial Number: 04-13137

Temperature: 22.2 °C

Pressure Range: 350 kPa

†Barometric Pressure: 999.9 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 428, 028

Technician: J. Ouellette

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error -Polynomial (%FS)
0.0	8858	8858	8858	0.326	0.09	0.128	0.04
70.0	8194	8194	8194	69.76	-0.07	69.80	-0.06
140.0	7525	7524	7525	139.8	-0.07	139.9	-0.04
210.0	6853	6853	6853	210.0	0.00	210.1	0.04
280.0	6183	6183	6183	280.0	0.01	280.1	0.03
350.0	5513	5513	5513	350.1	0.03	349.9	-0.03

(kPa) Linear Gage Factor (G): 0.1046 (kPa/ digit) Regression Zero: 8861

Polynomial Gage Factors: A: -1.332E-07 B: -0.1027 C: 919.89

Thermal Factor (K): 0.1909 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.01517 (psi/ digit)

Polynomial Gage Factors: A: -1.93248E-08 B: -0.01489 C: 133.42

Thermal Factor (K): 0.02769 (psi/ °C)

Calculated Pressures: Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$**

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 8855 Temp(T_0): 26.1 °C †Baro(S_0): 991.1 mbar Date: February 15, 2005

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302552

US 00019954

Zone 4 2/17/05 QA Documents

- DTW + initial transducer check.

Initial reading 8866.2
Reading at depth 6230.4
2635.8 digits

PSi 2635.8 digits x 0.01517 $\frac{psi}{digits}$ = 39.99 psi

Ft. H2O 39.99 psi x 2.31 $\frac{ft.}{psi}$ = 92.37'

DTW installed - ft. H2O

98 - 4.1 - 92.37 = 1.53 dtw

JMD
2/17/05

302553

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

Vibrating Wire Pressure Transducer Calibration Report

Mw-2BG Zone 5

Type: S AM 2/17/05

Date of Calibration: December 13, 2004

Serial Number: 04-14635

Temperature: 22.5 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.6 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: EBira

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9233	9232	9233	-0.059	-0.02	-0.092	-0.03
70.0	8551	8550	8551	70.09	0.03	70.03	0.01
140.0	7871	7871	7871	140.0	-0.01	140.0	-0.01
210.0	7190	7190	7190	210.0	0.01	210.0	0.00
280.0	6510	6510	6510	280.0	-0.01	280.0	-0.01
350.0	5829	5829	5829	350.0	0.00	350.0	0.01

(kPa) Linear Gage Factor (G): 0.1029 (kPa/ digit) **Regression Zero: 9232**

Polynomial Gage Factors: A: 1.191E-08 B: -0.1030 C: 950.21

Thermal Factor (K): -0.1081 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.01492 (psi/ digit)

Polynomial Gage Factors: A: 1.72813E-09 B: -0.01494 C: 137.82

Thermal Factor (K): -0.01568 (psi/ °C)

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9188 Temp(T_0): 23.1 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1

This report shall not be reproduced except in full without written permission of Geokon Inc.

Times MW-09 Initial DTW + transducer function check

initial reading: ~~9216~~

Reading at depth: ~~5260~~
5620
3596 Dg

psi 3596 Dg | 0.01492 psi / Dg |

3596
.01492
7192
32360
143840
3596000
53.65232

ft H_2O 53.65 psi | 2.31 ft / psi |

53.65
231
5365
160950
1073000
123.9315 ft

(Installed - 4.1) - 123.93

~~129.5 - 4.1~~
125.40
-123.93
1.47 ft bgs

ok JW 2/17/05

JW

302555

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA Temperature sensor will not read. JM 2/14/05

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14636

Temperature: 22.5 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.6 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Erica

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9233	9234	9234	0.268	0.08	0.027	0.01
70.0	8615	8615	8615	69.99	0.00	70.05	0.01
140.0	7996	7996	7996	139.8	-0.07	140.0	0.00
210.0	7375	7375	7375	209.8	-0.07	210.0	0.00
280.0	6753	6753	6753	279.9	-0.03	279.9	-0.02
350.0	6128	6128	6128	350.3	0.09	350.0	0.01

(kPa) Linear Gage Factor (G): 0.1127 **(kPa/ digit)** **Regression Zero:** 9236

Polynomial Gage Factors: **A:** -2.323E-07 **B:** -0.1092 **C:** 1027.66

Thermal Factor (K): -0.0818 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.01635 **(psi/ digit)**

Polynomial Gage Factors: **A:** -3.36912E-08 **B:** -0.01583 **C:** 149.05

Thermal Factor (K): -0.01187 **(psi/ °C)**

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9195 Temp(T_0): 22.9 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

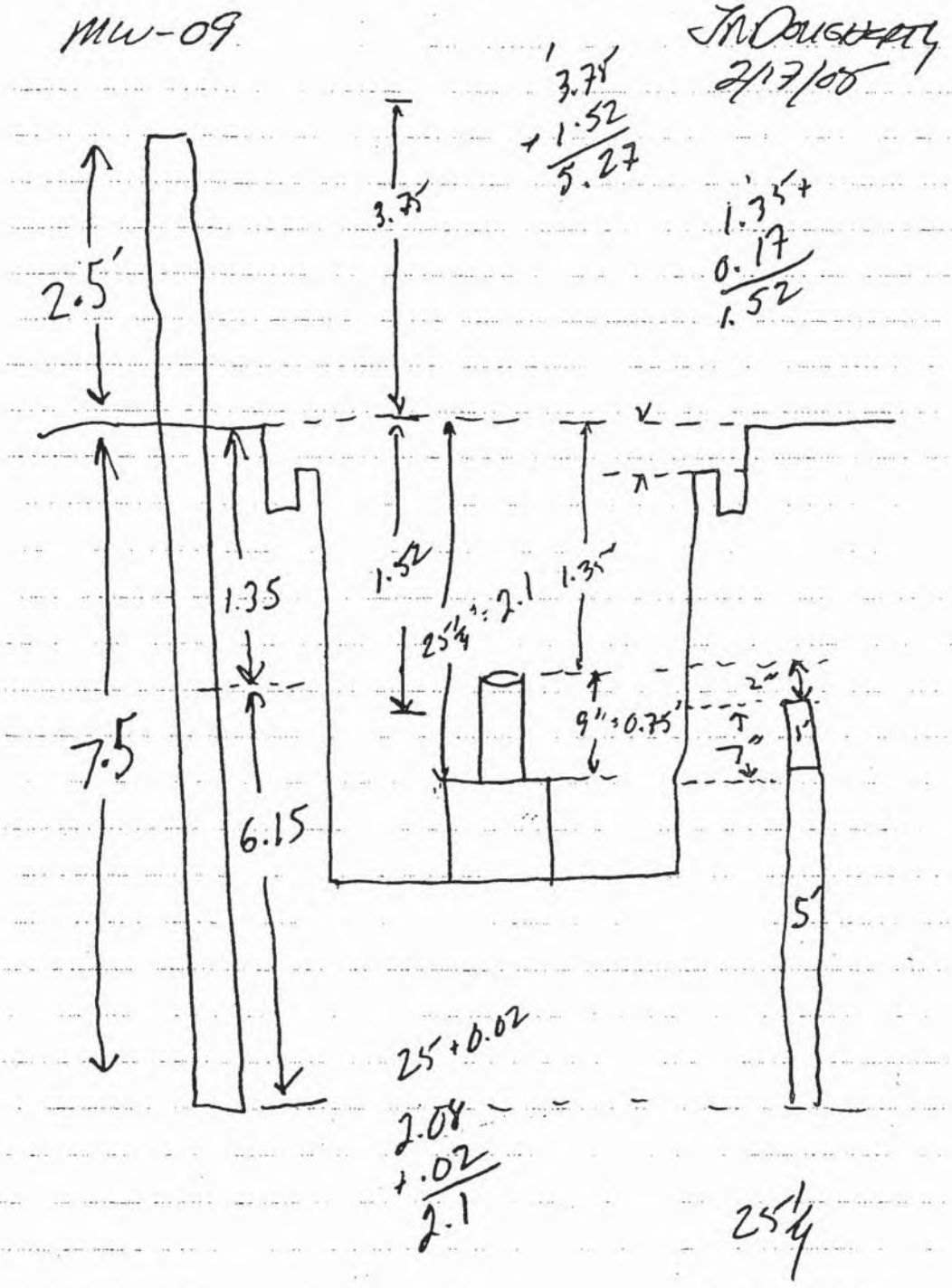
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302556

CDM

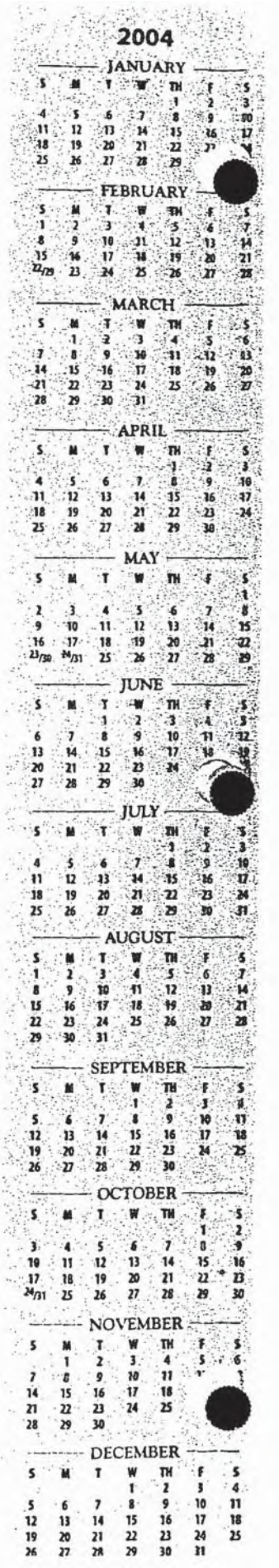
consulting · engineering · construction · operations



listen. think. deliver.

www.cdm.com

302557



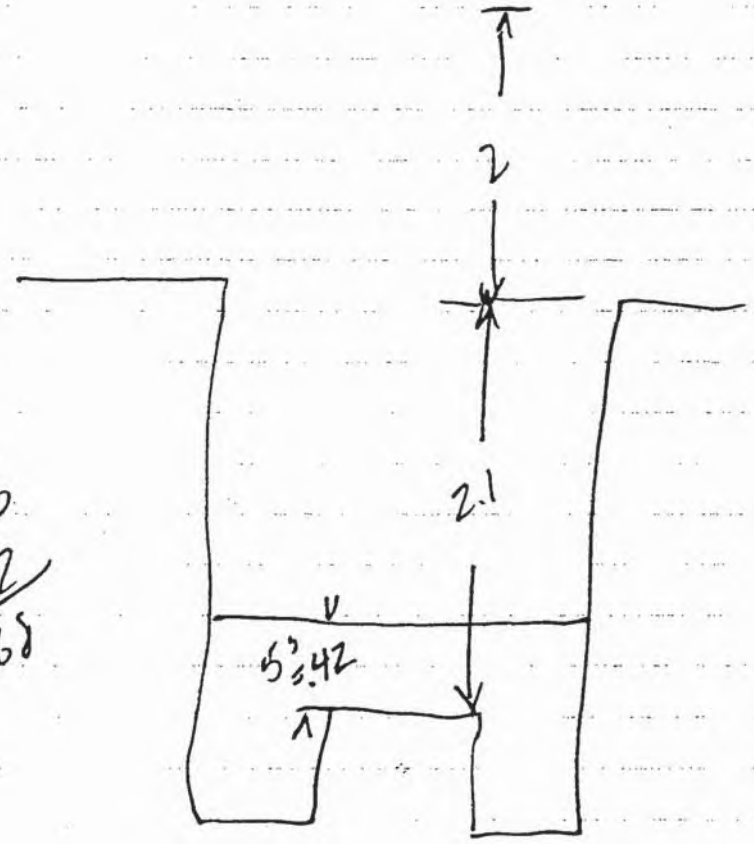
US 00019959

CDM

consulting · engineering · construction · operations

MW-09

J.N. Daugherty.



10'
2.10
-0.42
1.68

4.1

listen. think. deliver.

www.cdm.com

302558

2004

JANUARY

S	M	T	W	TH	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

FEBRUARY

S	M	T	W	TH	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22/29	23	24	25	26	27	28

MARCH

S	M	T	W	TH	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

APRIL

S	M	T	W	TH	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

MAY

S	M	T	W	TH	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23/30	24/31	25	26	27	28	29

JUNE

S	M	T	W	TH	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

JULY

S	M	T	W	TH	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

AUGUST

S	M	T	W	TH	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

SEPTEMBER

S	M	T	W	TH	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

OCTOBER

S	M	T	W	TH	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24/31	25	26	27	28	29	30

NOVEMBER

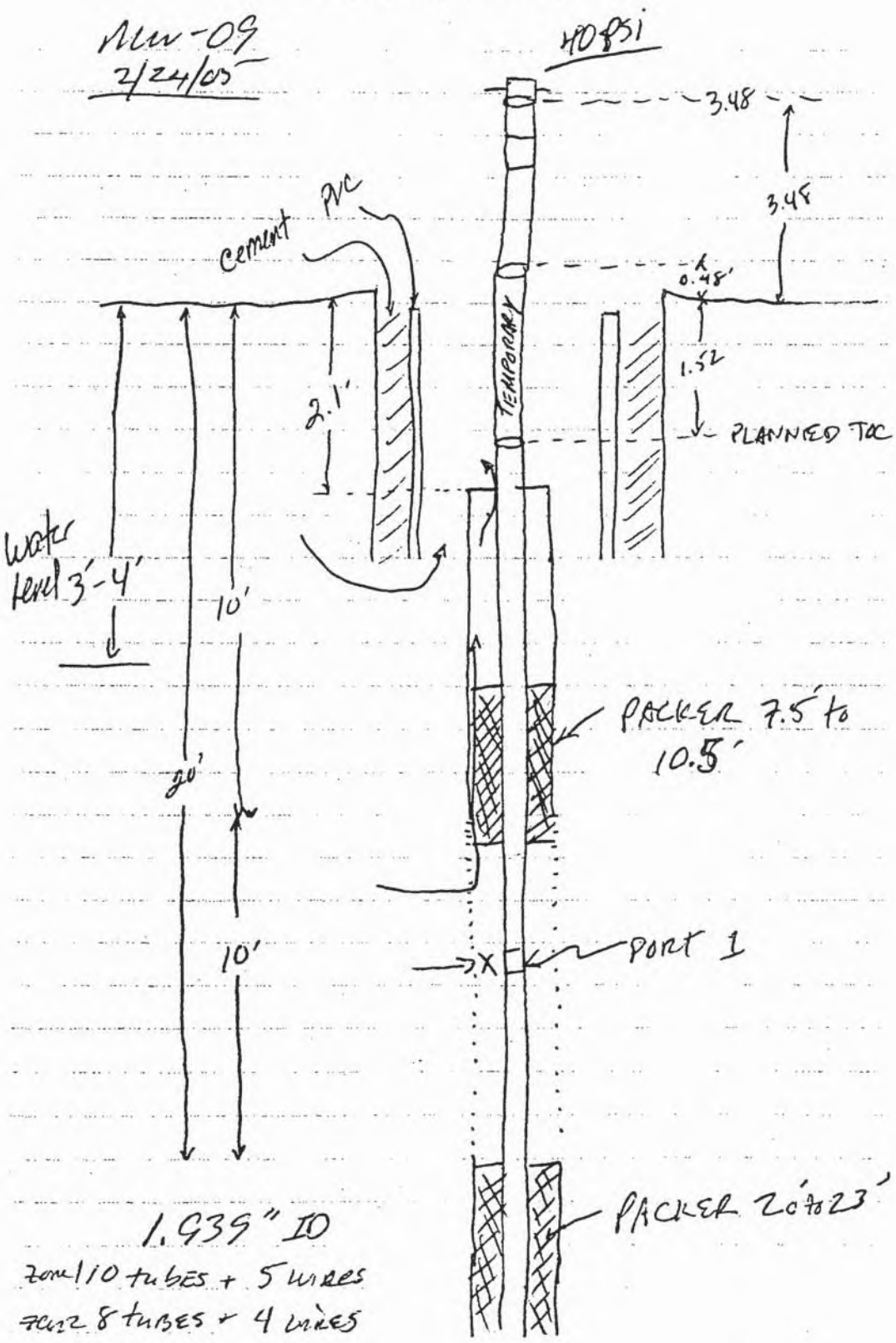
S	M	T	W	TH	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

DECEMBER

S	M	T	W	TH	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

CDM

consulting · engineering · construction · operations



listen. think. deliver.

www.cdm.com

302559

2004

JANUARY

S	M	T	W	TH	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29		

FEBRUARY

S	M	T	W	TH	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22/29	23	24	25	26	27	28

MARCH

S	M	T	W	TH	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

APRIL

S	M	T	W	TH	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

MAY

S	M	T	W	TH	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23/30	24/31	25	26	27	28	29

JUNE

S	M	T	W	TH	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

JULY

S	M	T	W	TH	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

AUGUST

S	M	T	W	TH	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

SEPTEMBER

S	M	T	W	TH	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

OCTOBER

S	M	T	W	TH	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24/31	25	26	27	28	29	30

NOVEMBER

S	M	T	W	TH	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18		
21	22	23	24	25		
28	29	30				

DECEMBER

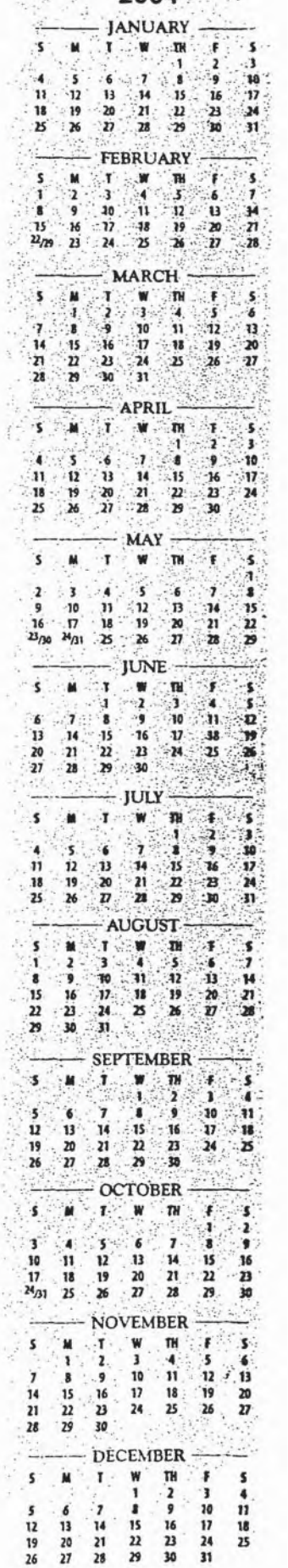
S	M	T	W	TH	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

CDM

consulting · engineering · construction · operations

Put wtr back on.
Fill up with water + repressurize

Where intervals btw screens grouted or filled w bentonite pellets?



listen. think. deliver.

www.cdm.com

302560

US 00019962

MPW-10

302561

CDM 125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-10 **Boring Location:** Roosevelt Ave. Dog Park
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York	**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147
Drilling Contractor: Uni-Tech Drilling Co. **Drilling Method:** Rotasonic **Sample Method:** Vibration Extraction **Date Started:** 12/20/2004 **Date Completed:** 02/11/2005 **Logged By:** Adrian Steinhauff (P.W.GROSSER, INC.)	**Northing:** 280640.585 **Easting:** 1240276.043 **Surface Elevation (ft. above msl):** 170.73 **Total Depth (ft bgs):** 250 **Initial Depth to Water (ft bgs):** **Field Screening Instrument:** PID

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
0	170	#1	0	0-6	2					GRAVEL AND SAND: Medium to coarse sand, 15-20% coarse gravel, 5-10% silt, 10yr (7/2), brownish yellow.	
5	165	#2	0	6-16	7					GRAVEL AND SAND: Medium to coarse sand, 15-20% coarse gravel, 5-10% silt, 10yr (7/2), brownish yellow.	
10	160										
15	155	#3	0	16-26	6					GRAVEL: Coarse gravel and fine gravel mix,10yr (7/2), light grayish.	
20	150									GRAVEL AND SAND: Coarse sand, 10% gravel, 10-15% silt, 10yr (6/3), pale brown.	
25	145	#4	0	26-36	7					GRAVEL AND SAND: Medium to coarse sand, 15-20% silt, 10% gravel, 10yr (5/6), yellowish brown.	
30	140									GRAVEL AND SAND: Medium sand, 5% gravel, 10yr (6/4), light yellowish brown.	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302562

US 00019964

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-10 **Boring Location:** Roosevelt Ave. Dog Park
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet' / Inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
35	135	#5	0	36-46	7					FINE SAND: Fine sand, 5-10% silt, 10yr (5/4), very pale brown.	
40	130									CLAY AND SAND: Fine sand and clay mix, 10yr (4/3), brown.	
45	125	#6	0	46-56	7					CLAY AND SAND: Fine sand and clay mix, 10yr (4/3), brown.	
50	120										
55	115	#7	0	56066	9					SAND AND SILT: Very fine sand, 20-25% silt, 5% fine gravel, 10yr (7/3), very pale brown.	
60	110										
65	105	#8	0	66-76	8					SAND: Medium and fine sand, 10% silt, trace gravel, 10yr (6/4), light yellowish brown.	
70	100									GRAVEL AND SAND: Coarse sand, 20-25% clay, 5% gravel, 10yr (4/6), dark yellowish brown.	
										FINE SAND: Very fine sand, 15-	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302563

US 00019965

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-10 **Boring Location:** Roosevelt Ave. Dog Park
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
75	95									20% silt, trace gravel, 10yr (7/3), very pale brown.	
		#9	0	76-86	10					SAND: Medium sand, 10-15% silt, trace gravel, 10yr (6/2), light brownish gray.	
80	90										
										GRAVEL AND SAND: Medium and coarse sand, 5-10% gravel, 5-10% silt, 10yr (5/6), yellowish brown.	
85	85	#10	0	86-96	7					SAND: Medium sand, 5% silt, 10yr (6/3), pale brown.	
90	80										
										FINE SAND: Fine sand, 10-15% silt, trace gravel, 10yr (7/3), very pale brown.	
95	75	#11	0	96-106	6						
100	70										
										GRAVEL AND SAND: Very fine sand, 20% silt, 5-10% gravel, 10yr (6/4), light yellowish brown.	
105	65	#12	0	106-116	8					GRAVEL AND SAND: Medium and coarse sand, 10-15% gravel, 10-15% silt, 10yr (5/6), yellowish brown.	
110	60									CLAY AND SAND: Fine sand and clay mix, 5% gravel, 10yr (6/1), gray.	
115										CLAY AND SAND: Fine sand, 20-	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

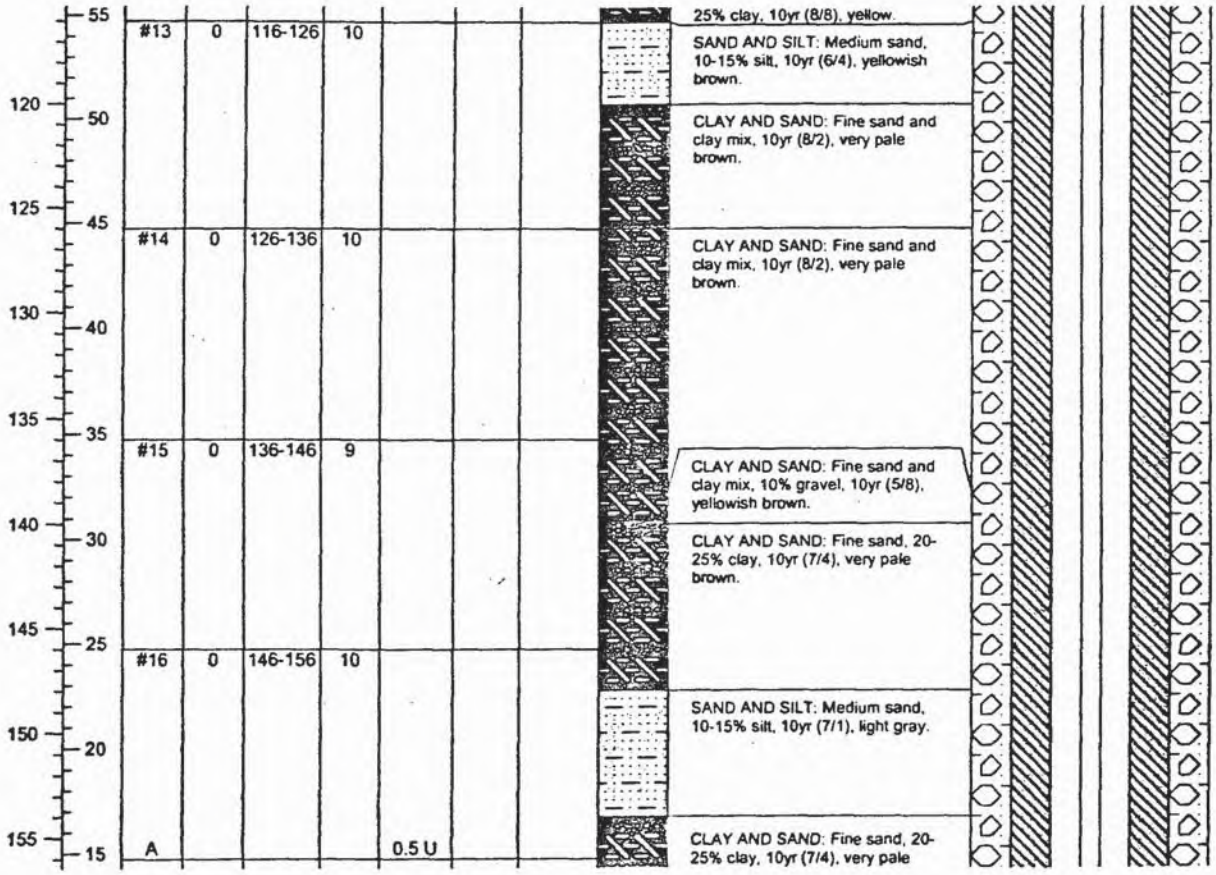
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302564

US 00019966

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-10 **Boring Location:** Roosevelt Ave. Dog Park
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

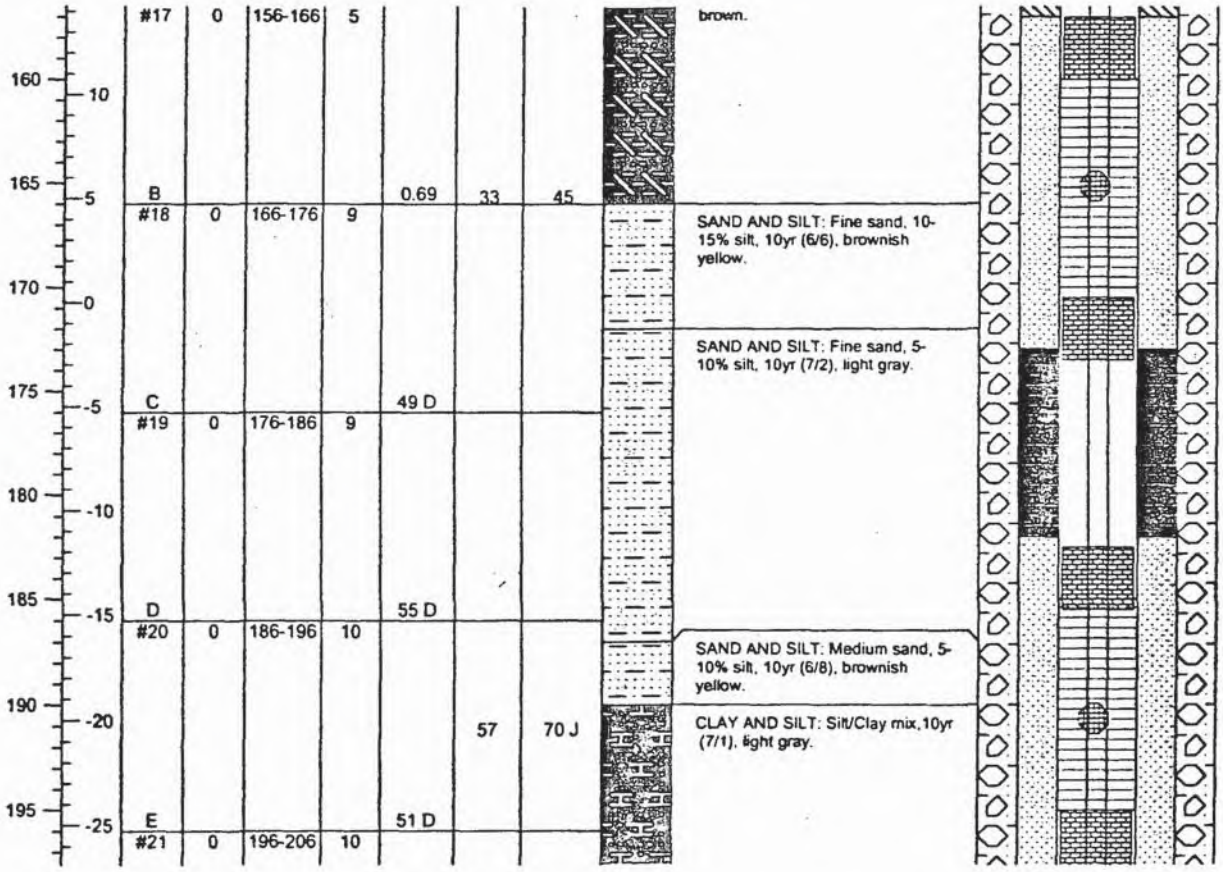
- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302565

US 00019967

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-10 **Boring Location:** Roosevelt Ave. Dog Park
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147



Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302566

US 00019968

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-10 **Boring Location:** Roosevelt Ave. Dog Park
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L) Screening	March 2005	May 2005	Graphic Log	Material Description	Well Construction
200	-30									SAND AND SILT: Fine sand, 15-20% silt, 10yr (8/1), white.	
205	-35	F				62 D					
		#22	0	206-216	10						
210	-40									SILT: Silt with 25-30% fine sand.	
215	-45	G				62 D					
		#23	0	216-226	8					FINE SAND: Fine sand, 15% silt, 10yr (7/2), light gray.	
220	-50									CLAY AND SILT: Silt/Clay, 20-25% fine sand, 10yr (6/1), gray.	
							62	76		FINE SAND: Fine sand, 25-30% silt, 10yr (7/3), very pale brown.	
225	-55	H				97 D				FINE SAND: Medium fine sand, 10-15% silt, 10yr (8/2), very pale brown.	
		#24	0	226-236	10						
230	-60										
235	-65	I				56 U				CLAY AND SAND: Fine sand/Clay mix, 10yr (7/3), very pale brown.	
		#25	0	236-246	10					SAND AND SILT: Medium sand, 10-15% silt, 10yr (6/2), light brownish gray.	

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302567

US 00019969

CDM	125 Maiden Lane, 5th Floor New York, NY 10038	**Boring Name:** MPW-10 **Boring Location:** Roosevelt Ave. Dog Park
Client: U.S. Environmental Protection Agency **Site Location:** Port Jefferson Station, New York		**Project Name:** Lawrence Aviation RI/FS **Project Number:** 3223-147

Depth (ft bgs)	Elevation (ft. msl)	Sample Number	PID Reading (ppm)	Sample Interval (ft bgs)	Recovery (feet / inches")	TCE Groundwater Sampling Results (ug/L)			Graphic Log	Material Description	Well Construction
						Screening	March 2005	May 2005			
240	-70						2	3		CLAY AND SAND: Fine sand, 25-30% clay, 10yr (6/4), light yellowish brown.	
245	-75	J				15					
250											

Note:
ft = feet, est. = estimated
bgs = below ground surface
msl = mean sea level
ug/L = microgram per liter

Horizontal Datum: NAD83
Horizontal Coordinate System: New York State Plane
Vertical Datum: NGVD 88
Units: feet bgs
ppm = parts per million

Well Construction Materials Symbol Key

- Waterloo Sampling Port
- Waterloo Packer (not to scale)
- Bentonite Seal
- Concrete
- Cement/Bentonite Grout
- 4-inch Stainless Steel Well Casing
- Sand Pack
- Natural Material
- 4-inch Stainless Steel Screen, No. 10 slot

Note: Groundwater screening was conducted as the borehole for the well was advanced.
In March and May 2005 groundwater samples were collected from the completed multiport wells.

302568

Time Onsite 0712 to 1720 = 10 hr.

Waterloo System Installation Log

Client: USEPA | Borehole Ø & Depth: 4" ø 249.55 | Date: 2/11/05
Site: LAI | Casing Depth: n/a | Sheet No.: 1 of 1
Borehole No.: MW-10 | Depth to Water: 14.51 CO825 | Approved: JWD (MB)

Unit FEET.	In	Depth to Top	Notes
			0800 Start at MW-10.
			0815 SOAK XDs
0.1	✓	248	BASE PLUG
3	✓	245	PACKER (4B)
5	✓		5' PVC Casing
1	✓		1' PVC Casing
0930 0.5	✓	238.5	PORT (VWP, BP) 4
2	✓		2' PVC Casing
1	✓		1' PVC Casing
3	✓	232.5	PACKER (4A)
2	✓		2' PVC Casing
2	✓		2' PVC Casing
3	✓	225.5	PACKER (3B)
2	✓		2' PVC Casing
1	✓		1' PVC Casing
0.5	✓	222	PORT (VWP, BP) 3
5	✓		5' PVC Casing
3	✓	214	PACKER (3A)
10	✓		10' PVC Casing
5	✓		5' ↓
1	✓		1' ↓
3	✓	195	PACKER (2AB)
2	✓		2' PVC Casing
2	✓		2' PVC Casing
1025 0.5	✓	190.5	PORT (VWP, BP) 2
5	✓		5' PVC Casing
3	✓	182.5	PACKER (2A)
5	✓		5' PVC Casing
2	✓		2' PVC
2	✓		2' PVC ↓
3	✓	170.5	PACKER (1B)
5	✓		5' PVC Casing
1100 0.5	✓	165	PORT (VWP, BP) 1
5	✓		5' PVC Casing
3	✓	157	PACKER (1A)
1130 10x1645	✓	DD	10' PVC Casing x HD
5.35	✓	0.73	above 4" S.S. Casing
4.91	✓	1.64	

Zone	Pull (Tightness)	Final position
1	✓	Gray Casing
2	✓	is 1.64' bgs
3	✓	TARGET WAS 1.65'
4	✓	OK per design

WITHIN CALIBRATION RANGE

Equipment Required

Unit	#	Unit	#
10 ft Casing	17	PVC Port (Single)	0
5 ft Casing	7	PVC Port (Double)	0
2 ft Casing	8	SS Port (Single)	0
1 ft Casing	4	SS Port (Double)	4
Base Plug	1	Double Valve Pump	0
Dow Packer	8	Bladder Pump	4
Bentonite Packer	0	VW Piezometer	4
Hydraulic Packer	0	Well Head Manifold	1
275' S.S. WIRE			
TUBING 2x1000'			
920' VWP Cable.			

04 — Reading Before Installation @ 0900

Zone	Piezo Serial #	Reading	Temp (C)
✓ 1	14619	9358.4	2.2
✓ 2	14618	9342 1.6	1.81
✓ 3	14792	9276.6	1.4
✓ 4	14791	9072	1.8
8	BLADDER	PUMP SHAKE	✓
8	BLADDER	PUMP SHAKE	✓
7	BLADDER	Pump SHAKE	✓
18	↓	↓	✓

190 and 250 265

04 Reading After Installation

Zone	Piezo Serial #	Reading	Temp (C)
1	14619	8805.2	11.0
2	14618	7984.4	11.3
3	14792	6879.5	11.3
4	14791	6268.7	11.3
1 8	HEAD = 23.19	DTW = 141.51	
2 8	48.74	141.76	
37	80.18	141.82	
4 8	96.60	141.90	

Borehole Water Level (after installation): n/a

* DTW IS UNCORRECTED

Comments

ZONE	OFFSET	TOP OF PORT TO INLET	BOTTOM OF XD TO SENSOR
4	0.45	0.17	27.4 min
3	0.45	0.17	↓
2	0.45	0.17	
1	0.45	0.17	

1330 All done & OFF LOCATION

at Zone 3 switch to Gardner Denver 1/4" Nylon Cable Ties (46-310)

06/00

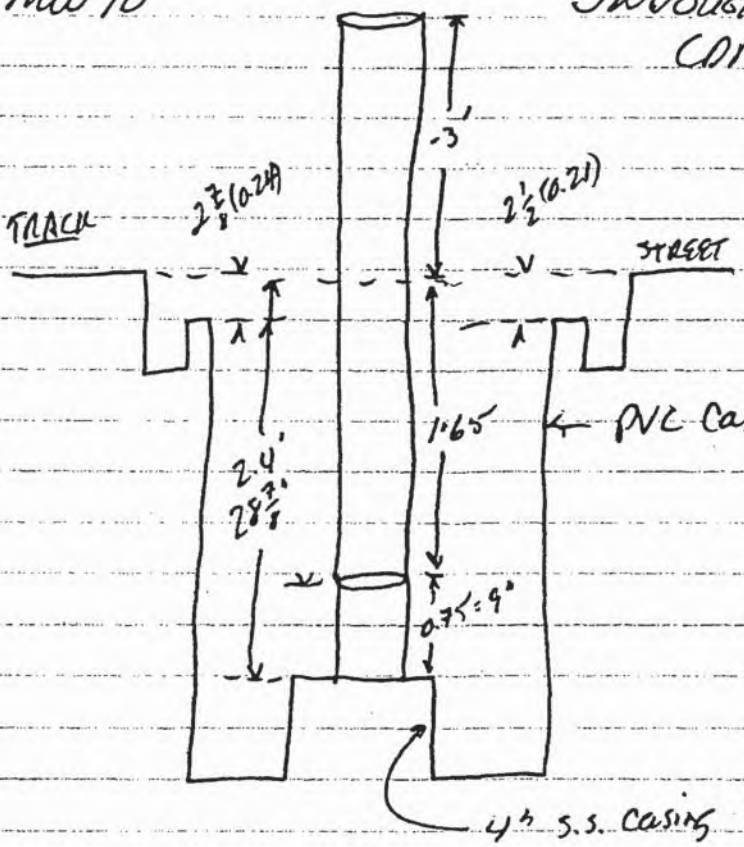
302569

US 00019971

CDM

consulting · engineering · construction · operations

2/11/05 MW-10 JA Doughtery CDM



~~Cut off Calculation~~

~~28 3/8 = 29"~~

~~om.~~

~~29" - 9" = 20"~~

~~36" + 20" = 56" Cut off~~

~~= 4.67'~~

Cut OFF

2.4 - 0.75 = 1.65'

4.65

Cable

2 3/4" = 0.23

1.65 - 0.23 = 1.42

= 1'5"

= 17"

~~Cable length~~

~~29" - 9" - 2 3/4"~~

~~20" - 2 3/4" = 17 1/4"~~

~~= 1.44~~

10.00

- 4.65

5.35

Check w Randy Blackburn

listen. think. deliver.

www.cdm.com

302570

2004

JANUARY

S	M	T	W	TH	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	
25	26	27	28	29		

FEBRUARY

S	M	T	W	TH	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22/29	23	24	25	26	27	28

MARCH

S	M	T	W	TH	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

APRIL

S	M	T	W	TH	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

MAY

S	M	T	W	TH	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23/30	24/31	25	26	27	28	29

JUNE

S	M	T	W	TH	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24		
27	28	29	30			

JULY

S	M	T	W	TH	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

AUGUST

S	M	T	W	TH	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

SEPTEMBER

S	M	T	W	TH	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

OCTOBER

S	M	T	W	TH	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24/31	25	26	27	28	29	30

NOVEMBER

S	M	T	W	TH	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	
14	15	16	17	18		
21	22	23	24	25		
28	29	30				

DECEMBER

S	M	T	W	TH	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

NOTES BY JN DOUGHERTY 2/11/05

Client: CDM -				Well No:	MPW-10	Prepared By:	RB
Install Order:	10			SWL:	155FT		6-Dec (2004)
Zones				4	3	2	1
Drillhole Depth			250				
Base Plug at:	SS Plug		248				
(SS Plug or PVC Plug)							
Depth to Top of	Dual	Ports		238.5	222	190.5	165
(Single or Dual)							
Depth to Top of	3.83	Packers					
(3.83 or 3.56 or 2.86)							
Desired Stick-up			-3				

Interval Diff. (feet)	Depth to Top (feet)	Unit Length (feet)	Qnty.	Description of Component	Zone No.	(feet)	Monitoring Equipment: Double Valve Pump OR Bladder Pump Description
	250			Depth to Btm.			
0.1	248.0	0.1	X	Base Plug			Manifold Type
	245.0	3.0	X	Packer			
							Stnd Wt Hd O Tube
			X 1	5' PVC Casing			1 Multipurge
							Pressure Sealed
			X 1	1' PVC Casing			
6.4	238.5	0.5	X	Port	4	265	VWP Transducer Bladder Pump
							04-14791
			X 1	2' PVC Casing			
			X 1	1' PVC Casing			
3.0	232.5	3.0	X	Packer			
			X X 2	2' PVC Casing			
4.0	225.5	3.0	X	Packer			
			X 1	2' PVC Casing			
			X 1	1' PVC Casing			
3.0	222.0	0.5	X	Port	3	250	VWP Transducer Bladder Pump
							04-14792
			X 1	5' PVC Casing			
			X	Packer			
5.0	214.0	3.0	X 1	10' PVC Casing			
			X 1	5' PVC Casing			
			X 1	1' PVC Casing			
16.0	195.0	3.0	X	Packer			
			X X 2	2' PVC Casing			
4.0	190.5	0.5	X	Port	2	215	VWP Transducer Bladder Pump
			X 1	5' PVC Casing			04-14618
5.0	182.5	3.0	X	Packer			
			X 1	5' PVC Casing			
			X X 2	2' PVC Casing			
9.0	170.5	3.0	X	Packer			
			X 1	5' PVC Casing			
5.0	165.0	0.5	X	Port	1	190	VWP Transducer Bladder Pump
			X 1	5' PVC Casing			04-14619
5.0	157.0	3.0	X	Packer			
			16	10' PVC Casing			
160.0	-3.0						

TOTALS					
	* 17	10' PVC Casing	* 920	1/4" X 0.17" Red LDPE Tubing	
	* 7	5' PVC Casing	° 920	1/4" X 0.17" Sample LDPE Tubing	
	* 8	2' PVC casing	* 920	VWP Transducer Cable	
	* 4	1' PVC casing	* 4	Dual 3/8" Stem Port Assembly	
	* 1	SS Plug	* 4	Bladder Pump	
	↘ 275	3/16" dia SS Support Cable	* 8	3.83 Packers	
			* 4	VWP Transducer	

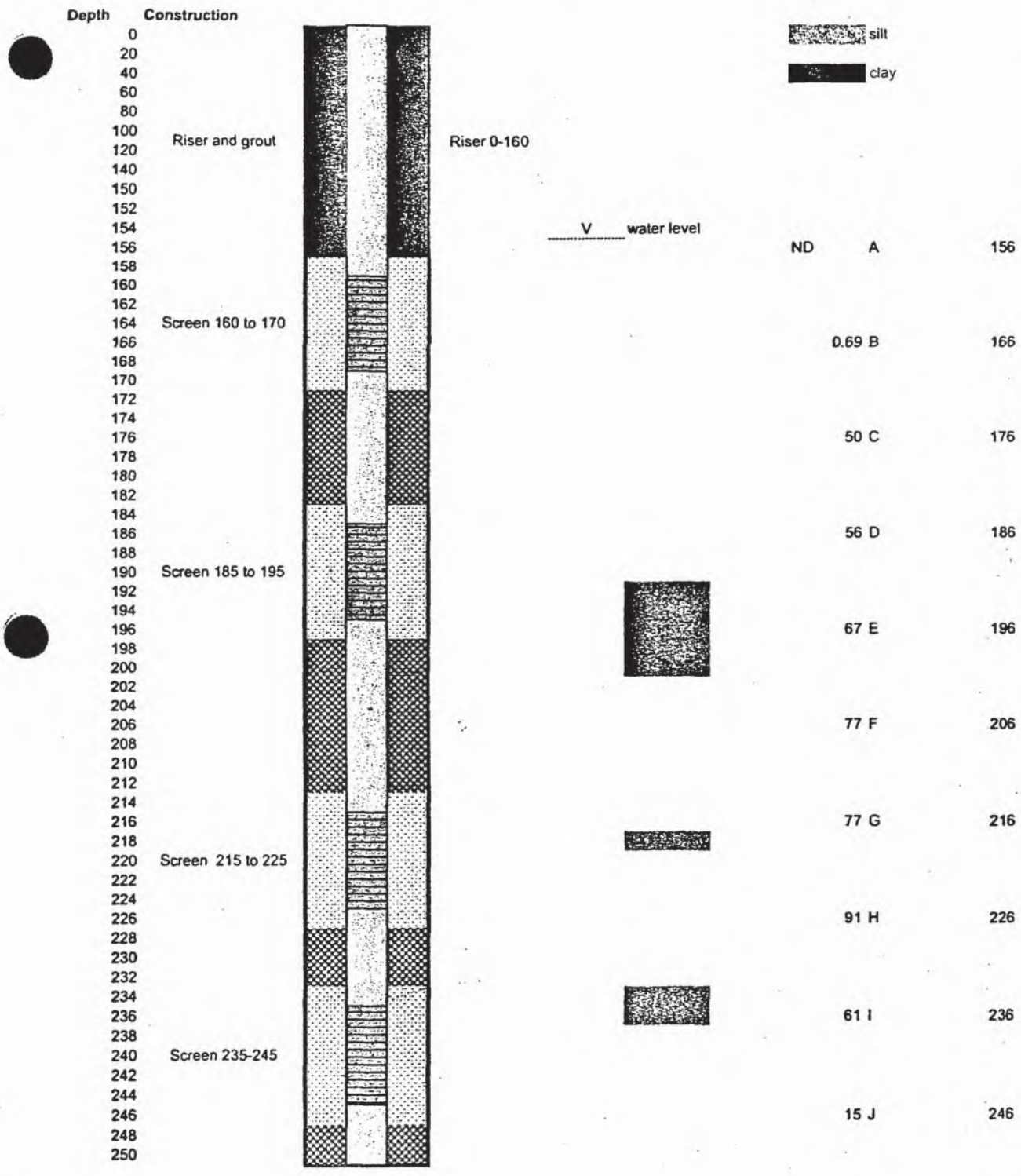
1/4/05 15:18
Macintosh HD:Desktop Folder:[401 CDM Dec6]Sum TLS

* MANIFOLD

Depths & port locations checked + compare to well construction.
DL.

302571

MPW-10



302572

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA MW-10 Zone 1

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14619

Temperature: 22.5 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.6 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Elice

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9370	9370	9370	0.092	0.03	-0.016	0.00
70.0	8811	8811	8811	70.04	0.01	70.06	0.02
140.0	8253	8253	8253	139.9	-0.04	139.9	-0.02
210.0	7693	7694	7694	209.9	-0.04	210.0	0.01
280.0	7132	7133	7133	280.1	0.02	280.1	0.04
350.0	6573	6573	6573	350.1	0.02	350.0	-0.01

(kPa) Linear Gage Factor (G): 0.1251 (kPa/ digit) **Regression Zero: 9371**

Polynomial Gage Factors: A: -1.035E-07 B: -0.1235 C: 1166.05

Thermal Factor (K): -0.0498 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.01815 (psi/ digit)

Polynomial Gage Factors: A: -1.50178E-08 B: -0.01791 C: 169.12

Thermal Factor (K): -0.00723 (psi/ °C)

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9334 Temp(T_0): 22.4 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302573

US 00019975

2/11/05 S/N 04-14619

Initial DTW & Function Check.

initial reading: 6358.4

reading at depth: 8805.2

553.2 Okgits

PSI: 553.2 × 0.01815 = 10.04 psi

Ft. H2O: 10.04 psi × 2.31 ft/psi = 23.19' = head.

DTW = installed depth − head

= 165 − 23.19 = 141.81'

302574

US 00019976

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

MW-10 - Zone 2

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14618

Temperature: 22.5 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.6 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: Elice

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9345	9346	9346	0.071	0.02	0.081	0.02
70.0	8694	8693	8694	69.96	-0.01	69.92	-0.02
140.0	8041	8041	8041	139.9	-0.03	139.9	-0.02
210.0	7387	7387	7387	210.0	0.01	210.1	0.02
280.0	6734	6734	6734	280.0	0.01	280.0	0.01
350.0	6081	6081	6081	350.0	0.01	350.0	-0.01

(kPa) Linear Gage Factor (G): 0.1072 **(kPa/ digit)** **Regression Zero:** 9346

Polynomial Gage Factors: **A:** -3.142E-08 **B:** -0.1067 **C:** 1000.06

Thermal Factor (K): -0.1236 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.01555 **(psi/ digit)**

Polynomial Gage Factors: **A:** -4.55777E-09 **B:** -0.01548 **C:** 145.05

Thermal Factor (K): -0.01793 **(psi/ °C)**

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9304 Temp(T_0): 22.6 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302575

US 00019977

02/11/05 S/N # 04-1461B

Initial Depth To Water & Function Test

Initial Reading: 9341.6

Reading at Depth: 7984.4

1357.2 digits

PSI : 1357.2 × 0.01555 = 21.10 psi

Ft. H_2O: 21.10 psi × 2.31 ft/psi = 48.74' = head

DTW : Installed depth - head

190.5' - 48.74' = 141.76'

302576

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

MW-10 Zone 3

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14792

Temperature: 22.8 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.5 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: EBeza

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9284	9284	9284	-0.135	-0.04	-0.011	0.00
70.0	8581	8581	8581	70.04	0.01	70.01	0.00
140.0	7880	7878	7879	140.1	0.03	139.9	-0.02
210.0	7177	7179	7178	210.1	0.02	210.1	0.02
280.0	6477	6478	6478	280.0	0.00	280.0	0.01
350.0	5777	5778	5778	349.9	-0.03	350.1	0.02

(kPa) Linear Gage Factor (G): 0.0998 **(kPa/ digit)** **Regression Zero:** 9283

Polynomial Gage Factors: **A:** 7.612E-08 **B:** -0.1010 **C:** 930.8

Thermal Factor (K): -0.0948 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.01448 **(psi/ digit)**

Polynomial Gage Factors: **A:** 1.10403E-08 **B:** -0.01464 **C:** 135.00

Thermal Factor (K): -0.01374 **(psi/ °C)**

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9240 Temp(T_0): 22.4 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

US 00019979

2/4/05 - s/n ~~0447~~ 04-14792 Zone 3 @ MW-10

MW Function Check

	3/16
Initial reading	9276.6
Reading at depth	6879.5
	2397.1

PSI = 2397.1 visits × 0.01448 $\frac{psi}{visit}$

= 34.71 psi

Ft. H_2O = 34.71 psi × 2.31 $\frac{ft.}{psi}$

= 80.18 ft. Head.

DTW = installed depth − head

= 222 − 80.18

= 141.82

302578

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

MW-10 Zone 4

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: December 13, 2004

Serial Number: 04-14791

Temperature: 22.8 °C

Pressure Range: 350 kPa

†Barometric Pressure: 976.5 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: EBiza

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9076	9076	9076	-0.103	-0.03	-0.139	-0.04
70.0	8393	8393	8393	70.17	0.05	70.18	0.05
140.0	7713	7713	7713	140.1	0.04	140.2	0.05
210.0	7036	7037	7037	209.8	-0.07	209.8	-0.05
280.0	6356	6354	6355	279.9	-0.04	279.8	-0.06
350.0	5672	5672	5672	350.2	0.04	350.1	0.03

(kPa) Linear Gage Factor (G): 0.1029 **(kPa/ digit)** **Regression Zero:** 9075

Polynomial Gage Factors: **A:** -2.376E-08 **B:** -0.1025 **C:** 932.5

Thermal Factor (K): -0.1299 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.01492 **(psi/ digit)**

Polynomial Gage Factors: **A:** -3.44653E-09 **B:** -0.01487 **C:** 135.25

Thermal Factor (K): -0.01883 **(psi/ °C)**

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9033 Temp(T_0): 22.6 °C †Baro(S_0): 1009.0 mbar Date: December 30, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc.

302579

US 00019981

02/11/05 S/N# 04 - 14791

Initial Depth to Water & Function Test

Initial Reading : 9072.0

Reading at Depth : 6268.7

2803.3 digits

PSI : 2803.3 digits x 0.01492 psi/digits = 41.82 psi

41.82 psi x 2.31 ft/psi = 96.60 = head

DTW = Installed Depth - head

238.5' - 96.60' = 141.9'

302580

Project: **Former Lawrence Aviation - NYSDEC #152016**	HRP Associates, Inc.	Test Boring/Monitor Well ID: **SB-302/HRP-IW-01**	
Location: **100 Sheep Pasture Rd, Port Jefferson, NY**	**DRILLING / SOIL LOG**		
HRP#: **DEC1027.OM Task 6**		Sheet No. 1 of 1	
	Rig Type: **CRS XL 140 Duo**		
Date**: 5/9/2024 - 5/10/2024**	**Hammer (weight [lb] / fall [inches])**	Driller: **Coastal Environmental Solutions - Dylan/Patrick**	
HRP Rep.: **Spencer Walker & Sutherland Lamond**		*Casing* / *Sampler* / *Core Barrel*	
Ground Elevation:	**PROPORTIONS**	Type: Steel	
Total Boring Depth: 220'	trace: 0 to 10% / some: 20 to 35%	O.D. (inch): 3.75" / 2.75"	
Depth to Bedrock: NA	little: 10 to 20% / and: 35 to 50%	I.D. (inch): 4.25" / 2.25"	

Sampler Depth interval (ft)		Sampler Blows per 6"	Recov. (ft)	Moisture	Soil Type (USCS)	Contact Interval (ft)	Soil Description (proportions, grain size, etc.)	PID (ppm)		Soil Sample Details	
from	to							Depth	Reading	Interval	Time
0	10	NA	0	NA	NA	0.0-10.0	No Sample	0.0-10.0	NA		
10	20	NA	5	Dry	SP	10.0-18.0	Brown medium SAND, trace fine sand, few fine to coarse gravel, trace coarse cobbles.	10.0-20.0	0.0	14-15	8:30
						18.0-20.0	Brown medium SAND, trace fine sand, few fine to coarse gravel.				
20	30	NA	8	Dry	SP	20.0-36.0	Brown medium SAND, few fine sand, trace fine to coarse, well graded, sub-angular gravel.	20.0-30.0	0.0	25-26	8:55
30	40	NA	8	Dry	SP			30.0-40.0	0.0	36-37	9:05
						36.0-40.0	Brown medium SAND, trace fine sand, trace silt, pulverized stone at 38 - 39 fbg.				
40	50	NA	8	Dry	SP	40.0-45.0	Brown medium SAND, trace fine sand, few fine to medium well graded, sub-angular, gravel.	40.0-50.0	0.0	49-50	9:30
						45.0-45.5	Pulverized stone, white.				
						45.5-50.0	Brown medium SAND, trace fine sand, trace silt, trace fine gravel. Silt lense at 49 fbg, dark brown.				
50	60	NA	10	Dry	SP	50.0-55.0	Brown medium SAND, little coarse sand, few fine to medium sub-angular gravel.	50.0-60.0	0.0	55-56	9:55
						55.0-57.0	Brown medium SAND, trace silt, dark brown, trace fine to medium sub-angular gravel.				
						57.0-60.0	Brown medium SAND, trace fine sand, trace fine to medium gravel, trace cobbles.				
60	70	NA	2	Dry	SP	60.0-65.0	Tan to brown medium SAND, trace fine sand, trace fine to medium gravel. Trace cobbles.	60.0-70.0	0.0	64-66	10:10
						65.0-70.0	Fine SAND, some fine gravel, trace medium to coarse gravel, whiteish/tan.				
70	80	NA	4	Moist	SP	70.0-77.0	Tan fine to coarse SAND, trace fine gravel, trace cobbles.	70.0-80.0	0.0	73-74	10:25
				Dry		77.0-80.0	Tan brown fine to medium SAND, trace fine to coarse well graded, sub-angular, gravel.				
80	90	NA	4	Moist	SP	80.0-85.0	Tan fine to coarse SAND, trace fine to medium gravel.	80.0-90.0	0.0	87-88	10:45
						85.0-89.0	Light tan to white fine SAND, pulverized rock, trace fine gravel.				
						89.0-90.0	Tan fine SAND, trace silt, trace fine to medium gravel.				
90	100	NA	5	Dry	SP	90.0-100.0	Brown medium to fine SAND, trace silt, trace fine to coarse, well graded, sub-angular, gravel. Pulverized stone at 98 fbg.	90.0-100	0.0	95-96	11:15
100	110	NA	5	Moist	SP	100.0-108.0	Brown fine SAND, trace silt, trace fine to medium sub-rounded gravel.	100-110	0.0	108-109	12:40
						108.0-110.0	Brown fine SAND, trace silt, trace fine to medium sub-rounded gravel. Red coloration at 109 fbg and pulverized stone at 110 fbg.				
110	120	NA	3	Moist	SP	110.0-115.0	Brown medium to coarse SAND, trace fine to medium sub-rounded gravel.	110-120	0.0	117-118	13:15
						115.0-118.0	Grayish brown medium to coarse SAND, some fine sand, trace fine to medium gravel, trace cobbles.				
						118.0-120.0	Brown fine to medium SAND, trace silts, trace fine gravel, with large stone at 120 fbg.				
120	130	NA	4.5	Dry	SP	120.0-124.0	Brown medium to coarse SAND, trace fine to medium sub-rounded gravel. Trace cobbles with silt & clay lense at 124 fbg.	120-130	0.0	125-126	13:40
						124.0-129.0	Light tan fine to medium SAND, some medium to coarse sub-rounded gravel.				
						129.0-130.0	Light tan fine to medium SAND, some medium to coarse sub-rounded gravel, trace silt/clay, brown and red.				
130	140	NA	3.75	Dry	SP	130.0-134.0	Grayish brown medium to coarse SAND, few fine to coarse sub-rounded well graded gravel.	130-140	0.0	134-135	14:10
				Slightly Moist		134.0-135.0	Tannish brown fine to medium SAND, trace silt.				
				Dry		135.0-136.0	Light tan fine to medium SAND, some medium to coarse sub-rounded gravel.				
						136.0-140.0	Tan fine to medium SAND, some medium to coarse sub-rounded gravel, trace silt.				
140	150	NA	2.5	Dry	SP	140.0-150.0	Grayish brown medium SAND, trace medium sub-angular gravel.	140-150	0.0	145-146	

Returned to finish boring on 9/30/2024 with MRS XL 275 sonic rig (6 inch sonic casing)											
150	160	NA	3.0	Slightly moist Moist	SP	150.0-153.0 153.0-160.0	Grayish brown coarse SAND, some fine to medium sand, trace coarse sub-angular gravel, trace cobbles Grayish medium SAND, trace medium to coarse sub-rounded gravel	150-160	0.0	159-160	15:30
160	170	NA	4.0	Dry	SP	160.0-163.0 163.0-170.0	Tannish brown medium SAND, some coarse sand, some fine to medium subangular pebbles Grayish brown coarse SAND, trace fine to medium sub-rounded gravel	160-170	0.0	164-165 (DUP-05)	10:00
170	180	NA	6.0	Slightly Moist Dry	SP	170.0-172.0 172.0-173.0 173.0-180.0	Graysh brown coarse SAND, some medium to coarse gravels, trace cobbles Grayish brown medium to coarse SAND with dark discoloration/staining, trace medium sub angular gravel Light tan/brown medium to coarse SAND and medium to coarse sub-angular gravel, trace fine to medium pebbles	170-172 172-173 173-180	0.0 5.3 0.0	172-173	10:15
180	190	NA	4.0	Slightly Moist	SP	180.0-183.0 183.0-190.0	Grayish brown medium SAND, some coarse sand, trace fine subrounded gravel Brown medium to fine SAND, trace fine sub-rounded gravel	180-185 185-186 186-190	0.3 3.7 0.0	185-186	11:25
190	200	NA	4.5	Slightly Moist	SP	190.0-200.0	Brown medium to fine SAND, trace fine sub-rounded gravel	190-200	0.0	197-198	11:30
200	210	NA	6.5	Wet Moist	SP	200.0-203.0 203.0-210.0	Brown fine SAND, trace silt Brown fine SAND	200-210	0.0	204-205	14:25
210	220	NA	6.5	Moist Wet	SP	210.0-217.0 217.0-220.0	Brown fine SAND Brown fine SAND, little medium sand, trace silt	210-220	0.0	215-216 (MS/MSD)	14:30
End of Boring @ 220'; boring overdrilled with 10-inch sonic casing to install HRP-IW-01 (details below)											
							Analysis: 14-15: VOCs, SVOCs, TAL metals, PCBS, PFAS, 1,4-Dioxane 20-30: VOCs 36-37: VOCs 49-50: VOCs 55-56: VOCs 64-66: VOCs 73-74: VOCs, SVOCs, TAL metals, PCBS, PFAS, 1,4-Dioxane 87-88: VOCs 95-96: VOCs 108-109: VOCs, SVOCs, TAL metals, PCBS, PFAS, 1,4-Dioxane 117-118: VOCs, PFAS, 1,4-Dioxane 125-126: VOCs 134-135: VOCs 145-146: VOCs, SVOCs, TAL metals, PCBS, PFAS, 1,4-Dioxane 159-160: VOCs 164-165: VOCs (DUP-05) 172-173: VOCs, SVOCs, TAL metals, PCBS 185-186: VOCs 197-198: VOCs 204-205: VOCs, PFAS, 1-4 Dioxane 215-216: VOCs, SVOCs, TAL metals, PCBS (MS/MSD)				

Monitoring Well Details

from	to	Borehole Diam. (in.)	Casing Diam. (in.)	Casing Material	Riser Diam. (in.)	Riser Material	Screen Diam. (in.)	Screen Material	Screen Slot Size
0	200	12	6	Type 304 Stainless Steel	N/A	N/A	N/A	N/A	N/A
200	220	12	6	Type 304 Stainless Steel	N/A	N/A	6	Stainless Steel	0.020

OIL TYPE

CH (Fat Clay)	OH (Organic Clay / Silt of High Plasticity)
CL (Lean Clay)	OL (Organic Clay / Silt of Low Plasticity)
GC (Clayey Gravel)	PT (Highly Organic Soil / Peat)
GM (Silty Gravel)	SC (Clayey Sand)
GP (Poorly Graded Gravel)	SM (Silty Sand)
GW (Well-Graded Gravel)	SP (Poorly Graded Sand)
MH (Elastic Silt)	SW (Well-Graded Sand)
ML (Silt)	

ANNULAR FILL MATERIALS

from	to	Material
0	196	Grout
196	198	#00 FilPro Sand
198	220	#1 FilPro Sand

140 lb./30" on 2" O.D. sampler

Cohesionless Density		Cohesive Consistence	
# Blows/ft		*# Blows/ft*	
0-4	very loose	0-2	very soft
5-9	loose	3-4	soft
10-29	medium dense	5-8	medium stiff
30-49	dense	15-Sep	stiff
50+	very dense	16-30	very stiff
		31+	hard

Project: **Former Lawrence Aviation - NYSDEC #152016**	HRP Associates, Inc.	Test Boring/Monitor Well ID: **SB-301/HRP-IW-02**	
Location: **100 Sheep Pasture Rd, Port Jefferson, NY**	**DRILLING / SOIL LOG**		
HRP#: **DEC1027.OM Task 6**		Sheet No. 1 of 1	
	Rig Type: **CRS XL 140 Duo**		
Date: **4/22/2024 - 5/8/2024**	**Hammer (weight [lb] / fall [inches])**	Driller: **Coastal Environmental Solutions - Dylan**	
HRP Rep.: **Joel Hara, Sarah Boison, Spencer Walker**			
Ground Elevation:	**PROPORTIONS**		
Total Boring Depth: 225'	trace: 0 to 10% / some: 20 to 35%		
Depth to Bedrock: NA	little: 10 to 20% / and: 35 to 50%		

	Casing	*Sampler*	*Core Barrel*
Type	Steel		
O.D. (inch)	3.75"	2.75"	
I.D. (inch)	4.25"	2.25"	

Sampler Depth interval (ft)		Sampler Blows per 6"	Recov. (ft)	Moisture	Soil Type (USCS)	Contact Interval (ft)	Soil Description (proportions, grain size, etc.)	PID (ppm)		Soil Sample Details	
from	to							Depth	Reading	Interval	Time
0	10	NA	0	NA	NA	0.0-10.0	No Sample	0.0-10.0	NA		
10	20	NA	9	Dry	SP	10.0-30.0	Brown fine SAND, few medium sand. Trace silt sand. Few fine to medium gravel. Trace fine sub-rounded gravel. Trace pulverized rock.	10.0-20.0	0.0	17-18	8:30
20	30	NA	8.5	Moist	SP			20.0-30.0	0.0	25-26	8:45
30	40	NA	7	Moist	SP	30.0-55.0	Brown fine SAND, some silt sand, few fine to medium sub-rounded gravel. Trace coarse gravel. Trace medium sand.	30.0-40.0	0.0	37-39	9:00
40	50	NA	9	Moist	SP			40.0-50.0	0.0	44-45	9:15
50	60	NA	7.5	Dry	SP	55.0-60.0	Light brown to tan fine SAND, few medium sand, trace silt sand. Few fine to medium rounded gravel. Trace large gravel.	50.0-60.0	0.0	55-56	9:30
60	70	NA	6	Damp	SP	60.0-70.0	Tan to light brown medium SAND, some fine sand. Trace coarse sand. Some fine to medium sub-rounded gravel. Pulverized cobble at 68 fbg.	60.0-70.0	0.0	66-68	10:00
70	80	NA	6	Moist	SP	70.0-76.0	Tan to light brown medium SAND, some fine sand. Trace coarse sand. Some fine to medium sub-rounded gravel.	70.0-80.0	0.0	75-76	10:30
						76.0-80.0	Tan medium SAND, few coarse sand. Trace fine sand. Few fine to medium rounded gravel.				
80	90	NA	7	Moist	SP	80.0-90.0	Tan to brown medium SAND, some fine sand, few fine gravel. Trace fine to medium sub-rounded gravel.	80.0-90.0	0.0	87-88	10:45
90	100	NA	7	Moist	SP	90.0-100	Tan to brown medium SAND, some fine sand, few fine gravel. Trace fine to medium sub-rounded gravel, trace pulverized rock fragments.	90.0-100	0.0	94-95	11:00
100	110	NA	8	Moist	SP	100-110	Brown fine SAND, few silt sand. Few small to medium rounded gravel. Trace large gravel.	100-110	0.0	105-106	11:30
110	120	NA	9	Moist	SP	110-120	Brown to tan medium SAND, few fine sand. Few fine sub-rounded gravel. Trace medium gravel. Trace pulverized rock fragments. Pulverized cobble toward bottom.	110-120	0.0	117-118	12:20
SB-301 Continued: April 29, 2024											
120	130	NA	Not Recorded	Dry	SP	120-126	Brown to tan fine to coarse SAND, some fine gravel, trace coarse gravel.	121	0.2	122-123	9:00
								122	0.3		
								123	0.4		
						126-130	Light tan fine SAND, little fine gravel, trace coarse gravel. Little medium to coarse sand.	124-130	0.0		
130	140	NA	Not Recorded	Dry	SP	130-137	Brown to tan fine to medium SAND, some fine gravel, trace coarse gravel.	130-140	0.0	136-137	9:45
						137-139	Light tan fine SAND, little medium to coarse sand. Little fine gravel. Trace coarse gravel.				
						139-140	Brown fine to medium SAND, little fine gravel.				
140	150	NA	Not Recorded	Moist	SP	140-148	Brown to tan fine to coarse SAND, some fine gravel. Trace coarse gravel.	141	0.8	141-142	12:00
						148-150	Light tan fine SAND, trace medium to coarse sand, trace fine to coarse gravel.	142	0.3		
								143-150	0.0		
150	160	NA	Not Recorded	Moist	SP	150-158	Brown to tan fine to coarse SAND, some fine to coarse gravel, little coarse gravel.	150-155	0.0	154-156	13:30
								155-156	0.1		
						158-160	Brown fine SAND, little fine to medium sand, trace fine to coarse gravel.	156-160	0.0		
160	170	NA	Not Recorded	NA	SP	160-165	Brown to tan fine to medium SAND, little coarse sand, some fine gravel, trace coarse gravel.	160	0.0	161-162	14:00
						165-169.5	Light tan fine SAND, little medium to coarse sand, trace fine gravel.	161	0.1		
						169.5-170	Brown fine to medium SAND, trace fine gravel.	162-170	0.0		
170	180	NA	Not Recorded	Dry	SP	170-173.5	Tan fine to medium SAND, trace fine gravel.	170-180	0.0	172-174	14:45
						173.5-174	Orange brown fine to medium SAND, trace fine gravel.				
						174-176	Tan fine to medium SAND, little fine to coarse gravel (crushed rock).				
						176-179	Light tan fine SAND, some medium sand, little fine gravel, trace coarse gravel.				
						179-180	Brown fine to medium SAND, trace fine gravel.				
SB-301 Continued: April 30, 2024											
180	190	NA	Not Recorded	NA	NA	180-190	No Recovery.				
190	200	NA	Not Recorded	Moist	SP	190-196	Light tan fine to coarse SAND, trace fine gravel.	190-200	0.0		
				Moist		196-200	Tan to brown fine to medium SAND, trace fine to coarse gravel.				

SB-301 Continued: May 1, 2024											
							Could not advance 5inch casing, additional 7inch casing delivered on 5/1/24. Advanced 7inch casing to 200 fbg. Attempted to advance 5inch casing without success. Removed all of the 7inch casing. 5inch casing at 180 fbg. No progress made by EOD.				
SB-301 Continued: May 6, 2024											
							Advanced 7 inch casing to 190 fbg, removed sampler. Unsuccessful attempt to collect GW sample. Well set at 200 fbg. No sample collected due to unsuccessful purging.				
SB-301 Continued: May 7, 2024											
							Collected groundwater sample from 195-200 fbg.				
SB-301 Continued: May 8, 2024											
200	210	NA		Moist	SP	200-202 202-208 208-210	Light tan, fine to medium SAND, trace fine gravel. Light tan, fine to medium SAND. Light tan fine to medium SAND, trace silt.	200-210	0.0	205-206	8:00
210	215	NA		Moist	SP	210-215	Tan fine to medium SAND, trace fine gravel. Clay/silt lense at 215 fbg.	210-215	0.0	211-212	8:30
							Set temporary well at 215 fbg with a 5 ft screen. Purged 100 gallons.			GW 210-215	10:00
215	225	NA		Moist	SP	215-223 223-225	Tan fine to medium SAND. Tan fine to medium SAND, trace silt and clay.	215-225	0.0	221-223	11:30
End of Boring @ 230'; boring overdrilled with 8-inch sonic casing on October 10, 2024 to install HRP-IW-02 (details below)											
							Analysis: 17-18: VOCs 25-26: VOCs 37-39: VOCs, SVOCs, TAL metals, PCBS, PFAS, 1,4-Dioxane 44-45: VOCs 55-56: VOCs 66-68: VOCs, SVOCs, TAL metals, PCBS 75-76: VOCs 87-88: VOCs 94-95: VOCs 105-107: 7: VOCs, SVOCs, TAL metals, PCBS, PFAS, 1,4-Dioxane 117-118: VOCs 122-123: VOCs 136-137: VOCs, MS/MSD 141-142: VOCs, DUP-02 154-156: VOCs, SVOCs, TAL metals, PCBS, PFAS, 1,4-Dioxane 161-162: VOCs 172-174: 7: VOCs, SVOCs, TAL metals, PCBS 195-196: VOCs 205-206: VOCs, SVOCs, TAL metals, PCBS, PFAS, 1,4-Dioxane, DUP-03 211-212: VOCs 221-223: VOCs				

Monitoring Well Details

from	to	Borehole Diam. (in.)	Casing Diam. (in.)	Casing Material	Riser Diam. (in.)	Riser Material	Screen Diam. (in.)	Screen Material	Screen Slot Size
0	200	12	6	Type 304 Stainless Steel	N/A	N/A	N/A	N/A	N/A
200	220	12	6	Type 304 Stainless Steel	N/A	N/A	6	Stainless Steel	0.020

OIL TYPE

CH (Fat Clay)	OH (Organic Clay / Silt of High Plasticity)
CL (Lean Clay)	OL (Organic Clay / Silt of Low Plasticity)
GC (Clayey Gravel)	PT (Highly Organic Soil / Peat)
GM (Silty Gravel)	SC (Clayey Sand)
GP (Poorly Graded Gravel)	SM (Silty Sand)
GW (Well-Graded Gravel)	SP (Poorly Graded Sand)
MH (Elastic Silt)	SW (Well-Graded Sand)
ML (Silt)	

ANNULAR FILL MATERIALS

from	to	Material
0	196	Grout
196	198	#00 FilPro Sand
198	220	#1 FilPro Sand

140 lb./30" on 2" O.D. sampler

Cohesionless Density		Cohesive Consistence	
Blows/ft		*# Blows/ft*	
0-4	very loose	0-2	very soft
5-9	loose	3-4	soft
10-29	medium dense	5-8	medium stiff
30-49	dense	15-Sep	stiff
50+	very dense	16-30	very stiff
		31+	hard

Project: **Former Lawrence Aviation - NYSDEC #152016**	HRP Associates, Inc.	Test Boring/Monitor Well ID: **SB-303/MW-ISCO-02R**
Location: **100 Sheep Pasture Rd, Port Jefferson, NY**	**DRILLING / SOIL LOG**	
HRP#: **DEC1027.OM Task 6**		Sheet No. 1 of 1
	Rig Type: **Truck Mounted Versa Sonic / CRS XL 140 Duo**	
Date**: 6/12/2024 - 6/17/2024; 10/8/2024 - 10/9/2024**	**Hammer (weight [lb] / fall [inches])**	Driller: **Coastal Environmental Solutions - Dylan/Patrick**
HRP Rep.: **Joel Hara & Spencer Walker**		
Ground Elevation:	**PROPORTIONS**	
Total Boring Depth: 220'	trace: 0 to 10% some: 20 to 35%	
Depth to Bedrock: NA	little: 10 to 20% and: 35 to 50%	

	Casing	*Sampler*	*Core Barrel*
Type	Steel		
O.D. (inch)	3.75"	2.75"	
I.D. (inch)	4.25"	2.25"	

Sampler Depth interval (ft)		Sampler Blows per 6"	Recov. (ft)	Moisture	Soil Type (USCS)	Contact Interval (ft)	Soil Description (proportions, grain size, etc.)	PID (ppm)		Soil Sample Details	
from	to							Depth	Reading	Interval	Time
0	10	NA	NA	NA	NA	0.0-10.0	No Sample	0.0-10.0	NA		
10	20	NA	5	Dry	SP	10.0-20.0	Brown fine SAND, little pulverized rock fragmants, little fine to medium sub-rounded gravel, trace silts	10.0-20.0	0.0	16-18	8:45
20	30	NA	5	Moist	SP	20.0-30.0	Brown fine SAND, little pulverized rock fragmants, trace fine to medium sub-rounded gravel, trace silts	20.0-30.0	0.0	25-26	9:00
30	40	NA	9	Dry	SP	30.0-40.0	Brown fine SAND, little silts, little fine to medium well sub-rounded gravel, trace coarse angular gravel	30.0-40.0	0.0	36-37	9:10
40	50	NA	4	Dry	SP	40.0-50.0	Grayish-brown fine SAND, some fine to medium gravel, little fine sub rounded gravel, trace pulverized rock fragments	40.0-42.0 42.0-45.0 45.0-50.0	0.0 0.1 0.0	44-45	9:20
50	60	NA	8	Dry	SP	50.0-60.0	Grayish-brown fine SAND, some fine to medium gravel, little fine sub rounded gravel, little silts, trace pulverized rock fragments	50.0-60.0	0.0	55-56	9:40
60	70	NA	7	Dry	SP	60.0-70.0	Grayish-brown fine SAND, some fine to medium gravel, some pulverized rock fragments, little fine sub-rounded gravel, little silts	60.0-70.0	0.0	66-68	10:00
70	80	NA	7	Moist	SP	70.0-80.0	Grayish-brown fine SAND, little medium sand, little fine to medium sub-rounded gravel, trace silts, trace coarse gravel	70.0-80.0	0.0	76-77	10:20
80	90	NA	8	Moist	SP	80.0-90.0	Grayish-brown medium SAND, little fine to medium sub-rounded gravel, trace coarse gravel, trace silts	80.0-90.0	0.0	86-87 (DUP-04)	10:45
90	100	NA	7	Dry	SP	90.0-95.0 95.0-100.0	Grayish-brown medium SAND, little fine to medium sub-rounded gravel, trace coarse gravel, trace silts Brownish-grey fine sand, some silts/very fine sand, little small to medium sub-rounded gravel, trace medium sand	90.0-100.0	0.0	95-96	11:15
100	110	NA	8	Dry	SP	100.0-110.0	Brownish-grey fine sand, some silts/very fine sand, little small to medium sub-rounded gravel, trace medium sand	100.0-110.0	0.0	104-105	13:00
110	120	NA	7	Dry	SP	110.0-112.0 112.0-120.0	Brownish-grey fine sand, some silts/very fine sand, little small to medium sub-rounded gravel, trace medium sand Brownish-grey fine SAND, little medium sand, little fine to medium gravel, little pulverized rock fragments	110.0-120.0	0.0	112-113	14:20
120	130	NA	5	Dry	SP	120.0-130.0	Brownish-grey fine SAND, little medium sand, little fine to medium gravel, little pulverized rock fragments, trace fine silts/clay, red discoloration/staining at 125 ft	120.0-130.0	0.0	125-127	8:00
130	140	NA	6	Dry	SP	130.0-140.0	Greyish-brown medium SAND, some fine sand, little fine to medium sub-rounded gravel, little pulverized rock fragments, trace fine angular gravel	130.0-140.0	0.0	136-137	8:50
140	150	NA	6.5	Dry	SP	140.0-150.0	Greyish-brown medium SAND, some fine sand, little fine to medium sub-rounded gravel, trace pulverized rock fragments	140.0-147.0 147.0-150.0	0.0 0.1	143-144	9:35

June 17, 2024: Soil observations and sampling ended @ 150' due to sonic casing/tooling abandoned at @ 150' within SB-303.

October 8, 2024: Boring offset to the north approximately 5 feet (note that field reports indicate the offset boring as SB-304) and advanced to final depth @ 220' for MW-ISCO-02R installation. Note that no soil samples were collected within the offset boring.

Analysis:

16-18: VOCs, SVOCs, TAL metals, PCBS

25-26: VOCs

36-37: VOCs, PFAS, 1,4-Dioxane

44-45: VOCs

55-56: VOCs

66-68: VOCs, SVOCs, TAL metals, PCBS

76-77: VOCs

86-87: VOCs (DUP-04)

95-96: VOCs

104-105: VOCs

112-113: VOCs (MS/MSD)

125-127: VOCs, SVOCs, TAL metals, PCBS

136-137: VOCs

143-144: VOCs, PFAS, 1,4-Dioxane

Monitoring Well Details

from	to	Borehole Diam. (in.)	Casing Diam. (in.)	Casing Material	Riser Diam. (in.)	Riser Material	Screen Diam. (in.)	Screen Material	Screen Slot Size
0	200	5	2	PVC	N/A	N/A	N/A	N/A	N/A
200	220	5	2	PVC	N/A	N/A	2	PVC	0.020

SOIL TYPE

CH (Fat Clay)	OH (Organic Clay / Silt of High Plasticity)
CL (Lean Clay)	OL (Organic Clay / Silt of Low Plasticity)
GC (Clayey Gravel)	PT (Highly Organic Soil / Peat)
GM (Silty Gravel)	SC (Clayey Sand)
GP (Poorly Graded Gravel)	SM (Silty Sand)
GW (Well-Graded Gravel)	SP (Poorly Graded Sand)
MH (Elastic Silt)	SW (Well-Graded Sand)
ML (Silt)	

ANNULAR FILL MATERIALS

from	to	Material
0	198	Grout
198	220	#1 FilPro Sand

140 lb./30" on 2" O.D. sampler

Cohesionless Density		Cohesive Consistence	
Blows/ft		*# Blows/ft*	
0-4	very loose	0-2	very soft
5-9	loose	3-4	soft
10-29	medium dense	5-8	medium stiff
30-49	dense	15-Sep	stiff
50+	very dense	16-30	very stiff
		31+	hard

APPENDIX E

EXCAVATION WORKPLAN

MOVE YOUR ENVIRONMENT FORWARD

EXCAVATION WORK PLAN

Lawrence Aviation Industries – Site # 152016
100 Sheep Pasture Road
Port Jefferson Station, NY 11776

Prepared For:
New York State Department of Environmental Conservation
625 Broadway
Albany, NY 12233

Prepared By:

HRP Associates, Inc.
197 Scott Swamp Road
Farmington, CT 06032

HRP #: DEC1027.OM

Issued On: September 18, 2025

TABLE OF CONTENTS

1.0 INTRODUCTION 1

1.1 General 1
1.2 Purpose 2

2.0 PRELIMINARY ACTIVITIES 3

2.1 Notification 3
2.2 Utility Clearance 3

3.0 SOIL REMOVAL AND MANAGEMENT 4

3.1 Excavation 4
3.2 Soil Stockpiling 4
3.3 Contaminated Soil Transportation and Disposal 5
3.4 Excavation Backfill 5
3.5 Fluids Management 6
3.6 Excavation Restoration 6
3.7 Contingency Plan 6
3.8 Community Air Monitoring Plan 6
3.9 Odor Control Plan 7
3.10 Dust Control Plan 7

1.0 INTRODUCTION

1.1 General

This Excavation Work Plan (EWP) is a required element of the Site Management Plan (SMP) for the former Lawrence Aviation Industries (LAI) Superfund Site, located at 100 Sheep Pasture Road, Port Jefferson Station, Brookhaven, New York (hereinafter referred to as the "Site"). The Site is currently in the New York State (NYS) Inactive Hazardous Waste Disposal Site Remedial Program Site No. 130072, Class 4, which is administered by New York State Department of Environmental Conservation (NYSDEC). The Class 4 designation indicates that the Site was properly closed but requires continued site management until the remedial objectives are achieved.

Industrial manufacturing operations were performed on the Site by LAI from at least 1959 until 2004. The facility was a manufacturer of titanium sheeting for the aeronautics industry. Liquid waste generated from the operations included fluorides, sludges, caustic acids, and halogenated solvents. In addition to liquid waste, transformers and capacitors filled with suspected polychlorinated biphenyls (PCBs) were identified. These wastes were stored and disposed of in several onsite areas including unlined lagoons and cesspools. LAI also reportedly crushed more than 1,600 – 55-gallon drums storing chemical wastes, allowing their liquid contents to spill onto unprotected soil.

Several investigations lead by Suffolk County and the NYSDEC concerning contamination of the LAI industrial facility were conducted during the 1970s and 1980s. During these studies, fluoride, toluene, carbon tetrachloride, and metals were detected in samples collected from sumps, puddles, laboratory cesspools, and surface water runoff at the LAI facility. Fluoride, nitrates, trichloroethylene (TCE), 1,1-dichloroethene (1,1-DCE), cis-1,2-dichloroethene (cis-1,2-DCE), tetrachloroethylene (PCE), and metals were detected in groundwater samples collected from adjacent residential wells. The U.S. Environmental Protection Agency (EPA) provided bottled water to homes with private wells affected by contaminated groundwater and subsequently connected those homes to the public water supply as part of response action conducted in 1987. The NYSDEC, Region 1 Resource Conservation and Recovery Act (RCRA) Hazardous Substance Group oversaw a major drum removal action at the site in 1991. The Suffolk County Water Authority, under contract with the NYSDEC, connected homes affected by groundwater contamination attributed to LAI to public water supplies throughout the 1990s. NYSDEC conducted a limited Remedial Investigation (RI) in 1997. The results of this investigation revealed that chlorinated volatile organic compounds (CVOCs) were detected in the groundwater and surface water. Based on the above investigations, the EPA proposed the site for inclusion on the National Priorities List (NPL) on October 22, 1999. The site was listed on the NPL February 4, 2000.

The EPA conducted an RI at the site from August 2003 to May 2005 through the Remedial Action (RA) Contract program. The RI documented a CVOC plume and identified PCB-contaminated soil at the site. The EPA personnel also noted conditions at the Site that warranted emergency removal action.

During the RI, EPA Region 2's Removal Action Branch removed approximately 1,300 drums, cylinders, and other containers containing various flammable solids, acids, bases, gases, and unknown compounds, and inventoried the laboratory area; identifying at least 390 containers. Most of the drums and containers were disposed offsite in October and November 2004. Non-hazardous materials were considered the property owner's responsibility and left at the Site. Approximately 13.5 tons of transformers and capacitors filled with suspected PCB liquid were removed from the site and disposed of as part of the 2004 removal action. During these actions, EPA personnel identified approximately

thirty additional electrical transformers in several areas of the site. NYSDEC removed most of the PCB-containing transformers in 2019.

On March 5, 2025, an EPA partial deletion was published in the Federal Register for the land and soils portion of the former LAI Site. The groundwater plume will not be considered for deletion as part of this action and will not be proposed for deletion from the NPL until cleanup criteria specified in the Record of Decision (ROD) have been met.

In 2025, NYSDEC reclassified the Site from a Class-2 Site, to Class-4 for continued Site management and operation of the active groundwater treatment facilities (GWTFs). The reclassification includes the modification of the Industrial Site boundary from 36.27-acres to approximately 5.50-acres which includes Tax Parcel 159-1-26 and a portion of Parcel 159-2-29. The NYSDEC Class-4 Site will include the groundwater treatment area encompassing an area of approximately 5.50-acres on the western, west central, and southern portion of the former industrial area, which includes the LAI groundwater extraction and treatment system (GE&T) on the southwest corner of the property (Parcel 159-1-26), and the active treatment area that overlies the west-central portion of the industrial area (Parcel 159-2-19), extending out to, and along the western and southern property boundary.

1.2 Purpose

As discussed above, impacted soils were previously identified at the Site and numerous remedial excavations and remedial activities have been conducted. This EWP was developed to be followed during any potential future excavation activities in order to protect human health and the environmental during excavation work and ensure that applicable regulations and guidance are followed.

There are currently no planned excavation activities for the Site. However, if future activities require excavation or removal of soils, former building foundations, or significant ground disturbance activities, then a task-specific EWP should be prepared. Intrusive activities have the potential to expose site workers and/or the public to remaining contamination in soil and/or concrete not yet identified. Any future excavation work should be conducted in accordance with an EWP. Additionally, a Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) should be prepared by the excavation Contractor in accordance with DER-10, Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1910, OSHA 29 CFR 1926, and all other applicable Federal, State, and local regulations. The EWP should be submitted to the NYSDEC for review and approval prior to conducting any excavation work.

2.0 PRELIMINARY ACTIVITIES

2.1 Notification

The excavating Contractor shall submit a task-specific EWP to the NYSDEC for review and approval at least fifteen days prior to the start of any intrusive activity, in which remaining contamination may possibly be encountered. The task-specific EWP shall include the following:

- A detailed description of the work to be performed, including the location and areal extent of the proposed excavation or removal activities;
- Plans for Site re-grading, estimated volumes of material to be excavated or removed and any work that may impact the Site engineering control (EC), such as the GWE&T system or associated extraction and monitoring wells;
- A schedule for the work, detailing the start and completion of all intrusive activities;
- A statement that the work will be performed in compliance with this EWP and OSHA 29 CFR 1910.120;
- A copy of the Contractor's HASP and CAMP;
- Identification of disposal facilities for potential waste streams; and
- Identification of sources for any imported backfill soils, along with any required laboratory analytical results.

2.2 Utility Clearance

Prior to implementing any intrusive activities, utility clearance procedures shall be conducted. The procedures include utility markouts required by law through the Code 753, obtaining and reviewing available Site utility drawings, and a field reconnaissance to verify, to the extent possible, the location of utilities relative to the planned locations of all intrusive activities.

The Code 753 utility markout shall be completed as per the 16 New York Codes, Rules and Regulations (NYCRR) Part 753. Consistent with the One-Call (also called Dig Safe New York) criteria, a request will be made by the excavation contractor at least 72 hours prior to initiating fieldwork. Confirmations that the utilities have been marked out, as per Code 753 requirements, shall be documented in the project file. All hard-copy confirmations will also be available in the field during all intrusive operations. If the utility markings become faint or obscure they will be refreshed as needed.

In addition, a private utility markout contractor shall also be utilized to survey proposed excavation areas for buried utilities or other subsurface features.

3.0 SOIL REMOVAL AND MANAGEMENT

Site excavation activities include the construction processes associated with the physical removal of potentially contaminated soil or concrete. These processes include excavation of potentially contaminated soil and concrete, transportation and disposal of contaminated materials, and restoration of the excavated area.

3.1 Excavation

At a minimum, the following requirements apply to excavations within the former industrial area of the Site. Methods for compliance with these requirements shall be addressed in the Contractor's task-specific EWP:

- A qualified environmental professional (QEP) or person under their supervision shall oversee all intrusive activities and "loadout" of any excavated material;
- Excavated materials shall be transported to a designated staging area such that they may be tested and properly managed;
- Excavated materials shall be staged on polyethylene sheeting to prevent contact with undisturbed soils;
- Stockpiles shall be secured each day by covering with polyethylene sheeting and employing methods to contain any sediment (such as surrounding with hay bales); and
- Excavation shall be performed in a manner that will prevent spills and the possibility for potentially contaminated materials to be mixed with uncontaminated material.

3.2 Soil Stockpiling

At a minimum, the following requirements apply to the storage of materials excavated from areas of the Site. Methods for compliance with these requirements shall be addressed in the Contractor's task-specific EWP:

- Excavated material shall be placed in temporary storage;
- Soil stockpiles shall be encircled with a berm and/or silt fence. Hay bales shall be used, as needed, near catch basins and other discharge points;
- Stockpiles shall be kept covered at all times with appropriately anchored tarps;
- Stockpiles shall be routinely inspected, and damaged tarp covers will be promptly replaced;
- In the unlikely event that soil must be stockpiled for extended lengths of time, stockpiles shall be inspected at a minimum of once per week and after every storm event. Results of inspections shall be recorded in a logbook and made available for inspection by the NYSDEC;
- Roll-off or equivalent units used to store any contaminated material shall be watertight; and
- Storage and handling of contaminated soil shall be performed in accordance with all applicable NYSDEC regulations.

3.3 Contaminated Soil Transportation and Disposal

Contaminated soil and sediment shall be transported to and be disposed of at a licensed facility in accordance with state and federal regulations.

The following requirements apply to the transportation and disposal of excavated contaminated material from the Site. Methods for compliance with these requirements shall be addressed in the Contractor's task-specific EWP:

- Sampling, classifying, manifesting, labeling, transporting, and disposal of waste shall be performed in accordance with all applicable federal, state, and local laws and regulations;
- Materials removed from the Site shall be transported directly to the disposal facility;
- All transport of materials shall be performed by licensed transporters in accordance with applicable local, State, and Federal regulations, including 6 NYCRR;
- Loaded vehicles leaving the Site shall be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and New York State Department of Transportation (NYSDOT) requirements (and all other applicable transportation requirements);
- Locations where vehicles enter or exit the Site shall be inspected daily for evidence of off-site soil tracking;
- Waste characterization sampling frequency, analysis methods, and analytical laboratory shall be approved by the NYSDEC prior to removal of any material from the Site;
- Letters of commitment shall be obtained from all disposal facilities to be used during the project. The letters shall state that the disposal facility is permitted to accept all Site waste and has the available capacity to receive the waste; and
- All vehicles shall be decontaminated prior to leaving the Site, if necessary.

3.4 Excavation Backfill

The following requirements apply to the fill material proposed to be used to restore the Site after excavation activities have been completed. Methods for compliance with these requirements shall be addressed in the Contractor's task-specific EWP:

- Fill material proposed to be used to restore the Site shall be similar in physical properties to the material removed. Fill used for building foundations or other construction is exempt from this requirement;
- The fill material shall be of equal or less permeability than the native soil in or adjacent to the excavated area;
- All fill material to be utilized at the Site shall meet the requirements of 6 NYCRR Part 375 Unrestricted Use criteria, at a minimum;
- Documentation of the quality of the fill shall be provided by a certification stating that it is virgin material from a commercial or noncommercial source; and

- If documentation of the quality of the fill material cannot be provided, a backfill evaluation proposal, which identifies material characterization protocols, shall be submitted to and approved by the NYSDEC prior to the use of any fill material.

3.5 Fluids Management

Based on the depth to groundwater beneath the Site (approximately 190 feet below grade), groundwater will not be encountered during excavation work.

3.6 Excavation Restoration

After the completion of soil removal and any other intrusive activities, all Site cover material shall be restored to pre-excavation conditions, or per the requirements of the NYSDEC.

3.7 Contingency Plan

If underground tanks or other previously unidentified contaminant sources are encountered during any excavation activities, such activities shall be suspended until sufficient equipment is mobilized to the Site to properly address these conditions. Sampling of all identified below-grade structures and contaminated soils, etc. shall be completed by the excavating Contractor, as necessary, to determine the nature of the material and develop proper disposal methods. Chemical analysis shall be performed for a full list of analytes (target analyte list [TAL] metals, target compound list [TCL] volatile and semi-volatile organic compounds, TCL pesticides, and PCBs), unless the Site history and previous sampling results provide a sufficient justification to limit this list of analytes. In this case, a reduced list of analytes shall be proposed to the NYSDEC for approval prior to sampling. Identification of unknown or unexpected contaminated media identified by screening during intrusive activities shall be promptly communicated to the NYSDEC's Project Manager. Reportable quantities of product will also be reported to the NYSDEC spills hotline.

3.8 Community Air Monitoring Plan

The excavating Contractor will be responsible for preparing a CAMP, which shall be included in the task-specific EWP. Guidance can be obtained in Appendix 1A (Generic CAMP) of DER-10. At a minimum, the CAMP shall include the following:

- Details of the perimeter air monitoring program;
- Action levels to be used;
- Analytes measured and instrumentation to be used; and
- A map of the location(s) of all air monitoring instrumentation. A map showing specific locations must be presented for monitoring stations based on generally prevailing wind conditions, with a note that the exact locations to be monitored on a given day will be established based on the daily wind direction.

Exceedances of action levels listed in the CAMP shall be reported to the NYSDEC Project Manager.

3.9 Odor Control Plan

The excavating Contractor shall be responsible for preparing an Odor Control Plan (OCP), as part of the task-specific EWP. This OCP shall be capable of controlling emissions of nuisance odors to off-site locations. If nuisance odors are identified at the Site boundary, or if odor complaints are received, work shall be halted, and the source of odors shall be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC shall be notified of all odor complaint events. Implementation of all odor controls, including the halting of any work, is the responsibility of the Contractor.

All necessary means shall be employed to prevent on and off-site odor nuisances. At a minimum, these measures shall include the following:

- Limiting the area of open excavations and size of soil stockpiles;
- Shrouding soil piles and open excavations with tarps and other covers; and
- Using foams to cover exposed odorous soils.

If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances shall include:

- Direct load-out of soils to trucks for off-site disposal;
- Use of chemical deodorants in spray or misting systems; and
- Use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive activities that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to onsite conditions or close proximity to sensitive receptors, odor control shall be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

3.10 Dust Control Plan

A Dust Control Plan that addresses dust management during intrusive activities will be addressed in the Contractor's task-specific EWP, and shall include, at a minimum, the following:

- The Site cover/maintained lawn removal shall be completed in stages to limit the area of exposed soils, vulnerable to dust production;
- Dust suppression shall initially be achieved through use of the existing hose located on the south side of the treatment system building. If this is ineffective, the Contractor shall utilize a dedicated on-site water truck for dust suppression;
- The truck shall be equipped with a water cannon capable of spraying water directly onto open excavations and onto soil stockpiles; and
- Gravel shall be used on roadways to provide a clean and dust-free road surface, if necessary.

APPENDIX F

HEALTH AND SAFETY PLAN

MOVE YOUR ENVIRONMENT FORWARD

SITE-SPECIFIC HEALTH AND SAFETY PLAN (HASP)

Lawrence Aviation Industries – Site #152016
Sheep Pasture Road
Port Jefferson Station, NY 11776

Prepared For:

Contract# D009808, Work Assignment No. 27
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, New York, 12233-7012

Prepared By:

HRP Associates, Inc.
197 Scott Swamp Road
Farmington, CT 06032

HRP #: DEC1027.OM

Issued On: November 6, 2023

Addendum Number	Date Issued	Reason For Modification
1	08/29/23	Update to site contacts
2	11/02/23	Updated Site hazards, changes in onsite hazards

Disclaimer

HRP Associates does not guarantee the health or safety of any person entering this site. Due to the potential hazards of this site and the activity occurring thereon, it is not possible to discover, evaluate, and provide protection for all possible hazards which may be encountered. Strict adherence to the health and safety guidelines set forth herein will reduce, but not eliminate, the potential for injury at this site. The health and safety guidelines in this plan were prepared specifically for this site for use and should not be used on any other site.

CERTIFICATION

This Addendum to HRP's Generic Health and Safety Plan has been prepared under the supervision of, and has been reviewed by, a Certified Safety Professional (CSP) certified by the Board of Certified Safety Professionals.



David Webster, CSP
BCSP # CSP-38036

TABLE OF CONTENTS

1.0 EMERGENCY CONTACTS/PLANNING....1

2.0 INTRODUCTION....2

2.1 Purpose and Scope....2
2.2 Site Information and Areas of Environmental Concern....2
2.3 Background and Project Description....2

3.0 AREAS OF ENVIRONMENTAL CONCERN....5

3.1 Scope of Work....5

4.0 HAZARD ANALYSIS....7

4.1 Hazard Analysis Summary/Minimization....8
4.2 Changes in Conditions or Scope....8
4.3 Personnel Monitoring Procedures....9

5.0 ENGINEERING CONTROL MEASURES/GENERAL SAFETY....10

5.1 Air Monitoring....10
5.2 Protective Zones....10

6.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)....12

6.1 Level of Protection....12

7.0 DECONTAMINATION....14

7.1 Decontamination Procedures....14
7.2 Emergency Decontamination....14
7.3 Personal Hygiene....14

8.0 EMERGENCY ACTION PLAN/SPILL RESPONSE....15

9.0 TRAINING/MEDICAL SURVEILLANCE....17

9.1 Training Requirements....17
9.2 Pre-Entry Briefing....17
9.3 Morning Safety (Tailgate) Meeting....17
9.4 Medical Surveillance....18

10.0 AUTHORIZATIONS....19

11.0 FIELD TEAM REVIEW....20

12.0 APPROVALS....21

13.0 RECORDKEEPING....23

Figures

Figure 1 Site Location Map
Figure 2 Site Plan with Areas of Environmental Concern
Figure 3 Route and Map to Nearest Hospital

Tables

Table 1a Chemical Hazards Known or Suspected On-Site
Table 1b Physical Hazards Known or Suspected On-Site

Appendices

Appendix A Safety and Logistics Planning Call Log
Appendix B Personnel Log
Appendix C Supervisor's Investigation Report
Appendix D Daily Job Brief Record
Appendix E Equipment Calibration Log
Appendix F HRP Safe Work Permit
Appendix G COVID-19 Health and Safety Guidelines
Appendix H Safety Data Sheets (for chemicals brought to the site)

1.0 EMERGENCY CONTACTS/PLANNING

The Health and Safety Officer will coordinate the entry and exit of response personnel in the event of an emergency. The following information, including directions to the nearest hospital shall be posted at the Site. When contacting the local authorities, be sure to provide: your name, facility name, full address, telephone number, and the nature of the emergency.

Emergency Phone Numbers Sheep Pasture Road Port Jefferson Station, New York	
Emergency Contacts	**Phone Number**
Fire, Ambulance, Police Emergency:	911
Port Jefferson Constable (routine calls):	(631) 774-0066
Port Jefferson Fire Department (routine calls):	(631) 473-8910
Mather Hospital (Location of Hospital):	(631) 473-1320
Poison Control Center:	1-800-222-1222
DEC Spills Hotline:	1-800-457-7362
National Response Center:	800-424-8802
Project Manager: Derek Roy	860-428-9366
Site Safety Officer: Derek Roy	860-428-9366
NYSDEC Project Manager: Payson Long, P.E.	518-727-8792

Map and directions to the following medical facilities are provided in **Figure 3**:

- **Mather Hospital -** located at 75 N Country Rd, Port Jefferson, NY 11777 (approximately 1 mile from the work site)

First Aid, Fire Protection, Emergency Response Equipment Storage Locations	
First Aid Kit:	In Vehicle
Fire Extinguisher:	In Vehicle
Eye Wash (Bottle):	In Vehicle
Spill Kit	In Vehicle
Hand Sanitizer	In Vehicle
Social distancing Caution Tape, Cones	In Vehicle

A Safety and Logistics Planning call will be held prior to conducting any intrusive activities at the site. Representatives from HRP and each subcontractor will attend the call to discuss logistical and safety challenges general to the scope of work and specific to the Site. This call is documented on the Safety and Logistics Planning Call Log in **Appendix A.**

2.0 INTRODUCTION

2.1 Purpose and Scope

This Health and Safety Plan (HASP) addresses the health and safety practices that will be employed by HRP Associates, Inc. personnel and our subcontractors while on the Lawrence Aviation Industries (LAI) Site. Field activities covered by this HASP include participating in site walk(s), site security, groundwater monitoring, surface soil sample collection, demolition oversight and remedial system optimization (RSO) activities.

This HASP has been developed in accordance with HRP's Generic Safety and Health Program as required under OSHA's Hazardous Waste Operations Standard (29 CFR 1910.120). This Plan has been developed to establish minimum standards necessary for onsite investigation activities to protect the health and safety of HRP personnel. HRP site personnel have received the required level of training and field experience as required under subpart (e) of the Standard, and have received medical examinations in accordance with HRP's medical surveillance program as required under subpart (f) of the Standard. No other personnel will be permitted in the Exclusion Zone unless they have received training and medical surveillance under the Standard.

HRP personnel and associated contractors shall be familiar with this HASP prior to conducting proposed site work. This plan must be present on site and be available for reference/inspection when the subject site work is being conducted.

2.2 Site Information and Areas of Environmental Concern

2.2.1 Site Information and Description

Site Name: Lawrence Aviation Industries

Site Address: 100 Sheep Pasture Road, Port Jefferson Station, NY 11776

Site Contact: Payson Long, P.E. New York State Department of Environmental Conservation (NYSDEC)

Site Contact Phone Number: 518-727-8792

2.3 Background and Project Description

The Lawrence Aviation Industries Site, located at Sheep Pasture Road, Port Jefferson Station, NY 11776, (**Figure 1**) is the focus of this investigation. This property is approximately 126 acres in size, according to the Suffolk online GIS map viewer. Several buildings are currently present on the Site: historically used for the manufacturing of titanium sheet metal for the aviation industry. Site operations closed in 1991 and the property is not occupied at present.

Surrounding land in the area of the Site is mostly residential properties. The land itself is somewhat level though the terrain is steeply sloped to the north, downward towards the harbor and Long Island Sound.

Environmental investigations were performed at the Site from 1991-2006, which identified historical releases that have impacted the soil and groundwater at the Site. Data from these investigations indicated that Trichloroethene (TCE), tetrachloroethene (PCE), acid wastes, including a historical hydrofluoric acid release, oils, sludge, heavy metals, and other industrial wastes; fluoride, toluene, carbon tetrachloride, and metals were found in samples collected from sumps, puddles, laboratory cesspools, and surface water runoff at Site. These contaminants are present at elevated levels in downgradient monitoring wells located North of the Site.

EPA removed over 1300 drums/containers, 13.5 tons of transformers and capacitors, and the soil remedy included the excavation and removal of approximately 550 tons of contaminated shallow soil from the Site in March 2011. The ongoing groundwater remedy includes two groundwater extraction and treatment systems at LAI and Old Mill Pond (OMP), respectively. The LAI and OMP extraction systems are intended to capture contaminant mass migrating off-site and mass migrating to the OMP at the plume front, respectively. A total of 85 wells are installed on- and off-site and includes monitoring wells, extraction wells, and injection wells.

2.3.1 Personnel Designations

The following personnel are designated to perform the stated project activities and to ensure that the requirements of this HASP are met. The same person may fill more than one role, and/or serve as an alternate in the absence of the designated team member.

All subcontractors must have received the required level of training and field experience as required under subpart (e) of OSHA 29 CFR 1910.120 and OSHA 29 CFR 1926.65 for Hazardous Waste Operations and Emergency Response (HAZWOPER).

Project Team Member	Responsibilities and Tasks
Chris Tedder (or Qualified Alternate Safety Officer)	**Health & Safety Officer – HRP Associates, Inc.** - Ensuring all site work is being performed in accordance with HRP Associates, Inc. Safety Program, as well as in accordance with local, state and federal regulations. - Directing and implementing HRP's HASP. - Reviewing the Subcontractor's HASP and being aware of the hazards detailed therein. - Conduct a job orientation meeting and routine safety meetings for HRP Associates, Inc. employees and subcontractors, as applicable. - Provide copies of these inspections, recordkeeping/personnel logs to the engineer/contractor as required. - Ensuring all project personnel have been adequately trained in the recognition and avoidance of unsafe conditions. - Authorizing Stop Work Orders that shall be executed upon the determination of an imminent health and safety concern, and will notify the appropriate contacts upon issuance of this order. - Authorizing work to resume, upon approval from the Contractor. - Directing activities, as defined in the HRP's and the Contractor's written HASP, during emergency situations. - Providing personnel monitoring where applicable. - Ensuring that adequate personal protective equipment and first aid supplies are available. - Ensure site security, to the extent practicable. - Ensure accident victims are promptly cared for, and the incident is investigated and properly reported.
Derek Roy (Site Supervisor/ Project Manager) **Joel Hara (Alternate Site Supervisor)**	**Site Supervisor/Project Manager – HRP Associates, Inc.** - Monitor and assist the site Health and Safety officer. - Maintain appropriate rules, regulations and codes at the job site. - Provide advance safety planning for all activities through the use of scheduling and administrative controls. - Obtain site-specific health and safety information and communicate that information with the appropriate personnel (i.e. contractors, client, etc.) - Report all injuries, illnesses and other incidents to the Director of Safety[1]. - Ensure all HRP personnel are trained and qualified to perform site work.
Site Workers[2] (Subcontractors)	**Site Workers** - Read and work in accordance with this HASP. - Report all unsafe work practices to the HSO. - Report all incidents, including near-misses to the HSO. - Work in a safe manner. - Provide Designated Competent Person
A complete list of HRP employee and subcontractor responsibilities (as applicable) can be found in the HRP Generic Health and Safety Plan. 1 Supervisor's Investigation Report included as (**Appendix C**) 2 A list of site workers will be maintained in the Personnel Log (**Appendix B**)	

3.0 AREAS OF ENVIRONMENTAL CONCERN

3.1 Scope of Work

In general, the work to be performed by HRP and HRP's subcontractors consists of monitoring, maintenance, and investigative methods to evaluate the environmental condition of the Site. This includes the following subtasks:

- Obtain access to the Site and evaluate/institute site security/implement and monitor deterrence measures.

Soils

- Collection of surface soil samples from different locations across the site using hand tools; two samples will be collected at each location and homogenized over depths from 0-2" and 2-6".
- Collection of subsurface soils via direct push and sonic drilling technologies from locations identified across the site as part of investigations to identify additional possible sources of contamination.
- Investigation derived waste (IDW) generated (if any) during sampling of monitoring wells shall be handled in accordance with [Sate/local agency requirements/guidelines]. Representative samples of cuttings and spoils will be analyzed to determine classification, treatment, and disposal.

Groundwater

- Completing synoptic water levels from all site monitoring and extraction wells.
- Collecting groundwater samples in accordance with low-flow groundwater sampling procedures.
- Investigation derived waste (IDW) generated (if any) sampling of monitoring wells shall be handled in accordance with applicable agency guidelines. Representative samples of IDW will be analyzed to determine classification, treatment, and disposal.

Surface water

- Investigation derived waste (IDW) in existing surface water pits shall be handled in accordance with [Sate/local agency requirements/guidelines]. Representative samples of IDW will be analyzed to determine classification, treatment, and disposal.
- Disposal activities will be determined based on the classification, treatment, and disposal methods identified during project implementation. Activities will include assisting/ monitoring local onsite personnel and subcontractors with treatment, and disposal of existing surface run-off water pits.

Building Demolition

- Demolition of onsite buildings will be completed by NYSDEC subcontractors, be aware of contaminant specific exclusion zone around the demolition area. NYSDEC subcontractors

include a general contractor, an abatement/demolition contractor, and a third party monitor. Exclusion zones will be designated by color specific caution tape.
- Maintain exclusion zones, safely monitoring buildings for changes in activity/ evidence of use, document progress with photos.

Additional Remedial System Optimization Activities

- Collection of groundwater data for treatability study and/or evaluating in-situ remedial options
- Characterization/demolition of Site buildings
- Maintenance and upgrades to site security system, perimeter fencing and gates.

Additional information will be provided in the Site Specific Work Plan(s) prepared for this Site under separate cover.

4.0 HAZARD ANALYSIS

The Site Supervisor/Project Manager shall complete the HRP Safe Work Permit in **Appendix F** prior to the start of the project. The Permit identifies hazards, conditions and materials that are known or suspected to be on-site.

Physical Hazards Present	☒ Electricity ☒ Trips/Falls/Floor openings ☒ Holes/Pits ☒ Inclement weather ☒ Heat ☒ Cold ☐ Vibration ☒ Flying particles	☐ Ionizing radiation ☐ Non-Ionizing radiation ☐ Lasers ☒ Overhead hazards ☒ Noise ☐ Visible dust ☒ Falling objects ☐ Other _____
Health/Chemical Hazards Present [1]	☒ Dust/Fumes/Particulates ☒ Flammable/Combustible ☐ Compressed gas ☐ Explosive ☐ Water reactive ☐ Unstable ☒ Contact with contaminated media	☐ Oxidizer ☐ Corrosive ☒ Toxic ☐ Highly Toxic ☐ Irritant ☐ Sensitizer ☐ Carcinogen/Mutagen ☐ Other _____
Environmental/Equipment Hazards Present	☒ Heavy machinery ☒ Drilling ☒ Water operations ☒ Mobile equipment ☒ Road work ☐ Railroad work ☐ Forklifts ☒ Power tools ☐ Welding ☒ Gas cylinders ☒ Overhead/underground utilities	☐ Trenching/excavation ☒ Elevated heights/man lifts ☐ Scaffolding ☐ Ladders ☒ Confined spaces ☒ Energized equipment ☒ Overhead hazards ☒ Drums/container handling ☒ Insects/rodents/snakes ☒ Biological hazards ☒ Other: Trespassers
Personal Safety Considerations	☒ Security Issues ☐ Remote setting ☒ Employees working alone ☒ Limited lighting	☐ Off hour shifts ☒ Dangerous wildlife/animals ☐ Limited cell phone service ☒ Other: Homeless inhabitants
[1] **Table 1** (following the text of this HASP) provides a list of chemical substances for reference, along with odor threshold, permissible exposure limit (PEL), threshold limit value (TLV), OSHA ceiling, IDLH concentration, route of exposure and symptoms of acute exposure, if any.		

Details of specific hazards associated with individual tasks will be discussed in the Daily Job Brief Record (**Appendix D**).

4.1 Hazard Analysis Summary/Minimization

HRP's Corporate Health & Safety Plan (in conjunction with this HASP) will be cross-referenced in order to obtain the safe work practice procedures for mitigating and preventing project site hazards identified in the table above. Job site hazard prevention and minimization information can be found in Section 3 of HRP's Generic Health & Safety Plan.

Confined Spaces

Only properly trained HRP personnel are authorized to enter confined spaces. Confined space entry may be performed by subcontractors who have the proper training and experience to conduct this work. Confined space entry ***is not*** anticipated during the RI.

Excavations

It is HRP's policy to ensure that for excavation projects the subcontracted environmental contractor will provide a competent person to perform daily and as needed inspections of excavation sites. This policy will be conveyed through the subcontract agreement with the environmental contractor. At a minimum HRP will provide our employees involved with construction projects with awareness level training regarding excavation hazards and notify the subcontracted firm if any obvious excavation safety hazard exists during the course of on-site activities.

Chemical Hazards

Hazardous chemicals known or suspected to be onsite are listed in **Table 1a** (follows text). **Table 1a** includes Chemical name, odor threshold OSHA PEL, ACGIH TLV, OSHA STEL, IDLH Concentrations, routes of exposure and symptoms of acute exposure. Chemicals likely to be encountered during site work are highlighted.

Physical Hazards

Physical hazards known or suspected to be onsite are listed in **Table 1b** (follows text). **Table 1b** includes description of potential hazards, methods to identify/minimize them, potential for occurrence and potentially affected tasks.

Personal Safety Considerations

HRP Employees will not be on-site without another employee from HRP, DEC employee, or sub-contractor. This is to maintain the safety of HRP's employees against the potential encounter with homeless persons known to be on-site. If an encounter does occur, HRP employees will announce their presence and authority to be on-site. The employees should then attempt to disengage in any encounter once they make themselves known.

4.2 Changes in Conditions or Scope

Should conditions or the scope of work described herein change significantly; a HASP Addendum will be completed.

4.3 Personnel Monitoring Procedures

Due to the current COVID-19 pandemic, HRP personnel and HRP subcontractors will conduct personal temperature checks with a non-contact infrared thermometer prior to entering Site buildings. If a worker has a temperature above 100.3 degrees, he or she should be directed to their supervisor (via phone, text or email) and asked to leave the project site immediately. Additional COVID-19 guidelines are included in the COVID-19 Site Specific HASP Addendum located in Appendix G.

5.0 ENGINEERING CONTROL MEASURES/GENERAL SAFETY

5.1 Air Monitoring

Air monitoring will be used to determine the concentrations of various chemicals while working in the exclusion zone to evaluate worker exposure to contaminated media. In order to determine potential health hazards and to determine the level of personal protection needed during sampling activities within the areas of concern, a Photoionization Detector (PID) and Community Air Monitoring Program (CAMP) will be periodically operated to monitor air quality for the purpose of ensuring minimal exposure to volatile organic compounds. Monitoring of atmospheres adjacent to on-going excavations and around the treatment area shall also be conducted with a PID and the Community Air Monitoring Program (CAMP) by designated on-site personnel. While HRP are not responsible for maintaining CAMP equipment, HRP personnel should be aware of monitoring activities and be ready to respond to changing site conditions or help to facilitate new work practices.

5.2 Protective Zones

Prior to commencement of work in area of suspected contamination, protective zones specific for each phase of the Plan will be established by the HSO if necessary prior to the start of field work. These zones will be defined during the Daily Job Brief.

The purpose of the protective zones is to prevent potential cross-contamination of adjacent areas as well as to protect project personnel from exposure to contaminated areas.

Protective zones shall be delineated as follows:

- **Exclusion Zone:** This is the contaminated area in which intrusive activities are performed. The "Area of Environmental Concern" (AOEC) is located within this area. A single access point for entrance and exit should be established and maintained, if possible. This zone should be delineated from the Contaminant Reduction Zone via perimeter cones or caution tape, or other applicable method. Work areas are shown on **Figure 2**. The Exclusion Zone delineation and any necessary modifications will be based on site conditions.

- **Contaminant Reduction Zone:** This zone is a transition zone located between the Exclusion Zone and the Support Zone and is utilized to decontaminate personnel and equipment.

- **Support Zone:** This zone will be utilized by equipment and vehicle storage and will be kept free of contaminated material. The HSO will determine the location of this zone. In the event of a site evacuation, the rally point will be the parking lot where vehicles are left for the days work at the Park Ave. site entrance.

  The designated rally point may be relocated by the HSO based on project or site conditions. All site workers will be notified of any relocation prior to implementation.

Note: protective zones ***are not*** anticipated for this project.

6.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

6.1 Level of Protection

As identified in Section 4.0, the overall health and safety risk associated with chemical hazards for HRP and associated contractors is considered significant. This is primarily due to the moderate concentrations of chemical contaminants expected based on minimal contact personnel will have with any potentially contaminated media. Therefore, the minimal level of protection for HRP personnel during the conduct of all the environmental work performed at the site will be Level D PPE, and will generally consist of the PPE listed below:

- Steel toe/shank work boots
- Hard hat, as necessary
- Safety vest, as necessary
- Coveralls/tyvek, as necessary
- Safety glasses/goggles/face shield, as necessary
- Hearing protection, as necessary

If site conditions warrant, an upgrade to Level C personal protective equipment (PPE) may be required. If required, the Contractor will make Level C PPE readily available.
Level C PPE generally includes:

- Full/half face, air purifying respirator with appropriate cartridges
- Same as Level D, but also includes tyvek taped pant/boot and glove/shirt

If the Daily Job Briefing determines that protection beyond Level C is required, HRP will re-evaluate the HASP as well as the site conditions, and will revise the HASP as required.

The following table provides a summary of the minimum level of PPE required on site:

Description	Level of Protection [1]	
	D	C
Body		
Work Clothes	R	R
Chemical Protective Suit (Tyvek)	O	R
High Visibility Clothing/ -Vest	O [2]	O [2]
Apron	O	O
Fall Protection	O [2]	O [2]
Head		
Hard Hat	R	R
Head Warmer	O	O
Eyes & Face		
Safety Glasses	R	R
Goggles (based on hazard)	O	R
Face Shield	O	O
Ears		
Plugs or Muffs	R [2]	R [2]
Hands & Arms		
Work Gloves	R	O [2]

Description	Level of Protection [1]	
	D	C
Chemical Resistant Gloves (Nitrile)	O	R
Insulated Gloves	O	O
Foot		
Work Boots/Steel Toe Boots	R	R
Chemical Resistant Boots	O	O
Disposable Boot Covers	O	O
Respiratory Protection [3]		
½ Mask Air Purifying Respirator (APR) or Full face APR	NA	R
Dust Protection	O	NA
Powered APR	NA	NA
SCBA/Supplied Air Respirator	NA	NA

R = Required, **O** = Optional, **NA** = Not Applicable

[1] The level of protection identified here does not include the necessary equipment for entering confined spaces. Refer to Confined Space Program for atmospheric sampling protocols and breathing and rescue equipment necessary for those operations.

[2] The use of this PPE may or may not be required depending on site conditions/location and will be addressed at the time of task assignment by the HSO.

[3] Respiratory protection necessary to protect against VOC, dusts/particulates and not oxygen deficient atmospheres.

The following table provides a general description of potential field activity tasks to be performed and associated (recommended) PPE. The use of this PPE may or may not vary depending on site conditions and will be addressed at the time of task assignment by the HSO.

Task Description	Invasive (Y/N)	Protection Level
Site Mobilization - Surveying, fence and barrier installation, hay bale installation, decon and work zone set up, soil staging areas preparation	N	Level D
Soil and Water Sampling - Drilling, sampling, soil moving as needed.	Y	Modified Level D or Level C – Respirator as needed based on monitoring. Eye protection required during collection of any liquid sample
Soil Excavation, Staging and Load-Out	Y	Modified Level D – or Upgrade to Level C dependent on monitoring
Decontamination - Truck dry sweeping, decon pressure wash of equipment, PPE change out	Y	Modified Level D – or Upgrade to Level C dependent on monitoring
Waste Management - Soil load-out for off-site disposal, water removal for disposal, PPE disposal, drum handling	Y	Modified Level D – or Upgrade to Level C dependent on monitoring
Site Control (Exclusion, Decontamination, Support Zones)	N	Modified Level D – or Upgrade to Level C dependent on monitoring
Communications - Use of hand signals, backup alarms, and voice	N	NA
Site Restoration	Y	Level D

7.0 DECONTAMINATION

7.1 Decontamination Procedures

All personnel and equipment leaving the exclusion zone must be properly cleaned and decontaminated. When there is evidence of chemical contamination during the site operations, all personnel will be decontaminated under the direction of the HSO. Clean-up and/or decontamination of personnel shall consist of washing off excessively soiled PPE with a disinfectant detergent scrub and water. At the very least, all personnel should wash their hands and face before leaving the exclusion zone. After washing, all disposable clothing (tyvek, gloves, etc.) will be removed and placed in a double lined plastic bag.

Sampling tools and any other non-disposable items will be decontaminated between sampling points, and at the direction of HRP personnel, to prevent cross-contamination of work areas or environmental samples, as applicable.

7.2 Emergency Decontamination

If immediate medical attention is required in an emergency, decontamination will be performed after the victim has been stabilized. If a worker has been exposed to an extremely toxic or corrosive material, then emergency decontamination will consist of flushing with copious amounts of water. If the victim cannot be decontaminated because it will interfere with emergency medical aid being administered, then the victim should be wrapped with plastic or other available items (i.e. an uncontaminated coverall) to reduce potential contamination of other personnel or medical equipment.

If a site worker has been overcome by heat related illness, then any protective clothing should be removed immediately. In the case of non-medical emergency evacuation, decontamination should be performed as quickly as possible, unless instant evacuation is necessary to save life or prevent injury.

7.3 Personal Hygiene

All employees will be required to wash hands and face prior to eating, smoking, drinking and going to the bathroom. Workers will be required to remove contaminated PPE and clothing prior to leaving the Contaminant Reduction Zone. All field personnel should avoid contact with potentially contaminated substances such as puddles, pools, mud, etc.

Due to the concerns over communicable diseases, all employees shall not touch or have direct contact with other individuals and will follow social distancing guidelines. In work conditions where required social distancing is impossible to achieve, affected employees shall be supplied PPE as appropriate, including a standard face covering, gloves, and eye protection. Workers will be supplied hand sanitizer, squeeze bottles of water, soap, disinfectant, and caution tape to set up social distancing boundaries as needed. Additional guidelines are described in the COVID-19 Site Specific HASP Addendum located in **Appendix G**.

8.0 EMERGENCY ACTION PLAN/SPILL RESPONSE

In the event of a worker injury, fire, explosion, spill, flood, or other emergency that threatens the safety and health of site workers, the following procedure will be followed:

1. If the emergency originates within the work area covered by this Plan, the HRP HSO shall act as the Emergency Coordinator. The emergency evacuation signal is an air horn or a loud yell. All emergency situations (including worker injuries, no matter how small) will be reported to the HSO, who will determine the appropriate emergency response, up to and including evacuation. Only the HSO may initiate evacuation of the work area. The HSO will be responsible for reporting any emergency situation to the appropriate authorities, using a telephone or other appropriate method.

2. In the case of an evacuation, site workers will exit the site along the safest route(s) and assemble with team members at a safe rally point. Those workers in the Exclusion Zone will follow the emergency decontamination procedures outlined in Section 7.2. Accounting of all site personnel will be conducted by the HSO using the personnel log at a location determined by the HSO.

3. HRP personnel are not permitted to participate in handling the emergency. Fire and medical emergencies will be handled by the local fire department and ambulance service. In the case of a spill of hazardous materials, a local commercial spill clean-up firm should be contacted (See Section 1.0).

In addition, the HSO/Project Manager must advise the site contact that the **New York State Department of Environmental Conservation (**NYSDEC**) NYS** Spill Hotline (1-800-457-7362) should be contacted within 2 hours of discovery and, if the spill quantity is greater than the Reportable Quantity (RQ) under CERCLA and/or SARA, the National Response Center (NRC) and Local Emergency Planning Committee should also be contacted. **State Spill Requirements:** All petroleum spills that occur within New York State (NYS) must be reported to the NYS Spill Hotline (1-800-457-7362) within 2 hours of discovery, except spills which meet **all of the following criteria:**

1. The quantity is known to be less than 5 gallons; and
2. The spill is contained and under the control of the spiller; and
3. The spill has not and will not reach the State's water or any land; and
4. The spill is cleaned up within 2 hours of discovery.

If the spill begins to flow overland and threatens to contaminate a storm drain or surface water, HRP personnel may attempt to contain and isolate the spill using any available resources, but only if, in the judgment of the HSO, such action will not expose the workers to dangerous levels of hazardous substances and is necessary to preserve life or property. In the event that a spill of material of any amount threatens to reach navigable waters, the NRC shall be contacted.

4. Once initial emergency procedures to protect worker safety and health have been addressed, and control of emergency has been completed, the HSO will complete an Investigation Report and submit this form to the appropriate personnel (HRP and/or client contact).

5. All site workers will be familiarized with the above procedures during the pre-entry briefing to be conducted before site work begins.

9.0 TRAINING/MEDICAL SURVEILLANCE

9.1 Training Requirements

All HRP and HRP subcontractor personnel who enter the work zone and/or Exclusion Zone must have successfully completed the 40-hour or 24-hour training requirement outlined in 29 CFR 1910(e). If the 40-hour or 24-hour training of any person occurred more than 12 months prior to commencement of work, then that person must have attended an 8-hour refresher course within the 12 months prior to commencement of work. If respirators are in use in the Exclusion Zone, then all personnel must have undergone respirator training and a fit test within the last 12 months. Training certificates and records for HRP employee(s) are on file at HRP. All other contractors will be required to supply written proof of training before being allowed into the Exclusion Zone.

9.2 Pre-Entry Briefing

Prior to commencement of work in an area of suspected contamination, HRP's Health and Safety Officer will conduct a pre-entry briefing with on-site contractors, which will include the following:

- Name of the HSO and person responsible for the visitor log.
- Description of the parcel as well as location of emergency telephones and the location/boundaries of the Exclusion Zone, Contamination Reduction Zone, and Support Zone, if established.
- Review of hospital locations and directions.
- Review of tasks to be conducted within the parcel by the site workers.
- Review of the Emergency Action Plan and rally point, including the nearest emergency communications and telephone numbers.
- The nature, level, and degree of anticipated hazards (physical and chemical) involved in the site work.
- Required personal protective equipment.
- Decontamination procedures.
- COVID-19 guidelines

The HSO should also, at this time, ensure that all on-site HRP and HRP subcontractor personnel have read the HASP and signed the last page of the original (Section 11.0). If additional information on the site becomes available, the HSO will call additional briefings as necessary.

9.3 Morning Safety (Tailgate) Meeting

The HRP HSO will conduct a safety overview meeting at the beginning of each workday on the site. The meeting will be given in addition to any tailgate meetings that the subcontractor conducts. A summary of the meeting topics signed by the personnel attending the meeting is included in **Appendix D**.

9.4 Medical Surveillance

All HRP and HRP subcontractor personnel entering the Exclusion Zone must have had a physical within the 12 months prior to commencement of site work. A physician's written opinion regarding fitness for work for each employee including work limitations, if any, is on file at HRP, as applicable. A written opinion for all other site personnel must be supplied prior to commencement of site work to the HRP HSO. Any work limitations for site personnel, or relevant medical information (i.e. allergic reactions to medication) should be included in this Plan.

10.0 AUTHORIZATIONS

Personnel authorized to enter the Exclusion Zone include the personnel listed in Section 2.4. Persons not listed in Section 2.4 may enter the Exclusion Zone only if the appropriate training and medical fitness certifications have been supplied to either the HRP Project Manager or Health and Safety Manager and the HSO or his/her designee on site has approved site entry. All personnel entering or leaving the Exclusion Zone must sign in and sign out with the recordkeeper.

11.0 FIELD TEAM REVIEW

All HRP personnel shall sign below after reading this HASP and shall agree with the following statement:

"I have read and understand this site specific Health and Safety Plan.
I will comply with the provisions set forth therein."

Printed Name	Signature	Date

12.0 APPROVALS

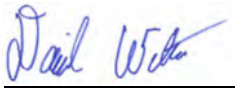
This plan meets the minimum requirements of 29 CFR 1910.120 and 29 CFR 1929.65 and has been written for specified site conditions, dates, and personnel, and must be amended if conditions change. By their signature, the undersigned certify that this HASP is approved and will be utilized during activities at the project.

Christopher Tedder, RG — Date
On-Site Health and Safety Officer



08/29/23

Derek Roy — Date
Project Manager



11/06/2023

David Webster, CSP — Date
Certified Safety Professional

Subcontractor:

I have been provided a copy of this HASP for review.

[Name] — Date

Representing _____

The Designated Competent person representing [subcontractor] at the site will be

_____.

Any alternate Competent Person will be noted in the Daily Job Brief Record (**Appendix D**).

ADDITIONAL APPROVALS (or Re-Approvals)	
Name:	**Date:**

13.0 RECORDKEEPING

By the completion of the Project this Site-Specific HASP Document, and all associated records (completed Safe Work Permit Forms, Daily Briefs Forms, Monitoring data, etc.) must be provided to the Office Administrative Assistant at the Office that implemented the Project. The Administrative Assistant will then electronically store these records into the project folder. It is expected that some scanning will be necessary.

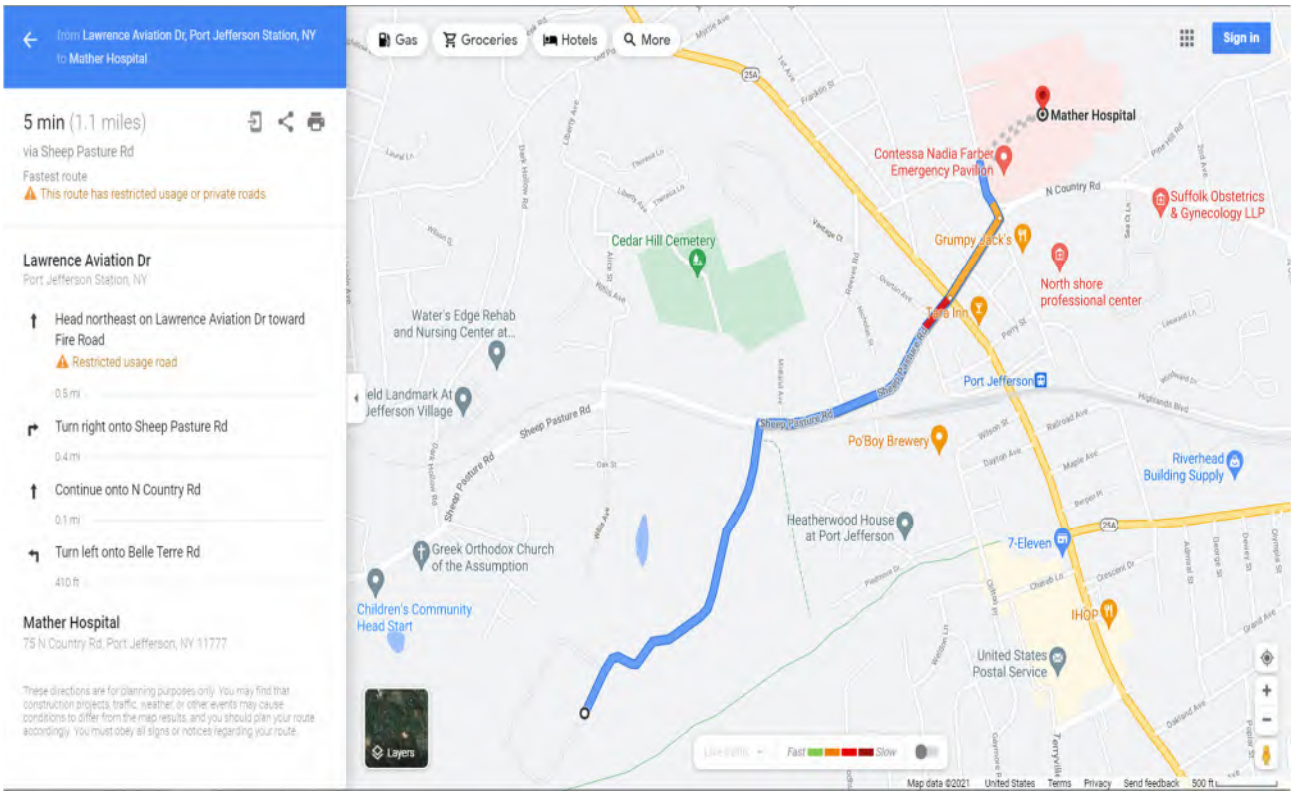
FIGURES

Figure 3: Route and Map to Nearest Hospital

Directions to Mather Hospital

Total Estimated Time: 5 Minutes
Total Estimated Distance: 1.1 Miles

End at Mather Hospital
75 N Country Rd, Port Jefferson, NY 11777



TABLES

TABLE 1a: Chemical Hazards Known or Suspected On-Site

TABLE 1a

CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-SITE

Highlight those that apply

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2] /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
1,1,1 Trichloroethane	44 ppm	350 ppm	350 ppm	---	700 ppm	Inh, Ing, Con	Head, Lass, CNS, Derm
1,1,2-Trichloroethane	---	10 ppm	10 ppm	----	[100 ppm]	Inh, Ing, Abs, Con	Eyes, Nose Irrit, Resp Irrit, CNS, Liver, Kidney Damage, Derm, [Carc]
1,2,4 Trimethylbenzene 1,3,5 Trimethylbenzene		25 mg/m^3	25 ppm	25 mg/m^3	ND	Inh, Ing, Con	Irrit Eyes, Skin, Nose, Throat, Resp Sys, Bron, Hyprochronic Anemia, Head, Drow, Ftg, Dizz, Nau, Inco, Vomit, Conf, Chemical Pneu (aspir lig)
1,1' Biphenyl	0.0062 mg/m^3	0.2 ppm	0.2 ppm	---	100 mg/m^3	Inh	
1,1-Dichloroethane	120 ppm	100 ppm	100 ppm	---	3,000 ppm	Inh, Ing, Con	CNS Depres, Skin Irrit, Liver, Lung and Kidney Damage
1,1-Dichloroethylene***	500 ppm	---	5 ppm	---	---	Inh, Con	CNS depress, Resp, [Carc]
1,2-Dichlorobenzene	50 ppm	50 ppm	25 ppm		200 ppm	Inh, Ing, Abs, Con	Irrit, Resp
1,2-Dichloroethylene	26-87 ppm	200 ppm	200 ppm	---	1,000 ppm	Inh, Ing, Con	Vomit, Irrit Eyes, Resp Sys; CNS Depres
1,2-Dichloropropane	130-190 ppm	75 ppm	75 ppm	---	[400 ppm]	Inh, Con, Ing	Eye irritation, Drow, light-headedness; irritated skin, [Carc]
1,3-Dichlorobenzene	---	----	---	----	---	----	----
1,4-Dichlorobenzene	20 ppm	75 ppm	10 ppm	----	[150 ppm]	Inh, Ing	[Carc], Eye Irrit, swelling around eye, headache, nausea, vomiting
1-Methylnaphthalene	0.02 ppm	---	---	---	---	---	---
2,4-Dichlorophenol	1.4007 mg/m^3	---	---	---	---	---	---
2,4-Dimethylphenol	0.001 mg/m^3	---	---	---	---	---	---
2-Methylnaphthalene	0.01 ppm	---	---	---	---	---	---
2-Methylphenol (o-cresol) [skin]	1.4 mg/L	5 ppm	5 ppm	---	250 ppm	Inh, Abs, Ing, Con	Confusion, depression, Resp Fail; difficulty breathing, irregular rapid respiration, weak pulse; skin, eye burns; dermatitis

TABLE 1a

CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-SITE

Highlight those that apply

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2] /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
3, 3'-Dichlorobenzidine	---	None	**---**	---	---	Inh, Abs, Ing, Con	Sens, Derm, Head, Dizz, Burns, GI Upset, [Carc]
4-Isopropyltoluene	---	---	---	---	---	Con, Inh, Ing	Defat, Eryt
Acenephthene	0.5048 mg/m^3	---	---	---	---	---	---
Acenaphthylene	---	---	---	---	---	---	---
Acetone	47.5 mg/m^3	1,000 ppm	500 ppm		2,500 ppm	Ing, Inh, Con	Head, Dizz; Irrit Eyes, Nose, Throat; Derm, CNS, Depress, Derm
Acetonitrile	70 mg/m^3	40 ppm	20 ppm	---	500 ppm	Inh, Ing, Abs, Con	Asphy; Nau, Vomit; Chest Pain; Weak, Stupor, Convuls; Eye Irrit
Aldrin	---	0.25 mg/m^3	0.25 mg/m^3	---	25 mg/m^3	Inh, Abs, Ing, Con	Head, Dizz, Nau, Vomit, Mal, Myo, [Carc]
Anthracene (Coal Tar Pitch)	---	0.2 mg/m^3			[80 mg/m^3]	Inh, Con	Derm, bron, [carc]
Antifreeze		50 ppm	100 mg/m^3 (aerosol)	---	ND	Inh, Ing, Con	Irrit Eyes, Skin, Nose, Throat, Nau, Vomit, Abdom Pain, Lass, Dizz, Stup, Conv, CNS, Depres, Skin Sen
Arsenic	----	0.010 mg/m^3	0.01 mg/m^3	----	[5 mg/m^3]	Abs, Inh, Con, Ing	Derm; GI; Resp Irrit; ulceration of nasal septum; Resp, Irrit, Hyper Pig of Skin, [Carc]
Asbestos	----	0.1 fiber/cm^3	0.1 fiber/cm^3	----	Lowest feasible concentration. 0.1 fiber/cm^3 for fibers >5 µm	Inh, Ing, Abs	Resp Irrit; Chest Pain; Cough; dysp
Barium (elemental)	---	0.5 mg/m^3	0.5 mg/m^3		50 mg/m^3 (barium components)	Inh, Ing, Con	Resp. Irrit, GI, Muscle Spasm, Eye Irrit, Slow Pulse; skin burns
Benzene*	4.7 ppm	1 ppm	0.5 ppm	5 ppm	[500 ppm]	Inh, Ing, Abs, Con	Irrit Eyes, Nose, Throat; Head, Nau, Derm, Ftg, Anor, Lass, [Carc]

TABLE 1a

CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-SITE

Highlight those that apply

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2] /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
Benzo(a)anthracene (coal tar pitch)	---	0.2 mg/m^3			[80 mg/m^3]	Inh, Con	[Carc], Derm, Bron
Benzo(a)pyrene (coal tar pitch)	---	0.2 mg/m^3	---		[80 mg/m^3]	Inh, Con	[Carc], Derm, Bron
Benzo(b)fluoranthene (coal tar pitch)	---	0.2 mg/m^3	---		[80 mg/m^3]	Inh, Con	[Carc], Derm, Bron
Benzo(g,h,i)perylene (coal tar pitch)	---	0.2 mg/m^3			[80 mg/m^3]	Inh, Con	[Carc], Derm, Bron
Benzo(k)fluoranthene (coal tar pitch)	---	0.2 mg/m^3			[80 mg/m^3]	Inh, Con	[Carc], Derm, Bron
Bis (2-ethylhexyl) Phthalate**	N/A	5 mg/m^3	5 mg/m^3	10 mg/m^3	[5,000 mg/m^3]	Inh, Ing, Con	[Carc], Irrit Eyes
Cadmium (dust)	---	0.005 mg/m^3	Lowest concentration feasible 0.01 mg/m^3	---	[9 mg/m^3]	Inh, Ing	CNS, Resp, Irrit, Vomit, Cough, Head, Chills, Nau, Diarr, Pulm Edema, Dysp, Chest Tight, [Carc]
Carbazole	---	---	---	---	---	Inh	---
Carbon disulfide	0.1-0.2 ppm	20 ppm	1 ppm	30 ppm	500 ppm	Inh, Abs, Ing, Con	Diz, Head,Ftg, Ner, anorexia, trembling hands, loss of fine motor coord, gastritis, eye, skin burns, Derm
Carbon Tetrachloride***	21.4 ppm	10 ppm	5 ppm	25 ppm	[200 ppm]	Inh, Abs, Con, Ing	CNS Depres, Nau, Vomit, Irrit, Irrit Eyes, Skin, Drow, Dizz, [Carc]
Chlorobenzene***	0.98 mg/m^3	75 ppm	10 ppm	---	1,000 ppm	Inh, Ing, Con	Irrit, Drow, CNS, Depres, Eyes, Skin, Nose, Inco.
Chloroform***	85 ppm	50 ppm	10 ppm	50 ppm	[500 ppm]	Inh, Ing. Con, Abs	Dizz, Dullness, Nau, Head, Ftg, Irrit Eyes, Skin, Conf, [Carc]
Chromium	---	1 mg/m^3	0.5 mg/m^3	---	250 mg/m^3	Inh, Ing, Con	Irrit Eyes, Sens Derm
Chrysene (coal tar pitch)		0.2 mg/m^3	---		[80 mg/m^3]	Inh, Con	Derm, Bron, [Carc]
Cis-1-2-Dichloroethylene	---	200 ppm	200 ppm	----	1000 ppm	Inh, Con, Ing	Irrit Eyes, Resp, CNS Depress

TABLE 1a

CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-SITE

Highlight those that apply

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2] /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
Copper (dusts and mists) (fumes)		1 mg/m^3 0.1 mg/m^3	1 mg/m^3 0.2 mg/m^3	----	100 mg/m^3	Inh, Ing, Con	Vomit, Derm, CNS, Irrit, Derm, Nau, Taste (metallic)
Cyanide	0.9 mg/m^3	5 mg/m^3	5 mg/m^3 (10 min)	5 mg/m^3	25 mg/m^3	Inh, Ing, Abs, Con	Weak, Head, Nau, Conf, Cyan
Dibenzo(a,h)anthracene						Inh, Ing	
Dichloromethane	540 mg/m^3	25 ppm	50 ppm	125 ppm	[2,300 ppm]	Inh, Abs, Ing, Con	Irrit Eyes, Skin, lass, drow, dizz, Numb, tingl, Nau, [Carc]
Diethylphthalate**	---	None	5 mg/m^3	---	N.D.	Inh, Ing, Con	Irrit Eyes, Skin, Nose, Throat, Head, Dizz, Nau, Lac, Possible Polyneur, Vestibular Dysfunc, Pain, Numb, lass, Spasms in Arms and Legs
Di-n-octylphthalate	---	---	---	---	---	Inh, Ing, Con	---
Dimethylpthalate	---	5 mg/m^3	5 mg/m^3	---	2,000 mg/m^3	Inh, Ing, Con	Irrit, Resp, Abdom
Ethyl Benzene*	8.7 mg/m^3	100 ppm	100 ppm	125 ppm	700 ppm	Inh, Abs, Con	Head. Irrit, Derm, Narc., Irrit Eyes, Skin; Coma
Fluoranthene		0.2 mg/m^3	0.2 mg/m^3			Ing, Inh	[Carc]
Fluorine*	6 mg/m^3	0.1 ppm	1 ppm	2 ppm	25 ppm	Inh, Con	
Fuel Oil/#2	----	----	300 ppm	----		Inh, Abs, Ins, Con	Irrit Eyes, Skin, Derm, Head, Ftg, Blurred Vision, Dizz, Conf
Ideno(1,2,3-cd)pyrene		0.2 mg/m^3				Ing, Inh	
Lead (inorganic forms and dust as Pb)****		0.05 mg/m^3	0.05 mg/m^3		100 mg/m^3	Inh, Ing, Con	Irrit, Cns, Vomit, Narco, Weak, Pall, Insom, Lass, Abdom, Constip
Mercury (organic alkyl compounds) [skin]		0.01 mg/m^3	0.01 mg/m^3	0.03 mg/m^3	2 mg/m^3	Inh, Abs, Ing, Con	Irrit Eyes, Skin; Cough & Chest Pain, Bron Pneu, Tremor, Insom, Irrty, Indecision, Head, Ftg, Weak, Stomatitis, Salv, GI Dist, Anor, Low-wgt, Ataxia

TABLE 1a

CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-SITE

Highlight those that apply

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2] /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
Mercury (compounds)	----	0.1 mg/m^3	0.025 mg/m^3	0.1 mg/m^3	10 mg/m^3	Inh, Abs, Ing, Con	Irrit Eyes, Skin; Cough & Chest Pain, Bron Pneu, Tremor, Insom, Irrty, Indecision, Head, Ftg, Weak, Stomatitis, Salv, GI Dist, Anor, Low-wgt, Ataxia
Methanol	13.1150 mg/m^3	200 ppm	200 ppm	---	6,000 ppm	Inh, Abs, Ing, Con	Irrit Eyes, Skin, Resp, Head, drow, dizz, Nau, Vomit, vis dist, Optic, derm
Methyl Ether	----	----	---	----	---	Inh	Poison
Methyl Ethyl Ketone (2-Butanone)***	0.7375 mg/m^3	200 ppm	200 ppm	300 ppm	3,000 ppm	Inh, Con, Ing	Irrit Eyes, Skin, Nose, Throat, Head, Dizz, Vomit, Derm
Methylene Chloride	540 mg/m^3	25 ppm	50 ppm	125 ppm	[2,300 ppm]	Inh, Ing, Con, Abs	Ftg, Weak, dizz, drow, Numb, Tingle [carc], Irrit Eyes, Skin, Nau
Mineral Spirit	20 ppm	500 ppm	100 ppm	---	20,000 mg/m^3	Inh, Ing, Con	Irrit Eyes, Nose, Throat, Dizz, Derm, Chemical pneu
Methyl tert butyl ether (MTBE)	---	---	50 ppm	---		Inh, Abs	
Naphtha	0.86 ppm	100 ppm	400 ppm	---	1,000 ppm	Inh, Con, Ing	Light Head, Drow, Irrit, Derm, Irrit Eyes, Skin, Nose
Naphthalene*	0.084 ppm	10 ppm	10 ppm	15 ppm	250 ppm	Inh, Abs, Ing, Con	Eye irritation; headache; confusion, excitement, malaise (vague feeling of ill-being); nausea, vomiting, abdominal pain; irritated bladder; profuse sweating; renal shutdown; dermatitis
Nickel (metal)	---	1 mg/m^3	1.5 mg/m^3	---	[10 mg/m^3]	Inh, Ing, Con	Head, Verti, Nau, Vomit, Pain, Cough, Weak, Convuls, Delirium, Pneu, ,[Carc]
Nitrobenzene	0.0235 mg/m^3	1 ppm	1 ppm	---	200 ppm	Inh, Abs, Ing, Con	Irrit Eyes, Skin, Anoxia, Derm, Anem, Methem

TABLE 1a

CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-SITE

Highlight those that apply

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2] /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
n-Butylbenzene	---	---	---	---	---	---	---
n-Propylbenzene	---	---	---	---	---	---	---
PCBs 42% chlorine (Aroclor 1242)	---	1 mg/m^3 (skin)	1 mg/m^3 (skin)	---	[5 mg/m^3]	Inh, Abs, Ing, Con	Irrit Eyes, Chloracne, Liver Damage [carc]
PCBs 54% chlorine (Aroclor 1254)	---	0.5 mg/m^3 (skin)	0.5 mg/m^3 (skin)	---	[5 mg/m^3]	Inh, Abs, Ing, Con	Irrit Eyes; Chloracne, Liver Damage [carc]
Petroleum Distillates	---	500 ppm	100 ppm		[1,100 ppm]	Inh, Ing, Con	Dizz, Drow, Head, Dry Skin, Nau, Irrit Eyes, Nose, Throat, [Carc]
Phenanthrene (Coal Tar Pitch)		0.2 mg/m^3	0.2 mg/m^3		[80 mg/m^3]	Inh, Con	Derm, bron, (carc)
Phenol**	0.1786 mg/m^3	5 ppm	5 ppm	---	250 ppm	Inh, Abs, Ing, Con	Irrit Eyes, Nose, Throat, Anor, Low Wgt, Weak Musc Ache, Pain, Dark Urine, Cyan, Liver, Kidney Damage, Skin, Burns, Derm, Ochronosis, Tremor, Convuls, Twitch
Pyrene		0.2 mg/m^3			[80 mg/m^3]	Inh, Con	[Carc]
Sec-Butylbenzene	---	---	---	---	---	---	---
Selenium	N/A	0.2 mg/m^3	0.2 mg/m^3	Unknown	1 mg/m^3	Inh, Ing, Con	Irrit, Head, Fever, Chills, Skin/Eye Burns, Metallic Taste, GI, Dysp, Bron
Silver (metal and soluble compounds as Ag)	----	0.01 mg/m^3	Metal = 0.1 mg/m^3 Soluble 0.01 mg/m^3		10 mg/m^3	Inh, Ing, Con	Blue-gray Eyes, Nasal Septum, Throat, Skin; Irrit, Ulcer, Skin, GI Dist
Tetrachloroethylene (a.k.a. perchloroethylene)***	4.68 ppm	100 ppm	25 ppm	200 ppm	[150 ppm]	Inh, Ing, Con, Abs	Irrit Eyes, Skin, Nose, throat, Resp. Nau, flush face, Neck, dizz, inco, head, drow, eryth, [Carc]

TABLE 1a

CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-SITE

Highlight those that apply

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2] /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
Toluene*	2.14 ppm	200 ppm	50 ppm	300 ppm	500 ppm	Inh, Abs, Ins, Con	Resp, Irrit, Ftg, Conf, Dizz, Head, Derm, Euph, Head, Dilated Pupils, Lac, Ner, Musc FTg, Insom, Pares, Derm, lass
Petroleum Distillates (naphtha)	10 ppm	100 ppm	400 ppm	---	1,000 ppm	Con, Inh, Ing	---
Trans 1,2-Dichloroethylene	0.3357 mg/m^3	200 ppm	200 ppm	---	1,000 ppm	Inh, Con	Irrit, Resp, CNS depress
Trichloroethylene***	21.4 ppm	100 ppm	50 ppm	200 ppm	[1,000 ppm]	Inh, Con, Abs, Ing	Head, Vert, Nau, Vomit, Derm, Vis Dist, Tremors, Som, Nau, Irrit Eyes, Skin, Card Acc., Ftg, [Carc]
Trichlorofluoromethane	28 mg/m^3	1,000 ppm	1,000 ppm		2,000 ppm	Inh, Con, Ing	Inco, trem, derm, card, asph, frost
Trichlorotrifluoroethane	45 ppm	1,000 ppm	1,000 ppm	1,250 ppm	2,000 ppm	Inh, Con, Ing	Irrit Skin, throat, Drow, Derm, CSN, Depress
Vinyl Chloride***	10-20 ppm	1 ppm	1 ppm	5 ppm	ND	Inh, Con	Lass, Abdom, Gi Bleeding; Hepatomegaly; Pallor or Cyan of Extremities; Liq: Frostbite; [Carc]
VM&P Naphtha (petroleum naphtha)	---	---	300 ppm	---	ND	Con, Ing, Inh	Irrit Eyes, Nose, Throat, Dizz, drow, head, nau, dry skin, chem. Pneumonitis
Xylene*	4.5 mg/m^3	100 ppm	100 ppm	150 ppm	900 ppm	Inh, Ing, Abs, Con	Dizz, Drow, Irrit, Excite, Nau, Vomit, Eyes, Skin, Nose, Throat
Zinc (oxide)	---	5 mg/m^3	2 mg/m^3	---	500 mg/m^3	Inh	Dry Throat, Cough, Chills, Tight Chest, Blurred Vision
4,4' DDD	---	---	---	---	---	Ing, Inh, Con	---
4,4' DDE	---	---	---	---	---	Ing, Inh, Con	---
4,4' DDT	5.0725 mg/m^3	1 mg/m^3	1 mg/m^3	---	[500 mg/m^3]	Inh, Abs, Ing, Con	Irrit Eyes, Skin, Pares, Tongue, Lips, Face, Trem, Anxi, Dizz, Conf, Mal, Head, Lass, Conv, Paresi Hands, Vomit, [Carc]

TABLE 1a

CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-SITE

Highlight those that apply

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2] /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
Aldrin		0.25 mg/m^3	0.25 mg/m^3	---	[25 mg/m^3]	Inh, Abs, Ing, Con	Head, Dizz, Nau, Vomit, Mal, Myo [Carc]
Chlordane [skin]	0.0084 mg/m^3	0.5 mg/m^3	0.5 mg/m^3		[100 mg/m^3]	Inh, Abs, Ing, Con	Blurred vision, confusion, delirium, cough; abdominal pian, nausea, vomiting diarrhea; irritability, tremor, convulsions [Carc]
EDB	76.8 mg/m^3	20 ppm		30 ppm	[100 ppm]	Inh, Abs	Resp. Irr, Eye Irr. [Carc]
Endosulfan I Endosulfan II	---	0.1 mg/m^3	0.1 mg/m^3	---	N.D.	Inh, Abs, Ing, Con	Irrit, Skin, Nau, Conf, Agit, Flush, Dry, Trem, Conv, Head
Endosulfan Sulfate		---	0.1 mg/m^3	---	---	Ing, Con	---
Endrin	1.8 x 10^{-2} ppm	0.1 mg/m^3	0.1 mg/m^{-3}	---	2 mg/m^3	Inh, Abs, Ing, Con	Epil Conv, Stup, Head, Dizz, Abdom, Nau, Vomit, Insom, Agress, Conf, Drow, Lass, Anor
Endrin Aldehyde	1.8 x 10^{-2} ppm	---	---	---	---	Inh, Con	---
Endrin Ketone	---	---	---	---	---	---	---
Heptachlor	0.02 ppm	0.5 mg/m^3	0.05 mg/m^3	---	[35 mg/m^3]	Inh, Abs, Ing, Con	In animals, Trem, Conv, [Carc]
Heptachlor epoxide	0.02 ppm	---	0.05 mg/m^3	---	---	Ing, Inh	Trem, Conv, [Carc]
Hydrogen Cyanide(Hydrocyanic Acid)	0.9 mg/m^3	10 ppm (11 mg/m^3)	4.7 ppm	4.7 ppm	50 ppm	Con, Inh, Ing, Abs	Asphy & death at high levels; Weak, Head, Conf, Nau, Vomit, Incr. Rate and Depth of Respiration or Respiration Slow and Gasping

TABLE 1a

CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-SITE

Highlight those that apply

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2] /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]

NOTES

* = Constituent found in ETPH

**=Constituent found in Acid/Base/Neutral Extractable Compounds

***=Constituent found in Volatile Organic Compounds

****=Constituent found in Leaching Lead

[1]PEL = Permissible Exposure Limit. If no PEL is available, then the NIOSH Threshold Limit Value (TLV) should be used, if available.

[2]Ceiling limit or Short Term Exposure Limit (STEL), if available. Again, the NIOSH TLV may be used if no OSHA standard exists.

[3]Abbreviations are contained on the next page

[ ] = Potential Occupational Carcinogen

ND = Not Been Determined

ABBREVIATIONS

abdom = Abdominal
abs = Absorption
aggress = Aggressiveness
agit = Agitation
anor = Anorexia
anos = Anosmia (loss of the sense of smell)
Anxi = anxiety
anem – Anemia
aspir = Aspiration
asph – asphyxia
bron = Bronchitis
bron pneu = Bronchitis pneumonitis
[carc] = Potential occupational carcinogen
Card = Cardiac arrhythmias
CNS = Central nervous system
conf = Confusion
constip = Constipation
con = Skin and/or eye contact
conv = Convulsions
corn = Corneal
cyan = Cyanosis
defat = Defatting
depres = Depressant/Depression
derm = Dermatitis
diarr = Diarrhea
dist = Disturbance
dizz = Dizziness
drow = Drowsiness
dry = Dry mouth
dysp = Dyspnea (breathing difficulty)
emphy = Emphysema
epil-conv = Epileptiform convulsions
eryth = Erythema
euph = Euphoria
fib = Fibrosis
frost = frostbite
ftg = Fatigue
flush = Flushing
GI = Gastrointestinal
head = Headache
hyperpig = Hyperpigmentation
inco = Incoordination
ing = Ingestion
inh = Inhalation
inj = Injury
insom = Insomnia
irrit = Irritation
irrty = Irritability
lac = Lacrimination (discharge of tears)
lass = Lassitude (weakness, exhaustion)
li-head = Lightheadedness
liq = Liquid
low-wgt = Weight loss
mal = Malaise (vague feeling of discomfort)
malnut = Malnutrition
methem = Methemoglobinemia
myo = Myochonic (jerks of limbs)
mg/m = milligrams/cubic meter
muc memb = Mucous membrane
mus ftg = Muscle fatigue
narco = Narcosis
nau = Nausea
ner = Nervousness
numb = Numbness
optic = Optic nerve damage (blindness)
pall = Facial pallor
parap = Paralysis
ppm = Parts per million
pares = Paresthesia
paresi = Paresis
peri neur = Peripheral neuropathy
pneu = Pneumonitis
prot = Proteinuria
pulm = Pulmonary
peri neur = Peripheral neuropathy
pneu = Pneumonia
prot = Proteinuria
pulm = Pulmonary
repro = Reproductive
resp = Respiratory
skin sen = skin sensitization
salv = Salvation
som = Somnolence (sleepiness unnatural drowsiness)
subs = Substernal (occurring beneath the sternum)
stup = Stupor
sys = System
tingle = tingle limbs
trem – Tremors
verti = Vertigo
vis dist = Visual disturbance
vomit = Vomiting
weak = Weakness

TABLE 1b: Physical Hazards Known or Suspected On-Site

TABLE 1b

PHYSICAL HAZARDS KNOWN OR SUSPECTED ON-SITE

Description of Hazard	Methods to Identify and Minimize	Potential for Occurrence	Potentially Affected Tasks
1. Operating Heavy Equipment	• Utilizing proper equipment operation methods • Maintain safe clearance distances • Wear appropriate eye/ear protection according to manufacturer's recommendations	Moderate	Observation of Excavation/Sampling
2. Inclement weather	• Determine probable weather conditions prior to arrival at site • Avoid working during hurricanes, blizzards, persistent heavy rain or snow, close thunderstorms	Moderate	Observation of Excavation/Sampling
3. Heat/cold Stress	• Determine probable weather conditions prior to arrival at site • Wear proper clothing • Monitoring of yourself and team mates • Drink plenty of fluids • Utilize work breaks as often as necessary • Avoid working in extreme cold conditions	Moderate	Observation of Excavation/Sampling
4. Slip, trip, and fall hazards caused by irregular and loose rocky topography	• Wear appropriate footwear to increase traction when possible • Be aware of surroundings, be aware of daily changing site conditions during demolition	Moderate	Observation of Excavation/Sampling/ Site Walks

TABLE 1b

PHYSICAL HAZARDS KNOWN OR SUSPECTED ON-SITE

Description of Hazard	Methods to Identify and Minimize	Potential for Occurrence	Potentially Affected Tasks
5. Utilities	• Complete a Call Before You Dig markout prior to the work start date • Obtain buried private lines information from and clear sampling locations with Site Contact • Avoid using heavy equipment or drill rig in close proximity to overhead utilities • Inspect sampling areas for Call Before You Dig markings; inspect catch basins and manholes to determine buried pipeline directions prior to sampling • Avoid sampling within area of pavement cuts that may be indicative of buried lines	Moderate	Observation of Excavation/Sampling
6. Falling into Test Pit or other Fall Hazards	• Wear appropriate footwear to increase traction • Be aware of surroundings • Do not stand too close to the edge of the test pit/ existing pit	High	Observation of Test Pit/ drainage of pits located on-site
7. Cave in of Test Pit	• Be aware of surroundings • Do not enter a Test Pit over three feet deep	Low	Observation of Test Pit
8. Inhalation of Volatiles	• Implement and adhere to action levels stipulated in air monitoring program for volatile organics • Wear appropriate protective equipment • Report potential exposure symptoms immediately • Utilize engineering controls such as fans	Low	Observation of Excavation/Sampling

TABLE 1b

PHYSICAL HAZARDS KNOWN OR SUSPECTED ON-SITE

Description of Hazard	Methods to Identify and Minimize	Potential for Occurrence	Potentially Affected Tasks
9. Skin contact with volatile organic compounds, semi volatile organic compounds, metals, TPHs, PCBs, pesticides, cyanide	• Wear appropriate protective clothing • Follow proper decontamination procedures • Report potential exposure symptoms immediately	Low	Observation of Excavation/Sampling

APPENDIX A

Safety and Logistics Planning Call Log

Safety and Logistics Call Log
DEC009808

Date of Call

Work Assignment Number / Task

DEC Site Name and Number

Names of Attendees (and phone #s):

HRP

- HRP PM
- HRP SSO
- HRP Other
- HRP Other
- HRP Other

DEC

- DEC PM
- DEC Other

Subcontractors

- Driller Contact
- Utility Survey
- Surveyor
- Construction
- Other

Other

Brief Description Scope of Work (Task Specific) Use additional forms for additional tasks

Logistics:

Date of Work:

Time to Meet:

Site Contact (phone)

Notification of Site Contact made by:

Describe any unusual site specific conditions/logistics here (if any):

Notes below as needed:

Water Needed? Source Confirmed?	Y / N
Electricity Needed? Source Confirmed?	Y / N
Water Storage Needed?	Y / N
Water Discharges? Permits Needed/Attained?	Y / N
Air Monitoring – CAMP?	Y / N

Will there be intrusive work? Y / N

Locations marked in the field? Y / N

NYS Code Rule 753/Dig Safe System: Ticket Number:

Confirmed that mark-out complete? Y / N

Anticipated Subsurface Conditions (Geology, Utilities, etc.):

Anticipated Depth to Groundwater:

Will NAPL/Product be Present: Y / N Describe:

Safety and Logistics Call Log
DEC009808

Will there be any other parties entering the work zones? Describe control measures:

Lab and Equipment:

Equipment: Y / N PID IP Water Level Indicator CAMP Pumps Controllers Survey Eq. GSP
Other: _____

Lab Analytical Required: Y / N VOCs SVOCs Metals PFAS 1,4D PCBs Pest/Herb
Other: _____

Media Tested: Soil Sediment Groundwater Surface Water Sub-slab[soil] Vapor Indoor Air
Notes of sample collection methods: _____

Bottle Order Received/Checked? Y / N
How will samples be conveyed to lab? _____
Sample TAT? Standard 24 hr TAT 48 hr TAT Other: _____

Review Site – Specific Hazards (per Site-Specific HASP to be provided prior to all parties):

Site Constituents of Concern: VOCs SVOCs PFAS 1,4-Dioxane
(circle) HVOCs
AVOCs
Metals pesticides herbicides
Asbestos PCBs
Lead Other: _____
Biologicals

Site Setting:

Urban	Suburban	Unoccupied
Traffic	Bystanders	Crime Plants Animals Vectors
Overhead Utilities		Underground Utilities Large Equipment
High Voltage		Flood/Tidal Limited Access
Confined Space		

Task-Specific Chemicals and Hazards (describe): _____
PPE Level (circle): D C B A Modifications: _____
Glove Types: _____ Face covering needed? Y / N
Other specialty PPE: _____

Safe to Work Alone: Y / N
Other Precautions: Y / N Describe: _____

COVID 19 Protocols to be Observed: Y / N

Waste Containment:
How/where will materials be contained, labelled, stored, or disposed?

Miscellaneous:

APPENDIX B
Personnel Log

PERSONNEL LOG				
Name	**Representing**	**Date**	**Time In**	**Time Out**

APPENDIX C
Supervisor's Investigation Report

INCIDENT REPORT

Section 1.0: Complete By Employee and Project Manager

(provide to Human Resources Manager) Incident Case No. _____

Employee Name: Employee Title/Position:	Age: Sex: ☐ Female ☐ Male	Time employee began work: Date of Incident: Time of Incident:	Weather Conditions: Date of Report: Time Report Completed:
Department: Office Location: Supervisor:			
Employee Address: Street: City/Town: Zip Code: Phone Number:	Location of Incident: Address: City/Town: State:		

Type of Incident:

☐ Motor Vehicle Accident ☐ Other Accident or Injury ☐ Near Miss (no actual accident or injury occurred)

- Did the incident or near miss occur during business hours and/or travel to and from a client location? Yes / No
- If a motor vehicle accident, was it a personal vehicle or company vehicle? Yes / No / Not Applicable
- Did the incident result in first aid treatment (either during or outside of business hours? Yes / No (if yes, add details below)
- Did the incident result in medical treatment beyond first aid? Yes / No (if yes, add details below)
- Did the incident result in lost time or days away from work? Yes/No (lost time begins the day after incident/injury)
  - If yes, provide number of days away from work:_____

Notes/Details:

_____

_____

If injuries occurred, list names and describe nature, degree, and body part injured: Number of injured:_____

1.

2.

Complete Section 3.0

WITNESS STATEMENT: WHAT HAPPENED AND WHAT WAS THE EMPLOYEE DOING BEFORE THE INCIDENT OCCURRED? WHAT WAS THE EMPLOYEE DOING WHEN THE INCIDENT OCCURRED? WHAT WAS THE EMPLOYEE DOING AFTER THE INCIDENT OCCURRED?	Describe what took place? Who was at fault for vehicle accidents, citation? Was power equipment involved, if so, describe?

WHAT WAS THE NATURE OF THE INJURY OR ILLNESS?	Tell us the body part that was affected and how it was affected – be specific Examples: strained lower back; chemical burn on hand
WHAT WAS THE ROOT CAUSE OF THE INCIDENT? List other individual involved in Section 3. COULD INCIDENT HAVE BEEN AVOIDED? HOW?	Get all the facts by studying the Job and situation involved. Question by use of WHY - WHAT – WHERE – WHEN – WHO – HOW Were there other factors (e.g., noise, ventilation, illumination, fatigue, age, medical conditions) that contributed to the accident?
WAS TRAINING FOR THE WORK ACTIVITY PROVIDED: TYPE: DATES:	WERE WARNING SIGNS OR LABELS POSTED:
WHAT SHOULD BE DONE? HOW CAN INCIDENT BE AVOIDED IN THE FUTURE?	WAS PERSONAL PROTECTIVE EQUIPMENT USED? NEEDED: AVAILABLE: CONTRIBUTED TO INJURY:
WHAT HAVE YOU DONE THUS FAR?	Take or recommend action, depending upon your authority. Follow up – was action effective?
HOW WILL THIS IMPROVE OPERATIONS?	OBJECTIVE Eliminate job hindrances

Completed by:	Reviewed by:	Date

Section 2.0: Complete By Supervisor or Human Resources Manager

Name: Role (witness, observer, injured, participant, etc.):	Address: Phone Number
Name: Role:	Address: Phone Number
Name: Role:	Address: Phone Number
Name: Role:	Address: Phone Number
Name: Role:	Address: Phone Number
Name: Role:	Address: Phone Number

Section 3.0: Corrective Actions (To be Completed by OHSM and CHSO)

Are corrective actions warranted? ☐ Yes ☐ No If so, proceed with corrective action list

Corrective Actions. List long term actions to be taken as a result of incident (use additional sheets if needed)	How was the corrective action implemented?	Target date of completion

OHSM Name:	CHSO Name:
OHSM Signature:	CHSO Signature:

End of incident report. Section 4.0 is to be completed and maintained by the Human Resources Department.

Section 4.0: Complete By Human Resources Manager

Incident Report Case No. _____

The information on this page is considered CONFIDENTIAL and must be treated as such. This page will only be available to Human Resources Department or the employee's supervisor.

Insured Name:	Employee Hire Dates: Start at Company: Current Position:
Policy Number:	Is employee a company: Owner, Officer, Neither.
Employee Soc. Sec. No.:	Marital Status: Spouse Name:
Was Employee Pay Interrupted, or paid in full for time:	Employee Pay Period: Weekly, Bi-Weekly, Monthly, Other (specify)
Employee Compensated by hourly or salary? Wage Information: (tips, bonuses, commission)	Typical No. of hours worked per day____, hours per week____. Typical Start of day time_____, end of day time_____.
Date of Stop Work: Date Returned to Work:	How often has employee visited doctor/hospital?
Doctor: Authorized by Co.: Y / N Street: City/Town: Zip Code: Phone Number: Authorized by Co.: Y / N	Hospital: Street: City/Town: Zip Code: Phone Number: Authorized by Co.: Y /N
Was the employee treated in an emergency room? ☐ Yes ☐ No	Was employee hospitalized overnight as an in-patient? ☐ Yes ☐ No If so, for how many days? _____

APPENDIX D
Daily Job Brief Record

DAILY JOB BRIEF RECORD

	Lawrence Aviation Industries	DEC1027.OM
Person Conducting	Site Name/Address	HRP Client Name/Job #
Payson Long/ 518-402-9651		Derek Roy
Client Contact/Phone	HRP H&S Rep.	HRP Supervisor
Date/Time	Number Attending	Weather

Designated Competent Person: _____

Description of Work: _____

_____

_____

_____

Attendees (use additional sheets as needed):

Name	Company	Signature

Emergency Telephone Numbers FIRE / POLICE / AMBULANCE: 911

Hospital Name & Location: _____

NYSDEC Spill Line: 1-518-457-7362 National Response Center: 800-424-8802 CBYD: 800-922-4455

Health & Safety Manager: Derek Roy 860-428-9366

HAZARDS

- ☐ Toxic
- ☐ Corrosive
- ☐ Flammable
- ☐ Combustible
- ☐ Reactive
- ☐ Path Waste
- ☐ Asbestos
- ☐ Extreme Cold/Heat
- ☐ Drains/Sumps
- ☐ Sharp Objects
- ☐ Drilling in Soil
- ☐ Lighting
- ☐ Slips/Trips/Falls
- ☐ Lead
- ☐ Soil Excavation
- ☐ Tank Excavation
- ☐ Trenching
- ☐ Floor Holes
- ☐ Working on/near Water
- ☐ Underground/Overhead Utilities
- ☐ Vehicle Traffic
- ☐ Hot Work
- ☐ Vac Truck
- ☐ Ladders
- ☐ Noise
- ☐ Lifting
- ☐ Powerwashing
- ☐ Elevated Work Area
- ☐ Live Electrical Circuits
- ☐ Pneumatic Tools
- ☐ Drum Handling
- ☐ Abrasive Blasting

PERSONAL SAFETY

- ☐ Supplied Air Respirator
- ☐ Fully Encapsulating Suit
- ☐ Overboots
- ☐ Safety Glasses
- ☐ Reflective Vests
- ☐ Hearing Protection
- ☐ SAR w/Egress Bottle
- ☐ Flash Suit
- ☐ Lifebelt/Lanyard
- ☐ Chemical Goggles
- ☐ Eye Wash
- ☐ Evacuation Plan
- ☐ SCBA
- ☐ NOMEX (flam resistant)
- ☐ Hardhats
- ☐ Face Shield
- ☐ Safety Shower
- ☐ Communications
- ☐ Air Purifying Respirator Cartridge: _____
- ☐ Protected Coveralls, Type: _____
- ☐ Outer Gloves, Type: _____
- ☐ Inner Gloves, Type: _____
- ☐ First Aid Kit
- ☐ Properly Sloped Excavation/ Trench
- ☐ PFD's
- ☐ Ventilation

FIRE SAFETY

- ☐ Fire Extinguishers
- ☐ Hot Work Permit
- ☐ Fire Blanket
- ☐ Explosion-Proof Equipment
- ☐ Equipment Grounded & Bonded
- ☐ Non-Sparking Tools
- ☐ Eliminate Ignition Sources
- ☐ Area Kept Wet
- ☐ Smoking Area Designated Location: _____
- ☐ Alarm Box in Area, Location: _____
- ☐ Fire Hose Laid Out

ISOLATE EQUIPMENT

- ☐ Establish Exclusion Zone/Traffic Cones
- ☐ Work Signs
- ☐ Stop Transfers
- ☐ Caution Tape Area
- ☐ GFCIS
- ☐ Temporary Fencing

ELECTRICAL EQUIPMENT

- ☐ LockOut/TagOut
- ☐ Non-Conductive Tools
- ☐ Equipment Grounded
- ☐ FR Suits/Coveralls

AIR MONITORING

Type of Meter: _____ Date last calibrated: _____

SUBSTANCE	LEVEL B MAX.	ACTION LEVEL/LEVEL C MAX.	LEVEL D MAX.

Health & Safety Comments / Topics & Safety Rules Reviewed / Questions / Concerns:

_____

_____

_____

_____

_____

_____

Contaminants of Concern: _____

HEALTH & SAFETY SIGNATURE: _____ Date: _____

Is there a Site-Specific or Generic Health & Safety Plan available on-site? Yes ☐ No ☐

☐ HAZARD ZONES NOT APPLICABLE, GENERAL WORK AREA

Level D ☐ Modified Level D ☐ Level C ☐

Anything above Level C, foreman should use a Confined Space Permit/Form.

Note: HOT WORK requires a hot work permit and minimum 20# fire extinguisher. Foreman or HSM must record at least one contaminant of concern above. Toxic plants may be considered a COC if no chemical hazards are expected.

LEVEL C
Respirator Type: _____

Name	Zone	Time In	Time Out	Decon Type

Before performing Level C work, ALL employees must review HRP's Respiratory Protection Program - a copy of which must be on-site along with a HASP.

APPENDIX E
Equipment Calibration Log

EQUIPMENT CALIBRATION LOG		
Instrument	**Calibration Date**	**Calibrated By**

APPENDIX F
HRP Safe Work Permit

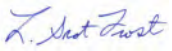
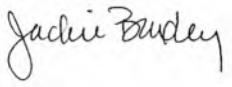
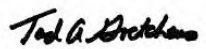
General Information:		
Project Description: Surficial Soil and groundwater Sampling	**Project Location: Lawence Aviation Road Port Jefferson Station, NY**	
Client:NY DEC	**Payson Long**	**518-402-9813**
	Contact Name	**Contact Phone**
Summary of Work:		
Using hand tools to collect surficial soil samples and monitoring well sampling.		

Created By:		**Approved by:**	**Alisa Werst**		
Reviewed with affected employee	**Signature**			**Date**	**8/17/21**

Check if Project Involves:	**Yes**	**No**	**Initial to Verify Completion**	**Criteria**
Hot Work *(Welding, Grinding, etc.)*	☐	☐		Hot Work Permit Issued – Fire Watch Required
Electrical Work	☐	☐		LOTO, confirm zero energy
Rigging or Heavy Lifting	☐	☐		Load Ratings, Employee Certification
Scaffolds	☐	☐		Competent Person Inspection Required
Confined Space Entry	☐	☐		Permit or Reclassification Form Required
Hazardous Chemicals	☒ ☐	☐ ☐		Chemical Names and SDS review with Employees Spill kit available, Secondary containment provided
Ladders	☐	☐		Proper Rating, No Metal Ladders, Current Inspection
Work at Heights	☐	☐		Training (verified), Approved Anchor Pts. or Fall Protection
Lockout Tagout	☐	☐		Training (verified), site first lock on
Excavation/Ground Penetration	☒	☐		Line Locate performed
Roof Work	☐	☐		Fall protection within 6 feet of edge
Portable Electrical Tools, cords	☐	☐		GFCI used, No damaged cords, Inspected
Fire System Impairment	☐	☐		External notifications made
Blocked Exits	☐	☐		Post signs and alternate exits
Other *(list)*:	☐	☐		

Required Permits		**PPE Required for Job or Required by Client**	
☐ None	☐ Ground Disturbance	☒ Safety Glasses	☐ Hearing Protection
☐ Confined Space	☐ Scaffold Inspection	☒ Safety Toe Shoes	☐ Hard Hats
☐ Hot Work	☐ Working At Heights	☐ Metatarsal Guards	☐ Other:
☐ Emergency Medical Care Provisions		☐ Cut Resistant Gloves/Sleeves	☐ Other:
☐ Other Permits:		☐ Respirator	

Special Considerations				
☒ Chemical	☐ Tight/Crowded Area	☐ Laceration/Abrasion	☐ Struck By	☐ Press
☐ Explosion	☐ Fire	☐ Falling Debris/Loads	☐ Struck Against	☒ Security
☒ Slip/Trip/Fall	☐ High Pressure	☐ Noise	☐ Automated Equip.	☒ Other:Overhead electrical haz.
☐ Exposed Movement	☐ Lighting	☐ Caught in/on	☐ Conveyors	☐ Other:
☒ Ergonomics	☒ Animals, bees, pests	☒ poisonous plants	☐ PCBs, Pb, asbestos	

REVISION APPROVAL LOG			
REV. #	**PREPARED BY**	**REVIEWED BY**	**APPROVED BY**
00	Date: 1/18/2021 Name: Scot Frost Sign: 	Date: 1/20/2021 Name: Jackie Baxley Sign: 	Date: 1/20/2021 Name: Tad Goetcheus Sign: 
01	Date: Name: Sign:	Date: Name: Sign:	Date: Name: Sign:
02	Date: Name: Sign:	Date: Name: Sign:	Date: Name: Sign:

CHANGE / REVIEW RECORDS			
REVISION DATE	**REVISION LEVEL**	**REASON / REVISION DESCRIPTION**	**APPROVED BY**

APPENDIX G

COVID-19 Health and Safety Guidelines

(Note: COVID-19 Health & Safety Guidelines are subject to change. Although this attachment has remained mostly unchanged over the past year, always go to the following CDC website @ www.cdc.gov to review for any substantive change.)

COVID19
SITE SPECIFIC HASP ADDENDUM

This addendum will remain in effect until what time the CDC, NIAID, and/or Surgeon General guidance is provided that removes the heightened awareness of social distancing, hand washing, and other protocols in response to COVID-19.

NECESSARY ADDITIONAL SUPPLIES

- Hand sanitizer (minimum 60% alcohol)
- Squeeze bottles of water (if no running water at job site)
- Soap
- Disinfectant (for tools, vehicles, common areas, etc.)
- Caution tape, cones or similar to set up social distancing boundaries as needed

EMPLOYEE HEALTH PROTECTION – ZERO TOLERANCE

The following applies to both HRP employees and contracted staff working on behalf of the HRP or the client.

- ZERO TOLERANCE FOR SICK WORKERS REPORTING TO WORK. IF YOU ARE SICK, STAY HOME! IF YOU FEEL SICK, GO HOME! IF YOU SEE SOMEONE SICK, SEND THEM HOME!
- If you are exhibiting any of the symptoms below, you are to report this to your supervisor (via phone, text or email) right away, and head home from the job site or stay home if already there. If you notice a co-worker showing signs or complaining about such symptoms, he or she should be directed to their supervisor (via phone, text or email) and asked to leave the project site immediately.
  COVID-19 Typical Symptoms:
  - Fever
  - Cough
  - Shortness of Breath
  - Sore Throat
  - Loss of taste or smell
- Prior to starting a shift, each employee will verbally self-certify to their supervisor that they:
  - Have no signs of a fever or a measured temperature above 100.3 degrees or greater, a cough or trouble breathing within the past 24 hours.
  - Have not had "close contact" with an individual diagnosed with COVID-19. "Close contact" means living in the same household as a person who has tested positive for COVID-19, caring for a person who has tested positive for COVID-19, being within 6 feet of a person who has tested positive for COVID-19 for about 15 minutes, or coming in direct contact with secretions (e.g., sharing utensils, being coughed on) from a person who has tested positive for COVID-19, while that person was symptomatic.
  - Have not been asked to self-isolate or quarantine by their doctor or a public health official.
  - These self-certifications may be documented at the request of the site owner
- Workers that are working in a confined space or inside a closed building envelope will have to be temperature screened by a Medical Professional or designated individual. Such screening shall be performed out of public view to respect privacy and results are kept private.
- Employees exhibiting symptoms or unable to self-certify should be directed to leave the worksite and seek medical attention and applicable testing by their health care provider. They are not to return to the work site until cleared by a medical professional.

GENERAL ON-THE-JOB GUIDANCE TO PREVENT EXPOSURE & LIMIT THE TRANSMISSION OF THE VIRUS

All Job Sites

- No touching or direct contact with other individuals, including handshaking.
- Wash hands often with soap and water for at least 20 seconds or alternatively when soap and water are not available, use an alcohol-based hand sanitizer with at least 60% ethanol or 70% isopropanol
- A "No Congregation" policy is in effect, individuals must implement social distancing by maintaining a minimum distance of 6-feet from all other individuals
- Avoid face to face meetings – critical situations requiring in-person discussion must follow social distancing
- Conduct all meetings via conference calls, if possible. Do not convene meetings of more than 10 people. Recommend use of cell phones, texting, web meeting sites and conference calls for project discussion
- Be sure to use your own water bottle, and do not share
- To avoid external contamination, bring food from home
- Maintain Social Distancing separation during breaks and lunch.
- To avoid sharing germs, please clean up after yourself. DO NOT make others responsible for moving, unpacking and packing up your personal belongings
- If you or a family member is feeling ill, stay home!

Multi-person job sites (i.e. HRP and subcontractors, etc.)

- Contractor and Field Offices are to be locked down to all but authorized personnel
- Each jobsite should develop cleaning and decontamination procedures that are posted and shared (if multi-person job site). These Procedures must cover all areas including trailers, gates, equipment, vehicles, etc. and shall be posted at all entry points to the sites, and throughout the project site.
- All individual work crew meetings/tailgate talks should be held outside and follow social distancing
- Please keep all crews a minimum of 6' apart at all times to eliminate the potential of cross contamination
- At each job briefing/tool box talk, employees are asked if they are experiencing any symptoms, and are sent home if they are
- Each jobsite should have laminated COVID-19 safety guidelines and handwashing instructions (last page of this addendum)
- All restroom facilities/porta-potties should be cleaned and handwashing stations must be provided with soap, hand sanitizer and paper towels
- All surfaces should be cleaned at least twice a day, including desk, work stations, door handles, laptops, etc.
- All common areas and meeting areas are to be regularly cleaned and disinfected at least once a day but preferably twice a day

- Single person job sites (just one HRP employee, no subs, vendors, etc.)
  - It is that person's responsibility to clean and disinfect all tools and reusable supplies upon return to the office
  - Cover coughing or sneezing with a tissue, then throw the tissue in the trash and wash hands, if no tissue is available then cough into your elbow
  - Avoid touching eyes, nose, and mouth with your hands

WORK SITE RISK PREVENTION PRACTICES

- At the start of each shift, confirm with all employees that they are healthy.
- All employees will be required to wear gloves (either latex or cut resistant depending on the task at hand)
- Use of eye protection is required (Safety glasses or googles at a minimum with or without face shields).
- In work conditions where required social distancing is impossible to achieve, affected employees shall be supplied PPE including as appropriate a standard face covering, gloves, and eye protection.
- All employees shall drive to work site/parking area in a single occupant vehicle. No one should ride together in the same vehicle
- When entering a machine or vehicle which you are not sure you were the last person to enter, make sure that you wipe down the interior and door handles with disinfectant prior to entry
- In instances where it is possible, workers should maintain separation of 6' from each other per CDC guidelines.
- Multi person activities will be limited where feasible (two person lifting activities)
- Large gathering places on the site such as shacks and break areas will be eliminated and instead small break areas will be used with seating limited to ensure social distancing.
- Contact the cleaning person for your office trailer or office space and ensure they have proper COVID- 19 sanitation processes. Increase their cleaning visits to daily
- Clean all high contact surfaces a minimum of twice a day in order to minimize the spread of germs in areas that people touch frequently. This includes but is not limited to desks, laptops and vehicles

Wash Stations: All sites without ready access to an indoor bathroom or running water MUST install Wash Stations or provide other means for handwashing

- Install hand wash stations with hot water, if possible, and soap at fire hydrants or other water sources to be used for frequent handwashing for all onsite employees.
- All onsite workers must help to maintain and keep stations clean
- If a worker notices soap or towels are running low or out, immediately notify supervisors
- Garbage barrels will be placed next to the hand wash station for disposal of tissues/towels
- If no other alternative exists, bring squeeze bottles with water and soap (only authorized for single employee job sites)

Please Note: This document is not intended to replace any formalized procedures currently in place within the site specific HASP or any job related contracts.

Where this guidance does not meet or exceed the standards put forth by the state, municipality, site owner, contractor or subcontractor, everyone shall abide by the most stringent procedure.

A site-specific COVID-19 Officer (also known as the Health and Safety Officer) shall be designated for every site.

Print and post at each job site

COVID-19/ Health and Safety Officer Name: _____

Phone Number: _____



Any issue of non-compliance with these guidelines shall be a basis for pausing the work. The Health and Safety Officer will address corrective actions with the subcontractor. Any additional issues of non-conformance may be subject to action against the subcontractor's prequalification and certification status.

APPENDIX H
Safety Data Sheets
(for chemicals brought to the site)

APPENDIX G

FIELD SAMPLING PLAN

MOVE YOUR ENVIRONMENT FORWARD

FIELD SAMPLING PLAN

Former Lawrence Aviation Superfund Site
100 Sheep Pasture Road
Port Jefferson, Suffolk County, NY 11776

Prepared For:

New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, NY 12233-7012

Contract#: D009808, Work Assignment #27

Prepared By:

HRP Associates, Inc.
197 Scott Swamp Road
Farmington, CT 06032

HRP#: DEC1027.OM

Issued: March 21, 2025

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 GROUNDWATER SAMPLING 1

2.1 Well Installation Procedures 1
2.2 Well Development Procedures 1
2.3 Well Purging Procedures 2
2.4 Well Sampling Procedures 3

3.0 SURFACE WATER SAMPLING 4

3.1 General 4
3.2 Equipment Selection Considerations 4
3.3 Sample Collection 4
3.3.1 Direct Method 4
3.3.2 Dip Sampler 5

4.0 SOIL/CONCRETE/DEBRIS SAMPLING 5

4.1 General 5
4.2 Equipment Selection 5
4.3 Soil Sample Collection 6
4.3.1 Soil Sample Collection from Split Spoons, Direct-Push Samplers, and Similar Devices 6
4.3.2 Surface Soil 7
4.4 Concrete Sample Collection – PCBs 7
4.5 Oily Concrete Surface Debris Sample Collection 8

5.0 SURFACE WATER PH MEASUREMENTS 8

5.1 General 8
5.2 Instrument Calibration 8
5.3 Field Measurement Procedures 8
5.3.1 Grab Sample Measurements 8
5.3.2 Flow-Through Cell Measurements 9
5.3.3 In-Situ Measurements 9

6.0 FIELD DOCUMENTATION 10

7.0 SAMPLE BOTTLE SELECTION 10

8.0 SAMPLE BOTTLE LABELING 10

9.0 CHAIN-OF-CUSTODY PROCEDURES 11

10.0 QUALITY CONTROL 12

Figures

Figure 1 Site Location Map
Figure 2 Monitor Well/Surface Water Sample Locations

Appendices

Appendix A Field Forms

GENERAL INFORMATION

Subject Property Information:
Former Lawrence Aviation Industries
100 Sheep Pasture Road
Town of Brookhaven
Port Jefferson Station, NY 11776

Consultant Information:
HRP Associates, Inc.
197 Scott Swamp Road
Farmington, CT 06032
www.hrpassociates.com
Phone: (860) 674-9570
Fax: (860) 674-9624
Project Number: DEC1027.OM

Client Information:
New York State Department of Environmental Conservation
625 Broadway
Albany, NY 12233

Report Date: March 21, 2025

Report Author:
Chris L. Tedder
Senior Project Manager

Project Manager:
Derek Roy, PG
Project Manager

Environmental Professional Certification

I declare that, to the best of my professional knowledge and belief, I meet the definition of Environmental Professional as defined in 40 CFR Part 312.10.

I have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the subject property. I have developed and performed the all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312.

Derek Roy, PG
Project Manager

1.0 INTRODUCTION

This Field Sampling Plan (FSP) provides procedures for the field activities to be completed as part of site management at the Lawrence Aviation Industries (LAI) Site (**Figure 1**). The field procedures presented in this FSP should be followed by all field personnel, as adherence can help to ensure the quality and usability of the data collected. The FSP should be used in concert with the following documents:

- Site Management Plan (SMP)
- Health and Safety Plan (HASP; Appendix E of SMP)
- Quality Assurance Project Plan (QAPP; Appendix G of SMP)

2.0 GROUNDWATER SAMPLING

2.1 Well Installation Procedures

A monitoring well and surface water sampling network exists at the LAI Site (**Figure 2**). In the event that additional wells need to be installed, or an existing well needs to be replaced, the following procedure outlines a New York State Department of Environmental Conservation (NYSDEC)-approved method of constructing overburden groundwater monitoring wells. The following is a step-by-step method of installing a well once a borehole has been drilled to the desired depth:

1. Thread a cap on the bottom section of the well screen. If more than one section of well screen is required, thread the sections together.
2. Lower the screen into the borehole with the riser section ready.
3. Add the first riser section to the screen. Do not drop the screen in the borehole.
4. Add riser sections as required until the bottom screen section touches the bottom of the borehole.
5. If completing the well with a road box, mark the riser two inches below ground surface and cut the riser. If completing the well with a protective casing, the riser should stick up above the ground surface.
6. Place a slotted cap or J-plug onto (into) the riser.
7. Place sand (filter-pack) into the annular space between the borehole and the polyvinyl chloride (PVC) screen and riser to approximately two feet above the top of the well screen. Place the sand in very slowly so it does not bridge in the well bore.
8. Place bentonite chips above the sand-pack.
9. Grout the road box or protective casing in place with a concrete mix.

2.2 Well Development Procedures

Wait at least 48 hours after completing well installation before beginning well development. Well development is completed by pumping or bailing groundwater from the well until the discharged water is relatively sediment free and the field parameters (e.g., turbidity, potential of Hydrogen (pH),

temperature, specific conductivity, oxidation-reduction potential (ORP), dissolved oxygen (DO), et cetera (etc.)) have stabilized. Development removes sediment from the well and can improve the hydraulic properties of the formation. Well development water can be discharged onto the ground surface downgradient of the well unless gross contamination is observed (e.g., non-aqueous phase liquid (NAPL), heavy sheens, odors, high photoionization detector (PID) readings, etc.). In these cases, the well development water must be containerized and sampled prior to discharge or disposal.

1. Select an appropriate well development method based upon water depth, well productivity, and sediment content of the water. Well development options include manual bailing or pumping. Surging of the well can also be completed using an appropriately sized surge block.
2. Assemble the necessary equipment on a plastic sheet surrounding the well.
3. Remove the slotted cap or J-plug ensuring that no foreign material enters the well.
4. Monitor the interior of the riser pipe for organic vapors using a PID. If a reading greater than five parts per million (5 ppm) is recorded, the well must be vented until levels are below 5 ppm before purging is started.
5. Measure depth to water and the total depth of the monitoring well using an electronic water level indicator.
6. Calculate the volume of water within the well.
7. Wash the end of the probe with soap and rinse with de-ionized (DI) water between wells.
8. Begin development and measure the initial turbidity, pH, temperature, specific conductivity, ORP, DO, etc. of the water and record the information on the Monitoring Well Sampling Log (**Appendix A**). Note the initial color, clarity, and odor of the water.
9. Continue to develop the well and periodically measure the water quality parameters indicated in Step 8, above. Development should continue until the purged water has a turbidity of less than fifty nephelometric turbidity units (50 NTUs) and the field parameters have stabilized.
10. Record depth to water, total well depth, volume of water removed, the field parameters, initial and final color, clarity, odors, sheens, the presence of NAPL, etc. on the Well Development Logs.

2.3 Well Purging Procedures

To collect representative groundwater samples, the monitoring wells must be adequately purged prior to sampling. Purging will require removing three to five volumes of standing water in rapidly recharging wells and at least one volume from wells with slow recharge rates. Sampling should commence as soon as adequate recharge has occurred.

1. Remove the slotted cap or J-plug ensuring that no foreign material enters the well.
2. Monitor the interior of the riser pipe for organic vapors using a PID. If a reading greater than 5 ppm is recorded, the well must be vented until levels are below 5 ppm before purging is started.

3. Measure depth to water and the total depth of the monitoring well using an electronic water level indicator.
4. Calculate the volume of water within the well.
5. Wash the end of the probe with soap and rinse with DI water between wells.
6. Utilize dedicated, new, polyethylene tubing (preferably 0.5-inch diameter high density polyethylene (HDPE)) for each well.
7. Begin purging the well using the low-flow method. Measure the initial turbidity, pH, temperature, specific conductivity, ORP, DO, etc. of the water and record the information on the Monitoring Well Sampling Log (**Appendix A**). Note the initial color, clarity, and odor of the water.
8. Continue purging the well until the required volume is removed and periodically measure the water quality parameters indicated in Step 7, above. If the well purges to dryness and sufficiently recharges within fifteen minutes, water can be removed as it recharges. If the well purges to dryness and does not sufficiently recharge within fifteen minutes, contact the NYSDEC project manager to determine if purging can be terminated.
9. Record depth to water, total well depth, volume of water removed, the field parameters, initial and final color, clarity, odors, sheens, the presence of NAPL, etc. on the Well Purging and Sampling Logs.

2.4 Well Sampling Procedures

1. Complete well sampling immediately after purging if recharge is sufficient. Otherwise, complete well sampling within 24 hours of purging if the well has recovered sufficiently to sample. If sufficient volume for analytical testing cannot be obtained from a well or if recharge exceeds 24 hours, contact the NYSDEC project manager to determine analytical priorities and validity of the sample.
2. Label sample bottles using a waterproof permanent marker per the procedures outlined in **Section 7.0**.
3. Collect the sample using the low-flow method by pumping groundwater directly into laboratory certified analyte-free sample bottles containing preservatives as required.
4. Place the sample bottles on ice in coolers.
5. Complete the chain-of-custody (CoC) form.
6. Collect a separate sample into a 120-milliliter (mL) plastic container to measure field parameters (e.g., pH, temperature, specific conductivity, ORP, DO, etc.) if a flow-through cell is not being utilized. Measure the turbidity of the sample with a turbidity meter.
7. Record the field parameters on the Well Purging and Sampling Logs (**Appendix A**).
8. Transport the samples to the analytical laboratory.

3.0 SURFACE WATER SAMPLING

3.1 General

This section of the FSP describes procedures and equipment to be used by field personnel when collecting surface water samples at the LAI and Old Mill Pond (OMP) sites. The samples should be collected with as little agitation or disturbance of the surface water body as possible.

3.2 Equipment Selection Considerations

Surface water sampling is generally accomplished by using one of the following samplers or techniques:

- Kemmerer Bottle
- Van Doren Sampler
- Bacon Bomb Sampler
- Dip Sampler
- Direct Method

For the LAI and OMP sites, the dip sampler and direct method are the most appropriate.

3.3 Sample Collection

Surface water samples will typically be collected either by directly filling the container from the surface water body being sampled or by decanting the water from a collection device such as a dip sampler.

3.3.1 Direct Method

For most surface water bodies at the LAI and OMP sites surface water samples can be collected using the direct method as follows:

1. Dip the laboratory certified analyte-free sample bottle into the surface water body being sampled to directly fill the bottle.
2. Pre-preserved sample bottles should not be used with the direct method as sample collection may dilute the concentration of preservative in the bottle. For these bottles, collect surface water directly into a laboratory certified analyte- free sample bottle and transfer this water into the preserved sample bottles.
3. Label sample bottles using a waterproof permanent marker per the procedures outlined in **Section 7.0**.
4. Place samples on ice (or blue ice) in coolers.
5. Complete the CoC form.
6. Record any field parameters measured and observations (e.g., water depth, clarity, odors, sheens, etc.) on the Surface Water Sampling Logs (**Appendix A**).

7. Transport the samples to the analytical laboratory.

3.3.2 Dip Sampler

A dip sampler is useful in situations where a sample is to be recovered from a surface water body where direct access is limited. The long handle on such a device allows access from a discrete location. The following procedures should be used when collecting surface water with a dip sampler:

1. Assemble the device in accordance with the manufacturer's instructions.
2. Extend the device to the sample location and collect the sample by dipping the sampler into the water.
3. Retrieve the sampler and transfer the sample to laboratory certified analyte-free sample bottles. Make sure that the dip sampler does not come in contact with the sample bottles.
4. Label sample bottles using a waterproof permanent marker per the procedures outlined in **Section 7.0**.
5. Place samples on ice (or blue ice) in coolers.
6. Complete the CoC form.
7. Record any field parameters measured and observations (e.g., water depth, clarity, odors, sheens, etc.) on the Surface Water Sampling Logs (**Appendix A**).
8. Transport the samples to the analytical laboratory.

4.0 SOIL/CONCRETE/DEBRIS SAMPLING

4.1 General

This section of the FSP describes procedures and equipment to be used by field personnel when collecting soil, concrete, and oily debris samples at the LAI and OMP sites.

4.2 Equipment Selection

Soil, concrete, and oily debris sampling is generally accomplished by using some or all of the following equipment and disposable supplies:

- Personal protection equipment (PPE)
- Stainless steel hand augers
- Stainless steel scoops
- Stainless steel augers
- Stainless steel bowls
- Stainless steel scrapers
- Plastic cones
- Hammer drill
- Buckets
- Brushes
- Paper towels
- Plastic (polyethylene) sheeting
- Sample containers with labels
- Sample preservation materials and equipment
- Decontamination solutions/equipment
- Coolers with ice (preferred) or ice packs.

- 1- or 1.5-inch concrete bit
- Distilled water
- Liquinox
- Tap water (potable)
- Stainless steel, Teflon, or polypropylene spatulas or scoops
- Stainless steel split spoons for soil sampling using a hollow-stem auger drilling rig
- Disposable acetate, Lexan, or clear PVC liners for direct-push soil sampling
- PID (preferred for most applications) and/or Flame Ionization Detector (FID)

4.3 Soil Sample Collection

Prior to conducting sampling, ensure that all necessary sampling equipment is clean and decontaminated. In addition, all re-usable sampling equipment will be decontaminated between each sampling location by an Alconox (or other non-phosphatic soap) wash, followed by a triple rinse using DI water. The sampling equipment will be allowed to air-dry and stored in a clean location prior to subsequent use.

Soil sampling for volatile or semi-volatile analysis should be conducted using only stainless-steel equipment or other chemically inert material that will not have the potential to contaminate the soil samples. Soil samples collected for volatile organic compound (VOC) analyses should never be mixed or composited. Sample collection for VOC analysis should be performed immediately after opening the sample collection device for each interval, before description of the soil sample or core, and collection of samples for other analytes, to limit loss of VOCs from the sample due to volatilization.

4.3.1 Soil Sample Collection from Split Spoons, Direct-Push Samplers, and Similar Devices

1. Soil sample retrieval from the subsurface will be accomplished using either a split-spoon sampler or Macro-Core® (or similar) sampler. After retrieval from the subsurface, the sampler will be placed on polyethylene sheeting and opened.
2. After opening the sampler, select the interval to be sampled and immediately place the sample into the laboratory supplied sample container(s). If collecting VOC samples, utilize a Terra Core® (or other similar laboratory supplied sampling device) to collect and place the correct amount of sample into the sample jars. For metals and polychlorinated biphenyl (PCB) samples, use a clean stainless-steel scoop to place the sample material into the laboratory supplied
3. After placing the sample into the sample jars, label the jar (sample identification, date, time sampled, sampler, and analysis), enter the sample data onto the CoC, and place the sample jar into an ice-filled cooler for transport to the analytical laboratory.
4. Clean all sampling devices prior to moving to the next location. Ensure that clean, disposable sampling gloves are used for each new sampling location.

4.3.2 Surface Soil

1. Soil sample retrieval from the surface interval (zero- to one-foot depth) will be accomplished using either a stainless-steel hand auger or, for shallow samples, a stainless-steel scoop may be used.
2. Advance the hand auger to the desired depth. If the sample depth is more than approximately six inches below surface, the auger bucket will be withdrawn and emptied and then advanced to the desired depth. If possible, collect the sample directly from the auger bucket into the appropriate sample jar(s). If the sample is intended to characterize the entire zero- to one-foot interval, the bucket will need to be emptied into a stainless-steel bowl after advancing approximately six inches, and then advanced the remaining six inches, with both buckets emptied into the stainless steel bowl. If sampling for VOCs, collect the sample directly from the bucket into the appropriate sample jars. Do not composite VOC samples.
3. If collecting samples less than six inches below ground surface, a stainless-steel scoop can be advanced to the appropriate depth, tilted back to expose fresh soil, and the sample collected directly from the freshly exposed soil into the appropriate sample jar.
4. After placing the sample into the sample jars, label the jar (sample identification, date, time sampled, sampler, and analysis), enter the sample data onto the CoC, and place the sample jar into an ice-filled cooler for transport to the analytical laboratory.
5. Clean all sampling devices prior to moving to the next location. Ensure that clean, disposable sampling gloves are used for each new sampling location.

4.4 Concrete Sample Collection – PCBs

Prior to conducting sampling, ensure that all necessary sampling equipment is clean and decontaminated. In addition, all re-usable sampling equipment will be decontaminated between each sampling location by a Liquinox (or other non-phosphatic soap) wash, potable water rinse, followed by a triple rinse using DI water. The sampling equipment will be allowed to air-dry and stored in a clean location prior to subsequent use.

The procedure for collection of bulk concrete samples for analysis for PCBs is:

1. Prepare the surface of the concrete by scraping away residue using a stiff putty knife and then wiping the area to be sampled with a DI water wetted paper towel.
2. After cleaning the surface, place an inverted cone over the sample location to minimize dust entrainment into the air.
3. Use a rotary hammer with a concrete bit (1- to 1.5-inch diameter) to pulverize the concrete to the appropriate depth. Upon reaching the required depth, set the inverted cone aside and use a stainless steel (or other inert material) scoop to collect the accumulated dust and place the dust into a laboratory supplied container.
4. Ensure the sample container is labeled and then place it into an ice-filled cooler. If a duplicate sample is to be collected from the sample location, drill a second hole immediately adjacent to the first hole, place the accumulated sample material from both

holes into a single sample container, mix the material, and then place approximately equal aliquots into appropriately labeled clean sample containers, and place into the sample cooler.

5. Upon completion of the sample collection, the sample location will be cleaned of excess dust using a wetted paper towel to be disposed of with other investigation derived wastes.
6. Between each sample location, the dust suppression cones, the stainless-steel scoops, and the drill bits will be decontaminated using a Liquinox/water wash, a tap water rinse, and a final DI water triple rinse. The cones, scoops, and bits will be set aside to air-dry. In order to ensure that no concrete dust remained adheres to the tip of the drill bit, a steel brush may be used in combination with a traditional hand brush.

4.5 Oily Concrete Surface Debris Sample Collection

After selection of the sample location, utilize a decontaminated stainless-steel scraper to scrape the oily debris from the concrete surface. Place the oily debris into a laboratory supplied sample container, label the sample, and place into an ice-filled cooler for transport to the analytical laboratory under CoC protocols.

Prior to moving to the next sampling location, decontaminate the stainless-steel scraper by a Liquinox (or other non-phosphatic soap) wash, potable water rinse, followed by a triple rinse using DI water. Allow the scraper to air-dry and move to the next sampling location.

5.0 SURFACE WATER PH MEASUREMENTS

5.1 General

This section of the FSP describes procedures to be used by field personnel when completing pH measurements of surface water bodies at the LAI and OMP sites. The pH of surface water is a common field measurement that can be made with any pH meter. Some meters measure both the temperature and pH of the sample with a single probe. This is the preferred meter to use.

5.2 Instrument Calibration

Many brands of instruments are commercially available to measure pH that incorporate a wide variety of technologies. In most cases, these meters are rented by consultants and come pre-calibrated from the rental company. Ensure that the meters used in the field have been calibrated prior to use, with a calibration check performed at the start and end of each day of sampling. Record calibration checks in the field log. If recalibration is required, the manufacturer's instruction manual should be consulted for specific procedures.

5.3 Field Measurement Procedures

5.3.1 Grab Sample Measurements

The following procedure should be used when completing pH measurements of a grab sample:

1. Collect a sample of surface water in a wide-mouth sample bottle. If the meter's thermistor is to be used for the temperature, the temperature should be read as soon as the reading stabilizes and prior to measuring the pH.

   Note: When the pH meter response is slow, unstable, or non-reproducible, it may be necessary to check the conductivity. If the conductivity is lower than 20 to 30 micromhos per centimeter (µmho/cm), it is permissible to add 1 mL of 1 mole/L (1M)-potassium chloride-solution per 100 mL of sample to improve response time for the probe.
2. Immerse the lower part of the probe into the wide-mouth sample bottle. In the field, the pH probe is typically not kept away from the bottom or sides of the bottle as this is not practical. Allow ample time for the probe to equilibrate with the sample. On some meters, when a stable reading is achieved, the "pH" icon will stop flashing, and the screen will freeze with the stable values displayed. Once equilibrated, take the readings.
3. Rinse the probe with DI water.
4. Repeat the procedure with a fresh surface water sample until successive sample readings are within 0.1 pH unit of each other.
5. Record the pH and temperature measurements on the Surface Water Sampling Log (**Appendix A**).
6. Rinse the probe with DI water and replace the end cap if applicable. For longer term storage, place probe in the manufacturer's recommended storage solution.

5.3.2 Flow-Through Cell Measurements

The following procedure should be used when completing pH measurements with a flow-through cell and a multi-meter:

1. Collect a sample of surface water in the flow-through cell.
2. Immerse the bottom portion of the probe in the flow-through cell. Allow ample time for the probe to equilibrate with the sample. Once equilibrated, take the readings.
3. Rinse the flow-through cell and probe with DI water.
4. Repeat the procedure with a fresh surface water sample until successive sample readings are within 0.1 pH unit of each other.
5. Record the measurements (e.g., pH, temperature, specific conductivity, ORP, DO, etc.) on the Surface Water Sample Log (**Appendix A**).
6. Rinse the flow-through cell and probe with DI water.

5.3.3 In-Situ Measurements

These procedures should be followed when conducting in-situ field pH measurements:

1. Place the probe into the surface water body to be measured and allow ample time for the probe to equilibrate with the water. Once equilibrated, take the readings.
2. Rinse the probe with DI water.

3. Repeat the procedure until successive sample readings are within 0.1 pH unit of each other.
4. Record the pH and temperature measurements on the Surface Water Sample Log (**Appendix A**).
5. Rinse the probe with DI water and replace the end cap if applicable. For longer term storage, place probe in the manufacturer's recommended storage solution.

6.0 FIELD DOCUMENTATION

Field notebooks should be used during all on-site work but should be supplemented with the Field Forms of **Appendix A**. A dedicated field notebook is maintained by the field technician overseeing the site activities. Field activities should also be photo-documented. The field notes, at a minimum, should include the following information:

- General observations
- Weather conditions
- Name(s) of the field personnel
- Types of samples collected
- Sample identification numbers
- Date and time of sample collection
- Sampling methods and devices
- Purge volumes (wells)
- Water depth (surface water)
- CoC and shipping information
- Field parameters (e.g., turbidity, pH, temperature, specific conductivity, ORP, DO, etc.)

If Field Forms are unavailable, all sample data shall be recorded in the field notebook.

7.0 SAMPLE BOTTLE SELECTION

The selection of sample bottles is based on the media being sampled and the required analysis. The analytical laboratory should supply certified analyte-free sample bottles containing the appropriate preservatives.

8.0 SAMPLE BOTTLE LABELING

The following procedure helps to prevent misidentification of samples and to clarify the location of samples collected during site management:

1. Write the following information with permanent marker on each laboratory supplied sample label:
    a. Site name and number
    b. Sample identification number
    c. Date and time of sample collection
    d. Sampler's initials

e. Sample preservation
f. Analysis required

2. Fix the label to each sample bottle.
3. Wrap each sample bottle with 2-inch cellophane tape to ensure that the label stays on the bottle.

Each sample is assigned a unique alpha-numeric identification code using the following abbreviations:

SW	=	Surface Water
MSB	=	Matrix Spike Blank
EB	=	Equipment Rinse Blank
MW	=	Monitoring Well (Groundwater)
TB	=	Trip Blank
RB	=	Rinse Blank
MS/MSD	=	Matrix Spike/Matrix Spike Duplicate
GW	=	Ground water
SB	=	Soil boring
CESS	=	Cesspool soil sample
DW	=	Dry Wells
P/PE	=	Post Excavation
XX	=	Concrete sample
YY	=	Oily debris sample (concrete surface)

An example of this code for a groundwater sample would be MW-1, specifying that the groundwater sample was collected from monitoring well MW-1. Field duplicate samples will be assigned a unique alpha-numeric identification code that specifies the date of collection, the letters FD (for field duplicate), and an ascending number that records the number of duplicate samples collected that day. Field personnel will record the duplicate sample information in the field book and on the appropriate Field Form (**Appendix A**).

9.0 CHAIN-OF-CUSTODY PROCEDURES

Proper documentation of sample collection and the methods used to control these documents are referred to as CoC procedures. CoC procedures are essential for: 1) presenting analytical results in a legal or regulatory forum (e.g., evidence in litigation or administrative hearings); 2) minimizing loss or misidentification of samples; and 3) ensuring that unauthorized persons do not tamper with the collected samples.

The following CoC guidelines should be utilized during sample collection as outlined in the National Enforcement Investigations Center (NEIC) Policies and Procedures of the U.S. Environmental Protection Agency (EPA) Office of Enforcement:

1. Complete the CoC form with all relevant information.
2. Ship the original CoC with the samples in a sealed, waterproof bag taped inside the lid of sample cooler. Place any additional paperwork in the sealed bag with the original CoC.
3. Retain a copy of the CoC.
4. Place adequate inert cushioning material (e.g., corrugated plastic, polypropylene foam wrap, etc.) in the bottom of the cooler.
5. Place bottles in the cooler so they do not touch (use cushioning material for dividers).
6. Place volatile organic analysis (VOA) vials in sealed/waterproof bags in the center of the cooler.
7. Pack cooler with ice in sealed/waterproof plastic bags. Blue ice can also be utilized.
8. Pack cooler with cushioning material.
9. Transport the samples to the analytical laboratory.

If the coolers need to be shipped to the analytical laboratory, the following should also be completed:

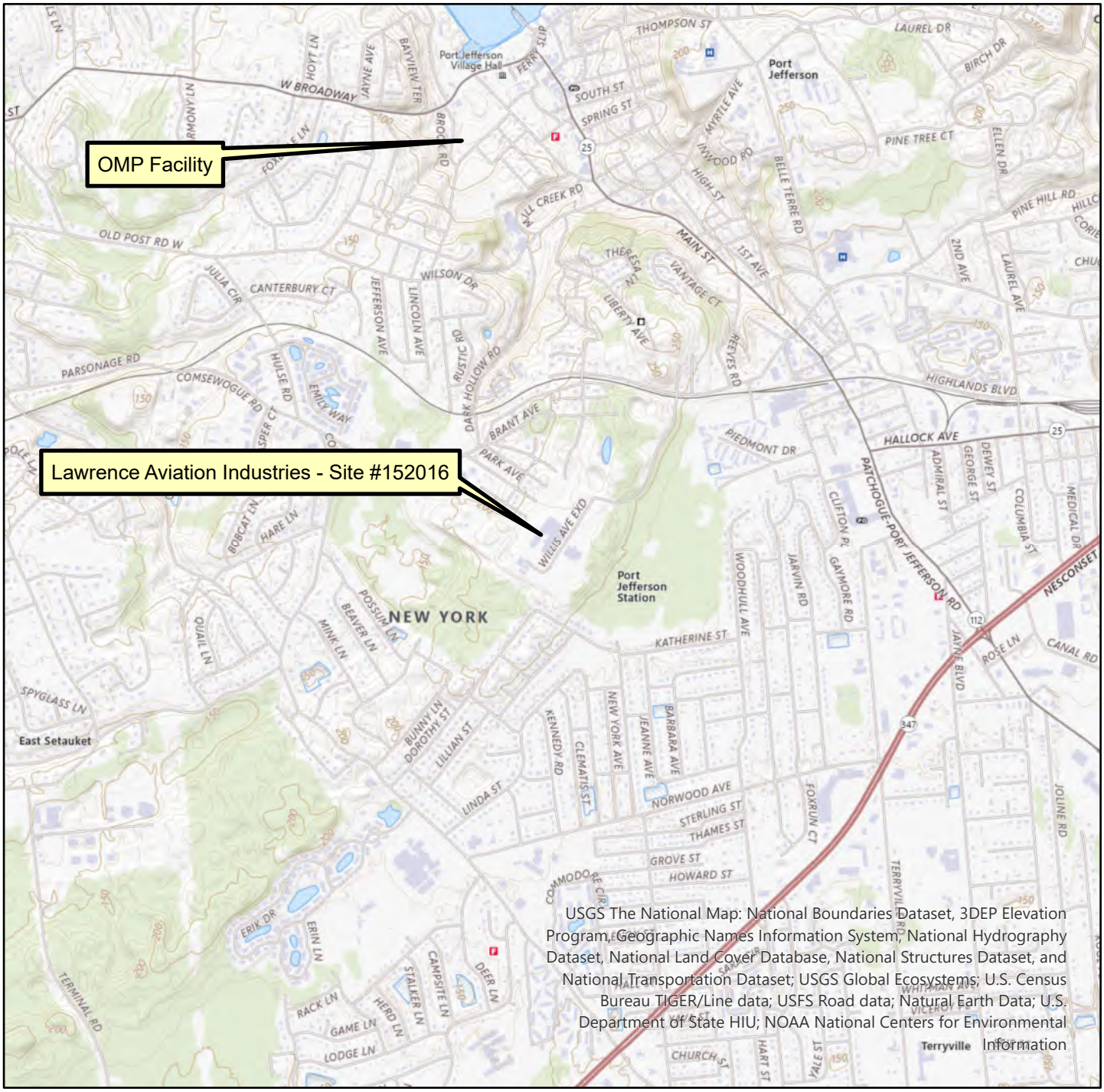
1. Tape the cooler drain shut.
2. Wrap the cooler with packing tape at two locations to secure the lid.
3. Attach the lab address to the top of the cooler.
4. Ship samples via overnight carrier the same day that they are collected.
5. Label the top of the cooler with " This End Up" or "This Side Up." Upward-pointing arrows should be placed on the sides of the cooler.
6. Fix custody seals on the front and back of the cooler and cover with packaging tape.
7. Ship the samples to the analytical laboratory.

More details concerning the CoC, custody seals, and sample handling, packaging, and shipping are provided in the QAPP (Appendix G of the SMP).

10.0 QUALITY CONTROL

The number of Quality Control samples to be collected during sampling activities at the LAI and OMP sites is described in the QAPP (Appendix G of the SMP).

FIGURES



N

0 1,000 2,000 4,000 6,000 8,000

Feet

1:24,000

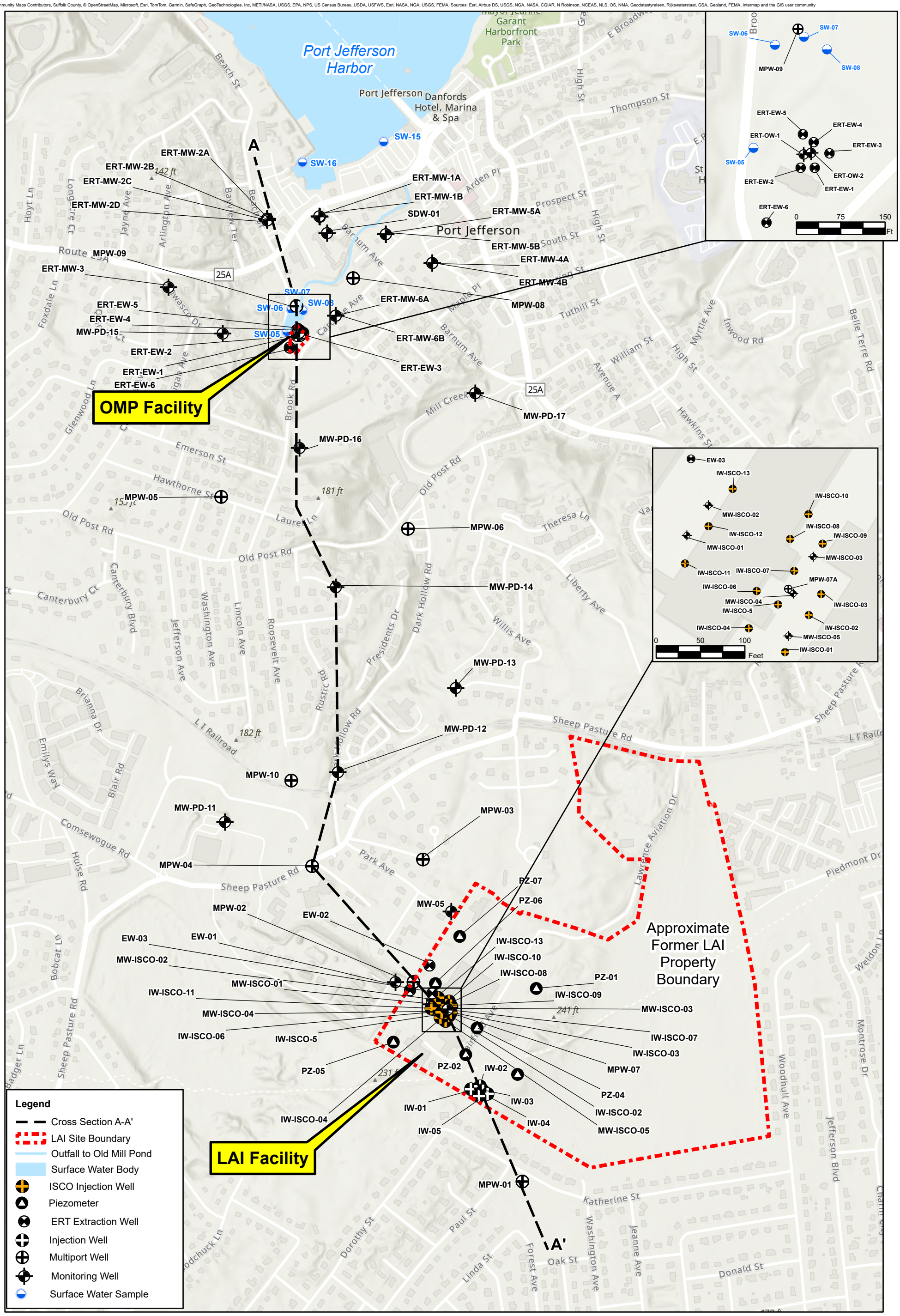
USGS Quadrangle Information
Quad ID: o40073h1
Name: Port Jefferson

Figure 1
Site Location
100 Sheep Pasture Road,
Port Jefferson Station, Brookhaven, NY
HRP #DEC1027.OM
Scale 1" = 2,000'

HRP
MOVE YOUR ENVIRONMENT FORWARD
ONE FAIRCHILD SQUARE
SUITE 110
CLIFTON PARK, NY 12065
(518) 877-7101
HRPASSOCIATES.COM

Path: S:\Data\NYDEC - NYSDEC\BROOKHAVEN\SHEEP PASTURE ROAD, PORT JEFFERSON STATION, NY 11776\DEC1027OM\GIS\GWM Figures\Site Location\Site Location.aprx

Esri Community Maps Contributors, Suffolk County, © OpenStreetMap, Microsoft, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, USFWS, Esri, NASA, NGA, USGS, FEMA, Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community



HRP
MOVE YOUR ENVIRONMENT FORWARD
197 SCOTT SWAMP ROAD
FARMINGTON, CT 06032
(860) 674-9570
HRPASSOCIATES.COM

Monitor Well/Surface Water Sample Locations and Cross Section Map

Lawrence Aviation Industries
SITE NO. 152016
Sheep Pasture Road
Port Jefferson, New York

JH — DESIGNED BY:	11X17 — SHEET SIZE:
BOB — DRAWN BY:	06/18/2024 — DATE:
DR — REVIEWED BY:	DEC1027.OM — PROJECT NUMBER:

North

1" = 700'
0 350 700 Ft

FIGURE 2

Path: S:\Data\NNYDEC - NYSDEC\BROOKHAVEN\SHEEP PASTURE ROAD, PORT JEFFERSON STATION, NY 11776\DEC1027OM\GIS\GWM Figures\Figures.aprx

APPENDIX A
Field Forms

HRP Associates, Inc.									
197 Scott Swamp Rd.			**Monitor Well Data Sheet**					**Well ID:**	
Farmington, CT 06032									
(860) 674-9570			Page ____ of ____						

Site Background Information

Site Location:		**Sampling Dates:**	
Job Number:		**Field Team Leader:**	
Weather:		**Team Personnel:**	

Ground Water Elevation Data

Date	Time	Sampler Name	Equipment Model		Depth to Water (ft)		Depth to Bottom (ft)	
			Solinst-101		uncorrected		uncorrected	
			corr. factor		corrected		corrected	
Measurement Point:						DTB - after sampling =		

Well Condition (circle one)

General Condition	Visible Well ID	Well Cap Present	Well Plumbness	Lock

Concrete Collar	Ponded Water	Comments:

Well Purging Data

Date	Time						Sampler Initials	Instrument Calibration Date
	Equipment Set-up		Purging		Sample Collection			
	Start	Finish	Start	Finish	Start	Finish		

Instrument Mfg & Model	
pH	
Temp.	
Sp. Cond.	
ORP	
DO	
Turbidity	

Initial Water Depth (ft):				Time:				
Time	Water Depth (ft)	Flow Rate (ml/min)	pH (s.u.)	Temp (^{o}C)	Sp Con (uS)	ORP (mV)	DO (mg/l)	Turbidity (ntu)
Req. Limits for Last 3 Readings			+/- 0.1	3%	3%	+/- 10 mv	10% > 0.5	10% > 5

Pump Mfg & Model	Color	Odor	Purge Vol (ml)	Sample Depth (ft.)

Sample Containers

Type & No.	Volume	Preservative		Type & No.	Volume	Preservative

HRP Associates, Inc.
197 Scott Swamp Rd.
Farmington, CT 06032
(860) 674-9570

Monitor Well Data Sheet

Page ____ of ____

Well ID:

Site Background Information

Site Location:
Job Number:
Weather:

Sampling Dates:
Field Team Leader:
Team Personnel:

Time	Water Depth (ft)	Flow Rate (ml/min)	pH (s.u.)	Temp (^{o}C)	Sp Con (uS)	ORP (mV)	DO (mg/l)	Turbidity (ntu)

HRP Associates, Inc.								
197 Scott Swamp Rd.			Surface Water Sample Data				Sample ID:	
Farmington, CT 06032								
(860) 674-9570			Page ____ of ____					

Site Background Information

Site Location:		Sampling Dates:	
Job Number:		Field Team Leader:	
Weather:		Sampler Name:	

Surface Water Observations

Date	Time	Water Conditions (clarity, odors, sheen, etc)	Water Depth (ft)

Water Monitoring Equipment

Instrument Mfg & Model								
pH								
Temp.								
Sp. Cond.								
ORP								
DO								
Turbidity								
Time			pH	Temp	Sp Con	ORP	DO	Turbidity
			(s.u.)	(°C)	(uS)	(mV)	(mg/l)	(ntu)

Sample Containers

Type & No.	Volume	Preservative		Type & No.	Volume	Preservative

APPENDIX H

QUALITY ASSURANCE PROJECT PLAN

MOVE YOUR ENVIRONMENT FORWARD

QUALITY ASSURANCE PROJECT PLAN (QAPP)

FORMER LAWRENCE AVIATION – SITE #152016
100 Sheep Pasture Road
Port Jefferson Station, Suffolk County, New York

Prepared For:

New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, NY 12233-7012

Contract#: D009808, Work Authorization No. 27

Prepared By:

HRP Associates, Inc.
1 Fairchild Square, #110
Clifton Park, NY 12055

HRP# DEC1027.OM

Issued On: September 18, 2025

TABLE OF CONTENTS

TITLE AND APPROVAL PAGE III

INTRODUCTION IV

SECTION A PROJECT ORGANIZATION AND RESPONSIBILITY 1

SECTION B PROBLEM DEFINITION 2

SECTION C PROJECT DESCRIPTION AND TIMELINE 3

SECTION D SAMPLING DESIGN AND SITE FIGURES 4

SECTION E SAMPLING AND ANALYTICAL METHOD REQUIREMENTS 5

SECTION F METHOD AND STANDARD OPERATING PROCEDURES REFERENCE TABLES .. 6

SECTION G LABORATORY EQUIPMENT CALIBRATION AND CORRECTIVE ACTION 8

SECTION H SAMPLE HANDLING AND CUSTODY REQUIREMENTS 12

SECTION I ANALYTICAL SENSITIVITY AND PROJECT CRITERIA 13

SECTION J FIELD QUALITY CONTROL REQUIREMENTS 29

SECTION K LABORATORY QUALITY CONTROL REQUIREMENTS 31

SECTION L DATA MANAGEMENT AND DOCUMENTATION 43

SECTION M ASSESSMENT AND RESPONSE ACTIONS 46

SECTION N PROJECT REPORTS 47

SECTION O FIELD DATA EVALUATION 48

SECTION P LABORATORY DATA EVALUATION 49

SECTION Q DATA USABILITY AND PROJECT EVALUATION 52

Figures

Figure 1 Site Location Map
Figure 2 Site Plan
Figure 2a Class-4 Site Boundary

Appendices

Appendix A Key Contact Information
Appendix B HRP SOPs
Appendix C Pace Analytical Laboratory SOPs
Appendix D Pace Analytical Laboratory QA and DUE Guidance Document

TITLE AND APPROVAL PAGE

QUALITY ASSURANCE PROJECT PLAN (QAPP)

Former Lawrence Aviation Site #152016
Port Jefferson, Suffolk County, NY

Preparer: _____
Signature

Eugene Watson 03/27/2025
Print Name Date

Project Manager: _____
Signature

Derek Roy 03/27/2025
Print Name Date

Project QA Officer: _____
Signature

Michael Varni 11/25/2024
Print Name Date

Contract Manager: _____
Signature

Mark Wright 11/25/2024
Print Name Date

NYSDEC Project Manager: _____
Signature

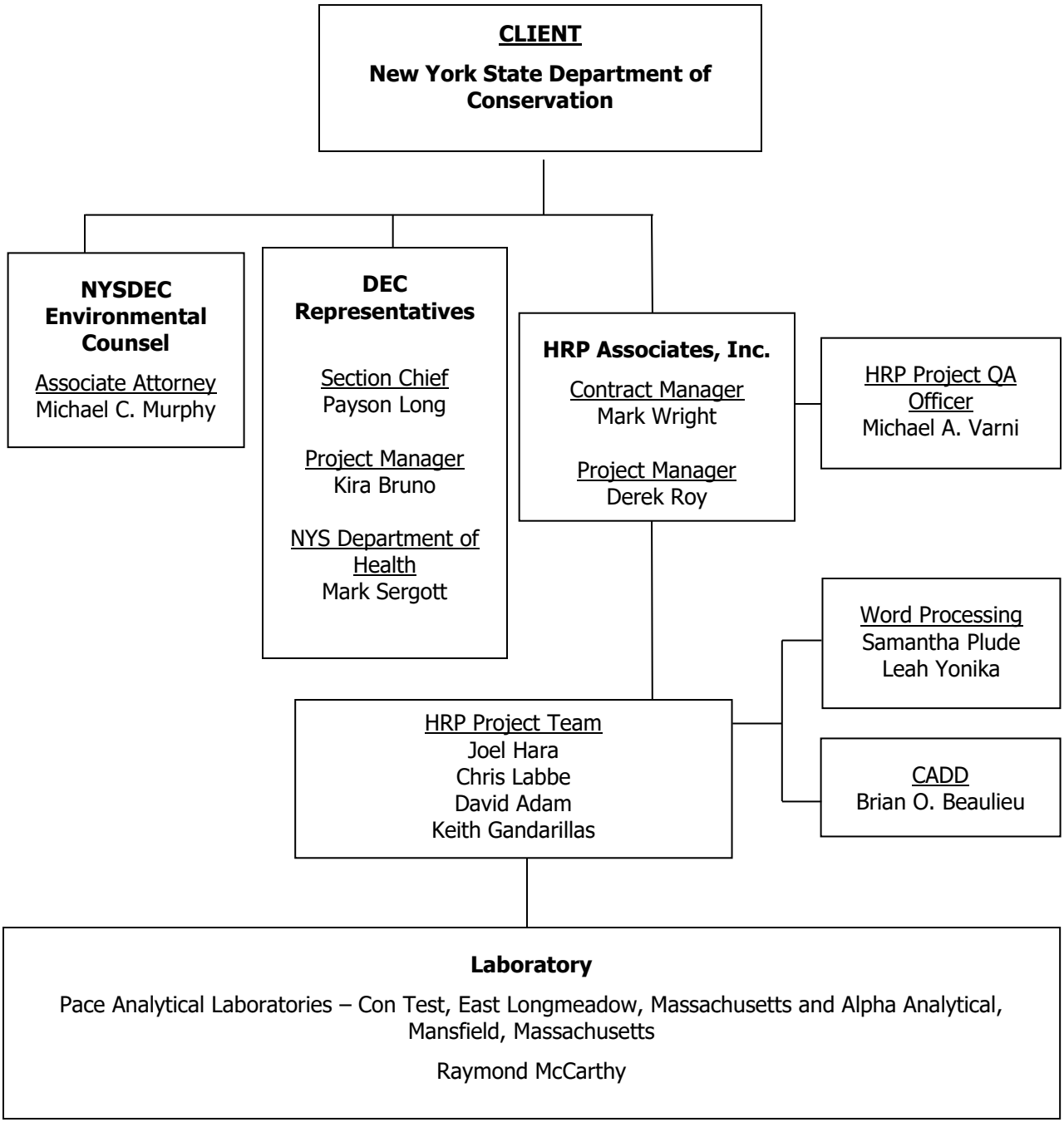
Kira Bruno 09/19/2025
Print Name Date

INTRODUCTION

The purpose of the Quality Assurance Project Plan (QAPP) is to establish the policies, organization, objectives, functional activities, and specific quality assurance (QA) activities for environmental measurements and information collected during remedial actions, ongoing operation and maintenance (O&M), and system optimization tasks at the former Lawrence Aviation Industries (LAI), Site No. 152016, located at 100 Sheep Pasture Road, Town of Brookhaven, Port Jefferson Station, New York ("Site"). Two groundwater extraction and treatment (GWE&T) systems were installed between 2010 and 2011. One system was installed to treat the on-Site LAI groundwater plume (LAI) and one installed to treat the downgradient plume edge adjacent to Old Mill Pond (OMP). The two LAI and OMP systems continue to treat groundwater and are on a monthly O&M and sampling schedule. Long term groundwater monitoring is performed to assess groundwater flow conditions, and remedial effectiveness as related to the operation of the two GWE&T remediation systems. This QAPP has been prepared under the New York State Department of Environmental Conservation (NYSDEC) Contract# D009808 Work Authorization (WA) No. 27.

This document may be updated periodically to reflect any changes in operating, sampling, or reporting procedures that are introduced in the future. The scope of the QAPP was developed from U.S. Environmental Protection Agency (EPA) guidelines outlined in EPA Requirements for "Guidance for Quality Assurance Project Plans, (QA/R-5)," EPA/240/B-01/003, May 2001.

SECTION A PROJECT ORGANIZATION AND RESPONSIBILITY



Appendix A includes contact information for the above.

SECTION B PROBLEM DEFINITION

Overview

This Quality Assurance Project Plan (QAPP) presents specific Quality Assurance/Quality Control (QA/QC) criteria for the potable well sampling to be performed by HRP Associates, Inc. (HRP) at the Former Lawrence Aviation Stie #152016 (the "Site") in Port Jefferson, Suffolk County, New York (**Figure 1**).

The former Lawrence Aviation Industries (LAI) Site encompassed approximately 124 acres and consisted of the former LAI industrial facility and the outlying parcels; the outlying parcels are undeveloped, wooded areas located south and southeast of the former industrial facility area. The former industrial facility area is approximately 36 acres in size and includes the former manufacturing area which previously included ten buildings, housing titanium manufacturing equipment, and titanium manufacturing processes, including chemical plating and pickling operations. The parcels are identified by Suffolk County Tax records as Tax Parcels 159-1-26, 159-2-8, 19, 20, and 22, 136-2-22, and 180-4-2-1. The current owner of the property is listed as Suffolk County Land Bank, LLC. The former LAI Site is bounded to the north by Long Island Railroad and Sheep Pasture Road; to the west residential developments and a commercial property; to the northeast by residential developments; and to the south by Long Island Lighting Company electrical transmission lines. In 2024, the Town of Brookhaven purchased 40 acres of the outlying parcels to the southeast across the New York State Department of Transportation (NYSDOT) right-of-way and is planned to remain as open greenspace (Tax Parcels 180-4-1 and 180-4-2-2). A NYSDOT right-of-way used for mixed-use recreational purposes bifurcates the southeastern corner of the former industrial area (Parcel 159-2-19) and outlying parcel (Parcel 180-4-1-0) and is delineated by security fencing (**Figure 2**). Chlorinated volatile organic compounds (CVOCs), primarily consisting of trichloroethylene (TCE) were detected in groundwater at the Site, including metals, and polychlorinated biphenyls (PCBs) detected in soil. Groundwater treatment is ongoing via two groundwater treatment facilities (GWFTs) and will continue until groundwater is remediated to the cleanup criteria specified in the Record of Decision (ROD) have been met.

In 2025, the New York State Department of Environmental Conservation (NYSDEC) reclassified the Site from a Class-2 Site, to Class-4 for continued Site management and operation of the active GWTFs. The reclassification includes the modification of the Industrial Site boundary from 36.27 acres to approximately 5.50 acres which includes Tax Parcel 159-1-26 and a portion of Parcel 159-2-29. The NYSDEC Class-4 Site will include the groundwater treatment area encompassing an area of approximately 5.50 acres on the western, west central, and southern portion of the former industrial area, which includes the LAI GWTF on the southwest corner of the property (Parcel 159-1-26), and the active treatment area that overlies the west-central portion of the industrial area (Parcel 159-2-19), extending out to, and along the western and southern property boundary (**Figure 2a**). The boundaries of the site are more fully described in the metes and bounds site description that is part of the Environmental Easement provided in the Site Management Plan (SMP).

SECTION C PROJECT DESCRIPTION AND TIMELINE

Detailed information regarding the work to be performed for this project is included in the August 2024 Schedule 1 – Scope of work – Amendment No. 2.

Site Management and Remedial System Optimization Tasks

Investigation, Sampling, and Remedial System Optimization to be performed as required:

- Investigation of building slabs to include sampling of concrete, sludge, sediment, and/or soil.
- Monthly groundwater treatment system sampling at the two treatment facilities (LAI and Old Mill Pond (OMP) facilities), in accordance with NYSDEC State Pollution Discharge Elimination System (SPDES) equivalent permits.
- Comprehensive groundwater sampling performed every fifteen months.
- Remedial system optimization, construction, and/or system improvements.

SECTION D SAMPLING DESIGN AND SITE FIGURES

Field data collection activities will be recorded using field logbooks. Field logbooks will be field survey books, bound notebooks, and/or digital tablet. Logbooks will be assigned to project. Each logbook will be identified by the project-specific document number. Logbook entries will contain a variety of information. At the beginning of each entry, the date, start time, weather, names of field team members present, level of personal protection being used will be entered.

Descriptions of any measurements or collected samples will be recorded within the logbook or on designated field forms. Entries will be made in ink, signed or initialed, and dated. No erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark that is signed or initialed and dated by the sampler. Whenever a sample is collected, or a measurement is made, a detailed description of the location of the sample or measurement will be recorded. Equipment used to collect samples and measurements will be identified (serial and/or instrument number), along with the date of calibration.

NOTE: Some field instrumentation requires daily calibration, this will also be recorded daily, as necessary, in the logbook and/or calibration log for the equipment, with a written record of the results of the calibration, as well as the date and name of the person performing the calibration.

Notes will also be recorded to document other sampling specifics including equipment used, time of sampling, sample description, depth of sample collection, number of sample containers, and container volume. Sample identification numbers will be assigned prior to sample collection. Field duplicate samples will be noted under sample description. Digital photographs will be taken during field activities. These photographs will be paired with a photograph of an identification log that includes the photo subject, date, direction the photo is being taken, and initials of the photographer.

The collected samples will be place in coolers and will be packaged in accordance with sample handling and custody protocols as detailed in **Section K**.

Data collection will consist of sampling of groundwater monitoring wells, monthly system sampling, and investigations soil and groundwater as needed. Laboratory analysis will be consistent with the established sampling protocols. The locations of the monitoring wells and treatment system locations are included on **Figure 2**.

If additional work or changes are required, HRP will make, and request approval of, amendments to this QAPP as needed.

SECTION E SAMPLING AND ANALYTICAL METHOD REQUIREMENTS

The following tables summarize sampling and analytical protocols that will be used during the investigation. Sampling method requirements described in this section include sample preparation, container requirements, and preservation requirements. Standard Operating Procedures (SOPs) detailing sample collection and analyses are provided in **Section F**.

Parameter	Matrix	Number of Samples*	Preparation Method	Analytical Method	Containers per Sample			Preservation Requirements			Maximum Holding Time
					No.	Size	Type	Temp.	Light Sensitive	Chemical	
SOIL/ SOLIDS											
VOCs by GC/MS	Soil/ Solids	75	5035A	SW-846 Method 8260B	3 vials 1 jar	40 ml vials any size jar	glass vials clear glass jar	2-6º C	No	MeOH/ DI Water	14 days
TAL Metals (except Hg) by ICP	Soil/ Solids	75	3050B	SW-846 Method 6010B	1	8 oz	clear glass jar	NA	No	NA	6 months
Mercury (Hg) by CV	Soil/ Solids	75	7471A	SW-846 Method 7471A	1	8 oz	clear glass jar	NA	No	NA	28 days
PCBs by GC	Soil/ Solids	75	3546	SW-846 Method 8082	1	8 oz	clear glass jar	2-6º C	No	NA	14 days
PFAS	Soil/ Solids	75	NA	Draft Method 1633	2	90 ml	polypropylene	2-6º C	No	Trizma	14/28 days
1,4-Dioxane	Soil/ Solids	75	3510C	SW-846 Method 8270 SIM	1	8 oz	amber glass jar	2-6º C	Yes	NA	7 days
GROUNDWATER/ SURFACEWATER											
VOCs by GC/MS	Aqueous	600	5035	SW-846 Method 8260B	2	40 ml	glass vial	2-6º C	No	HCL	14 days
TAL Metals (except Hg) by ICP-	Aqueous	525	3005A	SW-846 Method 6010B	1	500 ml	plastic bottle	NA	No	Nitric Acid	6 months
Mercury (Hg) by CV	Aqueous	525	7470	SW-846 Method 7470A	1	250 ml	plastic bottle	NA	No	Nitric Acid	28 days
Fluoride	Aqueous	110	300	EPA Method 300	1	200 ml	plastic bottle	2-6º C	No	NA	28 days
PFAS	Aqueous	525	NA	Draft Method 1633	3	250 ml	polypropylene	2-6º C	No	Trizma	14/28 days
1,4-Dioxane	Aqueous	525	3510C	SW-846 Method 8270 SIM	2	500 ml	amber glass jar	2-6º C	Yes	NA	7 days
Air											
VOCs by GC/MS	Air	90	NA	NYDEC-TO15-SIM(30)	1	6-liter	Summa	NA	No	NA	28 days

Legend:

C: Celsius
CV: Cold Vapor
DI Water = Deionized water
EPA: U.S. Environmental Protection Agency
GC: Gas Chromatography
ICP: Inductively Coupled Plasma
HCL: Hydrochloric Acid
MeOH: Methanol
mL: Milliliter
MS: Mass Spectrometry
PFAS: per- and polyfluoroalkyl substances
TAL: Target Analyte List
VOCs: Volatile Organic Compounds

*Total samples collected during all sampling events through 12/2026. Field QC includes one duplicate, one matrix spike and one matrix spike duplicate at a rate of one per twenty samples. Additional field reagent blanks for PFAS are described below.

SECTION F METHOD AND STANDARD OPERATING PROCEDURES REFERENCE TABLES

Laboratory Methods and SOPs

The following table presents all of the analytical methods and laboratory SOPs for all of the parameters listed. A copy of each of the laboratory SOPs referenced is included in **Appendix C** (Pace Analytical SOPs).

Analytical Method Reference					Pace Analytical SOP Reference (Appendix C)				
SOP Ref.	**Analytical Method**	**Document Title**	**Revision Number**	**Date**	**Document Title**	**Date**	**Revision Number**	**SOP Reference Number**	**Author's Name**
1	SW-846 Method 8260B	Method 8260D: "Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry"	4	Feb. 2017	ENV-SOP-ELON-0025 v05_EPA 8260D	7/25/2024	5	ENV-SOP-ELON-0025	KA
2	SW-846 Method 6010B	Method 6010D: "Inductively Coupled Plasma—Optical Emission Spectrometry"	5	July 2018	Alpha SOP: Metals by ICP EPA 6010D	6/13/2023	6	Alpha Doc#26796	Alpha QA Dept
3	SW-846 Method 7471A	Method 7471B: "Mercury in Solid Or Semisolid Waste (Manual Cold-Vapor Technique)"	2	Feb. 2007	Alpha SOP: Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique) EPA 7471	7/7/2022	4	Alpha Doc# 25924	Alpha Metals Analysis Dept
4	SW-846 Method 8082	Method 8082A: "Polychlorinated Biphenyls (PCBs) by Gas Chromatography"	1	Feb. 2007	Pace SOP: ENV-SOP-ELON-0034 v04_EPA 8082A-62964-4	8/27/2024	4	ENV-SOP-ELON-0034	KA
5	Draft Method 1633	Draft Method 1633: "Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS"	Draft	Aug. 2021	Pace SOP: ENV-SOP-ELON-0180 v03_PFAS EPA 1633	1/15/2025	3	ENV-SOP-ELON-0180	KA
6	Draft Method 1633	Draft Method 1633: "Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS"	Draft	Aug. 2021	Pace SOP: ENV-SOP-MANS-0111 v01 Preparation and Analysis of PFAS in Aqueous, Solid, and Tissue by EPA Method 1633	8/07/2024	1	ENV-SOP-MANS-0111	JH
7	SW-846 Method 8270 SIM	Method 8270E: "Semi-volatile Organic Compounds by Gas Chromatography/Mass Spectrometry"	6	June 2018	Pace SOP: ENV-SOP-ELON-0060 v02_1,4-Dioxane EPA 8270E Sim	8/27/2024	2	ENV-SOP-ELON-0060	KA
8	EPA Method 300	EPA Method 300.1: "Determination of Inorganic Anions in Drinking Water by Ion Chromatography"	1	April 27, 1999	Pace SOP: ENV-SOP-ELON-0043 v04_IC EPA 300.0	8/27/2024	4	ENV-SOP-ELON-0043	KA
9	NYDEC-TO15-SIM (30)	Method TO-15A: "Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially Prepared Canisters and Analyzed by Gas Chromatography Mass Spectrometry (GC-MS)"	2	Sept. 2019	Alpha SOP: ENV-SOP-MAN1-0001 v01 Volatile Organic Compounds in Ambient Air by TO-15	10/4/2024	1	ENV-SOP-MAN1-0001	Alpha GC/MS-Air Dept

Field Methods and SOPs

HRP has developed SOPs for field investigation and sampling activities that incorporate procedures from the appropriate American Society for Testing and Materials (ASTM) standards, as well as EPA SOPs and other sources. Copies of these HRP's SOPs are included in **Appendix B**. These procedures have been used to generate corporate field data sheets that will be used on projects as appropriate.

SOP Ref.	Document Title	Date
101	HRP Associates, Inc. SOP Soil Boring Advancement	August 2019
104	HRP Associates, Inc. SOP for Soil Sampling	July 2020
105	HRP Associates, Inc. SOP Soil Sample Collection for VOCs	August 2019

SOP Ref.	Document Title	Date
106	HRP Associates, Inc. SOP for Sample Handling	August 2019
107	HRP Associates, Inc. SOP Low Flow Groundwater Sampling	August 2019
108	HRP Associates, Inc. SOP Field Screening	August 2019

SECTION G LABORATORY EQUIPMENT CALIBRATION AND CORRECTIVE ACTION

Pace Analytical Laboratories

Copies of Pace Analytical SOPs are included in **Appendix C**.

Method	Instrument	Activity	Frequency	Acceptance Criteria	Corrective Action	SOP Ref.
EPA 8260D	GC/MS	BFB Tune Check (MS Only)	Initial setup and daily, prior to calibration.	BFB mass to m/z abundance criteria (see Lab SOP).	Run new calibration curve and/or service instrument.	1
		Initial calibration – min. 5 levels	At instrument set up, after CCV failures.	RSD≤20% or linear regression. Linear Regression Requirements: r≥0.998 or r^2≥0.99; Recalculated concentration of cal. point: ±30%, except low point (±50%); %RE (low): 50-150%R; %RE (mid): 70-130%R	Re-analyze standard, run new calibration curve and/or service instrument. May drop the lowest or highest point for an acceptable analyte cal. and recalculate the average RRF and %RSD or linear regression.	
		Continuing calibration – 10 ppb calibration check standard	Start of each twelve-hour analysis sequence, before any samples are analyzed.	±20%D	Re-analyze standard and/or re-calibrate. Re-analyze all samples since last compliant calibration standard. Dilute and re-analyze samples above the upper limit of quantitation. Diluted sample results should be within the upper half of the calibration range.	
EPA 6010D	ICP-AES	Initial calibration – a calibration blank, RL standard and a high-level standard. Verify using ICV, ICB and SIC standards.	Initial setup, daily prior to sample analysis, after CCV failures, and/or after major instrument maintenance.	ICV±10% ICB<½ of LLOQ or RL. SIC=|LLOQ| SIC<±LLOQ for all non-spiked elements.	Re-analyze standard, run new calibration curve and/or service instrument. SIC: Re-evaluate the IECs after running single element SIC.	2
		Continuing calibration – Mid-level calibration standard and calibration blank.	After initial calibration, after every ten samples, and end of sample run.	CCV±10%, RSD<5%. CCB≤½ of LLOQ or RL (whichever is lower). Internal Standard: 50-150%R LDR: ±10%	Re-analyze standard and/or re-calibrate. Re-analyze all samples since last compliant calibration standard. Dilute and reanalyze samples that exceed the linear range or use a calibrated alternate.	

Method	Instrument	Activity	Frequency	Acceptance Criteria	Corrective Action	SOP Ref.
EPA 7471	PE FIMS	Initial calibration – Plot the absorbances of prepared standards versus micrograms of mercury.	Initial setup, daily prior to sample analysis.	r≥0.995 ICB±0.2 µg/L ICV±10%	Re-analyze standard, re-make standard, run new calibration curve, and/or service instrument.	3
		Continuing calibration – CCV, CCB	Every ten samples.	CCV±20% CCB±0.2 µg/L	Re-analyze standard and/or re-calibrate. Re-analyze all samples since last compliant calibration standard. If the sample result is beyond 90% of the concentration of the highest point on the calibration curve or LDR study, dilute the sample extract and analyze samples.	
EPA 8082A	GS	Initial calibration – 6 levels. Curve must contain Aroclors 1016 and 1260.	At instrument set up, after CCV failure, and/or after major maintenance.	Low standard<RL Average RF<20% or r>0.99 Linear Regression %RE: low 50-150%, mid-point 70-130%. ICV: 80-120%	Re-analyze standard, run new calibration curve, and/or service instrument.	4
		Continuing calibration –Mid-point of curve and contain at least Aroclors 1016 and 1260.	Performed every twelve hours, every twenty samples or less, and at the end of the analytical sequence. Verify calibration with a one-point standard within twelve hours of Aroclor detection.	CCV: %RSD±20%.	Re-analyze standard and/or re-calibrate. Re-analyze all samples since last compliant calibration standard.	

Method	Instrument	Activity	Frequency	Acceptance Criteria	Corrective Action	SOP Ref.
EPA 1633	LC-MS/MS	Mass calibration and Mass calibration verification – See instrument manufacturer instructions.	Prior to first use and annually. After major instrument maintenance, movement of the instrument, or when other QC failures suggest the need.	Manufacturer's acceptance criteria.	Re-analyze standard, run new calibration curve, and/or service instrument.	5, 6
		Initial calibration – 9 levels and an IBLK Linear calibration – min. 6 levels. Non-linear calibration (Quadratic) – min. 7 levels. Two calibration model options: 1) ID Quantification 2) EIS Quantification	Initial setup, when calibration verification (ICV, ISC, CCV) results indicate the calibration is no longer valid, when changes made to the operating conditions may affect calibration performance, after major instrument maintenance, or after any other event that may affect instrument performance, such as moving the instrument.	See curve fit options in Lab SOP. For curve fits other than Average RF (RSD), pass RSE test at the low and midpoint calibration standard. LOQ Signal-to-Noise Ratio: 3:1 or minimally 10:1 if the analyte only has a quantification ion. Linear Calibration: RSD≤20%. Non-Linear Quadratic Calibration: RSE≤20%. ICV: ±30%R IBLK<MDL	Re-analyze standard, re-make standard, run new calibration curve, and/or service instrument. Reduce the range of calibration by excluding the highest concentration calibration standards or the first calibration standard.	
		Continuing calibration – CCV: ICAL Level 5	Beginning of each analytical sequence, after every ten environmental samples, and at the end of the sequence.	CCV: 70 – 130%	Re-analyze standard and/or re-calibrate. Re-extract and re-analyze all samples since last compliant calibration standard.	
EPA 8270E Sim	GC/MS	DFTPP Tuning (Mass Spectrometry Only)	Prior to calibration and/or at analyst's discretion.	DFTPP mass to m/z abundance criteria (see Lab SOP). Benzidine tailing<2.	Re-analyze standard, run new calibration curve, and/or service instrument.	7
		Initial calibration – min. 5 levels	At instrument set up, prior to sample analysis, after major instrument maintenance (e.g., change the electron multiplier or ion source chamber, column replacement), and/or if the calibration check standard criteria cannot be met.	See curve fit options in Lab SOP. For curve fits other than Average RF (RSD), pass RSE test at the low and midpoint calibration standard. Low concentration initial calibration standard≤RL. ICV: 70-130% %RSD≤20% or linear regression (r≥0.99).	Re-analyze standard, run new calibration curve, and/or service instrument May drop the lowest or highest point for an acceptable analyte cal. and recalculate the average RRF and %RSD or linear regression.	
		Continuing calibration – mid-point calibration standard	Start of each twelve-hour analysis sequence, before any samples are analyzed.	%D or %Drift: ±20%.	Re-analyze standard, re-calibrate, and/or service instrument. Re-analyze all samples since last compliant calibration standard.	
EPA 300.0	IC	Initial calibration – min. three-point calibration curve and a blank	Prior to the IDC, before any samples are analyzed, and/or at least semi-annually.	All points must back calculate ±10%. r≥0.995 Low-level standard=RL. ICV: ±10%.	Re-analyze standard, run new calibration curve, and/or service instrument. Sufficient standards must be used to clearly define nonlinear portions of the range.	8
		Continuing calibration – mid-range check Standard and a calibration blank	Beginning of every run, after every 10th sample, and at the end of the sample run.	CCV: ±10%	Re-analyze standard, re-calibrate, and/or service instrument. Re-analyze all samples since last compliant calibration standard.	

Method	Instrument	Activity	Frequency	Acceptance Criteria	Corrective Action	SOP Ref.
EPA TO-15	GC/MS	BFB Tune Check (MS Only)	Initial setup and daily, prior to calibration.	BFB mass to m/z abundance criteria (see Lab SOP).	Run new calibration curve and/or service instrument.	9
		Initial calibration – min. 5 levels. ICV: Mid-range calibration standard. Must be a different source than that used for the initial calibration.	Daily prior to sample analysis. ICV: After the initial calibration and prior to sample analysis.	Low point standard: 60-140%R ICV: ±40%R. RSD<30% or linear regression (r≥0.995).	Re-analyze standard, run new calibration curve, and/or service instrument.	
		Continuing calibration – mid-range calibration standard. Must be a different source than that used for the LCS/LCSD pair.	Prior to sample analysis.	70-130%	Re-analyze standard, re-calibrate, and/or service instrument. Re-analyze all samples since last compliant calibration standard.	

%D: Percent Difference	RSD: Relative Standard Deviation	AA: Atomic Absorption	ICV: Initial Calibration Verification	RL: reporting limit
ICB: Initial Calibration Blank	CF: Calibration Factor	CCB: Continuing Calibration Blank	CCV: Continuing Calibration Verification	IBLK: Instrument Blank
CV: Cold Vapor	µg/L: Micrograms per Liter	ECD: Electron Capture Detector	SIC: Single Interference Check	IECs: inter-element correction values
ml: Milliliters	FID: Flame Ionization Detector	uS/cm: Microsiemens per Centimeter	LCS: laboratory control sample	
GC: Gas Chromatography	CCC: Calibration Check Compounds	CR: Control Requirement	LCSD: laboratory control sample duplicate	
ppb: Parts Per Billion	ICP: Inductively Coupled Plasma	QC: Quality Control	ICAL: Initial Calibration	
MS: Mass Spectrometry	TAL: Target Analyte List	r: Coefficient of Correlation	EIS: Extracted Internal Standard	
PCM: Phase Contract Microscopy	RF: Response Factor	PLM: Polarizing Light Microscopy	ID: Isotope Dilution	

SECTION H SAMPLE HANDLING AND CUSTODY REQUIREMENTS

HRP Associates, Inc.

All samples will be collected in the appropriate containers and preserved according to the analytical method guidelines. Sample containers will be clearly labeled with the company name, job number, date, time, sampler's initials, and sample identification (i.e., location, depth, etc.). Samples will be stored in coolers with ice until arrival at the laboratory. Holding times for various parameters are specified in the most recent promulgated drinking water method for the requisite analytical parameter. Questions regarding holding times will be directed to the analytical laboratory.

Pace Analytical Laboratory

All laboratory samples will be tracked via a chain-of-custody. The chain-of-custody will include job number, date, time, sample identification (i.e., location, depth, etc.), and parameters to be analyzed. Each individual handling the sample must sign the chain-of-custody. The original chain-of-custody will remain with the sample throughout the duration of the sampling event and will be kept in the permanent project file. Copies of the chain-of-custody will be distributed to the working project file, laboratory manager, and the data package.

At the laboratory, the samples will be relinquished to the Sample Custodian with the signing of the chain-of-custody and filling out of the sample receipt check list form. The samples will be inventoried and visually inspected for damage. Each sample is assigned an individual laboratory sample number. Samples are logged into the "B" sample login book (the environmental sample logbook). The login includes the lab number, client, date, matrix, preservation, parameters, and laboratory batch ID. This information along with the login date and time, submitter ID, laboratory due date and priority, date sampled, date received, receiver, and any other appropriate laboratory information is then input into the Laboratory Information Management System (LIMS). A form is generated by LIMS and the original chain-of-custody is attached. Samples are transferred for preservation if necessary and refrigeration until analysis. The appropriate analyst or supervisor then performs analysis. After analysis is complete, water samples are held for 30 days and then samples are transferred to disposal; soil samples are held for 30 days, and then sent to storage for an additional 60 days in case further testing is requested. Samples are appropriately characterized and disposed in accordance with federal, state, and local regulations.

SECTION I ANALYTICAL SENSITIVITY AND PROJECT CRITERIA

Pace Analytical Standards

The state and/or federal standards established as of the date of this Site-specific QAPP have been incorporated into the following table along with the RLs listed in state and federal guidance documents. The sample analytical results for the Site will be compared to the appropriate NYSDEC standards.

Matrix: Aqueous
Analytical Group: VOCs by EPA Method 8260
Concentration Level: Low

Analyte	CAS#	Analytical Method	RL (µg/L)	MDL	New York State Regulatory Standards & Limits (µg/L)							
					375-6 SCO Unrestricted	375-6 SCO Residential	375-6 SCO Restricted Residential	375-6 SCO Commercial	375-6 SCO Industrial	Protection of Ecological Resources	Protection of Groundwater	Groundwater GA
1,1,1,2-Tetrachloroethane	630-20-6	8260	1.0	0.21	NA	NA	NA	NA	NA	NA	NA	5
1,1,1-Trichloroethane	71-55-6	8260	1.0	0.14	NA	NA	NA	NA	NA	NA	NA	5
1,1,2,2-Tetrachloroethane	79-34-5	8260	0.50	0.10	NA	NA	NA	NA	NA	NA	NA	NP
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	8260	1.0	0.16	NA	NA	NA	NA	NA	NA	NA	5
1,1,2-Trichloroethane	79-00-5	8260	1.0	0.18	NA	NA	NA	NA	NA	NA	NA	1
1,1-Dichloroethane	75-34-3	8260	1.0	0.15	NA	NA	NA	NA	NA	NA	NA	5
1,1-Dichloroethylene	75-35-4	8260	1.0	0.18	NA	NA	NA	NA	NA	NA	NA	NP
1,1-Dichloropropene	563-58-6	8260	1.0	0.18	NA	NA	NA	NA	NA	NA	NA	NP
1,2,3-Trichlorobenzene	87-61-6	8260	5.0	0.22	NA	NA	NA	NA	NA	NA	NA	5
1,2,3-Trichloropropane	96-18-4	8260	2.0	0.27	NA	NA	NA	NA	NA	NA	NA	NP
1,2,4-Trichlorobenzene	120-82-1	8260	1.0	0.19	NA	NA	NA	NA	NA	NA	NA	5
1,2,4-Trimethylbenzene	95-63-6	8260	1.0	0.16	NA	NA	NA	NA	NA	NA	NA	5
1,2-Dibromo-3-Chloropropane	96-12-8	8260	5.0	0.63	NA	NA	NA	NA	NA	NA	NA	0.04
1,2-Dibromoethane	106-93-4	8260	0.50	0.13	NA	NA	NA	NA	NA	NA	NA	NP
1,2-Dichlorobenzene	95-50-1	8260	1.0	0.17	NA	NA	NA	NA	NA	NA	NA	3
1,2-Dichloroethane	107-06-2	8260	1.0	0.13	NA	NA	NA	NA	NA	NA	NA	0.6
1,2-Dichloropropane	78-87-5	8260	1.0	0.17	NA	NA	NA	NA	NA	NA	NA	1
1,3,5-Trimethylbenzene	108-67-8	8260	1.0	0.17	NA	NA	NA	NA	NA	NA	NA	5
1,3-Dichlorobenzene	541-73-1	8260	1.0	0.15	NA	NA	NA	NA	NA	NA	NA	3
1,3-Dichloropropane	142-28-9	8260	0.50	0.097	NA	NA	NA	NA	NA	NA	NA	5
1,4-Dichlorobenzene	106-46-7	8260	1.0	0.17	NA	NA	NA	NA	NA	NA	NA	3
2,2-Dichloropropane	78-87-5	8260	2.0	0.33	NA	NA	NA	NA	NA	NA	NA	1

Analyte	CAS#	Analytical Method	RL (µg/L)	MDL	New York State Regulatory Standards & Limits (µg/L)							
					375-6 SCO Unrestricted	375-6 SCO Residential	375-6 SCO Restricted Residential	375-6 SCO Commercial	375-6 SCO Industrial	Protection of Ecological Resources	Protection of Groundwater	Groundwater GA
2-Butanone (MEK)	78-93-3	8260	20	1.4	NA	NA	NA	NA	NA	NA	NA	NP
2-Chlorotoluene	95-49-8	8260	1.0	0.21	NA	NA	NA	NA	NA	NA	NA	5
2-Hexanone	591-78-6	8260	10	1.3	NA	NA	NA	NA	NA	NA	NA	NP
4-Chlorotoluene	106-43-4	8260	1.0	0.16	NA	NA	NA	NA	NA	NA	NA	5
Acetone	67-64-1	8260	50	2.0	NA	NA	NA	NA	NA	NA	NA	NP
Acrylonitrile	107-13-1	8260	5.0	1.2	NA	NA	NA	NA	NA	NA	NA	NP
Benzene	71-43-2	8260	1.0	0.14	NA	NA	NA	NA	NA	NA	NA	1
Bromobenzene	108-86-1	8260	1.0	0.19	NA	NA	NA	NA	NA	NA	NA	NP
Bromodichloromethane	75-27-4	8260	0.50	0.19	NA	NA	NA	NA	NA	NA	NA	NP
Bromoform	75-25-2	8260	1.0	0.30	NA	NA	NA	NA	NA	NA	NA	NP
Bromomethane	74-83-9	8260	2.0	1.5	NA	NA	NA	NA	NA	NA	NA	5
Carbon Disulfide	75-15-0	8260	5.0	1.5	NA	NA	NA	NA	NA	NA	NA	60
Carbon Tetrachloride	56-23-5	8260	5.0	0.19	NA	NA	NA	NA	NA	NA	NA	NP
Chlorobenzene	108-90-7	8260	1.0	0.18	NA	NA	NA	NA	NA	NA	NA	5
Chloroethane	75-00-3	8260	2.0	0.46	NA	NA	NA	NA	NA	NA	NA	NP
Chloroform	67-66-3	8260	2.0	0.19	NA	NA	NA	NA	NA	NA	NA	7
Chloromethane	74-87-3	8260	2.0	0.50	NA	NA	NA	NA	NA	NA	NA	5
cis-1,2-Dichloroethylene	156-59-2	8260	1.0	0.20	NA	NA	NA	NA	NA	NA	NA	5
cis-1,3-Dichloropropene	542-75-6	8260	0.50	0.13	NA	NA	NA	NA	NA	NA	NA	0.4
Dibromomethane	74-95-3	8260	1.0	0.24	NA	NA	NA	NA	NA	NA	NA	NP
Dichlorodifluoromethane	75-71-8	8260	2.0	0.2	NA	NA	NA	NA	NA	NA	NA	NP
Ethylbenzene	100-41-4	8260	1.0	0.14	NA	NA	NA	NA	NA	NA	NA	5
Hexachlorobutadiene	87-68-3	8260	0.60	0.31	NA	NA	NA	NA	NA	NA	NA	0.01
Isopropylbenzene	98-82-8	8260	1.0	0.16	NA	NA	NA	NA	NA	NA	NA	NP
m + p Xylene	106-42-3	8260	2.0	0.25	NA	NA	NA	NA	NA	NA	NA	5
Methylene Chloride	75-09-2	8260	5.0	0.19	NA	NA	NA	NA	NA	NA	NA	5
MIBK	108-10-1	8260	10	1.4	NA	NA	NA	NA	NA	NA	NA	NP
MTBE	1634-04-4	8260	1.0	0.17	NA	NA	NA	NA	NA	NA	NA	NP
Naphthalene	91-20-3	8260	2.0	0.25	NA	NA	NA	NA	NA	NA	NA	10
n-Butylbenzene	104-51-8	8260	1.0	0.16	NA	NA	NA	NA	NA	NA	NA	5

Analyte	CAS#	Analytical Method	RL (µg/L)	MDL	New York State Regulatory Standards & Limits (µg/L)							
					375-6 SCO Unrestricted	375-6 SCO Residential	375-6 SCO Restricted Residential	375-6 SCO Commercial	375-6 SCO Industrial	Protection of Ecological Resources	Protection of Groundwater	Groundwater GA
n-Propylbenzene	103-65-1	8260	1.0	0.11	NA	NA	NA	NA	NA	NA	NA	5
o-Xylene	95-47-6	8260	1.0	0.16	NA	NA	NA	NA	NA	NA	NA	5
sec-Butylbenzene	135-98-8	8260	1.0	0.16	NA	NA	NA	NA	NA	NA	NA	5
Styrene	100-42-5	8260	1.0	0.13	NA	NA	NA	NA	NA	NA	NA	50
tert-Butylbenzene	98-06-6	8260	1.0	0.17	NA	NA	NA	NA	NA	NA	NA	5
Tetrachloroethylene	127-18-4	8260	1.0	0.17	NA	NA	NA	NA	NA	NA	NA	NP
Toluene	108-88-3	8260	1.0	0.11	NA	NA	NA	NA	NA	NA	NA	5
trans-1,2-Dichloroethylene	156-60-5	8260	1.0	0.16	NA	NA	NA	NA	NA	NA	NA	5
trans-1,3-Dichloropropene	10061-02-6	8260	0.50	0.017	NA	NA	NA	NA	NA	NA	NA	0.4
trans-1,4-Dichloro-2-Butene	110-57-6	8260	2.0	1.1	NA	NA	NA	NA	NA	NA	NA	NP
Trichloroethylene	79-01-6	8260	1.0	0.17	NA	NA	NA	NA	NA	NA	NA	5
Trichlorofluoromethane	75-69-4	8260	2.0	0.14	NA	NA	NA	NA	NA	NA	NA	5
Vinyl Chloride	75-01-4	8260	2.0	0.19	NA	NA	NA	NA	NA	NA	NA	NP

Matrix: Soil
Analytical Group: VOCs by EPA Method 8260 (sodium bisulfate preserved)
Concentration Level: Low

Analyte	CAS#	Analytical Method	RL (mg/kg)	MDL	New York State Regulatory Standards & Limits (mg/kg)							
					375-6 SCO Unrestricted	375-6 SCO Residential	375-6 SCO Restricted Residential	375-6 SCO Commercial	375-6 SCO Industrial	Protection of Ecological Resources	Protection of Groundwater	Groundwater GA
1,1,1,2-Tetrachloroethane	630-20-6	8260	0.0020	0.00057	0.68	100	100	500	1000	NP	0.68	NA
1,1,1-Trichloroethane	71-55-6	8260	0.0020	0.00059	NP	35	NP	NP	NP	NP	0.6	NA
1,1,2,2-Tetrachloroethane	79-34-5	8260	0.0010	0.00077	NP	100	NP	NP	NP	NP	6	NA
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	8260	0.010	0.0010	NP	NP	NP	NP	NP	NP	NP	NA
1,1,2-Trichloroethane	79-00-5	8260	0.0020	0.00052	0.27	19	26	240	480	NP	0.27	NA
1,1-Dichloroethane	75-34-3	8260	0.0020	0.00061	0.33	100	100	500	1000	NP	0.33	NA
1,1-Dichloroethylene	75-35-4	8260	0.0040	0.00096	NP	NP	NP	NP	NP	NP	NP	NA
1,1-Dichloropropene	563-58-6	8260	0.0020	0.00073	NP	NP	NP	NP	NP	20	NP	NA
1,2,3-Trichlorobenzene	87-61-6	8260	0.0020	0.00066	NP	80	NP	NP	NP	NP	0.34	NA
1,2,3-Trichloropropane	96-18-4	8260	0.0020	0.00081	NP	NP	NP	NP	NP	20	3.4	NA
1,2,4-Trichlorobenzene	120-82-1	8260	0.0020	0.00066	3.6	47	52	190	380	NP	3.6	NA

Analyte	CAS#	Analytical Method	RL (mg/kg)	MDL	New York State Regulatory Standards & Limits (mg/kg)							
					375-6 SCO Unrestricted	375-6 SCO Residential	375-6 SCO Restricted Residential	375-6 SCO Commercial	375-6 SCO Industrial	Protection of Ecological Resources	Protection of Groundwater	Groundwater GA
1,2,4-Trimethylbenzene	95-63-6	8260	0.0020	0.00096	NP	NP	NP	NP	NP	NP	NP	NA
1,2-Dibromo-3-Chloropropane	96-12-8	8260	0.0020	0.00081	NP	NP	NP	NP	NP	NP	NP	NA
1,2-Dibromoethane	106-93-4	8260	0.0010	0.00073	1.1	100	100	500	1000	NP	NP	NA
1,2-Dichlorobenzene	95-50-1	8260	0.0020	0.00064	0.02 [c]	2.3	3.1	30	60	10	0.02	NA
1,2-Dichloroethane	107-06-2	8260	0.0020	0.00069	NP	NP	NP	NP	NP	700	NP	NA
1,2-Dichloropropane	78-87-5	8260	0.0020	0.00062	8.4	47	52	190	380	NP	8.4	NA
1,3,5-Trimethylbenzene	108-67-8	8260	0.0020	0.00080	2.4	17	49	280	560	NP	2.4	NA
1,3-Dichlorobenzene	541-73-1	8260	0.0020	0.00064	NP	NP	NP	NP	NP	NP	0.3	NA
1,3-Dichloropropane	142-28-9	8260	0.0010	0.00056	1.8	9.8	13	130	250	20	1.8	NA
1,4-Dichlorobenzene	106-46-7	8260	0.0020	0.00062	NP	NP	NP	NP	NP	NP	NP	NA
2,2-Dichloropropane	78-87-5	8260	0.0020	0.0074	0.12	100	100	500	1000	100	0.12	NA
2-Butanone (MEK)	78-93-3	8260	0.0040	0.0084	NP	NP	NP	NP	NP	NP	NP	NA
2-Chlorotoluene	95-49-8	8260	0.0020	0.00051	NP	NP	NP	NP	NP	NP	NP	NA
2-Hexanone	591-78-6	8260	0.020	0.0069	NP	NP	NP	NP	NP	NP	NP	NA
4-Chlorotoluene	106-43-4	8260	0.0020	0.00058	0.05	100	100	500	1000	2.2	0.05	NA
Acetone	67-64-1	8260	0.10	0.052	NP	NP	NP	NP	NP	NP	NP	NA
Acrylonitrile	107-13-1	8260	0.0060	0.00096	0.06	2.9	4.8	44	89	70	0.06	NA
Benzene	71-43-2	8260	0.0020	0.00063	NP	NP	NP	NP	NP	NP	NP	NA
Bromobenzene	108-86-1	8260	0.0020	0.00061	NP	NP	NP	NP	NP	NP	NP	NA
Bromodichloromethane	75-27-4	8260	0.0020	0.00051	NP	NP	NP	NP	NP	NP	NP	NA
Bromoform	75-25-2	8260	0.0020	0.00088	NP	NP	NP	NP	NP	NP	NP	NA
Bromomethane	74-83-9	8260	0.0010	0.0018	NP	NP	NP	NP	NP	NP	NP	NA
Carbon Disulfide	75-15-0	8260	0.020	0.010	NP	100	NP	NP	NP	NP	2.7	NA
Carbon Tetrachloride	56-23-5	8260	0.0020	0.00058	0.76	1.4	2.4	22	44	NP	0.76	NA
Chlorobenzene	108-90-7	8260	0.0020	0.00048	1.1	100	100	500	1000	40	1.1	NA
Chloroethane	75-00-3	8260	0.020	0.0014	NP	NP	NP	NP	NP	NP	1.9	NA
Chloroform	67-66-3	8260	0.0040	0.00065	0.37	10	49	350	700	12	0.37	NA
Chloromethane	74-87-3	8260	0.010	0.0012	NP	NP	NP	NP	NP	NP	NP	NA
cis-1,2-Dichloroethylene	156-59-2	8260	0.0020	0.00069	0.25	59	100	500	1000	NP	0.25	NA
cis-1,3-Dichloropropene	542-75-6	8260	0.0010	0.00076	NP	NP	NP	NP	NP	NP	NP	NA

Analyte	CAS#	Analytical Method	RL (mg/kg)	MDL	New York State Regulatory Standards & Limits (mg/kg)							
					375-6 SCO Unrestricted	375-6 SCO Residential	375-6 SCO Restricted Residential	375-6 SCO Commercial	375-6 SCO Industrial	Protection of Ecological Resources	Protection of Groundwater	Groundwater GA
Dibromomethane	74-95-3	8260	0.0020	0.00062	NP	NP	NP	NP	NP	NP	NP	NA
Dichlorodifluoromethane	75-71-8	8260	0.020	0.00088	NP	NP	NP	NP	NP	10	NP	NA
Ethylbenzene	100-41-4	8260	0.0020	0.00058	1	30	41	390	780	NP	1	NA
Hexachlorobutadiene	87-68-3	8260	0.0020	0.00082	NP	NP	NP	NP	NP	NP	NP	NA
Isopropylbenzene	98-82-8	8260	0.0020	0.00077	NP	100	NP	NP	NP	NP	2.3	NA
m + p Xylene	106-42-3	8260	0.0040	0.0014	NP	100	100	500	1000	0.26	1.6	NA
Methylene Chloride	75-09-2	8260	0.020	0.00094	0.05	51	100	500	1000	12	0.05	NA
MIBK	108-10-1	8260	0.020	0.0088	NP	NP	NP	NP	NP	NP	NP	NA
MTBE	1634-04-4	8260	0.0040	0.00088	0.93	62	100	500	1000	NP	0.93	NA
Naphthalene	91-20-3	8260	0.0040	0.00099	NP	100	100	500	1000	NP	12	NA
n-Butylbenzene	104-51-8	8260	0.0020	0.00073	12	100	100	500	1000	NP	12	NA
n-Propylbenzene	103-65-1	8260	0.0020	0.00066	3.9	100	100	500	1000	NP	3.9	NA
o-Xylene	95-47-6	8260	0.0020	0.00068	NP	100	100	500	1000	0.26	1.6	NA
p-Isopropyltoluene	99-87-6	8260	0.0020	0.00065	NP	NP	NP	NP	NP	NP	10	NA
sec-Butylbenzene	135-98-8	8260	0.0020	0.00080	11	100	100	500	1000	NP	11	NA
Styrene	100-42-5	8260	0.0020	0.00064	NP	NP	NP	NP	NP	300	NP	NA
tert-Butylbenzene	98-06-6	8260	0.0020	0.00073	5.9	100	100	500	1000	NP	5.9	NA
Tetrachloroethylene	127-18-4	8260	0.0020	0.00087	1.3	5.5	19	150	300	2	1.3	NA
Toluene	108-88-3	8260	0.0020	0.00059	0.7	100	100	500	1000	36	0.7	NA
Total xylenes	NA	8260	NP	NP	0.26	100	100	500	1000	0.26	1.6	NA
trans-1,2-Dichloroethylene	156-59-2	8260	0.0020	0.00060	0.19	100	100	500	1000	NP	0.19	NA
trans-1,3-Dichloropropene	10061-02-6	8260	0.0010	0.00077	NP	NP	NP	NP	NP	NP	NP	NA
trans-1,4-Dichloro-2-Butene	110-57-6	8260	0.0040	0.00075	NP	NP	NP	NP	NP	NP	NP	NA
Trichloroethylene	79-01-6	8260	0.0020	0.00075	0.47	10	21	200	400	2	0.47	NA
Trichlorofluoromethane	75-69-4	8260	0.010	0.0012	NP	NP	NP	NP	NP	NP	NP	NA
Vinyl Chloride	75-01-4	8260	0.010	0.00078	0.02	0.21	0.9	13	27	NP	0.02	NA

Matrix: Air
Analytical Group: VOCs by EPA Method TO-15
Concentration Level: Low

Analyte	CAS#	Analytical Method	RL (ppbv)	RL (µg/m³)	New York State Department of Health Air Guideline Values (µg/m³)	
					NYSDOH Air Guidance values	NYSDOH Immediate Action Levels
1,1,1-Trichloroethane**	71-55-6	TO-15	0.092	0.5	NP	NP
1,1,2,2-Tetrachloroethane	79-34-5	TO-15	0.073	0.5	NP	NP
1,1,2-Trichloroethane	79-00-5	TO-15	0.092	0.5	NP	NP
1,1-Dichloroethane	75-34-3	TO-15	0.12	0.5	NP	NP
1,1-Dichloroethene*	75-35-4	TO-15	0.13	0.5	NP	NP
1,1-Difluoroethane	75-37-6	TO-15	0.19	0.5	NP	NP
1,2,4-Trichlorobenzene+	120-82-1	TO-15	0.067	0.5	NP	NP
1,2,4-Trimethylbenzene	95-63-6	TO-15	0.1	0.5	NP	NP
1,2-Dibromo-3-chloropropane	96-12-8	TO-15	0.052	0.5	NP	NP
1,2-Dibromoethane	106-93-4	TO-15	0.065	0.5	NP	NP
1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 114)	76-14-2	TO-15	0.072	0.5	NP	NP
1,2-Dichlorobenzene	95-50-1	TO-15	0.083	0.5	NP	NP
1,2-Dichloroethane	107-06-2	TO-15	0.12	0.5	NP	NP
1,2-Dichloroethene, Total	540-59-0	TO-15	0.13	0.5	NP	NP
1,2-Dichloropropane	78-87-5	TO-15	0.11	0.5	NP	NP
1,3,5-Trimethylbenzene+	108-67-8	TO-15	0.1	0.5	NP	NP
1,3-Butadiene	106-99-0	TO-15	0.23	0.5	NP	NP
1,3-Dichlorobenzene	541-73-1	TO-15	0.083	0.5	NP	NP
1,4-Dichlorobenzene	106-46-7	TO-15	0.083	0.5	NP	NP
1,4-Dioxane	123-91-1	TO-15	0.14	0.5	NP	NP
2,2,4-Trimethylpentane (isooctane)+	540-84-1	TO-15	0.08	0.53	NP	NP
2,2-Dichloro-1,1,1-trifluoroethane (Freon 123)	306-83-2	TO-15	0.08	0.5	NP	NP
2-Butanone (MEK)	78-93-3	TO-15	1.7	5	NP	NP
2-Hexanone	591-78-6	TO-15	0.12	0.5	NP	NP
2-Propanol (Isoproppyl Alcohol)	67-63-0	TO-15	2	5	NP	NP
3-Chloro-1-propene (Allyl Chloride)	107-05-1	TO-15	0.16	0.5	NP	NP

Analyte	CAS#	Analytical Method	RL (ppbv)	RL (µg/m³)	New York State Department of Health Air Guideline Values (µg/m³)	
					NYSDOH Air Guidance values	NYSDOH Immediate Action Levels
4-Ethyltoluene	622-96-8	TO-15	0.1	0.5	NP	NP
4-Methyl-2-pentanone	108-10-1	TO-15	0.12	0.5	NP	NP
Acetone	67-64-1	TO-15	2.1	5	NP	NP
Benzene+	71-43-2	TO-15	0.16	0.5	NP	NP
Bromodichloromethane	75-27-4	TO-15	0.075	0.5	NP	NP
Bromoform	75-25-2	TO-15	0.048	0.5	NP	NP
Bromomethane	74-83-9	TO-15	0.13	0.5	NP	NP
Carbon Disulfide	75-15-0	TO-15	1.6	5	NP	NP
Carbon Tetrachloride*	56-23-5	TO-15	0.016	0.1	NP	NP
Chlorobenzene	108-90-7	TO-15	0.11	0.5	NP	NP
Chlorodifluoromethane (Freon 22)	75-45-6	TO-15	0.14	0.5	NP	NP
Chloroethane	75-00-3	TO-15	0.19	0.5	NP	NP
Chloroform	67-66-3	TO-15	0.1	0.5	NP	NP
Chloromethane	74-87-3	TO-15	0.24	0.5	NP	NP
Chloropentafluoroethane	76-15-3	TO-15	0.079	0.5	NP	NP
Chloropentafluoroethane (Freon 115)	76-15-3	TO-15	0.079	0.5	NP	NP
cis-1,2-Dichloroethene*	156-59-2	TO-15	0.13	0.5	NP	NP
cis-1,3-Dichloropropene	10061-01-5	TO-15	0.11	0.5	NP	NP
Cumene	98-82-8	TO-15	0.1	0.5	NP	NP
Cyclohexane+	110-82-7	TO-15	0.29	1	NP	NP
Dibromochloromethane	124-48-1	TO-15	0.059	0.5	NP	NP
Dichlorodifluoromethane (Freon 120)	75-71-8	TO-15	0.1	0.5	NP	NP
Ethylbenzene+	100-41-4	TO-15	0.12	0.5	NP	NP
Heptane+	142-82-5	TO-15	0.13	0.52	NP	NP
Hexachlorobutadiene	87-68-3	TO-15	0.047	0.5	NP	NP
m,p-Xylenes+	179601-23-	TO-15	0.12	0.5	NP	NP
Methyl Acetate	79-20-9	TO-15	0.17	0.5	NP	NP
Methyl tert-Butyl Ether	1634-04-4	TO-15	0.14	0.5	NP	NP
Methylcyclohexane	108-87-2	TO-15	0.12	0.5	NP	NP

Analyte	CAS#	Analytical Method	RL (ppbv)	RL (µg/m³)	New York State Department of Health Air Guideline Values (µg/m³)	
					NYSDOH Air Guidance values	NYSDOH Immediate Action Levels
Methylene Chloride**	75-09-2	TO-15	0.14	0.5	60	NP
Naphthalene+	91-20-3	TO-15	0.13	0.55	NP	NP
n-Hexane+	110-54-3	TO-15	0.14	0.5	NP	NP
o-Xylene+	95-47-6	TO-15	0.12	0.5	NP	NP
Styrene	100-42-5	TO-15	0.12	0.5	NP	NP
Tetrachloroethene**	127-18-4	TO-15	0.074	0.5	100	300
Toluene+	108-88-3	TO-15	0.13	0.5	NP	NP
trans-1,2-Dichloroethene	156-60-5	TO-15	0.13	0.5	NP	NP
trans-1,3-Dichloropropene	10061-02-6	TO-15	0.11	0.5	NP	NP
Trichloroethene*	79-01-6	TO-15	0.019	0.1	5	20
Trichlorofluoromethane	75-69-4	TO-15	0.089	0.5	NP	NP
Trichlorotrifluoroethane (Freon 113)	76-13-1	TO-15	0.065	0.5	NP	NP
Vinyl Chloride***	75-01-4	TO-15	0.039	0.1	NP	NP

Legend:

*: Compounds listed in soil vapor/indoor air matrix A; minimum RL will be 0.20 µg/m³ for indoor/ambient air and 1 µg/m³ for sub-slab soil vapor

**: Compounds listed in soil vapor/indoor air matrix B; minimum RL will be 1 µg/m³ for indoor/ambient air and 1 µg/m³ for sub-slab soil vapor

***: Compounds listed in soil vapor/indoor air matrix C; minimum RL will be 0.20 µg/m³ for indoor/ambient air and 1 µg/m³ for sub-slab soil vapor

+: Compounds listed in soil vapor/indoor air matrix D, E, and F; minimum RL will be less than 1 µg/m³ for indoor/ambient air and 1 µg/m³ for sub-slab soil.

Matrix: Soil
Analytical Method: Metals 6010D/7471B
Concentration level (if applicable): Low

Analyte	CAS#	Analytical Method	RL (mg/kg)	MDL	New York State Regulatory Standards & Limits (mg/kg)							
					375-6 SCO Unrestricted	375-6 SCO Residential	375-6 SCO Restricted Residential	375-6 SCO Commercial	375-6 SCO Industrial	Protection of Ecological Resources	Protection of Groundwater	Groundwater GA
Aluminum	7429-90-5	6010D	4	1.3	NP	NP	NP	NP	NP	10000	NP	NA
Antimony	7440-36-0	6010D	2	1.54	NP	NP	NP	NP	NP	12	NP	NA
Arsenic	7440-38-2	6010D	0.4	0.1728	13	16	16	16	16	13	16	NA
Barium	7440-39-3	6010D	0.4	0.0424	350	350	400	400	10000	433	820	NA
Beryllium	7440-41-7	6010D	0.2	0.022	7.2	14	72	590	2700	10	47	NA

Analyte	CAS#	Analytical Method	RL (mg/kg)	MDL	New York State Regulatory Standards & Limits (mg/kg)							
					375-6 SCO Unrestricted	375-6 SCO Residential	375-6 SCO Restricted Residential	375-6 SCO Commercial	375-6 SCO Industrial	Protection of Ecological Resources	Protection of Groundwater	Groundwater GA
Cadmium	7440-43-9	6010D	0.4	0.022	2.5	2.5	4.3	9.3	60	4	7.5	NA
Calcium	7440-70-2	6010D	4	2.268	NP	NP	NP	NP	NP	10000	NP	NA
Chromium	7440-47-3	6010D	0.4	0.3392	1	22	110	400	800	1	19	NA
Cobalt	7440-48-4	6010D	0.8	0.0992	NP	30	NP	NP	NP	20	NP	NA
Copper	7440-50-8	6010D	0.4	0.0908	50	270	270	270	10000	50	1720	NA
Iron	7439-89-6	6010D	2	0.42	NP	2000	NP	NP	NP	NP	NP	NA
Lead	7439-92-1	6010D	2	0.0952	63	400	400	1000	3900	63	450	NA
Magnesium	7439-95-4	6010D	4	0.652	NP	NP	NP	NP	NP	NP	NP	NA
Manganese	7439-96-5	6010D	0.4	0.2144	1600	2000	2000	10000	10000	1600	2000	NA
Mercury	7439-97-6	7471B	0.08	0.05216	0.18	0.81	0.81	2.8	5.7	0.18	0.73	NA
Nickel	7440-02-0	6010D	1	0.3232	30	140	310	310	10000	30	130	NA
Potassium	7440-09-7	6010D	100	20.28	NP	NP	NP	NP	NP	NP	NP	NA
Selenium	7782-49-2	6010D	0.8	0.1316	3.9	36	180	1500	6800	3.9	4	NA
Silver	7440-22-4	6010D	0.2	0.1192	2	36	180	1500	6800	2	8.3	NA
Sodium	7440-23-5	6010D	80	42.4	NP	NP	NP	NP	NP	NP	NP	NA
Thallium	7440-28-0	6010D	0.8	0.3608	NP	NP	NP	NP	NP	5	NP	NA
Vanadium	7440-62-2	6010D	0.4	0.0604	NP	100	NP	NP	NP	39	NP	NA
Zinc	7440-66-6	6010D	2	0.2424	109	2200	10000	10000	10000	109	2480	NA

Matrix: Aqueous
Analytical Method: Metals 6010D/7470A
Concentration level (if applicable): Low

Analyte	CAS#	Analytical Method	RL (mg/L)	MDL	New York State Regulatory Standards & Limits (mg/L)							
					375-6 SCO Unrestricted	375-6 SCO Residential	375-6 SCO Restricted Residential	375-6 SCO Commercial	375-6 SCO Industrial	Protection of Ecological Resources	Protection of Groundwater	Groundwater GA
Aluminum	7429-09-5	6010D	0.1	0.0318	NA	NA	NA	NA	NA	NA	NA	NP
Antimony	7440-36-0	6010D	0.05	0.0071	NA	NA	NA	NA	NA	NA	NA	0.003
Arsenic	7440-38-2	6010D	0.005	0.0019	NA	NA	NA	NA	NA	NA	NA	0.025
Barium	7440-39-3	6010D	0.01	0.0021	NA	NA	NA	NA	NA	NA	NA	1
Beryllium	7440-41-7	6010D	0.005	0.0009	NA	NA	NA	NA	NA	NA	NA	0.003
Cadmium	7440-43-9	6010D	0.005	0.001	NA	NA	NA	NA	NA	NA	NA	0.005

Analyte	CAS#	Analytical Method	RL (mg/L)	MDL	New York State Regulatory Standards & Limits (mg/L)							
					375-6 SCO Unrestricted	375-6 SCO Residential	375-6 SCO Restricted Residential	375-6 SCO Commercial	375-6 SCO Industrial	Protection of Ecological Resources	Protection of Groundwater	Groundwater GA
Calcium	7440-70-2	6010D	0.1	0.035	NA	NA	NA	NA	NA	NA	NA	NP
Chromium	7440-47-3	6010D	0.01	0.0021	NA	NA	NA	NA	NA	NA	NA	0.05
Cobalt	7440-48-4	6010D	0.02	0.0017	NA	NA	NA	NA	NA	NA	NA	NP
Copper	7440-50-8	6010D	0.01	0.0022	NA	NA	NA	NA	NA	NA	NA	0.2
Iron	7439-89-6	6010D	0.05	0.009	NA	NA	NA	NA	NA	NA	NA	0.3
Lead	7439-92-1	6010D	0.01	0.0027	NA	NA	NA	NA	NA	NA	NA	0.025
Magnesium	7439-95-4	6010D	0.1	0.0153	NA	NA	NA	NA	NA	NA	NA	35
Manganese	7439-96-5	6010D	0.01	0.0016	NA	NA	NA	NA	NA	NA	NA	0.3
Mercury	7439-97-6	7470A	0.0002	0.0000915	NA	NA	NA	NA	NA	NA	NA	0.0007
Nickel	7440-02-0	6010D	0.025	0.0024	NA	NA	NA	NA	NA	NA	NA	0.1
Potassium	7440-09-7	6010D	2.5	0.237	NA	NA	NA	NA	NA	NA	NA	NP
Selenium	7782-49-2	6010D	0.01	0.0035	NA	NA	NA	NA	NA	NA	NA	0.01
Silver	7440-22-4	6010D	0.007	0.0028	NA	NA	NA	NA	NA	NA	NA	0.05
Sodium	7440-23-5	6010D	2	0.12	NA	NA	NA	NA	NA	NA	NA	20
Thallium	7440-28-0	6010D	0.02	0.0025	NA	NA	NA	NA	NA	NA	NA	0.0005
Vanadium	7440-62-2	6010D	0.01	0.002	NA	NA	NA	NA	NA	NA	NA	NP
Zinc	7440-66-6	6010D	0.05	0.0021	NA	NA	NA	NA	NA	NA	NA	2

Matrix: Soil
Analytical Method: PCB 8082A
Concentration level (if applicable): Low

Analyte	CAS#	Analytical Method	RL (mg/kg)	MDL	New York State Regulatory Standards and Limits (mg/kg)							
					375-6 SCO Unrestricted	375-6 SCO Residential	375-6 SCO Restricted Residential	375-6 SCO Commercial	375-6 SCO Industrial	Protection of Ecological Resources	Protection of Groundwater	Groundwater GA
Aroclor-1016	12674-11-2	8082A	0.020	0.0049	0.1	1	1	1	25	1	3.2	NA
Aroclor-1221	11104-28-2	8082A	0.020	0.0093	0.1	1	1	1	25	1	3.2	NA
Aroclor-1232	11141-16-5	8082A	0.020	0.0049	0.1	1	1	1	25	1	3.2	NA
Aroclor-1242	53469-21-9	8082A	0.020	0.0055	0.1	1	1	1	25	1	3.2	NA
Aroclor-1248	12672-29-6	8082A	0.020	0.0048	0.1	1	1	1	25	1	3.2	NA
Aroclor-1254	11097-69-1	8082A	0.020	0.0060	0.1	1	1	1	25	1	3.2	NA
Aroclor-1260	11096-82-5	8082A	0.020	0.0042	0.1	1	1	1	25	1	3.2	NA

Analyte	CAS#	Analytical Method	RL (mg/kg)	MDL	New York State Regulatory Standards and Limits (mg/kg)							
					375-6 SCO Unrestricted	375-6 SCO Residential	375-6 SCO Restricted Residential	375-6 SCO Commercial	375-6 SCO Industrial	Protection of Ecological Resources	Protection of Groundwater	Groundwater GA
Aroclor-1262	37324-23-5	8082A	0.020	0.0052	0.1	1	1	1	25	1	3.2	NA
Aroclor-1268	11100-14-4	8082A	0.020	0.0053	0.1	1	1	1	25	1	3.2	NA

Matrix: Aqueous
Analytical Method: PCB 8082A
Concentration level (if applicable): Low

Analyte	CAS#	Analytical Method	RL (µg/L)	MDL	New York State Regulatory Standards & Limits (µg/L)							
					375-6 SCO Unrestricted	375-6 SCO Residential	375-6 SCO Restricted Residential	375-6 SCO Commercial	375-6 SCO Industrial	Protection of Ecological Resources	Protection of Groundwater	Groundwater GA
Aroclor-1016	12674-11-2	8082A	0.020	0.13	NA	NA	NA	NA	NA	NA	NA	0.09
Aroclor-1221	11104-28-2	8082A	0.020	0.10	NA	NA	NA	NA	NA	NA	NA	0.09
Aroclor-1232	11141-16-5	8082A	0.020	0.094	NA	NA	NA	NA	NA	NA	NA	0.09
Aroclor-1242	53469-21-9	8082A	0.020	0.11	NA	NA	NA	NA	NA	NA	NA	0.09
Aroclor-1248	12672-29-6	8082A	0.020	0.094	NA	NA	NA	NA	NA	NA	NA	0.09
Aroclor-1254	11097-69-1	8082A	0.020	0.10	NA	NA	NA	NA	NA	NA	NA	0.09
Aroclor-1260	11096-82-5	8082A	0.020	0.12	NA	NA	NA	NA	NA	NA	NA	0.09
Aroclor-1262	37324-23-5	8082A	0.020	0.083	NA	NA	NA	NA	NA	NA	NA	0.09
Aroclor-1268	11100-14-4	8082A	0.020	0.076	NA	NA	NA	NA	NA	NA	NA	0.09

Matrix: Soil
Analytical Method: 1,4-Dioxane 8270SIM
Concentration level (if applicable): Low

Analyte	CAS#	Analytical Method	RL (mg/kg)	MDL	New York State Regulatory Standards & Limits (mg/kg)							
					375-6 SCO Unrestricted	375-6 SCO Residential	375-6 SCO Restricted Residential	375-6 SCO Commercial	375-6 SCO Industrial	Protection of Ecological Resources	Protection of Groundwater	Groundwater GA
1,4-Dioxane	123-91-1	8270 SIM	0.050	.018	NA	NA	NA	NA	NA	NA	NA	NA

Matrix: Aqueous
Analytical Method: 1,4-Dioxane 8270SIM
Concentration level (if applicable): Low

Analyte	CAS#	Analytical Method	RL (µg/L)	MDL	New York State Regulatory Standards & Limits (µg/L)							
					375-6 SCO Unrestricted	375-6 SCO Residential	375-6 SCO Restricted Residential	375-6 SCO Commercial	375-6 SCO Industrial	Protection of Ecological Resources	Protection of Groundwater	Groundwater GA
1,4-Dioxane	123-91-1	8270 SIM	0.20	0.18	NA	NA	NA	NA	NA	NA	NA	0.35

Matrix: Aqueous
Analytical Method: Fluoride 300.0
Concentration level (if applicable): Low

Analyte	CAS#	Analytical Method	RL (µg/L)	MDL	New York State Regulatory Standards & Limits (µg/L)							
					375-6 SCO Unrestricted	375-6 SCO Residential	375-6 SCO Restricted Residential	375-6 SCO Commercial	375-6 SCO Industrial	Protection of Ecological Resources	Protection of Groundwater	Groundwater GA
Fluoride	7681-49-4	300.0	0.10	0.068	NA	NA	NA	NA	NA	NA	NA	1500

Matrix: Soil
Analytical Method: PFAS 1633
Concentration level (if applicable): Low

Analyte	CAS#	Analytical Method	RL (µg/kg)	MDL	New York State Regulatory Standards & Limits (µg/kg)							
					375-6 SCO Unrestricted	375-6 SCO Residential	375-6 SCO Restricted Residential	375-6 SCO Commercial	375-6 SCO Industrial	Protection of Ecological Resources	Protection of Groundwater	Groundwater GA
Perfluorooctanoic acid (PFOA)	335-67-1	1633	0.20	0.0069	0.66	6.6	33	**500**	600	NP	1.1	NP
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	1633	0.20	0.061	0.88	8.8	44	440	440	NP	3.7	NP
Perfluorobutanoic acid (PFBA)	375-22-4	1633	0.80	0.27	NA	NA	NA	NA	NA	NA	NA	NP
Perfluorobutanesulfonic acid (PFBS)	375-73-5	1633	0.80	0.064	NA	NA	NA	NA	NA	NA	NA	NP
Perfluoropentanoic acid (PFPeA)	2706-90-3	1633	0.40	0.13	NA	NA	NA	NA	NA	NA	NA	NP
Perfluorohexanoic acid (PFHxA)	307-24-4	1633	0.20	0.082	NA	NA	NA	NA	NA	NA	NA	NP
Perfluorodecanoic acid (PFDA)	335-76-2	1633	0.20	0.063	NA	NA	NA	NA	NA	NA	NA	NP
Perfluorododecanoic acid (PFDoA)	307-55-1	1633	0.20	0.075	NA	NA	NA	NA	NA	NA	NA	NP
Perfluoroheptanesulfonic acid (PFHpS)	375-92-8	1633	0.20	0.10	NA	NA	NA	NA	NA	NA	NA	NP
N-EtFOSAA (NEtFOSAA)	2991-50-6	1633	0.20	0.092	NA	NA	NA	NA	NA	NA	NA	NP
N-MeFOSAA (NMeFOSAA)	2355-31-9	1633	0.20	0.10	NA	NA	NA	NA	NA	NA	NA	NP

Analyte	CAS#	Analytical Method	RL (µg/kg)	MDL	New York State Regulatory Standards & Limits (µg/kg)							
					375-6 SCO Unrestricted	375-6 SCO Residential	375-6 SCO Restricted Residential	375-6 SCO Commercial	375-6 SCO Industrial	Protection of Ecological Resources	Protection of Groundwater	Groundwater GA
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	1633	0.20	0.068	NA	NA	NA	NA	NA	NA	NA	NP
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	1633	0.20	0.064	NA	NA	NA	NA	NA	NA	NA	NP
Perfluorodecanesulfonic acid (PFDS)	335-77-3	1633	0.20	0.065	NA	NA	NA	NA	NA	NA	NA	NP
Perfluorooctanesulfonamide (PFOSA)	754-91-6	1633	0.20	0.081	NA	NA	NA	NA	NA	NA	NA	NP
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	1633	0.20	0.075	NA	NA	NA	NA	NA	NA	NA	NP
1H,1H,2H,2H-Perfluorooctanesulfonic acid (6:2FTS A)	27619-97-2	1633	0.80	0.29	NA	NA	NA	NA	NA	NA	NA	NP
Perfluoroundecanoic acid (PFUnA)	2058-94-8	1633	0.20	0.083	NA	NA	NA	NA	NA	NA	NA	NP
Perfluorononanoic acid (PFNA)	375-95-1	1633	0.20	0.075	NA	NA	NA	NA	NA	NA	NA	NP
Perfluoroheptanoic acid (PFHpA)	375-73-5	1633	0.20	0.083	NA	NA	NA	NA	NA	NA	NA	NP
1H,1H,2H,2H-Perfluorodecanesulfonic acid (8:2 FTS)	39108-34-4	1633	0.80	0.37	NA	NA	NA	NA	NA	NA	NA	NP
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	113507-82-7	1633	0.40	0.15	NA	NA	NA	NA	NA	NA	NA	NP
Perfluoro-3,6-dioxaheptanoic acid (NFDHA)	151772-58-6	1633	0.40	0.25	NA	NA	NA	NA	NA	NA	NA	NP
Perfluoro-3-methoxypropanoic acid (PFMPA)	377-73-1	1633	1.9	0.54	NA	NA	NA	NA	NA	NA	NA	NP
Perfluoro-4-methoxybutanoic acid (PFMBA)	863090-89-5	1633	0.40	0.12	NA	NA	NA	NA	NA	NA	NA	NP
Perfluoro-1-pentanesulfonate (PFPeS)	2706-91-4	1633	0.20	0.064	NA	NA	NA	NA	NA	NA	NA	NP
1H,1H,2H,2H-Perfluorohexanesulfonic acid (4:2 FTS)	757124-72-4	1633	0.80	0.30	NA	NA	NA	NA	NA	NA	NA	NP
HFPO-DA (Gen-X)	13252-13-6	1633	0.80	0.34	NA	NA	NA	NA	NA	NA	NA	NP
11CL-PF3OUdS	763051-92-9	1633	0.80	0.27	NA	NA	NA	NA	NA	NA	NA	NP
9CL-PF3ONS	756426-58-1	1633	0.80	0.23	NA	NA	NA	NA	NA	NA	NA	NP
ADONA	919005-14-4	1633	0.80	0.32	NA	NA	NA	NA	NA	NA	NA	NP
Perfluorododecanesulfonic acid (PFDoS)	79780-39-5	1633	0.80	0.37	NA	NA	NA	NA	NA	NA	NA	NP

Analyte	CAS#	Analytical Method	RL (µg/kg)	MDL	New York State Regulatory Standards & Limits (µg/kg)							
					375-6 SCO Unrestricted	375-6 SCO Residential	375-6 SCO Restricted Residential	375-6 SCO Commercial	375-6 SCO Industrial	Protection of Ecological Resources	Protection of Groundwater	Groundwater GA
Perfluorononanesulfonic acid (PFNS)	68259-12-1	1633	0.20	0.050	NA	NA	NA	NA	NA	NA	NA	NP
3-Perfluoropropyl propanoic acid (FPrPA)	356-02-5	1633	1.0	0.49	NA	NA	NA	NA	NA	NA	NA	NP
2H,2H,3H,3H-Perfluorooctanoic acid (FPePA)	914637-49-3	1633	5.0	1.5	NA	NA	NA	NA	NA	NA	NA	NP
3-Perfluoroheptyl propanoic acid (FHpPA)	812-70-4	1633	5.0	1.6	NA	NA	NA	NA	NA	NA	NA	NP
N-MeFOSE	24448-09-7	1633	2.0	0.65	NA	NA	NA	NA	NA	NA	NA	NP
N-MeFOSA	31506-32-8	1633	0.20	0.056	NA	NA	NA	NA	NA	NA	NA	NP
N-EtFOSE	1691-99-2	1633	2.0	0.71	NA	NA	NA	NA	NA	NA	NA	NP
N-EtFOSA	4151-50-2	1633	2.0	0.090	NA	NA	NA	NA	NA	NA	NA	NP

Matrix: Aqueous
Analytical Method: PFAS 1633
Concentration level (if applicable): Low

Analyte	CAS#	Analytical Method	RL (ng/l)	MDL	New York State Regulatory Standards & Limits (ng/l)							
					375-6 SCO Unrestricted	375-6 SCO Residential	375-6 SCO Restricted Residential	375-6 SCO Commercial	375-6 SCO Industrial	Protection of Ecological Resources	Protection of Groundwater	Groundwater GA
Perfluorooctanoic acid (PFOA)	335-67-1	1633	1.6	0.42	NA	NA	NA	NA	NA	NA	NA	6.7
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	1633	1.6	0.40	NA	NA	NA	NA	NA	NA	NA	2.7
Perfluorobutanoic acid (PFBA)	375-22-4	1633	6.4	0.80	NA	NA	NA	NA	NA	NA	NA	NP
Perfluorobutanesulfonic acid (PFBS)	375-73-5	1633	1.6	0.34	NA	NA	NA	NA	NA	NA	NA	NP
Perfluoropentanoic acid (PFPeA)	2706-90-3	1633	3.2	0.45	NA	NA	NA	NA	NA	NA	NA	NP
Perfluorohexanoic acid (PFHxA)	307-24-4	1633	1.6	0.28	NA	NA	NA	NA	NA	NA	NA	NP
Perfluorodecanoic acid (PFDA)	335-76-2	1633	1.6	0.39	NA	NA	NA	NA	NA	NA	NA	NP
Perfluorododecanoic acid (PFDoA)	307-55-1	1633	1.6	0.35	NA	NA	NA	NA	NA	NA	NA	NP
Perfluoroheptanesulfonic acid (PFHpS)	375-92-8	1633	1.6	0.85	NA	NA	NA	NA	NA	NA	NA	NP
N-EtFOSAA (NEtFOSAA)	2991-50-6	1633	1.6	0.65	NA	NA	NA	NA	NA	NA	NA	NP
N-MeFOSAA (NMeFOSAA)	2355-31-9	1633	1.6	1.50	NA	NA	NA	NA	NA	NA	NA	NP
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	1633	1.6	0.15	NA	NA	NA	NA	NA	NA	NA	NP

Analyte	CAS#	Analytical Method	RL (ng/l)	MDL	New York State Regulatory Standards & Limits (ng/l)							
					375-6 SCO Unrestricted	375-6 SCO Residential	375-6 SCO Restricted Residential	375-6 SCO Commercial	375-6 SCO Industrial	Protection of Ecological Resources	Protection of Groundwater	Groundwater GA
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	1633	1.6	0.48	NA	NA	NA	NA	NA	NA	NA	NP
Perfluorodecanesulfonic acid (PFDS)	335-77-3	1633	1.6	0.51	NA	NA	NA	NA	NA	NA	NA	NP
Perfluorooctanesulfonamide (FOSA)	754-91-6	1633	1.6	0.56	NA	NA	NA	NA	NA	NA	NA	NP
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	1633	1.6	0.62	NA	NA	NA	NA	NA	NA	NA	NP
6:2 Fluorotelomersulfonic acid (6:2FTS A)	27619-97-2	1633	6.4	3.0	NA	NA	NA	NA	NA	NA	NA	NP
Perfluoroundecanoic acid (PFUnA)	2058-94-8	1633	1.6	0.51	NA	NA	NA	NA	NA	NA	NA	NP
Perfluorononanoic acid (PFNA)	375-95-1	1633	1.6	0.65	NA	NA	NA	NA	NA	NA	NA	NP
Perfluoroheptanoic acid (PFHpA)	375-73-5	1633	1.6	0.28	NA	NA	NA	NA	NA	NA	NA	NP
1H,1H,2H,2H-Perfluorodecanesulfonic acid (8:2 FTS)	39108-34-4	1633	6.4	3.3	NA	NA	NA	NA	NA	NA	NA	NP
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	113507-82-7	1633	3.2	0.57	NA	NA	NA	NA	NA	NA	NA	NP
Perfluoro-3,6-dioxaheptanoic acid (NFDHA)	151772-58-6	1633	3.2	2.1	NA	NA	NA	NA	NA	NA	NA	NP
Perfluoro-4-oxapentanoic acid (PFMPA)	377-73-1	1633	3.2	0.46	NA	NA	NA	NA	NA	NA	NA	NP
Perfluoro-5-oxahexanoic acid (PFMBA)	863090-89-5	1633	3.2	0.43	NA	NA	NA	NA	NA	NA	NA	NP
Perfluoro-1-pentanesulfonate (PFPeS)	2706-91-4	1633	1.6	0.47	NA	NA	NA	NA	NA	NA	NA	NP
1H,1H,2H,2H-Perfluorohexanesulfonic acid (4:2 FTS)	757124-72-4	1633	6.4	1.3	NA	NA	NA	NA	NA	NA	NA	NP
HFPO-DA (Gen-X)	13252-13-6	1633	6.4	1.5	NA	NA	NA	NA	NA	NA	NA	NP
11CL-PF3OUdS	763051-92-9	1633	6.4	1.7	NA	NA	NA	NA	NA	NA	NA	NP
9CL-PF3ONS	756426-58-1	1633	6.4	0.93	NA	NA	NA	NA	NA	NA	NA	NP
ADONA	919005-14-4	1633	6.4	0.85	NA	NA	NA	NA	NA	NA	NA	NP
Perfluorododecanesulfonic acid (PFDoS)	79780-39-5	1633	1.6	0.72	NA	NA	NA	NA	NA	NA	NA	NP
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	1633	1.6	0.47	NA	NA	NA	NA	NA	NA	NA	NP

Analyte	CAS#	Analytical Method	RL (ng/l)	MDL	New York State Regulatory Standards & Limits (ng/l)							
					375-6 SCO Unrestricted	375-6 SCO Residential	375-6 SCO Restricted Residential	375-6 SCO Commercial	375-6 SCO Industrial	Protection of Ecological Resources	Protection of Groundwater	Groundwater GA
3-Perfluoropropyl propanoic acid (FPrPA)	356-02-5	1633	8.0	2.2	NA	NA	NA	NA	NA	NA	NA	NP
3-Perfluoropentyl propanoic acid (FPePA)	914637-49-3	1633	40	7.0	NA	NA	NA	NA	NA	NA	NA	NP
3-Perfluoroheptyl propanoic acid (FHpPA)	812-70-4	1633	40	9.0	NA	NA	NA	NA	NA	NA	NA	NP
N-MeFOSE	24448-09-7	1633	1.6	1.3	NA	NA	NA	NA	NA	NA	NA	NP
N-MeFOSA	31506-32-8	1633	1.6	1.5	NA	NA	NA	NA	NA	NA	NA	NP
N-EtFOSE	1691-99-2	1633	1.6	0.65	NA	NA	NA	NA	NA	NA	NA	NP
N-EtFOSA	4151-50-2	1633	1.6	0.65	NA	NA	NA	NA	NA	NA	NA	NP

SECTION J FIELD QUALITY CONTROL REQUIREMENTS

Soil Sampling

QC Sample	Frequency	Acceptance Criteria	Corrective Action	Data Quality Indicator
Duplicate (for calculating relative percent difference (RPD))	One per twenty	Duplicate concentrations are within ±30% for water	Flag in data report.	Precision
Matrix Spike/Matrix Spike Duplicate	One per twenty	≥20-≤130%	Compare to LCS recoveries. Flag in data report. Evaluate effect on data usability	Precision
Field Reagent Blank	One per set of samples for PFAS	No contaminants are detected.	Flag in data report. Evaluate effect on data usability.	Decontamination procedure, potential cross contamination

Groundwater Sampling

QC Sample	Frequency	Acceptance Criteria	Corrective Action	Data Quality Indicator
Duplicate (for calculating RPD)	One per twenty	Duplicate concentrations are within ±30% for water	Flag in data report.	Precision
Matrix Spike/Matrix Spike Duplicate	One per twenty	≥20-≤130%	Compare to LCS recoveries. Flag in data report. Evaluate effect on data usability	Precision
Field Reagent Blank	One per set of samples for PFAS	No contaminants are detected.	Flag in data report. Evaluate effect on data usability.	Decontamination procedure, potential cross contamination

LAI Groundwater Extraction and Treatment (GWE&T)

QC Sample	Frequency	Acceptance Criteria	Corrective Action	Data Quality Indicator
Duplicate (for calculating RPD)	NA	NA	NA	NA
Matrix Spike/Matrix Spike Duplicate	NA	NA	NA	NA
Field Reagent Blank	NA	NA	NA	NA

OMP GWE&T

QC Sample	Frequency	Acceptance Criteria	Corrective Action	Data Quality Indicator
Duplicate (for calculating RPD)	NA	NA	NA	NA
Matrix Spike/Matrix Spike Duplicate	NA	NA	NA	NA
Field Reagent Blank	NA	NA	NA	NA

OMP GWE&T Air

QC Sample	Frequency	Acceptance Criteria	Corrective Action	Data Quality Indicator
Duplicate (for calculating RPD)	NA	NA	NA	NA
Matrix Spike/Matrix Spike Duplicate	NA	NA	NA	NA
Field Reagent Blank	NA	NA	NA	NA

SECTION K LABORATORY QUALITY CONTROL REQUIREMENTS

Pace Analytical

QC requirements for samples analyzed by each method are included in the tables below. Method validation and performance requirements are included in Pace Analytical's SOPs (**Appendix C**).

EPA 8260D

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
EPA 8260D				
ICAL	At instrument set up, after CCV failures	Must meet one of curve fit options presented in Laboratory SOP Section 11.2.1. For any curve fit other than Average RF (RSD), curve must also pass RSE test at the low and midpoint calibration standard.	Identify and correct source of problem, repeat	None. Do not proceed with analysis
ICV	After Each ICAL	All analytes must be within ± 30% of the true value. (%R) except difficult compounds within 40-160%.	Identify source of problem, re-analyze. If repeat failure, repeat ICAL. Analysis may proceed if it can be demonstrated that the ICV exceedance has no impact on analytical measurements. For example, the ICV %R is high, CCV is within criteria, and the analyte is not detected in sample(s).	Qualify analytes with ICV out of criteria.
CCV	Every twelve hours prior to sample analysis, after every twenty, and at end of analytical window.	Opening CCV: All analytes within ± 20%D	See Laboratory SOP Section 11.2.2 for required corrective actions based on circumstance.	Qualify analytes with CCV out of of criteria.
Internal Standards	Every field sample, standard and QC sample	Must meet criteria specified in Laboratory SOP Section 11.1.2.	Troubleshoot instrument performance. Reanalyze samples.	Qualify outages and explain in case narrative.
Surrogate	Every field sample, standard and QC sample	Must meet criteria specified in Laboratory SOP Section 11.1.1.	Troubleshoot instrument performance. Reanalyze samples or note if permissible	Qualify outages and explain in case narrative
Method Blank	One per batch of twenty or less samples	Must meet criteria specified in Laboratory SOP Section 11.1.3.	Flag any contamination	Qualify outages and explain in case narrative
LCS/LCSD	One per batch of twenty or less samples	Must meet criteria specified in Laboratory SOP Section 11.1.4.	Troubleshoot instrument performance. Reanalyze samples or note if permissible	Qualify outages and explain in case narrative

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
EPA 8260D				
Matrix Spike/Matrix Spike Duplicate	One per batch of twenty or less samples	Must meet criteria specified in Laboratory SOP Section 11.1.5 and 11.1.6.	If LCS is acceptable, narrate nonconformance	Qualify outages and explain in case narrative
Trip Blank	Client Request	<RL	Flag any contamination	Qualify outages and explain in case narrative

EPA 6010D

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
EPA 6010D				
ICAL	At instrument set up, after CCV failures	Must meet one of curve fit options. For any curve fit other than Average RF (RSD), curve must also pass RSE test at the low and midpoint calibration standard.	Identify and correct source of problem, repeat	None. Do not proceed with analysis
ICV	After Each ICAL	±10%	Re-analyze ICV. If still failing terminate the analysis, correct the problem, and recalibrate the instrument.	Qualify analytes with ICV out of criteria.
CCV	After every tenth sample and at the end of the sample run.	CCV±10%, RSD<5%.	Reanalyze, service instrument, and/or re-calibrate.	Qualify analytes with CCV out of criteria.
Internal Standards	Every field sample, standard and QC sample.	Monitored for 50-150% recovery or laboratory generated control ranges.	Reanalyze sample or QC check. If this fails, run successive increasing dilutions until the internal standards associated with the elements of interest are within range. Troubleshoot instrument, re-calibrate, verify. Re-analyze samples that were run after the last acceptable CCV/CCB pair.	Qualify outages and explain in case narrative.
Spectra Interference Check (SIC) Standard	Beginning of the first analytical run of the day.	Absolute value of LLOQ.	Re-evaluate the inter-element correction values (IECs) after running single element SIC. Re-calibrate and confirm using the ICV/ICB pair and the SIC reanalyzed before proceeding with analysis. Note nonconformance.	Qualify outages and explain in case narrative.
LDR Check Solution	Run at a point above the highest calibration standard under the same calibration used to quantify the associated sample data.	±10%	NA	NA

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
EPA 6010D				
Method Blank	One per sample batch	MB≤ ½ LLOQ	Re-analyze new aliquot of the method blank. If analyte result≥RDL, sample(s) must be considered out of control, and are re-digested and re-analyzed.	Qualify outages and explain in case narrative.
LCSW/SRM	One per sample batch	Must meet criteria specified in Laboratory SOP Section 9.2.	Rerun LCS. Reanalyze samples or note if permissible	Qualify outages and explain in case narrative.
Matrix Spike/Matrix Spike Duplicate	One per sample batch	Must meet criteria specified in Laboratory Section 9.5.	Perform post-analytical spike (75-125%R). If post spike fails, perform dilution test. If the dilution test fails, then a chemical or physical interference effect should be suspected.	Qualify outages and explain in case narrative.
Laboratory Duplicate	One per sample batch	Must meet criteria specified in Laboratory Section 9.6.	Note nonconformance.	Qualify outages and explain in case narrative.

EPA 7471B

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
EPA 7471B				
ICAL	Initial setup, daily prior to sample analysis, after CCV failures, and/or after major instrument maintenance.	r≥0.995 ICB±0.2 µg/L ICV±10%	Identify and correct source of problem, repeat	None. Do not proceed with analysis
ICV	After the calibration curve.	±10%	Re-analyze ICV. If still failing terminate the analysis, correct the problem, and recalibrate the instrument.	Qualify analytes with ICV out of criteria.
ICB	After the ICV.	± 0.2 µg/L	Identify and correct source of problem, repeat None. Do not proceed with analysis	
CCV	After every tenth sample.	±20%	Reanalyze, service instrument, and/or re-calibrate. If the CCV %Recovery is outside of acceptance criteria, re-analyze all samples since last compliant calibration standard.	Qualify analytes with CCV out of criteria.
CCB	After the CCV.	± 0.2 µg/L	Identify and correct source of problem, repeat	None. Do not proceed with analysis
Method Blank	One per batch of twenty or less samples	MB<RL	Re-digest batch.	Qualify outages and explain in case narrative.
Preparation Blank Standard (PBS)	One per batch of twenty or less samples	±0.2 µg/L	Identify and correct source of problem, repeat	None. Do not proceed with analysis

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
EPA 7471B				
LCS	One per batch of twenty or less samples	80 – 120%	Re-digest and re-analyze associated batch and another LCS.	Qualify outages and explain in case narrative.
MS	One per batch of twenty or less samples	80 – 120%	Perform post-analytical spike (75-125%R). If the post digestion spike is beyond 75 – 125%, the sample and its spike are redigested.	Qualify outages and explain in case narrative.
Laboratory Duplicate	One per batch of twenty or less samples	RPD≤20%	Visually evaluate the sample matrix and re-digest. If the matrix appears problematic, dilute and re-analyze sample digestate or note nonconformance.	Qualify outages and explain in case narrative.

EPA 8082A

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
EPA 8082A				
ICAL	At instrument set up, after CCV failure, after major maintenance	Must meet one of curve fit options presented in Laboratory SOP Section 11.3.2. For any curve fit other than Average RF (RSD), curve must also pass RSE test at the low and midpoint calibration standard.	Identify and correct source of problem, repeat	None. Do not proceed with analysis
ICV	After each ICAL	All analytes must be within ± 20% of the true value. (%R)	Identify source of problem, re-analyze. If repeat failure, repeat ICAL. Analysis may proceed if it can be demonstrated that the ICV exceedance has no impact on analytical measurements. For example, the ICV %R is high, CCV is within criteria, and the analyte is not detected in sample(s).	Qualify analytes with ICV out of criteria.

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
EPA 8082A				
RT Window Position (Daily)	Once per ICAL and at the beginning of the analytical window.	The width of the retention time window for each surrogate and Aroclor peak will be ±3 times the standard deviation of the mean absolute retention time established during the 72-hour period. See Laboratory SOP Section 11.3.3	NA	NA
RT Window Study	At method set-up and after major instrument maintenance	Window is ± 3 times the standard deviation	NA	NA
CCV	Performed every twelve hours and after no more than twenty samples and at the end of the analytical sequence.	All analytes within ± 20 %D	See Laboratory SOP Section 11.3.4 for required corrective actions based on circumstance.	Qualify analytes with CCV out of of criteria.
Surrogate	Added to all blanks, standards, samples, and spikes	TCMX and DCB must be between 30-150%	See Laboratory SOP Section 11.3.8 for required corrective actions based on circumstance.	Qualify if outside criteria
Method Blank	One per batch of twenty or less samples	<RL	See Laboratory SOP Section 11.3.5 for required corrective actions based on circumstance.	Qualify if outside criteria
LCS/LCSD	One per batch of twenty or less samples	All analytes must be within ± 40% of the true value. (%R) RPD = <20% waters and <30% soils	See Laboratory SOP Section 11.3.6 for required corrective actions based on circumstance.	Qualify if outside criteria
Matrix Spike/Matrix Spike Duplicate	One per batch of twenty or less samples	All analytes must be within ± 40% of the true value. (%R) RPD = <50%	See Laboratory SOP Section 11.3.7 for required corrective actions based on circumstance.	Qualify if outside criteria

EPA 1633

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
EPA 1633 (Laboratory SOP #5)				
Mass Calibration	Annually and as needed.	Must meet manufacturer's acceptance criteria.	Identify and correct source of problem, repeat Mass Calibration.	None. Do not proceed with analysis.
Mass Calibration Verification	After mass calibration.	Must meet manufacturer's acceptance criteria.	Identify and correct source of problem, repeat Mass Calibration.	None. Do not proceed with analysis.

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
EPA 1633 (Laboratory SOP #5)				
Initial Calibration (ICAL)	Initially at instrument setup, then as needed.	Must meet linearity requirement specified in Laboratory SOP Section 9.3.1 for type of curve fit used.	Identify and correct source of problem, repeat.	None. Do not proceed with analysis.
Initial Calibration Verification (ICV)	With each ICAL, prior to sample analysis.	All analytes must be within ± 30% of their true values. (%R)	Identify and correct source of problem, re- analyze. If repeat failure, repeat ICAL.	If corrective action is not taken, qualify or disclose nonconformity for data user to assess impact on project samples.
Calibration Blank (ICB)	Daily prior to analysis and after high concentration standards.	Non-DoD: No targets detected greater than MDL.	Identify and correct source of contamination or performance issue. Alternately, re-calibrate using a lower concentration standard for the highest point.	None. Do not proceed with analysis.
RT Window Position	During ICAL and at the beginning of each analytical sequence.	Set position using the mid-point of the ICAL on the day ICAL is performed; otherwise, the opening CCV is used. RT Window is ± 60 secs from RT position.	NA	NA
Instrument Sensitivity Check (ISC)	Daily prior to analysis.	All native and isotopically labelled compounds within ± 30% recovery.	Identify and correct source of problem and reanalyze ISC. If problem persists, repeat ICAL.	None. Do not proceed with analysis.
Bile Salts Check	With each ICAL and daily with each CCV.	Bile Salt peak detected >1 min outside RT window for PFOS.	Identify and correct source of problem, then reevaluate Bile Salts separation from PFOS.	None. Do not proceed with analysis.
Continuing Calibration Verification (CCV)	At the beginning (ISC) and every ten samples.	All native and isotopically labelled compounds within ±30% recovery.	See Laboratory SOP Section 9.3.6 for required corrective actions based on circumstance.	Qualify test results associated with CCV failure.
IBLK/Continuing Calibration Blanks (CCB)	IBLK: Daily prior to analysis and after high concentration standards. CCB: After each bracketing CCV.	Non-DoD: No targets detected > MDL.	Identify and correct source of contamination or performance issue. Reanalyze IBLK.	No samples shall be analyzed until opening IBLK has met acceptance criteria, unless the samples to be analyzed will not report the compound(s) detected in the IBLK.
EIS	Added to all samples and QC.	See Laboratory SOP Table 9.	If batch QC is acceptable, reanalyze to confirm failure. If confirmed, re-extract from reduced sample amount and reanalyze sample, if possible. If failure persists, no further action is needed.	Qualify outages

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
EPA 1633 (Laboratory SOP #5)				
Non-extracted Internal Standards (NIS)	Added to all sample extracts.	NIS areas in all samples must be within 50 – 200% of the average area of the corresponding NIS in the ICAL.	Troubleshoot instrument performance. Reanalyze samples.	Qualify outages
Method Blank (MB)	One per batch of twenty or fewer samples	Non-DOD: no targets detected greater than the LOQ or 1/10 of the concentration detected in associated sample(s), whichever is greatest.	If IBLK is acceptable, reanalyze MB to confirm. If confirmed, re-extract and reanalyze associated impacted samples if sufficient amount remains and samples are within holding time; otherwise qualify associated test results.	Qualify outages
LCS/LLLCS	One pair per batch of twenty or fewer samples	%R: See Laboratory SOP Table 8	If the most recent ISC/CCV is acceptable, reanalyze LCS to confirm. If low-failure results are confirmed, re-extract and reanalyze associated samples (if sufficient sample remains). If insufficient sample remains for reprep, narrate and report data associated with low-failure LCS. If high-failure results are confirmed and sample(s) is ND for failing compound, narrate and report sample data.	Qualify outages
Matrix Spike/Matrix Spike Duplicate	Not required. Based on client request.	%R: See Laboratory SOP Table 8 RPD ≤30%	NA	Qualify outages.
Laboratory Duplicate	See Laboratory SOP Section 11.5.1	RPD from parent sample ≤30%	NA	Qualify outages.

EPA Method 1633

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
EPA Method 1633 – Aqueous, Solid, and Tissue (Laboratory SOP #6)				
Demonstration of Capability (DOC)	Initially, prior to analyzing field samples and annually thereafter.	See Method Acceptance Criteria for each matrix in the Tables below.	Identify and correct source of problem, repeat.	None. Do not proceed with analysis.

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
EPA Method 1633 – Aqueous, Solid, and Tissue (Laboratory SOP #6)				
Mass Calibration	Annually and on as-needed basis.	Must meet manufacturer's acceptance criteria.	Identify and correct source of problem, repeat.	None. Do not proceed with analysis.
Mass Calibration Verification	After each Mass Calibration performed.	Must meet manufacturer's acceptance criteria.	Identify and correct source of problem, repeat Mass Calibration.	None. Do not proceed with analysis.
Initial Calibration (ICAL)	At instrument set up, after CCV failure and/or major maintenance.	Must meet one of the curve fit options presented in Laboratory SOP Section 9.2.4.	Identify and correct source of problem, repeat.	None. Do not proceed with analysis.
Initial Calibration Verification (ICV)	After Each ICAL.	All analytes must be within ± 30% of their true values. (%R)	Identify and correct source of problem, re-analyze. If repeat failure, repeat ICAL. Analysis may proceed if it can be demonstrated that the ICV exceedance has no impact on analytical measurements. For example, the ICV %R is high, CCV is within criteria, and the analyte is not detected in sample(s).	Qualify analytes with ICV out of criteria when results are unaffected; otherwise, correct the problem and repeat ICV.
Initial Calibration Blank (ICB)	After highest concentration ICAL standard.	Must meet criteria specified in Laboratory SOP Section 9.2.5: all detections ≤MDL concentration.	Identify and correct source of contamination or performance issue. Alternately, calibrate using a lower concentration standard for the highest point.	No samples shall be analyzed until ICB has met acceptance criteria.
RT Window Position	Once per ICAL and at the beginning of the analytical window.	Position is set using the mid-point of the ICAL on the day ICAL is performed; otherwise, opening CCV is used. RT Window is ± 60 secs from RT position.	NA	NA
Instrument Sensitivity Check (ISC)	Daily before sample analysis.	All native and isotopically labelled compounds within ± 30% recovery.	Identify and correct source of problem and reanalyze ISC. If problem persists, repeat ICAL.	No samples shall be analyzed until ISC has met acceptance criteria. See Laboratory SOP Section 9.2.4.5 for exceptions.
Bile Salts Check	With each ICAL and daily with each CCV	Bile Salt peak detected >1 min outside RT window for PFOS.	Identify and correct source of problem, then reevaluate Bile Salts separation from PFOS.	No samples shall be analyzed until Bile Salts Check has met acceptance criteria.
Continuing Calibration Verification (CCV)	Daily before sample analysis, after every ten samples, and at end of analytical sequence.	All native and isotopically labelled compounds within ±30% recovery.	See Laboratory SOP Section 9.2.4.5 for required corrective actions based on circumstance.	Qualify analytes with CCV out of criteria.

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
EPA Method 1633 – Aqueous, Solid, and Tissue (Laboratory SOP #6)				
IBLK/Continuing Calibration Blank (CCB)	Daily prior to analysis and after high standards, including CCV.	Must meet criteria specified in Laboratory SOP Section 9.2.5: all detections ≤MDL concentration.	Identify and correct source of contamination or performance issue. Reanalyze IBLK.	No samples shall be analyzed until IBLK has met acceptance criteria.
EIS	Every field sample, standard and QC sample.	See Method Acceptance Criteria for each matrix in the Tables below.	If batch QC is acceptable, reanalyze to confirm. If confirmed, re-extract and reanalyze samples. If reprep is within acceptance, report reprep data. If failure is confirmed by reprep, qualify as matrix impacted.	Qualify outages and explain in case narrative.
NIS	Every field sample, standard and QC sample.	NIS areas in all samples must be within 50 – 200% of the average area of the corresponding NIS in the ICAL.	Troubleshoot instrument performance. Reanalyze samples.	Qualify outages and explain in case narrative.
Method Blank (MB)	One per batch of twenty or fewer samples.	Must meet criteria specified in Laboratory SOP Section 10.4.1: all detections ≤MDL concentration.	If IBLK is acceptable, reanalyze MB to confirm. If confirmed, re-extract and reanalyze associated impacted samples (if sufficient sample remains). If insufficient sample remains for reprep, narrate and report data associated with unacceptable MB. See Laboratory SOP Section 10.4.1 for more details.	Qualify outages and explain in case narrative.
LCS/LLLCS	One pair per batch of twenty or fewer samples.	See Method Acceptance Criteria for each matrix in the Tables below; must meet criteria specified in Laboratory SOP Section 10.4.2.	If most recent ISC/CCV is acceptable, reanalyze LCS to confirm. If low-failure results are confirmed, re-extract and reanalyze associated samples (if sufficient sample remains). If insufficient sample remains for reprep, narrate and report data associated with low- failure LCS. If high-failure results are confirmed and sample(s) is ND for failing compound, narrate and report sample data.	Qualify outages and explain in case narrative.
Matrix Spike/Matrix Spike Duplicate	One pair per batch of twenty or fewer samples. (If requested)	RSD ≤30% between Matrix Spike/Matrix Spike Duplicate	If possible, reprep to confirm.	Qualify outages and explain in case narrative.
Laboratory Duplicate	One per AFFF sample; One per prep batch for all other matrices (if requested).	RSD ≤30% between parent/DUP	If possible, reprep to confirm.	Qualify outages and explain in case narrative.

EPA 8270E Sim

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
EPA 8270E Sim				
ICAL	At instrument set up, after CCV failure	Must meet one of curve fit options presented in Laboratory SOP Section 9.2.4. For any curve fit other than Average RF (RSD), curve must also pass RSE test at the low and midpoint calibration standard.	Identify and correct source of problem, repeat	None. Do not proceed with analysis
ICV	After Each ICAL	All analytes must be within ± 30% of the true value. (%R)	Identify source of problem, re-analyze. If repeat failure, repeat ICAL. Analysis may proceed if it can be demonstrated that the ICV exceedance has no impact on analytical measurements. For example, the ICV %R is high, CCV is within criteria, and the analyte is not detected in sample(s).	Qualify analytes with ICV out of criteria.
CCV	Daily, at the start of each twelve-hour sequence	All analytes within ± 20 % of the true value (%R)	See Laboratory SOP Section 9.2.5 for required corrective actions based on circumstance.	Qualify analytes with CCV out of of criteria.
Internal Standards	Every field sample, standard and QC sample	15-130%	Troubleshoot instrument performance. Reanalyze samples.	Qualify outages and explain in case narrative.
Surrogate	Every field sample, standard and QC sample	15-130%		
Method Blank	Every twenty samples or less	<RL		
LCS/LCSD	Every twenty samples or less	40-140%		
Matrix Spike/Matrix Spike Duplicate	Every twenty samples or less	30-140%		
Tune Standard	Prior to ICAL and analyst discretion	Meet criteria in Laboratory SOP Section 9.2.2		

EPA TO-15

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
EPA 300.0				
ICAL	At instrument set up, after CCV failure – new ICAL every 6 months	Must meet the criteria presented in Laboratory SOP Section 9.2. R≥0.995 Back calculate cal points in curve At least 3 to be 90-110%	Identify and correct source of problem, repeat	None. Do not proceed with analysis

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
EPA 300.0				
ICV	After Each ICAL	All analytes must be within ± 10% of the true value. (%R)	Identify source of problem, re-analyze. If repeat failure, repeat ICAL. Analysis may proceed if it can be demonstrated that the ICV exceedance has no impact on analytical measurements. For example, the ICV %R is high, CCV is within criteria, and the analyte is not detected in sample(s).	Qualify analytes with ICV out of criteria.
CCV	Daily, before sample analysis, after every 10, and at end of analytical window.	All analytes must be within ± 10 % of the true value. (%R)	See Laboratory SOP Section 9.2.3 for required corrective actions based on circumstance.	Qualify analytes with CCV out of of criteria.
Method Blank	One per batch of twenty or less samples.	<RL NC samples = < ½ RL	See Laboratory SOP Section 11.3.5 for required corrective actions based on circumstance.	If samples are ND – Qualify
LCS/LCSD	One per batch of twenty or less samples.	90-110% RPD = 20%	See Laboratory SOP Section 11.3.7 for required corrective actions based on circumstance.	Qualify analytes with LCS out of criteria.
MS	One per batch of ten or less samples. MSD performed only upon client request.	80-120%	See Laboratory SOP Section 11.3.9 for more info. If fortified sample fails, the recovery criteria, but the CB, ICV, LCS, and CCVs are in control, the problem is a result of the matrix and not the IC system.	Qualify analytes with MS out of criteria.
Sample Duplicate	One per batch of ten or less samples	RPD = 20%	See Laboratory SOP Section 11.3.8 for required corrective actions based on circumstance.	Qualify analytes with Sample Dup out of criteria

EPA TO-15

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
EPA TO-15				
BFB Tune Check	Initial setup and daily, prior to calibration.	BFB mass to m/z abundance criteria (see Laboratory SOP, Table 5).	Run new calibration curve and/or service instrument.	None. Do not proceed with analysis.
ICAL	At instrument set up, after CCV failures	RSD<30% or linear regression. Linear Regression Requirements: r≥0.995; Low point cal. standard: 60-140%R	Identify and correct source of problem, repeat	None. Do not proceed with analysis.
ICV	After the initial calibration and prior to sample analysis.	All analytes must be within ± 30%R of the true value.	Identify source of problem, re-analyze. If repeat failure, repeat ICAL.	None. Do not proceed with analysis.
CCV	Prior to sample analysis.	70-130%	Re-calibrate.	Qualify analytes with CCV out of criteria.
Internal Standards	Every field sample, blank, and LCS.	Must meet criteria specified in Laboratory SOP Section 9.7.2 and 12.	Troubleshoot instrument performance. Reanalyze samples.	Qualify outages and explain in case narrative.

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
EPA TO-15				
TIC Internal Standards	TIC analysis.	50-200% of the blank area counts	Use a different internal standard or an estimated internal standard total ion area.	Qualify outages and explain in case narrative.
Laboratory Method Blank	After samples suspected of being highly contaminated.	≤RL	Flag any contamination. Re-analyze blank.	Qualify outages and explain in case narrative
LCS	Daily, prior to sample analysis.	70-130%	Troubleshoot instrument performance. Re-analyze. Re-calibrate.	Qualify outages and explain in case narrative.
LCSD	Based on client request.			
Laboratory Duplicate	Daily	RPD<25	Re-analyze. See Laboratory SOP Section 2.1 and 9.6 for exceptions.	

SECTION L DATA MANAGEMENT AND DOCUMENTATION

Documentation that will be generated for the project, and the data management procedures that will be used in handling that information is described in the table below. The four basic areas included below are field data, laboratory data and data assessment (verification and validation of data), and filing of data, which will be presented in the final report are listed below.

Field Sample Collection Documents and Records	Analytical Laboratory Documents and Records	Data Assessment Documents and Records	Project File
• HRP Daily Field Report • Chain-of-Custody forms • Soil Sample Collection Log • Air Sample collection Log	• Sample receipt logs • Internal and external Chain-of-Custody forms • Equipment calibration logs • Sample preparation worksheets/logs • Sample analysis worksheets/run logs • Telephone/email logs • Corrective action documentation • Laboratory analytical data package	• Data validation reports (DVRs) • Field inspection checklist(s) • Review forms for electronic entry of data into database • Corrective action documentation	• HRP will retain copies of all Field reports, laboratory reports or other generated documents, sampling logs, and DVRs for a period of five years. Electronic copies of all forms will be generated upon completion and stored on HRP's electronic network.

Field Data

All field data for potable well sampling will be recorded in a permanently bound waterproof notebook. All notes will include the date, sampling location, weather conditions, any measurements taken, and any problems encountered in the field.

The sampling labels and the chain-of-custody will be clearly written and consistent with one another, as indicated in **Section I**.

The field work sheets will be reviewed by the Project Geologist/Scientist and the Project Manager for completeness and accuracy for each project within one to two days of each day of field work. The Geologist/Scientist and/or the Project Manager will make any necessary inquiries with Field Personnel regarding missing information or data or suspected inconsistencies or errors in the field reports within one to two days of identifying such issues. They will follow up to ensure that any necessary corrections or changes have been made, not just to the field reports themselves, but also with respect to any changes that might be necessary to the field program based on identified issues. Final review of field work sheets will be conducted following completion of the field sampling activities and prior to placement of the work sheets into the project file. The work sheets, including any necessary corrections, will be included in the final project report.

Laboratory Data

Analytical samples are recorded in a permanently bound laboratory notebook, specific to each instrument. A brief narrative is included at the end of each analytical run that includes any problems encountered with the standards, samples, blanks, or QC samples. Some of the automated analytical equipment (GC and GC/MS) have computer-generated analytical runs which automatically flag and note any problems on the computer run. If any corrective action is taken, it will be noted in narrative in the instrument notebook.

The following deliverables may be provided by the laboratory, as applicable:

- Client's Name
- Project Number
- Laboratory Sample ID
- Client Sample ID
- Collection Date
- Sample Matrix
- Analyses
- Analytical Results/Data Results Sheets
- RLs
- Reporting Units
- Dilution Factor in case narrative
- Date Analyzed
- Method Blank Results
- Surrogate Recoveries and Acceptance Limits
- Matrix Spike/Matrix Spike Duplicate Results and Acceptance Limits
- Spike/Duplicate Results and Acceptance Limits
- Laboratory Control Sample Results and Acceptance Limits
- Project Narrative which contains all observations and deviations

Types of information the laboratory will provide include, as applicable:

- Analytical Summary Sheets
- QC Summary Sheets

The following will be maintained by the laboratory, as applicable:

- All raw data including chromatograms
- Copies of instrument logbooks

- Analytical bench sheets
- Performance Evaluation (PE) sample results
- ICP Serial Dilution results
- ICP Interference Check Sample results

Pace Analytical will provide analytical reports in electronic data deliverables (Excel format and/or PDF).

Post-laboratory Data Processing

Laboratory analytical data provided as an electronic data deliverable will be entered into the HRP electronic database. Analytical data and related information entered into the can be subsequently retrieved for use during the data evaluation and report preparation processes. However, once data from the laboratory is entered into the HRP database, only a limited number of specifically trained HRP personnel have the ability to make changes to the information stored in the database.

Project Files

The working files will be stored via hard copy and/or electronically with the Project Staff during the operation of the Scope of Work. Subsequent to the completion of the project and issuance of all final documents, all pertinent information will be stored electronically in HRP's archive files for future reference.

SECTION M ASSESSMENT AND RESPONSE ACTIONS

All field personnel will be provided with a copy of the Site-specific QAPP to review prior to commencement of field activities. Subsequent to the review and prior to beginning any site work, the Project Manager or designated Senior Project Staff Member will review the QAPP with field personnel. At the conclusion of each field day, field personnel will provide a verbal report to the Senior Project Staff member, Project Manager, and/or Project QA Officer. Any deviations from the QAPP will be documented. If significant, the client and/or EPA Project Manager will be contacted.

During the course of a project, field audits will be conducted to evaluate conformance with various components of the field program. Field audits will be conducted by the QA Officer, Project Manager, or a designated alternate qualified to evaluate performance of project activities in the field with respect to conformance with such project elements as the Site-specific Work Plan, SOPs for field activities, and site-specific Health and Safety Plan (HASP). Depending on the length of the field component of the project or the number of different field activities that are performed during a project, more than one field audit may be performed.

Results of a field audit will be documented in a Field Audit Report, which will be included in the project file. When appropriate or necessary to ensure conformance with project objectives, corrective measures will be taken in the field at the time of the audit. In all cases, the project manager will be informed of the results of the audit at the conclusion the field day, and any additional corrective measures that may be necessary will be taken before subsequent field activities are undertaken. Depending on the nature of any non-conformances identified, subsequent field audits will be conducted to evaluate whether any necessary corrective measures were effective in eliminating the non-conformance.

Following completion of field activities, the Project QA Officer will perform a final review of the scope of sampling activities and sample handling practices to ensure that the activities are consistent with the QAPP. Any previously unidentified discrepancies will be reported to the Project Manager for review. All discrepancies and deviations from the QAPP will be documented in the final report.

SECTION N PROJECT REPORTS

HRP Associates, Inc.

Reporting

The sampling data will be assembled, evaluated with respect to the appropriate criteria, and presented in a summary report as soon as the data is validated but no later than two months following sampling (or later depending on the delivery of results from the Laboratory), as requested by the DEC. The report will include maps showing the locations of all sampling points, analytical data summary tables, laboratory analytical reports, documentation of data verification and performance of a Data Quality Assessment (DQA) and Data Usability Evaluation (DUE) for all Category B Deliverables in accordance with NYSDEC guidance and will present conclusions and recommendations regarding the environmental status of the site.

Pace Analytical Laboratory

The laboratory will provide the HRP project manager (Derek Roy) with electronic copies of the analytical results within the standard turnaround time of seven to ten business days for VOCs, metals, PCBS, and 1,4 dioxane results, and ten to fifteen days for PFAS results.

SECTION O FIELD DATA EVALUATION

All field screening and sampling procedures will be reviewed with the field personnel. All personnel that perform field screening and sampling activities will have been trained with respect to procedures described in the SOPs that will be used pursuant to the Site-specific QAPP. Training of project personnel in the use of field equipment is performed in-house by HRP's Field Technical Services personnel experienced in the use of the various types of field equipment necessary for each project. Training is held on an as-needed basis prior to conducting any field work involving the use of that equipment. Periodic technical staff-wide training is also conducted on the use of various field screening and sampling equipment. HRP tracks the training and skills of various employees through an internal Core Skills spreadsheet that tracks the experience, and skill sets of each individual. The Project Manager will ensure that all personnel assigned work tasks described in the QAPP have the proper training and familiarity with the SOPs and operation of field equipment required for the work.

Field personnel will be given a copy of the Site-specific QAPP to read prior to performing any field screening and sampling activities or will be directed by the Project Manager and/or Senior Project Staff Member as to what screening and sampling procedures are to be employed.

The Project Manager and/or designated Senior Project Staff Member will speak to the field sampling team on a daily basis to verify that the screening and sampling procedures specified in the QAPP are being followed. As part of the DUE for a project, information on the Field Data Work Sheets will be evaluated by the Project Manager and Project Staff Member with respect to any potential impact such information might have on the usability of the analytical data or on the interpretation of analytical or other data for the project. Such an evaluation will include consideration of the conceptual site model and data quality objectives for the project.

These managerial controls will verify that the field screening and sampling procedures contained in the Site-specific QAPP are utilized. The project manager will be responsible for verifying that the field screening and sampling procedures are appropriate to meet the objective of the proposed investigations.

SECTION P LABORATORY DATA EVALUATION

The contract laboratories, Pace Con-Test will perform internal validation procedures in accordance with their SOPs.

All Category B data will be validated by an independent third-party data validator (DV) in accordance with NYSDEC DER-10. The validator will provide a Tier 1 plus a Data Usability Summary Report (DUSR) using the most recent EPA Region 1 data validation guidelines.

The following tasks will be performed and documented in the QA/QC section of the final Site activities report. A discussion will also be provided that includes any observations and conclusions about the quality of the data and any limitations on the way it should be used, as applicable.

A. Summary of Technical Usability

The data validator will identify and document the following:

- Laboratory and laboratory project number
- Number of samples and sample field IDs submitted to the laboratory by comparing the laboratory narrative to the chain-of-custody
- The laboratory sample IDs
- List parameters analyzed by comparing the laboratory narrative to the chain-of-custody

B. Technical Issues Affecting Accuracy

The data validator will review, document, and comment on:

- Whether data quality protocols were met, as applicable
- Sample holding times compared to acceptable holding times
- Sample minimum detection limits are below applicable appropriate drinking water standard or other applicable criteria
- Laboratory control sample recoveries compared to acceptable laboratory control sample recoveries as established by the method SOPs of the laboratory internal procedures, as applicable
- Matrix spike recoveries compared to acceptable matrix spike recoveries as established by the method SOPs of the laboratory internal procedures, as applicable

C. Technical Issues Affecting Precision and Representativeness

As applicable, the RPD will be calculated between samples and sample duplicates and between matrix spikes and matrix spike duplicates. The acceptable RPD for sample duplicates and matrix spikes varies by method. The acceptable RPDs water sample duplicates ranges from less than or equal to twenty percent (20%) to 50% (as indicated in **Section K**).

D. Technical Issues Affecting Sensitivity

As applicable, the data validator will review and comment on any contaminants identified in Method Blanks and Field Equipment Blanks

The data validator will review the RLs identified in the laboratory analytical report and evaluate the RLs relative to project-specific objectives.

E. Summary of Completeness, Documentation, and Chain-of-Custody Issues

As applicable, the validator will review the deliverable package for the following components in accordance with applicable state and federal guidance documents:

- Laboratory Narrative which identifies laboratory observations and nonconformances
- Data Results Sheets
- Method Blank Results
- Surrogate Recoveries and Acceptance Limits
- Matrix Spike/Matrix Spike Duplicate Results and Acceptance Limits
- Laboratory Control Sample Results and Acceptance Limits

If any sample or QC issues are documented in the narrative that are not included as part of the data package deliverables, the laboratory will be contacted, copies of the relevant information obtained, and a discussion of any limitations on the use of the data will be presented in the QA/QC section of the final report. If the data deliverables package is incomplete, the laboratory will be contacted and requested to provide the missing documentation.

F. QA Objectives

A DUSR will be provided by the third party data validator, and will analyze the precision, accuracy, representativeness, comparability, and completeness (PARCC) of all Category B analytical data generated by the laboratory. Data identified outside of QA protocols will be flagged as noted above. PARCC data quality indicators will be used to assign data qualifiers, and to validate the analytical data. A description of each data quality indicator is provided below.

- Precision – Measures the agreement among a set of replicate measurements. Field precision is assessed through the collection and analysis of field duplicates. Analytical precision is estimated by duplicate/replicate analyses, usually on laboratory control samples, spiked samples, and/or field samples. The most commonly used estimates of precision are the RSD and, when only two samples are available, the RPD.
- Accuracy – Accuracy is the closeness of a measured result to an accepted reference value. Accuracy is usually measured as a percent recovery. QC analyses used to measure accuracy include standard recoveries, laboratory control samples, spiked samples, and surrogates.

- Representativeness – Sample representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. It is dependent on the proper design of the sampling program and will be satisfied by ensuring the approved plans were followed during sampling and analysis. The conceptual site modeling process, with appropriate figures, maps, and/or cross-sections will be used to ensure that samples are collected in the appropriate locations to be representative of the objectives of the site activities, as applicable. Groundwater contour maps will be used to determine if wells have been placed appropriately to identify impact from a release. HRP will review all data and flag any unexpected and/or anomalous results in the corresponding reports.
- Comparability – Comparability expresses the degree of confidence with which one data set can be compared to another. It is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the approved plans are followed, and that proper sampling and analysis techniques are applied. Further, when assessing comparability, data sets should be of known and documented quality.
- Completeness – Completeness is a measure of the amount of valid data collected compared to the amount planned. Measurements are considered to be valid if they are unqualified or qualified as estimated data during validation. Field completeness is a measure of the number of samples collected versus the number of samples planned. Laboratory completeness is a measure of the number of valid measurements compared to the total number of measurements planned.
- In order to ensure comparability of data throughout the course of the project, the HRP QA Manager or Project Manager will follow the same sampling procedures and request the same laboratory protocols throughout the project. HRP will also review field notes and laboratory data to ensure that adherence to the Site-specific QAPP has been maintained throughout the course of the project. HRP will consult with the field technicians or laboratory personnel if any missing or anomalous data is encountered. RPD values for field duplicates will be compared to the criteria specified in the QAPP. If necessary, the laboratory will be asked to reanalyze samples to verify results.

SECTION Q DATA USABILITY AND PROJECT EVALUATION

Field Duplicate Results

All field duplicate results will be presented in tables included in the corresponding reports.

Representativeness

HRP will review all data and flag any unexpected and/or anomalous results in the corresponding reports. The Project Manager and Project Geologist/Engineer/Scientist will consult with field personnel regarding clarification of any anomalous or missing data or information. All findings will be presented in the final report.

Comparability

In order to ensure comparability of data throughout the course of the project, HRP will follow the same sampling procedures and request the same laboratory protocols throughout the project. HRP will also review field notes and laboratory data to ensure that adherence to the Site-specific QAPP has been maintained throughout the course of the project. HRP will consult with the field technicians or laboratory personnel if any missing or anomalous data is encountered. RPD values for field duplicates will be compared to the criteria specified in the QAPP. If necessary, the laboratory will be asked to reanalyze samples to verify results.

HRP will present data in table format as appropriate. If historical data is available, such as multiple groundwater monitoring events, it will be included in reports to evaluate contaminant trends.

Sensitivity

HRP will compare all laboratory minimum RLs to the appropriate drinking water standard to verify that they are below the standards. If RLs are found above the standard, the laboratory will be contacted to reanalyze the sample at a RL below the standard. If it is not possible to achieve RLs below the drinking water standard, the analyte will be flagged in the report.

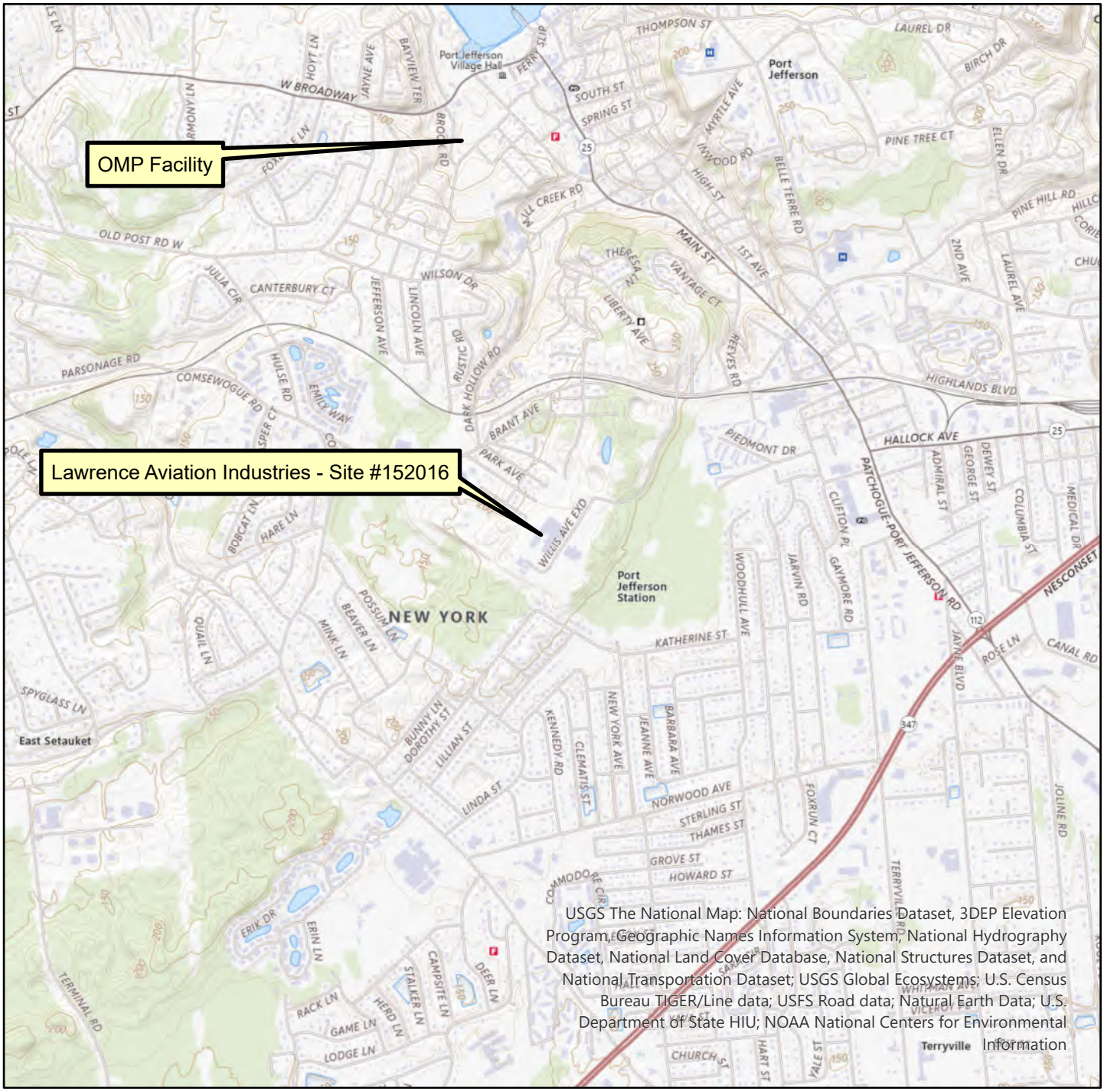
Usability Summary

HRP will discuss the usability of data collected in the corresponding reports and discuss any effect that usability might have on the overall findings for the project. Any data gaps and unusable data will be noted in the project reports. Data usability is, in part, based on the data quality objectives for the project and the conceptual site model. Therefore, based upon the results of data verification, DQA, and DUE (**Section P**) 100% of the critical samples must be valid in order to be usable.

Report Distribution

The report from the investigations will be distributed to NYSDEC and EPA Region 1, and an electronic copy will be available on the DECInfo Locator website.

FIGURES



N

0 1,000 2,000 4,000 6,000 8,000

Feet

1:24,000

USGS Quadrangle Information
Quad ID: o40073h1
Name: Port Jefferson

Figure 1
Site Location
100 Sheep Pasture Road,
Port Jefferson Station, Brookhaven, NY
HRP #DEC1027.OM
Scale 1" = 2,000'

MOVE YOUR ENVIRONMENT FORWARD

ONE FAIRCHILD SQUARE
SUITE 110
CLIFTON PARK, NY 12065
(518) 877-7101
HRPASSOCIATES.COM

Path: S:\Data\NYDEC - NYSDEC\BROOKHAVEN\SHEEP PASTURE ROAD, PORT JEFFERSON STATION, NY 11776\DEC1027OM\GIS\GWM Figures\Site Location\Site Location.aprx

Esri, NASA, NGA, USGS, FEMA, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Sources: Esri, Maxar, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap, and the GIS user community

Port Jefferson Harbor

Garant Harborfront Park

Port Jefferson

The Steam Room

Port Jefferson Free Library

Port Jefferson Village Hall

Port Jefferson Fire Department

Jefferson School

Maryhaven Center of Hope

Infant Jesus Roman Catholic Church

Greek Orthodox Church of the Assumption

Verizon

A

A'

SW-15

SW-16

SW-07

SW-06

SW-08

SW-05

ERT-MW-2A

ERT-MW-2B

ERT-MW-2C

ERT-MW-2D

ERT-MW-1A

ERT-MW-1B

SDW-01

ERT-MW-5A

ERT-MW-5B

ERT-MW-4A

ERT-MW-4B

MPW-08

ERT-MW-6A

ERT-MW-6B

ERT-MW-3

MPW-09

ERT-EW-5

ERT-EW-4

MW-PD-15

ERT-EW-2

ERT-EW-1

ERT-EW-6

ERT-EW-3

OMP Facility

MW-PD-16

MW-PD-17

MPW-05

MPW-06

MW-PD-14

MW-PD-13

MW-PD-12

MPW-10

MW-PD-11

MPW-03

MPW-04

MPW-02

EW-02

EW-03

EW-01

MW-ISCO-02

MW-ISCO-01

IW-ISCO-11

MW-ISCO-04

IW-ISCO-06

IW-ISCO-5

PZ-05

PZ-07

PZ-06

MW-05

IW-ISCO-13

IW-ISCO-10

IW-ISCO-08

PZ-01

IW-ISCO-09

MW-ISCO-03

IW-ISCO-07

IW-ISCO-03

MPW-07

PZ-04

IW-ISCO-02

MW-ISCO-05

PZ-02

IW-02

IW-03

IW-04

IW-01

IW-05

IW-ISCO-0

MPW-01

LAI Facility

Former LAI Industrial Area

Approximate Former LAI Outlying Properties

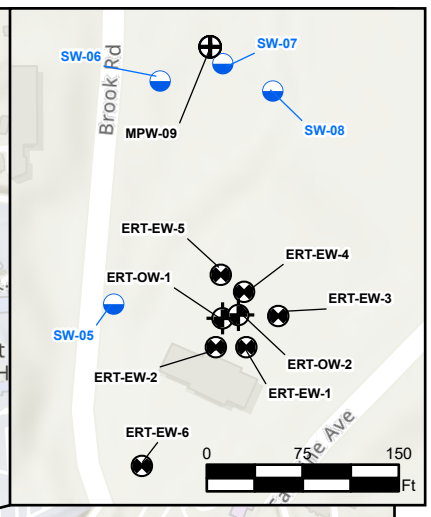
231 ft

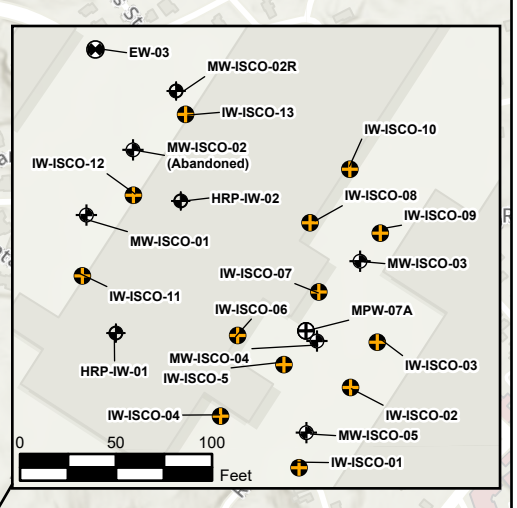
241 ft

181 ft

182 ft

153 ft





Legend

- Cross Section A-A'
- Former LAI Outlying Properties
- Outfall to Old Mill Pond
- Surface Water Body
- ISCO Injection Well
- Piezometer
- ERT Extraction Well
- Injection Well
- Multiport Well
- Monitoring Well
- Surface Water Sample
- LAI Site Boundary

HRP
MOVE YOUR ENVIRONMENT FORWARD

197 SCOTT SWAMP ROAD
FARMINGTON, CT 06032
(860) 674-9570
HRPASSOCIATES.COM

Site Layout Map
Lawrence Aviation Industries
SITE No. 152016
Sheep Pasture Road
Port Jefferson, New York

JH DESIGNED BY:	11X17 SHEET SIZE:
BOB DRAWN BY:	06/18/2024 DATE:
DR REVIEWED BY:	DEC1027.OM PROJECT NUMBER:

North

1" = 700'

0 350 700 Ft

FIGURE 2

Path: S:\Data\NNYDEC - NYSDEC\BROOKHAVEN\SHEEP PASTURE ROAD, PORT JEFFERSON STATION, NY 11776\DEC1027OM\GIS\GWM Figures\Figures.aprx

Legend

- NYS DOT Setauket-Port Jefferson Station Greenway Trail
- LAI Site Boundary
- Suffolk County NY Tax Parcels
- Groundwater Treatment Building
- Class-4 Inactive Hazardous Waste Disposal Site
- System Piping
- Approximate Underground Water Line
- Approximate Underground Electric
- ISCO Injection Well
- Piezometer
- ERT Extraction Well
- Injection Well
- Multiport Well
- Monitoring Well

136-2-22

159-2-20

Class 4 Site
5.50 Acres

159-2-19
35.349 Acres

159-1-26
2.639 Acres

180-4-1-0
4.544 Acres

180-4-2-1

180-4-2-2

HRP
MOVE YOUR ENVIRONMENT FORWARD
197 SCOTT SWAMP ROAD
FARMINGTON, CT 06032
(860) 674-9570
HRPASSOCIATES.COM

NORTH

0 75 150
Feet

REVISIONS

NO	DATE	DESCRIPTION

DESIGNED:	DRAWN:	REVIEWED:	APPROVED:
DR	BOB	DR	DR

SCALE:	ISSUE DATE:	PROJECT NUMBER:	SHEET SIZE:
1"=150'	03/06/2025	DEC1027.OM	24"X36"

Lawrence Aviation Industries
Site #152016
100 Sheep Pasture Road
Port Jefferson Station, New York

Class-4 Site Boundary

FIGURE NO.
2a

Path: S:\Data\NY\DEC - NY\SEC\BROOKHAVEN\SHEEP PASTURE ROAD, PORT JEFFERSON STATION, NY 11776\DEC1027.OM\GIS\Demolition\Parcels - Delisting\Parcels - Delisting.aprx

APPENDIX A
Key Contact Information

KEY REPRESENTATIVE NAMES AND CONTACT INFORMATION

Title	Name and Affiliation	Contact Information	Responsibilities
Client	Payson Long NYSDEC	(518) 402-9651 (office) payson.long@dec.ny.gov New York State Department of Conservation 625 Broadway Albany, NY 12233-7017	DEC Section Chief
Client	Kira Bruno NYSDEC	(518) 402-8068 (office) kira.bruno@dec.ny.gov New York State Department of Conservation 625 Broadway Albany, NY 12233-7017	DEC Project Manager
Client	Mark Sergott NYSDOH	(518) 402-7860 (office) mark.sergott@health.ny.gov Bureau of Environmental Exposure Investigation Empire State Plaza Corning Tower, Room 1787 Albany, NY 12237	Environmental and Exposure Evaluation
Client	Michael C. Murphy NYSDEC	(518) 402-8564 (office) michael.murphy1@dec.ny.gov New York State Department of Conservation 625 Broadway Albany, NY 12233-7017	NYSDEC Office of General Counsel
Contract Manager	Mark Wright HRP Associates, Inc.	(860) 674-9570 Ext. 1305 (office) mark.wright@hrpassociates.com 1 Fairchild Square, Suite 110 Clifton Park, NY 12065	Contract Management
Project Manager	Derek Roy HRP Associates, Inc.	(860) 674-9570 ext. 1118 (office) derek.roy@hrpassociates.com 197 Scott Swamp Road Farmington, CT	Project Management
QAO	Michael Varni HRP Associates, Inc.	(860) 674-9570 ext. 1172 (office) michael.varni@hrpassociates.com 197 Scott Swamp Road Farmington, CT	QA and QC
Site Manager	Joel Hara HRP Associates, Inc.	(860) 773-3618 (office) joel.hara@hrpassociates.com 197 Scott Swamp Road Farmington, CT	Site Management
Field Team Leader	Christopher J. Labbe HRP Associates, Inc.	(860) 470-2707 (office) chris.labbe@hrpassociates.com 197 Scott Swamp Road Farmington, CT	Supervision and Field Activities, Health and Safety, QA/QC
Customer Service Manager	Raymond McCarthy Pace Analytical Laboratory	(413) 486-5067 (office) Raymond.McCarthy@pacelabs.com 39 Spruce Street East Longmeadow, MA	Lab Project Management

APPENDIX B
HRP SOPs

HRP Associates, Inc.

STANDARD OPERATING PROCEDURE
for

Soil Boring Advancement

SOP # 101

Revision Date: August 31,2019

LIST OF REVISIONS

Date	Summary of Changes	Approval
	Original document preparation	
8/2019	Multiple revisions throughout document	Gail L. Batchelder, Ph.D.

Reviewed by

HRP Quality Assurance Officer:

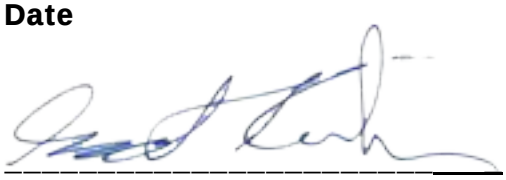


Gail L. Batchelder, Ph.D., P.G., L.E.P.

August 31, 2019

Date

Vice President /
Practice Leader - Environmental:



Scot Kuhn, P.G., L.E.P.

August 31, 2019

Date

1.0 Introduction

This Standard Operating Procedure (SOP) discusses procedures and techniques for advancing soil borings either for exploration, soil sampling, or the installation of monitoring wells. The HRP representative should be aware that the drillers are responsible for the operation and safety of the drilling rig itself, but it is the responsibility of the HRP representative to ensure that proper procedures are used with respect to sampling and decontamination of equipment. This document was prepared in general accordance with ASTM methods D6282 / D6282M-14, *Standard Guide for Direct Push Soil Sampling for Environmental Site Characterizations*; D1452-16, *Practice for Soil Investigation and Sampling by Auger Borings*; and D1586-14, *Test Method for Penetration Test and Split-Barrel Sampling of Soils*. Procedures used to collect soil samples for chemical screening and/or subsequent laboratory analysis are provided in HRP SOP # 104*, Soil Sampling*.

2.0 Equipment - General

Equipment supplied by HRP for activities associated with the advancement of soil borings using hollow-stem auger or direct-push drilling techniques typically includes:

- Stainless steel spatula or alternative for splitting samples
- Portable Photoionization Detector (PID) instrument for sites where volatile organic compounds (VOCs) are a concern
- Polyethylene plastic sheeting or alternative technique
- Sample collection containers (glass jars, etc.)
- Indelible marker
- Two 5-gallon buckets
- Decontamination brushes
- Decontamination solutions/equipment
- Cooler with ice and/or cold packs
- Sample labels
- Field logbook and appropriate field forms
- Personal Protective Equipment, including clean disposable gloves, hard hat, steel toe shoes, hearing protection, and other equipment required by the site-specific Health & Safety Plan
- Clipboard
- Water-level tape with audible alarm
- Chain-of-Custody forms
- Paper towels

2.1. Drilling Rig

Unless otherwise specified, all soil borings will be installed using hollow-stem auger equipment or a Geoprobe® Macro-Core® sampler or similar device powered by an appropriate rig.

2.2. Water

Water is occasionally required to maintain the stability of the boring or specific drilling procedures. If water is used, the source(s) and estimated quantity will be recorded in the drilling log. Only a potable water supply may be used for drilling purposes.

2.3. Central Auger Bit Plug

In order to maintain clean, accurate samples, no hollow-stem auger drilling may be conducted without the use of a central auger bit plug. The driller should be made aware of this prior to entering the site, as is necessary.

3.0 Cleaning and Decontamination

Prior to advancing a soil boring, the HRP representative will ensure that all necessary equipment is clean and decontaminated, including the rig, all augers, rods and bits and other downhole equipment, samplers, brushes, and any other tools or equipment. Decontamination procedures may vary slightly from those presented below, dependent upon the particular types of contaminants encountered.

a. Decontamination supplies:

- solution of Alconox™ or Liquinox™ and water prepared in a 5-gallon bucket (approximately 2.5 gallons). Another 5-gallon bucket will contain potable water (approximate 2.5 gallons).
- Deionized water
- 5-gallon buckets
- Spray bottles
- Brushes
- Paper towels
- isopropyl alcohol/water solution (as appropriate based on contaminants and analyses to be performed)
- <10% nitric acid/water solution (as appropriate based on contaminants and analyses to be performed)

b. Sampling devices (typically split spoons or Macro-Core®-type sampling devices) will be decontaminated between each sample. The order of decontamination solutions and procedures for split-spoon and other multi-use sampling devices is as follows:

Decontamination in the following order:

- Wipe or scrub excess dirt from equipment, as needed, using brush or paper towels
- Rinse/scrub in potable water (in a 5-gallon bucket) to remove additional loose debris, as necessary

- Wash in a solution of Alconox™ or Liquinox™ and potable water (in a 5-gallon bucket)
- Rinse with potable water
- Rinse with analyte-free water
- *The following steps may be required by the QAPP, by regulatory agency, or necessary due to the nature of the contaminants*
- Spray with <10% isopropyl/water solution when organics are potential constituents of concern
- Rinse with potable water
- Rinse with <10% nitric acid/water solution when metals are potential constituents of concern
- Rinse with potable water
- Rinse with deionized water
- Wipe with a clean paper towel (optional, depending on weather conditions)
- Air Dry (as appropriate)

Alternative methods of cleaning may more appropriate (or necessary) for an individual pieces of equipment, based on site conditions, site contaminants, Quality Assurance Project Plan (QAPP), or site-specific work plan requirements, Alternative decontamination solutions must be consistent with overall objectives for the project, and use of alternative decontamination solutions or decontamination procedures must be made after consultation with the HRP project manager and must be documented in field paperwork as to rationale and appropriateness. Decisions regarding alternative decontamination procedures or solutions must be made in coordination with the HRP Project Manager and/or Quality Assurance Officer for the project.

c. At the end of the project day, all HRP equipment which is used on the site shall be decontaminated. Disposal of all spent decontamination solutions shall be in accordance with the requirements of the site work plan and state and federal requirements.

4.0 OSHA

The Foreman or Supervisor of the drilling crew shall be the "Competent Person" as required by OSHA for all work. However, to the best of his or her ability, the HRP representative should bring to the “Competent Person’s” attention conditions which may be unsafe or present a hazard to the drilling crew, the general public, or other workers on the site.

The HRP representative has stop-work authorization to be exercised upon determination of an imminent health or safety hazard. The project manager will be contacted immediately after a stop-work order is executed.

5.0 VOC Monitoring

If the potential exists for VOCs to be a concern at the site, a portable PID shall be available on site and shall be used to screen all cuttings and fluids (if any) removed from the borehole, and to screen the breathing zone in the working area for VOC levels.

6.0 Soil Boring Advancement

6.1. Rig Operation

a. Rig operation is the responsibility of the drilling crew Foreman or Supervisor.

b. The HRP representative will review utility locations with the drilling foreman prior to drilling and will bring to the attention of the drilling foreman and rig operator the requirements for sampling, health and safety, identified utility restrictions, decontamination procedures, and well construction specifications, as appropriate.

c. It is the responsibility of the drilling Foreman or Supervisor to ensure that the rig, upon arrival on-site, is in good working order; that all required equipment and supplies are present; and that the rig is free of loose debris, oil leaks, or defective equipment.

6.2. Field Screening

The procedure to obtain a PID reading for a soil sample is described in an attachment to HRP's SOP # 104, *Soil Sampling*.

6.3. Disposal of Potentially Contaminated Materials

Potentially contaminated cuttings or fluids, as indicated by knowledge of the site, discoloration, PID readings, or other evidence shall be disposed of in accordance with the requirements of the HRP site-specific Work Plan, QAPP, and applicable state and federal regulations.

6.4. Refusal

When drilling through unconsolidated materials using a hollow-stem auger drilling rig, the term "refusal" is generally defined as the failure of an approximate 2-inch diameter split-spoon sampler to penetrate more than one-tenth of a foot with 100 blows using a 140-pound hammer dropped from a height of 30 inches. However, refusal can also be designated at the discretion of the HRP representative if the Macro-Core® or similar sampler cannot advance using the standard operating procedures for the direct-push drilling rig by the rig's manufacturer.

6.5. Bedrock

a. The term "bedrock" will not be used in a boring log or other description unless a minimum of three (3) feet of bedrock core is recovered using an appropriate core drill, and in the opinion of a competent geologist, the core exhibits the characteristics of known bedrock in the region.

b. The terms "apparent bedrock" or "possible bedrock" may be used in a boring log at the judgment of the HRP representative, even if 3 feet of bedrock has not been cored, provided there is reasonable justification for such a conclusion.

6.6. Other

Depending on the specific site, other considerations may be applicable. Consult the site-specific work plan and health and safety plan (HASP) for details.

7.0 Logging Procedures for Soil Borings

a. The following information shall be recorded on the boring log:

- Project name, site location, and HRP job number.
- Boring identification number, borehole diameter, boring location on the site, drilling method, contractor, groundwater observations, the logger's name and the date.
- Depth below grade, sample I.D. number, identification numbers for duplicate samples, PID reading, number of blows required for each six-inch penetration of a 2-inch split spoon using a 140-pound hammer, rig behavior (i.e. drilling effort, etc.).
- A complete sample description, including at a minimum: depth of the sampling interval, depth of significant changes in lithology, material size and gradation, color, moisture, density, physical evidence of contamination, and any unusual odors. Procedures for describing subsurface materials may vary depending on the purpose of the sampling effort (i.e., hydrogeologic properties, lithologic description, geotechnical characteristics). In addition to HRP SOP #103 *Soil Logging and Description Using a Modified Burmister Classification System*, ASTM Standard D2488-90 "Practice for Description and Identification of Soils (Visual-Manual Procedure) and ASTM Standard D2487-92 "Classification of Soils for Engineering Purposes (Unified Soil Classification System)" may be consulted for additional information on describing soils, especially the latter if soil description for engineering purposes is needed.
- The use of water for drilling purposes, if any, including source(s) and estimated quantities.

8.0 Soil Sample Retrieval

8.1. Split-Spoon Sampling

a. Samples of unconsolidated materials are collected with a split-spoon sample device operating inside of and in advance of hollow-stem augers. However, if split-spoon sampling is not possible for an interval, other methods for collecting a sample may be employed based on the discretion of the HRP representative.

b. In general, the hollow-stem augers and the central auger bit plug shall be advanced to the depth of the sampling interval.

c. After removing the central auger bit plug, the split-spoon sampler will be lowered into the augers. It will then be driven up to 24 inches into the soil using a 140-pound hammer with a fall of 30 inches. The HRP representative will record the blows for each six-inch increment.

d. The spoon shall be opened by the driller. The HRP representative may assist in opening the split spoons, at his or her discretion.

e. At a minimum, the HRP representative will record on the boring log a description of the material in the sampler (material gradation, lithology, color), blow counts, depth of penetration below grade, PID instrument reading, percent or amount of recovery, moisture, density, physical evidence of contamination, and odor (if any).

f. Prior to reuse, the sampler shall be decontaminated.

g. Soil samples collected for archival purposes shall be placed into clean soil jars and labeled with the boring number, sample collection depth, date and job number. Additional labeling requirements may be specified in the site-specific work plan and/or QAPP.

h. The procedures for collection of soil samples for chemical analysis are described in HRP SOP for Soil Sampling.

8.2. Soil Sampling from a Macro-Core®

a. In general, the Macro-Core® cutting shoe and sampling tube shall be advanced by applying the static weight of the rig and/or a hydraulically-powered rotary hammer.

b. The stainless steel sampling tube shall be opened by the driller by unscrewing the cutting shoe and removing the 48" or 60"- liner of suitably inert material. The HRP representative may assist in opening the sampling tubes, at his or her discretion.

c. The HRP representative will record on the boring log a description of the material in the sampler (material gradation, lithology, color), percent or amount of recovery, depth of penetration of sampler below grade, PID instrument reading, moisture, density, physical evidence of contamination, and odor (if any) in accordance with

HRP SOP # 103, *Soil Logging and Description Using a Modified Burmister Classification System*.

d. Prior to reuse, the Macro-Core® sampler shall be decontaminated. The liners are not suitable for re-use and must be disposed of properly after samples have been collected.

e. Soil samples collected for archival purposes shall be placed into clean soil jars and labeled with the boring number, sample collection depth, date and job number. Additional labeling requirements may be specified in the site-specific work plan and/or QAPP.

f. The procedures for collection of soil samples for chemical analysis are described in the HRP SOP for Soil Sampling.

8.3. Sampling from Auger Flights

In cases where an insufficient amount of sample is available from the split spoon, collection of a sample from an auger flight may be appropriate. However, the utility of this sample is limited because an accurate measurement of the depth where the soil originated and the degree of mixing with other soil are not known. Samples taken from an auger flight may not be used for VOC analysis, except for screening purposes. The limitations of this type of sample should be carefully considered before submitting an auger flight sample for laboratory analysis. Auger flight samples can be collected using two methods.

1. A sample of the drill cuttings can be collected as the soil is extruded onto the ground (after rotation of the drill stem has stopped); or

2. A sample can be collected directly off the augers (after rotation of the drill stem has stopped) by removing a portion or all of the drill stem from the ground.

Typically, the closer the sample can be collected to the cutting bit when using Method 2, the greater the ability to estimate the depth of sample origin.

9.0 Abandonment of Soil Borings

a. If the boring is not to be used for other purposes (i.e., monitoring well, soil vapor probe, soil vapor extraction well, etc.), it shall be abandoned following completion and collection of samples for screening and/or laboratory analysis.

b. In general, the procedure for boring abandonment is as follows:
For most borings, bentonite chips or drilling tailings (spoils) should be used for backfill, either of which should be compacted during the backfilling operation. If drilling spoils are used, then they should be free from any evidence of contamination, unless site-specific work instructions specify otherwise based on project-specific data quality objectives. In all cases, backfilling of boreholes must be consistent with state and federal regulations and guidelines and specific

details regarding backfilling will be provided in site-specific work plans or work instructions.

If there are confining layers present in a boring and the presence of DNAPL is suspected, the boring shall be filled and sealed as the augers are withdrawn with cement-bentonite grout. If no confining layers were noted in a boring and the presence of DNAPL is not suspected, bentonite pellets or chips may be used, preferably as the augers are withdrawn. The pellets or chips should be compacted during the backfilling operation.

Well abandonment regulations vary from state to state. All monitoring wells will be abandoned if no longer needed in accordance with the regulatory requirements of the state where the work is performed.

c. In paved areas, when bentonite chips or grout is being used, the upper one to two feet of the borehole shall be filled, up to two inches below the existing grade, with sand to allow for repair of the pavement, concrete, or other surface material.

d. Asphalt pavement shall be repaired using cold-patch asphalt filler, unless otherwise specified in the site-specific work plan; concrete surface will be repaired with concrete; all other surfaces will be repaired as appropriate to be consistent with the surrounding surface.

10.0 Soil Boring Location Records

Following completion of the soil boring, its location in relation to known mapped features should be recorded for future reference using either taped measurements from two identified locations or surveyed relative to site features.

11.0 References

ASTM International. 2014. Standard Guide for Direct Push Soil Sampling for Environmental Site Characterizations, ASTM D6282 / D6282M-14.

ASTM International. 2016. Standard Practice for Practice for Soil Investigation and Sampling by Auger Borings, ASTM D 1452-16.

ASTM International. 2018. Standard Practice for Test Method for Penetration Test and Split-Barrel Sampling of Soils, ASTM D1586-18.

New York State Department of Environmental Conservation (NYSDEC). 2010. "DER-10, Technical Guidance for Site Investigation and Remediation", Division of Environmental Remediation. May 2010.

U.S. Environmental Protection Agency (US EPA), Region 4. 2015. Operating Procedure: Field Equipment Cleaning and Decontamination. SESDPROC-205-R3. Science and Ecosystem Support Division. Athens, GA.

HRP Associates, Inc.

STANDARD OPERATING PROCEDURE
for

Soil Sampling

SOP # 104

Revision Date: July 21, 2020

LIST OF REVISIONS

Date	Summary of Changes	Approval
	Original document preparation	
8/2019	Multiple revisions throughout document	Gail L. Batchelder, Ph.D.
7/2020	Revisions to address PFAS updates	Gail L. Batchelder, Ph.D.

Reviewed by

Technical Director:

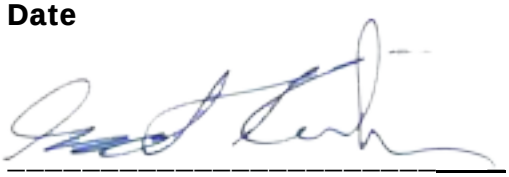


Gail L. Batchelder, Ph.D., P.G., L.E.P.

July 23, 2020

Date

Vice President /
Practice Leader - Environmental:



Scot Kuhn, P.G., L.E.P.

July 23, 2020

Date

This Standard Operating Procedure (SOP) provides the general procedures for Soil Sampling for environmental investigation- and remediation-related activities. The SOP was developed based on a number of sources that represent prevailing standards and guidelines typically used in the field of environmental investigation and remediation. However, the procedures described herein are not intended to supersede any applicable local, State or Federal regulations. Nor can the procedures described in this SOP take into account every condition that might be encountered in the field or every project-specific data quality objective. An important component of this SOP is the need to document those instances where the procedures described herein are not followed for a specific project, the rationale for not following the procedures described in the SOP, and a description of the alternative procedures that were used instead.

Due to significant concerns related to the presence of per- and polyfluoroalkyl substances (PFAS) in the environment and the very specific sampling considerations that must be addressed when sampling environmental media for these compounds, an addendum to this SOP specific to sampling soil for PFAS is provided as **Addendum #1**.

1.0 Introduction

This SOP describes a methodology for collecting soil samples that are representative of unconsolidated material for purposes of evaluating environmental quality. The SOP was developed in general accordance with the accepted industry protocols and guidance for the sampling of soil and unconsolidated deposits, including federal and state guidance documents and scientific literature.

Sampling of unconsolidated materials at a site may require the collection of those materials from the surface and/or subsurface. Although the term “soil” can have a specific definition based on the depth of unconsolidated materials to which the reference is being made, for the purposes of this Standard Operating Procedure (SOP), the term “soil” will be used regardless of the depth from which the samples are collected. Soil samples may be collected from the vadose zone (i.e., above the water table) or from the saturated zone (i.e., below the water table). Evaluation of such saturated soil samples should take into consideration the possibility that the detected contamination may be present due to groundwater transport versus a direct contaminant release at a given location.

The soil sampling procedure must also consider the potential for loss of volatile organic compounds (VOCs) during sample retrieval and handling and be designed accordingly. Procedures for sampling soils for subsequent laboratory analysis for VOCs are provided in the HRP SOP # 105, *Collection of Soil Samples for Analysis for Volatile Organic Compounds*.

Depending on project-specific data quality objectives and/or the project-specific work plan, field screening for various constituents may be indicated as a part of a soil sample collection effort. Recognizing that significant adaptations to standard protocols are necessary prior to, and during, sampling of soil for PFAS, **Addendum #1**, *Special Considerations for Collection of Soil Samples for PFAS Analysis*, has been included as a component of this SOP to help ensure that PFAS-specific protocols are followed when sampling for PFAS is included in a sampling plan.

Because field screening for total volatile organic compounds (VOCs) using a photoionization detector (PID) is the most commonly performed field screening activity, procedures for such screening are described in **Attachment A** of this *Soil Sampling* SOP. In addition to field screening for total VOCs, screening of soil samples for the presence of non-aqueous-phase liquid (NAPL) or for metals may be important components of soil sampling at a site depending on the project-specific data quality objectives and the project-specific work plan. Procedures for such field screening will be provided in

the individual project-specific work plan, since specifics of such screening procedures are more likely to be developed to meet the project-specific data quality.

Visual observation and characterization of soil samples is an important component of the soil sampling process. Procedures for geologic logging and characterization of soil samples are provided in HRP SOP # 103 entitled, *Soil Logging and Description Using a Modified Burmister Classification System.* When regulatory requirements or guidelines, or project-specific objectives require that the Unified Soil Classification System or other accepted soil classification system be used for a project, that classification system may be used in lieu of the Modified Burmister Classification System when such rationale is provided.

2.0 Specific Equipment List (not all items are required for a given sampling event)

- Personal protection equipment
- Stainless steel, Teflon, or polypropylene spatulas or scoops
- Stainless steel hand augers
- Stainless steel split spoons for soil sampling using a hollow-stem auger drilling rig
- Disposable acetate, lexan, or clear polyvinyl chloride (PVC) liners for direct-push soil sampling
- Stainless steel/glass pan
- Distilled water
- Plastic (polyethylene) sheeting
- Sample containers with labels
- Sample preservation materials and equipment
- Decontamination solutions/equipment
- Photoionization detector (PID) (preferred for most applications) and/or Flame Ionization Detector (FID)
- Coolers with ice (preferred) or ice packs

3.0 Documentation

- Site Plan/Activity Sheet
- Notebook/sketch pad
- Chain-of-custody record
- Instrument calibration logs (if required)
- Boring or test pit logs (as applicable)
- Applicable Soil Screening form(s)

4.0 Soil Sampling Precautions

1. Prior to conducting sampling, ensure that all necessary sampling equipment is clean and decontaminated in accordance with the site-specific work plan and/or decontamination procedures specified in Section 3.0 of HRP SOP # 101, *Advancement of Soil Borings in Unconsolidated Materials*.

2. Soil sampling for volatile or semivolatile analysis should be conducted using only stainless steel equipment or other chemically inert material that will not have the potential to contaminate the soil samples.

3. Soil samples collected for VOC analyses should never be mixed or composited. Sample collection for VOC analysis should be performed immediately after opening the sample collection device for each interval, before description of the soil sample or core and collection of samples for other analytes, to limit loss of VOCs from the sample due to volatilization. Soil sample collection techniques for VOCs are described in HRP SOP # 105, *Collection of Soil Samples for Analysis for Volatile Organic Compounds*. Procedures identified in that SOP are designed to ensure that soil samples are preserved in accordance with U.S. EPA Method 5035.

4. Generally, compositing of samples for any analysis should be performed only after careful consideration of sampling goals. In general, compositing is an acceptable and often required methodology only for waste characterization sampling.

5. Collection of samples for laboratory analysis at a single specified location should proceed in the order of greatest to least volatilization potential. As indicated above, sample collection for VOC analysis must be conducted first, followed by collection of samples into sample containers in order of volatility (e.g. petroleum hydrocarbons, semivolatile organic compounds (SVOCs), PCBs, metals, etc.).

6. The QAPP, site-specific work plan, and/or work instructions should describe the management of excess soil (i.e., soil not placed into containers for laboratory analysis) generated during soil sampling activities. In the absence of a specific soil management policy, excess soil collected during sampling should be handled in accordance with HRP's policy for management of investigation-derived waste. In all cases, disposal of excess soil must be in accordance with applicable federal, state, and local regulations. Depending on federal, state, and local regulations and the project-specific QAPP, work plan, and/or work instructions, soil exhibiting evidence of contamination may be returned to the borehole if the project-specific goal is to remediate the soil in the area where the contaminated soil will be returned.

7. Decontamination of field sampling equipment should be performed in accordance with Section 3.0 of HRP SOP 101, *Advancement of Soil Borings in Unconsolidated Materials.* Any sampling equipment that is reused during the sampling activities must be decontaminated between collections of every sample.

8. Sampling soil for PFAS requires that multiple special precautions and procedures be followed both before and during the soil sampling activity. Those precautions and alternative procedures are presented in **Addendum #1**.

In addition to decontamination between samples, all reusable equipment used for sampling shall be cleaned and decontaminated and any disposable equipment should be appropriately disposed of upon completion of all sampling requirements and prior to leaving the site. If more thorough decontamination is necessary than can be adequately performed in the field, such equipment should be wrapped in plastic and returned to the office for more complete decontamination.

Ideally, the project-specific QAPP, work plan, and/or work instructions should specify how decontamination fluids will be managed at the site. Any fluids generated during decontamination must be containerized for subsequent disposal in accordance with federal, state, and local regulations, and as specified in the site-specific QAPP, work plan, and/or work instructions. All

decontamination fluids generated at the site shall be subsequently disposed of in accordance with federal, state, and local regulations, as well as procedures specified in the site-specific QAPP, work plan, and/or work instructions.

5.0 Soil Sample Collection from Split Spoons, Direct-push Samplers, and Similar Devices

1. Personal protective equipment (PPE) should be donned and maintained in accordance with the site-specific work plan and/or health and safety plan during all sampling procedures. In the event that no PPE has been specified for a particular sampling event, disposable nitrile gloves should be donned, at a minimum, during all sampling procedures. Gloves must be changed after sampling from each individual sampling interval.

2. Soil sample retrieval from the subsurface shall be performed using an appropriate sample retrieval device (i.e., split spoon, Macro-core®, etc.) based on project-specific objectives and as designated in the project-specific QAPP, work plan, and/or work instructions. After collecting soil from each designated sampling interval using the soil retrieval device, the device shall be placed on polyethylene sheeting. Under no circumstances should the sampling device be allowed to touch the ground surface or other sampling surface until after the soil sample(s) have been collected from the device. Sample collection using hand augering techniques require special consideration, as indicated below in Section 6.0 of this SOP.

3. Collect soil samples for VOC analysis from the designated sampling interval(s) or sub-interval(s) as indicated in the site-specific QAPP, work plan, or work instructions as soon as possible after opening the soil sample retrieval device and prior to conducting other sampling activities. Methodologies for soil sample collection and preservation for VOC analysis is described in HRP SOP # 105, *Collection of Soil Samples for Analysis for Volatile Organic Compounds.* Collection of soil samples for VOC analysis from hand-augered sampling intervals requires special consideration, as indicated below in Section 6.0 of this SOP.

4. Following collection of soil samples for VOCs analysis, examine the soil core or soil sample to record color, texture, consistency, moisture content, and other pertinent characteristics in the field notebook or HRP boring log/field data sheet, as described in HRP SOP # 103, *Soil Logging and Description Using a Modified Burmister Classification System.*

5. Collect aliquots of soil from designated sampling intervals into appropriate sampling containers using a stainless steel or Teflon® sampling implement, such as a sampling spatula or spoon. In no instance should samples be placed into the sampling container using a sampling implement that is not made of inert material or a sampling glove.

   To ensure that the laboratory has sufficient sample volume to complete all analyses requested, fill sampling jars as completely as possible. Once filled, wipe rim and threads of sampling jar with a paper towel dampened with distilled water to remove excess soil particles that could interfere with proper closure of the jar lid.

6. If required, and if a sufficient sample is available after filling all jars, vials, etc., then soil from a given sample can be collected in a re-sealable plastic bag, or similar container, and screened in the field with a (PID) for total VOCs in accordance with the procedures

described in **Attachment A**. Aliquots of soil may also be collected for screening purposes at this time.

7. Label the sample container(s) in accordance with procedures described in project-specific QAPP, work plan, and/or work instructions. Alternatively, sampling jars may be pre-labeled; in which case, the sample label should be double-checked prior to placing soil into the container.

8. Although compositing of samples is not generally appropriate, there may be circumstances when compositing of soil aliquots from two or more sampling intervals may meet project-specific Data Quality Objectives. **Under no circumstances may samples be composited for subsequent analysis for VOCs**.

   When samples are to be composited, the following approach should be used. Using decontaminated sampling equipment, collect and carefully place soil into a stainless steel bowl or pan to thoroughly mix or composite, if necessary. All soil samples must be thoroughly mixed to ensure that the sample is as representative as possible of the soil being sampled. One method used to effectively homogenize samples is described below:

   - the material in the sample pan should be divided into quarters
   - each quarter should be mixed individually
   - two quarters should then be mixed to form halves
   - the two halves should be mixed to form a homogenous matrix
   - procedure should be repeated several times until the sample is adequately mixed

   Place aliquots of the homogenized sample into an appropriate, labeled container(s). If more than one sample container must be filled, place a spoonful of soil in each container in sequence and repeat until all containers are full or the sample volume has been exhausted.

   Fill containers in the order of greatest volatilization potential to least potential for volatilization. As noted above in Section 3, sampling for VOC analysis should be performed first and should be conducted using the procedures described in HRP SOP #105, *Collection of Soil Samples for Analysis for Volatile Organic Compounds*.

9. Place sample(s) in cooler with ice (preferred to meet and maintain cooler temperature at 4°C ± 2°C) or ice packs as soon as possible following collection into sampling containers. Samples of waste or highly-contaminated media must not be placed in the same cooler as samples expected to contain low concentrations of contaminants.

10. Deliver, or arrange for delivery of, selected samples to the analytical laboratory or to be returned to the HRP office for subsequent delivery to the laboratory or to be maintained on hold pending the need to analyze the samples at a later date, unless such storage at the HRP office would not be in accordance with regional office sample storage and management procedures.

11. Follow field-specific sample handling procedures described in the project-specific QAPP, work plan, and/or work instructions.

12. Following sample collection and field-management of the collected sample(s), and before re-use, thoroughly decontaminate any reusable sampling collection devices (split-spoon sampler, direct-push samplers, hand auger, stainless steel spatula or spoon) after each sampling interval using appropriate decontamination procedures, as described in Section 3.0 of HRP SOP # 101, *Advancement of Soil Borings in Unconsolidated Materials*.

6.0 Soil Sample Collection from Hand Augers

1. Follow all procedures for soil sample collection described in Section 5.0 of this SOP, with the exceptions noted below.

2. Use a stainless steel hand auger to sample 0" to 6" or 0" to 12", or other sampling intervals, as specified in the project-specific work plan. Generally, the hand auger can only collect a sample from intervals that are no more than approximately 6 inches at one time.

3. With the exception of sample collection for VOC analysis (which is described below) and when the objective for a sample collection interval is greater than the depth that can be achieved during a single retrieval of a hand auger from the subsurface, place each aliquot of soil retrieved by the hand auger from the specified sampling interval into a stainless steel bowl or pan to be composited with additional soil from that sampling interval. Once soil retrieval from the full sampling interval is complete, homogenize the soil in the bowl using an appropriate technique (such as that described in Section 7), then collect soil samples into individual sampling containers to ensure that samples submitted for laboratory analysis are representative of the specified sampling interval.

4. When soil samples are to be collected from a hand auger for subsequent laboratory analysis for VOCs, the aliquot of soil collected for VOCs must be collected directly from the material inside the hand auger if at all possible. As a result, the site-specific work plan and/or work instructions should specify the specific 6-inch depth interval(s) from which the sample(s) for VOC analysis should be collected. If it not possible to collect the aliquot of soil for VOC analysis directly from the hand auger, the material in the hand auger may be placed into a large, zippered, polyethylene bag, which is tightly closed before the sample can be collected. The sample should then be collected from the polyethylene bag within no more than 5 minutes of removal from the subsurface.

7.0 Compositing of Soil Samples

Although compositing of samples is not generally appropriate, there may be circumstances when compositing of soil aliquots from two or more sampling intervals or locations may meet project-specific Data Quality Objectives. **Under no circumstances may samples be composited for subsequent analysis for VOCs**. When samples are to be composited, the following approach should be used.

- Following collection from the subsurface, place soil samples intended for compositing into a stainless steel bowl or pan to thoroughly mix or composite. Thorough mixing of the samples is important to ensure that the sample is as representative as possible of soil from the locations being sampled. One method used to effectively homogenize samples is described below:

- the material in the sample pan should be divided into quarters
- each quarter should be mixed individually
- two quarters should then be mixed to form halves
- the two halves should be mixed to form a homogenous matrix
- procedure should be repeated several times until the sample is adequately mixed

o Place aliquots of the homogenized sample into an appropriate, labeled container(s). If more than one sample container must be filled, place a spoonful of soil in each container in sequence and repeat until all containers are full or the sample volume has been exhausted.

o Fill containers in the order of greatest volatilization potential to least potential for volatilization. As noted above in Section 3, sampling for VOC analysis should be performed first and should be conducted using the procedures described in HRP's SOP for *Collection of Soil Samples for Analysis for Volatile Organic Compounds*.

8.0 References for Soil Sampling Procedures

ASTM International. 2016. Standard Practice for Soil Investigation and Sampling by Auger Borings. ASTM D1452/D1452M-16.

Michigan Department of Environmental Quality (DEQ). 2018. *General PFAS Sampling Guidance*, October 2018.

Michigan DEQ. 2018. *Groundwater PFAS Sampling Guidance*, October 2018.

New York State Department of Environmental Conservation (NYSDEC). 2010. "DER-10, Technical Guidance for Site Investigation and Remediation", Division of Environmental Remediation. May 2010.

NYSDEC. 2020. *Guidelines for Sampling and Analysis of PFAS Under NYSDEC's Part 375 Remedial Programs*, Appendix B, NYSDEC, January 2020.

U.S. Environmental Protection Agency (U.S. EPA) (2014). Soil Sampling, SESD Operating Procedure, SESDPROC-300-R3 (rev. 3), U.S. EPA Science and Ecosystem Support Division, August 21, 2014.

ATTACHMENT A

Attachment A

Field Screening of Soil Using a Photoionization Detector

Photoionization detectors (PIDs) are used in general screening of soil, water, or air for the presence of volatile organic compounds (VOCs). The instrument is used only to screen for the presence of total concentrations of VOCs, not for the presence of individual constituents, and not all constituents of interest may be detected by the instrument. It is also possible to screen soil samples for the presence of VOCs using a flame ionization detector (FID), but use of this instrument is far less frequent than a PID. Procedures for field screening of soil samples using an FID are provided in HRP SOP # 2-005, *Field Screening Procedures for Soil Samples.*

Because PIDs can only ionize molecules in air, no liquids or solids should be introduced into the sample line. A PID can have limited use in higher humidity or in the presence of methane due to potential fouling of the lamp, although performance may be improved by using a vapor trap in those PID models that may be equipped with one.

Users should refer to the operation manual for the instrument being used to ensure that the electron voltage for the bulb used is appropriate for compounds of interest. For example, use of higher electron volt (ev) bulbs (generally 11.7 ev) are needed for halogenated alkanes, such as 1,1,1-trichloroethane, or higher molecular weight aromatic compounds due to the increased strength of the bonding force of these chemicals. For general screening purposes, use of a 10.6 ev bulb as an "all purpose" bulb is recommended. However, predetermination of compounds of interest is helpful before deciding which bulb to use for a specific project.

Generally, short-chain, alkane hydrocarbons, such as octane or those compounds generally found in mineral spirits, do not exhibit a high response factor to a PID, and therefore, the presence of those compounds may not be detected by the instrument. In such cases, an FID may be appropriate to use in conjunction with the PID if such compounds are of specific concern.

<u>Specific Equipment List</u>

- PID (Photovac^{tm} Microtip, Photovac^{tm} 2020, MIniRae^{tm} 3000, or equivalent)
- Re-sealable plastic/polyethylene bags
- Personal protection equipment
- Calibration gas

<u>Documentation</u>

- Site plan
- Activity log/Sample log
- Notebook/Sketch pad
- PID calibration Guide

Procedure – For Soil/Solid Matrix Samples

Following calibration of instrument per manufacturer's procedures:

1. Record background reading.
2. Place a small quantity of soil to be tested (between 50 to 150 grams) into a re-sealable plastic/polyethylene bag.
3. Let soil warm to ambient temperature. Care should be taken to ensure that the equilibration temperature is relatively consistent throughout the day (e.g. 50 degrees in the morning compared to 75 degrees in the afternoon). (When the ambient temperature is below approximately 50° F, it is recommended that soil samples be brought into a warmer environment and allowed to equilibrate to the warmer ambient temperature before proceeding with measurement of the sample.)
4. Insert probe tip into bag (do not allow the probe tip to touch the matrix) by puncturing the side of the bag in such a manner so as to avoid the potential loss of volatiles to the atmosphere before the probe tip can be inserted.
5. Record reading.

Samples that are wet may give a false positive reading. This effect may be present if readings gradually increase with no discernable leveling off. If this effect is observed, the instrument bulb should be cleaned, and the instrument should be recalibrated prior to re-testing the sample. If the response persists, the screening results should be noted as suspect. However, to help minimize the effect of moisture on screening results, some PID models may be equipped with a moisture trap to remove at least some of the moisture as the air enters the instrument.

ADDENDUM #1

Special Consideration for the Collection of Soil Samples for PFAS Analysis

Addendum #1

Special Considerations for Collection of Soil Samples for PFAS Analysis

INTRODUCTION

This addendum to HRP SOP # 104, *Soil Sampling*, has been prepared specifically to address the collection of soil samples for subsequent analysis for PFAS. Because of the possibilities of cross-contamination from everyday materials typically used during the collection of environmental samples that are known to, or could potentially, contain PFAS, and the low detection/reporting limits that are required for PFAS analysis, it is necessary to develop specific sampling protocols designed to minimize issues of cross-contamination during sample collection and handling.

Many states have developed guidelines or produced guidance documents specific to PFAS sampling. Some are more comprehensive than others. Based on a review of multiple guidance documents and scientific literature, HRP has elected to develop this addendum by adapting information primarily from the guidance documents produced by the Michigan Department of Environmental Quality (DEQ) because collectively, those guidance documents are comprehensive and cover the sampling of multiple types of environmental media (the reference for these documents is provided in the reference section of SOP # 104). Those documents also seemed to provide additional information on the rationale for many of the protocols, which is especially important when, in some cases, guidance from one state appears to conflict with guidance from another state. The Michigan DEQ documents were also published quite recently, in some cases less than a year ago, and in all cases, less than two years ago as of the date of this addendum (July 2020). Recent information on PFAS sampling protocols is especially important to use as a baseline because the information available on PFAS is constantly evolving and must be reviewed frequently to ensure that SOPs are kept current with the latest scientific developments.

While this addendum provides a summary of PFAS sampling protocols applicable to soil sampling, HRP is incorporating by reference the full guidance document on soil sampling from the Michigan DEQ, entitled, *Soil PFAS Sampling Guidance,* as well as the Michigan DEQ guidance document entitled, *General PFAS Sampling Guidance*. However, with offices in several states, HRP personnel must be cognizant of any state-specific guidance associated with PFAS sampling. Use of the Michigan guidance as a baseline protocol is not intended to supersede, and should not be used to supersede, any state-specific guidance that is applicable for projects in states where there may be conflicting protocols for PFAS sampling. That being said, if state or federal agencies require alternative protocols to be used, and HRP personnel believe that those protocols to be outdated, HRP should confer with the relevant state or federal agency to discuss using the most up-to-date protocols available. After consultation with the appropriate HRP technical and QA/QC staff, this would include using protocols that might be in conflict with the information provided in this SOP Addendum, which might then need to be revised.

The following paragraphs describe elements of PFAS-specific protocols for sampling of soil for PFAS. Table PFAS-1 summarizes specific considerations and protocols that must be followed

during PFAS sampling in general, which should be using during PFAS sampling activities for soil, as applicable. Table PFAS-1 has been adapted from the Michigan DEQ *PFAS Sampling Quick Reference Field Guide*.

LABORATORY ANALYSIS AND CONTAINERS

Soil samples collected are intended to be analyzed for PFAS by EPA Method 537, EPA Method 537 ver. 1.1, or other acceptable method.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory that will be performing the PFAS analysis.

SAMPLING EQUIPMENT

Acceptable materials for sampling include: stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials maybe acceptable if pre-approved by the applicable state or federal department. Review Table PFAS-1 for a list of allowable and prohibited materials.

No sampling equipment components or sample containers should come in to contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer.

Acceptable equipment includes use of a stainless steel spoon and a steel hand auger or shovel with no coatings. Other equipment maybe considered appropriate based on sampling conditions.

SUPPLIES AND PERSONAL PROTECTION EQUIPMENT (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers. A new pair of nitrile gloves shall be donned prior to any of the following activities:

- Decontamination of reusable sampling equipment
- Contact with sample bottles or water containers
- Sample collection
- Handling of any quality assurance/quality control samples

Attention should be given to any field supplies, PPE, personal body products (e.g., shampoos, moisturizers, cosmetics, etc.), sunblock, insect repellent, and food/food packaging that may include PFAS which could cross-contaminate field samples. Table PFAS-1 provides a list of allowable and prohibited materials.

- Several brands of waterproof field books contain PFAS and should not be used. Documentation of field activities should be on loose paper on an aluminum clipboard or in a waterproof field book that does not use PFAS. Field notes should be taken with a ball point pen and not any type of felt tip marker. Additional allowable items for field documentation are listed in Table PFAS-1.

- Some adhering materials contain PFAS, including sticky notes, and should be avoided. Pre-printed labels should be verified as PFAS-free.

- Chemical ice packs should not be used. Samples for PFAS analysis should be placed on ice immediately and should ideally be received by the laboratory at a temperature less than 6º Celsius.

- Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

- Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable) should be used that does not contain PFAS. Water resistant, waterproof, stain-treated, clothing recently washed with fabric softeners, and new clothing should be avoided. If sampling in inclement weather a canopy tent may be a good option. However, any water resistant or waterproof material likely contains PFAS and disposable nitrile gloves should be worn when putting up and/or moving the tent.

- Personal care products should never be used or applied in the sampling area. If necessary, allowable products (indicated in Table PFAS-1) may be applied in the staging area, ata distance from sampling bottles and equipment. Hands should be thoroughly washed following application of any personal care product.

- Sunscreen and insect repellent should never be applied in the sampling area, and only allowable products (as indicated in Table PFAS-1) may be applied in the staging area, away from sampling bottles and equipment. Hands must be thoroughly washed following application of these products. Clothing chemically treated for ultraviolet protection should be avoided. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

- Food and food packaging is not allowed within the sampling zone. If consuming food on-site becomes necessary, it can be done in the staging area. PPE must be removed. After eating, hands must be thoroughly washed and new PPE must be donned before returning to the sampling area. Bottled water and hydration beverages are permitted outside of the sampling area.

EQUIPMENT DECONTAMINATION

Standard two-step decontamination using detergent (Alconox® is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification. Previous results of “non-detect” for PFAS from the UCMR3 water supply testing program are acceptable as verification.

Some decontamination reagents may not be suitable for the removal of PFAS during decontamination (i.e. they may not be appropriate for unbinding PFAS from the surface of field

equipment prior to rinsing). Equipment blanks are recommended to ensure that the reagents used for decontamination successfully remove PFAS from field equipment.

SAMPLING TECHNIQUES

Soil samples should be collected using stainless steel, acetate, or polypropylene constructed equipment. Liners for soil sampling should not contain PFAS. Acetate or single-use PVC liners may be acceptable.

Care should be taken to not cross-contaminate PFAS samples if other analyses are being sampled for. A separate set of sampling equipment and laboratory sample containers is recommended for PFAS sampling, with decontamination, as necessary, and glove changes in between sampling for non-PFAS contaminants of concern and PFAS.

The following considerations should be taken during sample collection to prevent contamination:

- Dust and fibers must be kept out of sample bottles.
- The sample cap should never be placed directly on the ground during sampling. If sampling staff must set the sample bottle cap down during sample collection and a second member of the sampling crew (wearing a fresh pair of powderless nitrile gloves) is not available, set the cap on a clean surface (cotton sheeting, HDPE sheeting, triple rinsed cooler lid, etc.).
- Bottles should only be opened immediately prior to sampling and should be capped immediately after collecting the sample.
- Samples should be double bagged using resealable LDPE bags (e.g., Ziploc®).
- Prior to shipment, samples need to be chilled, and must not exceed 50° F (10°C) during the first 48 hours after collection.

SAMPLE IDENTIFICATION AND LOGGING

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain-of-custody. A PFAS-free writing utensil must be used to label the empty sample bottle prior to or immediately after the sample collection, and the ink must be allowed to dry completely before proceeding with sampling. Preprinted labels from the laboratory can also be used.

QUALITY ASSURANCE/QUALITY CONTROL

- Immediately place samples in a cooler maintained at 4 ± 2ºCelsius using ice.
- Trip blanks are recommended to evaluate the potential for introduction of contaminants during transport of the sample containers from the laboratory to the site, or from the site to the laboratory.

- A field blank should be collected with every sample to evaluate the potential for PFAS in the environment to enter the water sample as it is being collected. The field blank is collected by transferring laboratory-supplied, PFAS-free water from the container supplied by the laboratory to a second laboratory-supplied container in the area where the sample from the private water supply is being collected.

- Duplicate samples should be collected at a minimum frequency of 1 duplicate sample per 20 samples collected, although in certain sensitive situations it may be appropriate to increase the frequency of duplicate sample collection

- If non-disposable equipment is used to collect a sample, an equipment blank should be collected every day that sampling is conducted and at a minimum frequency of one equipment blank per 20 samples. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers.

- One matrix spike / matrix spike duplicate (MS/MSD) should be collected for every sample batch and for each different matrix type, with a minimum sampling frequency of 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and is to be identified on the chain-of-custody.

- Trip blanks are recommended to evaluate the potential for introduction of contaminants during transport of the sample containers from the laboratory to the site, or from the site to the laboratory.

DOCUMENTATION

Care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process. A soil log or sample log shall document the location of the sample/borehole, depth of the sample, sampling equipment, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Use of, or contact with, any known or potential PFAS containing materials should be documented.

TABLE PFAS-1

Quick Reference Guide to Considerations for PFAS Sampling[1]

The following table provides a summary of items that are likely to contain PFAS (identified as "prohibited items") and identifies acceptable alternatives. The information in this table does not represent a complete listing of either prohibited or allowable materials. Also identified are common materials used during field sampling activities for which further evaluation is needed prior to use during sampling. For specific products, the manufacturers should be contacted to determine if PFAS were used in the production of that product. Information in this list will likely change as new information becomes available.

Prior to reviewing the information in the table, the following items should be noted. These are prohibited items that should **NEVER** be used during a PFAS sampling event:

- Items or materials that contain fluoropolymers such as:
  - Polytetrafluoroethylene (PTFE), that includes the trademarks Teflon® and Hostaflon®
  - Polyvinylidene fluoride (PVDF), that includes the trademark Kynar®
  - Polycholotrifluoroethylene (PCTFE), that includes the trademark Neoflon ®
  - Ethylene-tetrafluoro-ethylene (ETFE), that includes the trademark Tefzel®
  - Fluorinated ethylene propylene (FEP), that includes the trademarks Teflon® FEP and Hostaflon® FEP
- Items or materials that contain any other fluoropolymer.

[1] The information in the table has been taken from the table entitled, *MDEQ PFAS Sampling Quick Reference Field Guide*, published by the Michigan Department of Environmental Quality (revised October 17, 2018), with minor adaptations, based on information provided in other state guidance documents and related information.

PFAS SAMPLING REFERENCE GUIDE			
Category	**Prohibited**	**Allowable**	**Needs Screening[2]**
Pumps, Tubing, and Sampling Equipment	Items or materials containing any Fluoropolymer (potential items include tubing, valves, or pipe thread seal tape).	• High-density polyethylene (HDPE) • Low-density polyethylene (LDPE) tubing • Polypropylene • Silicone • Stainless-steel • Any items used to secure sampling bottles made from: ○ Natural rubber ○ Nylon (cable ties) ○ Uncoated metal springs ○ Polyethylene	Any items or materials that will come into direct contact with the sample that have not been verified to be PFAS-free. It should not be assumed that any sampling items or materials are PFAS-free based on composition alone.
Sample Storage and Preservation	• Polytetrafluoroethylene (PTFE) materials • Teflon® -lined bottles or caps • Chemical or blue ice	• Laboratory-provided PFAS-free bottles (HDPE or polypropylene) • Regular wet ice • Thin HDPE sheeting • LDPE resealable storage bags (i.e. Ziploc®)that will not contact the sample media[3]	• Aluminum foil[4] • Plastic storage bags other than those listed as Allowable • Low-density polyethylene (LDPE) bottles • Glass jars[4]
Field Documentation	• Clipboards coated with PFAS • Notebooks made with PFAS-treated paper • PFAS-treated loose paper • PFAS-treated adhesive paper products	• Loose paper (non-waterproof, non-recycled) • Rite in the Rain® notebooks • Aluminum, polypropylene, or Masonite field clipboards • Ballpoint pens, pencils, and Fine or Ultra-Fine Point Sharpie® markers	• Plastic clipboards, binders, or spiral hard cover notebooks • All markers not listed as "Allowable" • Post-It® Notes or other adhesive paper products • Waterproof field books
Decontamination Materials	• Decon 90® • PFAS-treated paper towel	• Alconox®, Liquinox®,or Citranox® • PFAS-free deionized water (must be triple rinsed • Cotton cloth or untreated paper towel	• Municipal water • Recycled paper towels or chemically treated paper towels

PFAS SAMPLING REFERENCE GUIDE			
Category	**Prohibited**	**Allowable**	**Needs Screening[2]**
Clothing, Boots, Rain Gear, and PPE	• New or unwashed clothing • Anything made of or with Gore-Tex™ or other water-resistant synthetics • Anything applied with or recently washed with: ○ Fabric softeners ○ Fabric protectors, including UV protection ○ Insect resistant chemicals ○ Water, dirt, and/or stain resistant chemicals	• Powderless nitrile gloves • Well-laundered synthetic or 100% cotton clothing, with most recent launderings not using fabric softeners • Clothing and materials made of or with: ○ Polyurethane ○ Polyvinyl chloride (PVC) ○ Wax coated fabrics ○ Rubber/Neoprene ○ Uncoated Tyvek®	• Latex gloves • Water and/or dirt-resistant leather gloves • Any special gloves required by a HASP • Tyvek® suits, clothing that contains Tyvek®, or coated Tyvek®
Food and Beverages	No food should be consumed in the staging or sampling areas, including pre-packaged food or snacks. (However, if consuming food on-site becomes necessary, it must be done no closer to the sampling location than the staging area. PPE must be removed. After eating, hands must be washed thoroughly and new PPE must be donned before returning to the sampling location.)	• The following may be brought to, and consumed, only outside the vicinity of the sampling area: ○ Bottled water ○ Hydration drinks (i.e. Gatorade®, Powerade®)	

PFAS SAMPLING REFERENCE GUIDE			
Category	**Prohibited**	**Allowable**	**Needs Screening[2]**
Personal Care Products (PCPs)[5] - for day of sample collection	Any PCPs, sunscreen, and insect repellent applied in the sampling area.	The following PCPs, sunscreens, and insect repellents may be applied in the staging area, away from sampling bottles and equipment followed by thoroughly washing hands: • Cosmetics, deodorants/antiperspirants, moisturizers, hand creams, and other PCPs • Banana Boat® for Men Triple Defense Continuous Spray Sunscreen SPF 30 • Banana Boat® Sport Performance Coolzone Broad Spectrum SPF 30 • Banana Boat® Sport Performance Sunscreen Lotion Broad Spectrum SPF 30 • Banana Boat® Sport Performance Sunscreen Stick SPF 50 • Coppertone® Sunscreen Lotion Ultra Guard Broad Spectrum SPF 50 • Coppertone® Sport High Performance AccuSpray Sunscreen SPF 30 • Coppertone® Sunscreen Stick Kids SPF 55 • L'Oréal® Silky Sheer Face Lotion 50 • Meijer® Clear Zinc Sunscreen Lotion Broad Spectrum SPF 50 • Meijer® Sunscreen Continuous Spray Broad Spectrum SPF 30 • Meijer® Clear Zinc Sunscreen Lotion Broad Spectrum SPF 15, 30 and 50 • Meijer® Wet Skin Kids Sunscreen Continuous Spray Broad Spectrum SPF 70 • Neutrogena® Beach Defense Water+Sun Barrier Lotion SPF 70 • Neutrogena® Beach Defense Water+Sun Barrier Spray Broad Spectrum SPF 30	Products other than those listed as "Allowable".

PFAS SAMPLING REFERENCE GUIDE			
Category	**Prohibited**	**Allowable**	**Needs Screening[2]**
		• Neutrogena® Pure & Free Baby Sunscreen Broad Spectrum SPF 60+ • Neutrogena® UltraSheer Dry-Touch Sunscreen Broad Spectrum SPF 30 • OFF® Deep Woods • Sawyer® Permethrin	

Notes:
2. Equipment blank samples collected prior to use in the field may provide some information that products are PFAS-free, but a single equipment blank would generally not be considered sufficient to demonstrate that the material does not contain PFAS.
3. For surface water foam samples: LDPE storage bags may be used in the sampling of foam on surface waters. In this instance, it is allowable for the LDPE bag to come into direct contact with the sample media.
4. For fish and other wildlife samples: Depending on the project objectives, glass jars and aluminum foil might be used for PFAS sampling. PFAS has been found to bind to glass and if the sample is stored in a glass jar, a rinse of the jar is required during the sample analysis. PFAS are sometimes used as a protective layer for some aluminum foils. An equipment blank sample should be collected prior to any aluminum foil use.
5. Based on evidence, avoidance of PCPs is considered to be precautionary because none have been documented as having cross-contaminated samples due to their use. However, if used, application of PCPs must be done at the staging area and away from sampling bottles and equipment, and hands must be thoroughly washed after the use of any PCPs prior to sampling.

HRP Associates, Inc.

STANDARD OPERATING PROCEDURE
for

Collection of Soil Samples
for Analysis for Volatile Organic Compounds

SOP #105

Revision Date: August 31, 2019

LIST OF REVISIONS

Date	Summary of Changes	Approval
	Original document preparation	
8/2019	Multiple revisions throughout document	Gail L. Batchelder, Ph.D.

Reviewed by

HRP Quality Assurance Officer:



Gail L. Batchelder, Ph.D., P.G., L.E.P.

August 31, 2019

Date

Vice President / Practice Leader - Environmental:



Scot Kuhn, P.G., L.E.P.

August 31, 2019

Date

Preamble

This Standard Operating Procedure (SOP) provides the general procedures for collecting and preserving soil samples for analysis for volatile organic compounds in accordance with EPA Method 5035 during environmental investigation- and remediation-related activities. The SOP was developed based on sources that represent prevailing standards and guidelines typically used in the field of environmental investigation and remediation. However, the procedures described herein are not intended to supersede any applicable local, State or Federal regulations. Nor can the procedures described in this SOP take into account every condition that might be encountered in the field or every project-specific data quality objective. An important component of this SOP is the need to document those instances where the procedures described herein are not followed for a specific project, the rationale for not following the procedures described in the SOP, and a description of the alternative procedures that were used instead. In such situations, state-specific protocols should be explicitly cited as part of the document of procedures.

(Note: The text of this Standard Operating Procedure has been taken in large part from the guidance document published by the Connecticut Department of Energy and Environmental Protection entitled, *GUIDANCE FOR COLLECTING AND PRESERVING SOIL AND SEDIMENT SAMPLES FOR LABORATORY DETERMINATION OF VOLATILE ORGANIC COMPOUNDS,* Final, February 28, 2006, because that document provides a thorough discussion of sampling procedures that may be used to be consistent with U.S. EPA protocols, preservation methods, and other applicable guidance on the subject.)

1.0 INTRODUCTION

Soil and sediment samples collected for laboratory analysis for volatile organic compounds (VOCs) require special handling to prevent loss of VOCs leading to low-biased results. This Standard Operating Procedure (SOP) describes soil sample collection and preservation techniques designed to minimize losses from soil and sediment samples (hereinafter referred to as soil samples) due to volatilization and biodegradation during collection, storage and analysis. This procedure does not allow for the compositing of soil samples for VOC analysis because of the potential for loss of VOCs during the compositing process.

The procedure described herein refers only to the collection and preservation of sub-samples of soil in accordance with EPA Method 5035 for subsequent laboratory analysis for VOCs. HRP SOP #2-002, *Soil Sampling*, describes more general procedures associated with soil sample collection for environmental purposes and laboratory analysis for other constituents.

2.0 SOIL SAMPLING TECHNIQUES FOR LABORATORY ANALYSIS FOR VOCS

2.1 Overview of Sampling Approach

The soil sample collection procedure for determination of VOCs is a two-step process:

Step 1 – Collect an undisturbed soil sample, as defined below, from the subsurface, or expose the targeted area from where a sub-sample for laboratory analysis will be collected,

Step 2 – Collect a representative sub-sample from the undisturbed sample or directly from the exposed subsurface.

2.2 Collection of Undisturbed Samples

Undisturbed samples are those for which the sampling device minimizes break-up of the structure of the soil to the extent practicable. Undisturbed samples can be collected using such techniques as:

- Coring, such as the methods utilizing split-spoon sampling devices, MacroCores®, and large-bore direct-push samplers;
- Bulk sampling, for example, undisturbed soil volumes collected using a backhoe bucket from sidewalls of trenches and excavations where direct access to the sampling location (sidewall or bottom) is not safe; and
- Direct collection of samples from the surface or subsurface using a device such as a hand auger.

When collecting samples for laboratory determination of VOCs, the device used to collect the undisturbed soil sample must be removed as soon as possible from the subsurface; and most importantly, **the sub-samples that are intended for VOC determination must be collected as soon as possible to reduce loss of VOCs due to volatilization (Ideally, sub-samples should be collected within five minutes of opening the soil sample collection device and prior to any disturbance of the soil core other than slicing open the soil core itself. Aliquots of soil for laboratory analysis must be collected from the interior of the core, without including any portion of the core that has been in contact with the sampling device).**

Attempts must be made to further minimize loss of VOCs by managing the sample collection environment (i.e., limiting sun, wind, heat, etc.).

Planning and careful preparation are critical for a successful sampling event. Checklists should be used to ensure that all necessary equipment and supplies are present and in proper working order and that the following conditions are achieved:

- Undisturbed soil to be collected for sub-sampling for VOCs should be collected in a manner that controls the acquisition of the samples such that they do not “stack up” awaiting logging and sub-sampling;
- Soil cores should not be stored in large-diameter sample collection equipment, orsmaller-diameter sampling devices or capped liners (brass, acetate, lexan, polycarbonate etc.) for longer than 10 to 15 minutes prior to collection of sub-samples

for VOC analysis. In all cases following collection of soil cores or samples from the sub-subsurface and prior to collection of the sub-samples for VOC analysis, soil retrieved from the sub-surface must be tightly capped or covered to minimize the potential for volatilizations of VOCs from the retrieved soil before the sub-samples for VOC analysis can be collected;

• Cores should not be exposed to extreme weather conditions, such as direct sunlight, rain and wind, and sub-sample collection should occur in an area that minimizes exposure to the elements (e.g., under cover, shady areas); and

• Undisturbed soil samples cannot be transferred from the core sampler to a secondary container (empty sample bottle, plastic bag, aluminum foil, or sampling bowls) for future sample collection.

To the extent practicable, undisturbed samples should always be collected. However, in some cases, collection of a disturbed sample may be necessary to characterize source areas or other critical locations. If disturbed soil samples must be collected, the rationale for collecting such disturbed samples must be provided. However, under no circumstances should a sub-sample be collected from a disturbed sample that was previously used for field-screening purposes.

2.3 Collection of the Soil Sub-Samples for Analysis for VOCs

Sub-samples are those samples that are submitted to the laboratory for analysis for VOCs. Sub-sampling of the undisturbed soil sample must be performed using a dedicated or decontaminated, small-diameter sampler. Sub-samples must be collected as soon as possible from the undisturbed sample after the undisturbed soil sample is collected.

3.0 OVERVIEW OF SUB-SAMPLING DEVICES

Sub-sampling of the large-diameter or bulk sampling device for VOCs must be performed with the use of a dedicated or decontaminated small-diameter core sampler. The small-diameter core sampler must be capable of collecting the required amount of sample from the large-diameter sampling device (e.g., split-spoon or soil corer) or from freshly exposed subsurface soils. The small-diameter core sampler must be capable of delivering the sample quickly and directly into the sample container without disturbing the native soil structure.

Small-diameter core samplers used in the collection of samples for VOCs must be constructed of non-reactive materials that will not sorb, leach or alter the concentration of VOCs in the sample. Examples of these materials are stainless steel, glass and brass. Other materials, such as Viton®, PTFE and some rigid plastics, which have demonstrated limited absorptive or diffusive passage of VOCs, can be used as long as the contact time between the sample and the sampler is minimized, or the materials are used for an airtight seal of the sampler. It is important to note that some syringes may be coated with glycerin and should not be used.

There are many acceptable small-diameter core samplers. Product names are included in this SOP for illustrative purposes and do not indicate that a specific sampling device be used as long as the data quality objective for sample collection can be met by a specific device and the suitability of the selected small-diameter core sampler not otherwise indicated in this SOP is explained.. Currently available small-diameter core samplers include a modified 10-milliliter (ml) disposable plastic syringe, a Purge and Trap Soil Sampler®, En Core® samplers, Easy Draw Syringe® or other small-diameter tube/plunger sampler.

The small-diameter core sampler should fit inside the mouth of the sample container to avoid loss of sample, prevent damage to the sealing surfaces or container threads and ease the soil transfer process.

3.1 Procedure for Obtaining Test Samples to Determine Sub-Sample Volume

The procedures used by the analytical laboratories to determine VOC concentrations in soil require approximately equal amounts of soil and liquid to be used in the procedure. If the ratio of soil to liquid is too high, the soil will not be adequately dispersed in the liquid, leading to poor results. If the amount of soil is too low, the detection limits will be raised, which could potentially affect the usability of the results.

The small-diameter core sampler must be able to deliver a minimum of 5 grams of sample (≈ 3 cm^3 of sample, assuming a density of 1.7 g/cm^3) into a 40-ml VOA vial. While most small-diameter core samplers can only be used for sampling and placement into the appropriate sample containers, only the En Core®-type samplers can be used for sampling, storage, and transportation of the sample to the laboratory. Small-diameter core samplers should be selected based upon the properties of the matrix, the type of preservation method (field vs. lab), and personal preferences.

It is important that the small-diameter core sampler provide the required mass of sample material. Consequently, it is often valuable to perform a test of sample collection procedures using the small-diameter core sampler by collecting a test sample (of similar matrix to that being sampled) and weighing that sample to determine the amount of soil needed to obtain the required mass of sample material for each type of small-diameter core sampler and analytical method.

The procedure for obtaining a test sample is as follows:

1. Using a small electronic portable scale with an accuracy of 0.1 grams, weigh the empty small-diameter core sampler (e.g., disposable syringe) to the nearest 0.1 grams. The scale must be calibrated before use and intermittently checked during the day to ensure accurate weight measurement. Calibration information must be recorded in the field logbook. A translucent cover can be placed over the scale during the weighing process to negate variations caused by wind.

2. Push the small-diameter core sampler test sample into the matrix to collect the required mass of material (3 cm^3 should yield approximately 5 grams of sample [wet weight]).

3. Wipe clean any soil adhering to the outside of the small-diameter core sampler before weighing.

4. If the weight is above the required amount, remove excessive soil by extruding a small portion of the core and cutting it away with a decontaminated trowel or spatula. If the weight is below the weight limit, obtain additional soil by reinserting the small-diameter core sampler into the soil core. Re-weigh after each addition or removal of sample from the small-diameter core sampler until the target weight is attained. Note the sample volume and amount in the small-diameter core sampler.

5. Discard the test sample appropriately.

6. Use the volume of the test sample as a guide in collecting the appropriately sized sub-sample of a similar matrix. Additional test samples should be weighed whenever a change in the matrix is observed.

3.2 Overview of Procedure for Collection of Sub-Samples

The goal of soil sampling for the purposes of evaluating concentrations of VOCs in soil is to obtain a representative soil sample in accordance with the data quality objectives for the project. Often, this is accomplished using an appropriate small-diameter core sampler.

Different sample matrices (e.g., sand, gravel, clay, fill) may warrant slightly different sub-sampling field techniques. The goal for all techniques is to collect the sub-sample as quickly as possible while minimizing disruption. For sub-samples that do not fit into the samplers, the rationale for any deviations from this guidance must be documented.

The procedure for obtaining soil sub-samples is noted below. It is important to remember that collection of sub-samples from a soil core or other sampling device **must** be performed first, as soon as the device is opened, in order to minimize losses of VOCs from the soil. Geologic logging of the soil core, collection of an aliquot of soil for field screening, and collection of soil samples for submittal to the laboratory for other analysis must be performed after collection of the sub-sample(s) for VOC analysis from that soil core or sampling device has been performed.

Sub-sampling procedures for collection of soil for VOC analysis are as follows:

1. Once the sampling interval has been selected, expose a fresh surface of the soil for collection of a sub-sample for VOC analysis. A loss of VOCs from the surface of the soil will occur even if the soil has been exposed for a short period of time (during screening, etc.). Removal of the unwanted surficial material can be accomplished by scraping the soil surface with a decontaminated spatula or trowel. Soil sampling must commence immediately once a fresh surface has been exposed.

2. Using the test sample as a guide, push the small-diameter core sampler into the matrix to collect a volume of material that will yield the required mass of sample (wet weight) as determined by the analytical method.

3. Depending upon the texture, depth or moisture content, insert the small-diameter core sampler straight into the matrix, on an angle. Multiple insertions can be made to obtain the required sample weight or to provide a more representative sub-sample from the desired sampling interval.

4. After sample collection, wipe the outside of the small-diameter core sampler to remove any excess material adhering to the barrel using a paper towel dampened with distilled water.

5. Immediately open the sample container and extrude the soil core into the sample container that will be submitted to the laboratory. Avoid splashing any preservative, if present, out of the sample container by holding the container at an angle while slowly extruding the soil core into the sample container. Do not immerse the small-diameter core sampler into the preservative. If an En Core®-type sampler is to be used for storage and shipment, prepare the sampler for shipment according to manufacturer's instructions.

6. Collect the required number of sample containers or En Core®-type samplers based on the chosen preservation and analytical methods, as discussed in the subsequent section on soil preservation methods.

7. Collect an additional aliquot of soil from the sampling interval into a separate sample container for determination of soil moisture content. A two-ounce jar is usually sufficient for this purpose or it should be indicated on the chain-of-custody that an aliquot may be extracted for this purpose from the sampling jar submitted for laboratory analysis. Collect an additional 50- to 150- gram aliquot of soil from the sampling interval to be used for field screening for total VOCs using a PID and/or FID in accordance with procedures described in Attachment A of HRP SOP # 2-002, S*oil Sampling*.

8. As noted above, ensure the threads and cap of the sample container or En Core®-type sampler are free of soil particles by wiping with a clean paper towel, dampened with distilled water to remove soil particles from the threads and sealing surface of the sample container or En Core®-type sampler.

9. Record the laboratory and field identification numbers in the field notes and on the chain of custody. Record the sample identification information on the sample container using a suitable marker. Container labels with wire or rubber band attachments can be used, provided they can be removed easily for sample weighing. Do not attach any additional adhesive-backed labels or tape to the sample containers unless requested by laboratory or specified in manufacturer instructions. This will increase the weight of the sample container and the laboratory will not be able to determine the sample weight.

10. After sample collection, immediately return the containers to an iced cooler. Sample containers from different locations should be placed in separate ziplock bags to help avoid cross-contamination. The laboratory sample number or field sample identification number may be placed on the bag and cross-referenced on the chain of custody. Proper sample management and chain-of-custody procedures should be maintained at all times from sample collection to transfer of samples to the laboratory. The laboratory performing the analysis will determine the sample weight.

4.0 PRESERVATION OF SOIL SAMPLES

4.1 Overview of the Soil Preservation Procedure

The preservation of samples for VOC analysis can be initiated either at the time of sample collection or in the laboratory. This section deals with the preservation of soil samples in the field using chemical and physical preservation methods.

It is important that the laboratory analytical methods, field preservation methods, appropriate sample containers and sample holding times are determined prior to mobilizing to the field. It is also necessary to consider that additional sample containers maybe required for various quality assurance/ quality control (QA/QC) samples such as matrix-spike and matrix-spike duplicates (MS/MSD). The number of extra containers required varies by laboratory and analytical procedure.

In addition to the various chemical preservation methods, samples must be physically preserved (e.g., iced or frozen) in the field immediately upon sample collection. It is important to match

up the correct physical preservation method with the appropriate sample container and field chemical preservation method. According to U.S. EPA Contract Laboratory Protocol (CLP) Guidance for Field Samplers, the physical preservation methods are described as:

Iced – soil and sample containers are cooled to 4º ± 2ºC.

Frozen – soil and sample containers are cooled to between -7º to -15º C.

Sample containers that will be frozen should be placed on their side prior to freezing process to prevent breakage. Additional aliquots for screening and moisture determination need only be iced and kept cooled at 4º ± 2ºC; these sample containers should not be frozen. **Sample containers and En Core®-type samplers should not be frozen below -20º C, as the integrity of the container seals, o-rings and septum may be compromised by the freezing, resulting in the loss of VOCs upon thawing of the sample.**

En Core®-type samplers with soil containing greater than approximately 20% moisture should not be frozen. Greater than 20% moisture is extremely moist and is easy to spot with visible pooling of liquid on the sample surface. In most cases involving soil sampling, greater than 20% moisture is unusual.

In addition, the use of dry ice to freeze samples immediately upon sample collection or for use during shipment is not recommended. Dry ice, which is at a temperature of -78.5ºC, will lower the temperature of the sample container below the design specifications, causing damage to the glass, septum, seals, o-rings, and cap. In addition, dry ice has specific handling, storage and shipping requirements that outweigh its usefulness to the field sampling team.

4.2 Sub-Soil Sample Collection Procedures

When collecting soil sub-samples for determination of volatile organic compounds, up to four types of samples may be required:

- A high-concentration-level sample
- A low-concentration-level sample
- An SPLP/TCLP sample
- A sample for percent solids determination

Samples for both high-concentration level and low-concentration levels are necessary for each subsample, since the actual concentration in the soil retrieved from the subsurface is not known prior to analysis. Additional samples may be necessary for matrix spikes and matrix spike duplicates. Field and trip blanks also may be required.

An overview of the various options for sample collection procedures is attached as Figure 1.

4.3 High-Concentration Sub-sample Collection Procedures

There are two options for collection of the high-concentration sample: collection of the sample in a methanol preserved VOA vial or using En Core®-type samplers.

4.3.1 High-Concentration Sample Option 1, Methanol Preservation

Supplies:

Electronic field balance accurate to 0.1 grams

Minimum of one VOA vial (40 ml), pre-weighed and containing 5 or 10 mls of methanol

Sub-sampling device

1. Label the vials as appropriate. Do not add more weight (e.g., excessive labels) to the pre-weighed vials.

2. Weigh the vials to confirm the recorded vial weight.

3. Select the area to be sampled as soon as possible after the soil is exposed.

4. Obtain a test sample, using the coring device and field balance, to determine approximately how much volume of soil will yield equal grams of soil to methanol (5 or 10 ± 1 grams). This step may be skipped when the amount of soil needed for a particular matrix at a site has been determined.

5. Scrape away the surface material from the area to be sampled to expose fresh soil.

6. Rapidly insert the syringe into the soil to obtain the sample. Quickly extrude the sample into the vial containing the methanol. Wipe off the threads and cap; seal the vial.

7. Using the field balance, weigh and record the weight of the vial. A record of the weight must be submitted with the samples to the laboratory.

8. Place sample in cooler with ice.

9. Collect separate sample for percent solids, if necessary.

4.3.2 High-Concentration Sample 2, Use of En Core®-Type Samplers

Supplies:

One 5 or 10 -gram En Core®-type Sampler

1. Label the sample as appropriate.

2. Select the area to be sampled as soon as possible after the soil is exposed.

3. Scrape away the surface material from the area to be sampled to expose fresh soil.

4. Rapidly insert the sampler into the soil to obtain the sample. Quickly wipe the contact areas to remove any soil particles, close and seal the device.

5. Place devices in resealable pouch, place in cooler on ice.

6. Collect separate sample for percent solids, if necessary.

7. Samples must be frozen, preserved, or analyzed within 48 hours of collection.

4.4 Low-Concentration Sub-Sample Collection Procedures

There are four options for collecting low-concentration soil samples:

- collection in VOA vials containing water
- collection in empty VOA vials
- collection using En Core®-type devices
- collection in VOA vials containing sodium bisulfate.

All of the procedures using VOA vials are essentially the same, with the exception that there are specific limitations associated with preservation using sodium bisulfate, including formation of

acetone in samples containing high amount of humic material, and certain analytes, such as styrene, vinyl chloride, trichloroethene (TCE), may be decomposed by the bisulfate, leading to low-biased results, and carbonate-rich soils may effervesce, which will result in significant losses of VOCs. Due to these limitations, use of sodium bisulfate as a preservative is discouraged unless there is a compelling reason why it is necessary for a specific project or because it is a regulatory requirement.

4.4.1 Low-Concentration Sample Option 1, Collection in VOA Vials Containing Water

Supplies:

Electronic field balance accurate to 0.1 grams

Two VOA vials (40 ml), pre-weighed and containing 5 mls of water and a magnetic stir bar

Sub-sampling device

1. Label the vials as appropriate. Do not add more weight (e.g., excessive labels) to the pre-weighed vials.

2. Select the area to be sampled as soon as possible after the soil is exposed.

3. Obtain a test sample, using the coring device and field balance, to determine approximately how much volume of soil will yield 5 grams of soil. Note that the sample weight should be within 1 gram of the nominal weight, e.g. 5± 1 gram. This step may be skipped when the amount of soil needed for a particular matrix at a site has been determined.

4. Scrape away the surface material from the area to be sampled to expose fresh soil.

5. Rapidly insert the syringe into the soil to obtain the first 5-gram sample. Quickly extrude the sample into one of the two vials containing the water. Wipe off the threads and cap; seal the vial.

6. Repeat steps 4 and 5 for the second vial containing water.

7. Using the field balance, weigh and record the weight of each vial. A record of the weight must be submitted with the samples to the laboratory. Often, the laboratories will supply pre-weighed vials, so weighing the vials in the field would not be necessary in such cases.

8. Place all samples in cooler with ice.

9. Collect separate sample for percent solids, if necessary.

10. Samples must be frozen or analyzed within 48 hours of collection.

4.4.2 Low-Concentration Sample Option 2, Collection in Empty VOA Vials

Supplies:

Electronic field balance accurate to 0.1 grams

Two VOA vials (40 ml), pre-weighed containing a magnetic stir bar

Sub-sampling device

1. Label the vials as appropriate. Do not add more weight (e.g., excessive labels) to the pre-weighed vials.

2. Select the area to be sampled as soon as possible after the soil is exposed.

3. Obtain a test sample using the coring device and field balance, to determine approximately how much volume of soil will yield 5 grams of soil. Note that the sample weight should be within 1 gram of the nominal weight, e.g. 5± 1 gram. This step may be skipped when the amount of soil needed for a particular matrix at a site has been determined.

4. Scrape away the surface material from the area to be sampled to expose fresh soil.

5. Rapidly insert the syringe into the soil to obtain the first 5-gram sample. Quickly extrude the sample into one of the two vials. Wipe off the threads and cap; seal the vial.

6. Repeat steps 4 and 5 for the second vial.

7. Using the field balance, weigh and record the weight of each vial. A record of the weight must be submitted with the samples to the laboratory. As noted above, this step is not necessary of the laboratory supplies pre-weighed vials.

8. Place all samples in cooler with ice.

9. Collect separate sample for percent solids, if necessary.

10. Samples must be frozen or analyzed within 48 hours of collection.

4.4.3 Low-Concentration Sample Option 3, Collection Using En Core®-Type Devices

Supplies:

Two 5-gram En Core®-type sampling devices

1. Label the sample as appropriate.

2. Select the area to be sampled as soon as possible after the soil is exposed.

3. Scrape away the surface material from the area to be sampled to expose fresh soil.

4. Rapidly insert the sampler into the soil to obtain the first sample. Quickly wipe the contact areas to remove any soil particles, close and seal the device. Place device in re-sealable pouch

5. Repeat steps 3 and 4 for the second En Core®-type device.

6. Place both devices in resealable pouches, place in cooler on ice.

7. Collect separate sample for percent solids, if necessary.

8. Samples must be frozen, preserved or analyzed within 48 hours of collection.

4.4.4 Low-Concentration Sample Option 4, Collection in VOA Vials Containing Sodium Bisulfate

Supplies:

Electronic field balance accurate to 0.1 grams

Two VOA vials (40 ml), pre-weighed containing 5 ml sodium bisulfate solution and a magnetic stir bar

Sub-sampling device

1. Label the vials as appropriate. Do not add more weight (e.g., excessive labels) to the pre-weighed vials.

2. Select the area to be sampled as soon as possible after the soil is exposed.

3. Obtain a test sample using the coring device and field balance to determine approximately how much volume of soil will yield 5 grams of soil. Note that the sample weight should be within 1 gram of the nominal weight, e.g. 5 ± 1 gram. This step may be skipped when the amount of soil needed for a particular matrix at a site has been determined.

4. Scrape away the surface material from the area to be sampled to expose fresh soil.

5. Rapidly insert the syringe into the soil to obtain the first 5-gram sample. Quickly extrude the sample into one of the two vials containing the bisulfate solution. Wipe off the threads and cap; seal the vial.

6. Repeat steps 4 and 5 for the second vial.

7. Using the field balance, weigh and record the weight of each vial. A record of the weight must be submitted with the samples to the laboratory.

8. Place all samples in cooler with ice.

9. Collect separate sample for percent solids, if necessary.

4.5 Collection of Soil Samples for TCLP or SPLP Extraction and VOC Analysis

The holding time for soil samples to begin the leaching procedure for Toxicity Characteristic Leaching Procedure (TCLP) or Synthetic Precipitation Leaching Procedure (SPLP) extraction for VOC analysis is 14 days from collection. Therefore, any samples collected for TCLP or SPLP extraction and placed on "hold" pending results of total analysis for VOCs for a given sampling interval, must be analyzed within the 14-day holding time.

Supplies:

25-gram En Core®-Type Sampler

1. Label the sampler as appropriate.

2. Select the area to be sampled as soon as possible after the soil is exposed.

3. Scrape away the surface material from the area to be sampled to expose fresh soil.

4. Rapidly insert the sampler into the soil to obtain the sample. Wipe off the threads and cap; seal the sampler.

5. Place sampler in re-sealable pouch and place in cooler with ice.

6. Samples must be frozen or leached within 48 hours of collection.

4.6 Collection of Soil Samples for Percent Solids Determination

A laboratory typically can use any container submitted for analysis to determine the percent solids of a soil, **except a container submitted for VOC analysis.** If the other laboratory analyses, besides volatile organic compounds (either total or TCLP/SPLP for VOCs), are to be performed on soil for a given sampling interval and location, a separate container(s) will be needed for the other tests. The percent solids determination can then be performed using the soil in the container(s) for the other tests. In the event that only VOCs are to be determined for a given soil sample, an additional sample (no more than 20 grams are needed) must be collected in a separate container and submitted to the laboratory.

5.0 REFERENCES

Connecticut Department of Energy and Environmental Protection (2006). *Guidance for Collecting and Preserving Soil and Sediment Samples for Laboratory Determination of Volatile Organic Compounds*, ver. 2, Final, February 28, 2006,

Missouri Department of Natural Resources (2013). *Missouri Risk-Based Corrective Action Process for Petroleum Storage Tanks*, October 17, 2013.

United States Environmental Protection Agency (USEPA) (2002). *Method 5035A (SW-846): Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples*. USEPA. July 2002.

HRP Associates, Inc.

STANDARD OPERATING PROCEDURE
for

Sample Handling

SOP #108

Revision Date: August 31, 2019

LIST OF REVISIONS

Date	Summary of Changes	Approval
	Original document preparation	
8/2019	Multiple revisions throughout document	Gail L. Batchelder, Ph.D.

Reviewed by

HRP Quality Assurance Officer:

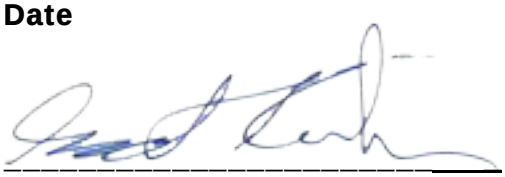


Gail L. Batchelder, Ph.D., P.G., L.E.P.

August 31, 2019

Date

Vice President /
Practice Leader - Environmental:



Scot Kuhn, P.G., L.E.P.

August 31, 2019

Date

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 CONTAINERS 2

2.1 Soils and Unconsolidated Materials 2
2.2 Liquids 2
2.3 Gasses 2

3.0 PRESERVATION 3

3.1 Refrigeration 3
3.2 pH Adjustment and Other Preservatives 3
3.3 Holding Times 3

4.0 SAMPLE COLLECTION AND PREPARATION 4

4.1 Filtration 4
4.2 Compositing 5
4.3 Chain-of-Custody Procedures 5
4.3.1 Chain-of-Custody Form 5
4.3.2 Sample Labeling Nomenclature 5
4.3.3 Delivery/Receipt Procedures 6

5.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) 7

5.1 Blanks 7
5.2 Duplicates 7

6.0 REFERENCES 8

ATTACHMENT

Attachment A Representative Chain-of-Custody Form

1.0 INTRODUCTION

This SOP identifies the containers, preservatives, sample preparation, chain-of-custody procedures, and QA/QC procedures associated with the various types of samples collected and analyzed by HRP.

Equipment: This SOP deals primarily with methods requiring no equipment other than sample containers.

Documentation: Field notebook and map or field work sheets to detail location of sampling points and relevant information related to sample collection.

Chain-of-custody form for each sample delivery group.

2.0 CONTAINERS

2.1 Soils and Unconsolidated Materials

Samples of soil and other unconsolidated materials will be collected into wide-mouth glass jars with tightly fitting lids, or other appropriate container based on the analyses to be conducted. Specific information related to the appropriate container can be found in the project-specific Quality Assurance Project Plan (QAPP) and/or work plan. Sample containers to be submitted directly to the laboratory should be filled to the extent possible to eliminate any headspace and to ensure that sufficient sample is available for all analyses to be performed, although filling the jar completely is not required if that amount of soil is not needed to accomplish the project objectives for analyses to be performed.

However, for those samples for which analysis for volatile organic compounds (VOCs) will be conducted, EPA Method 5035A methods for sample collection and preservation will be used. Those methods are described in detail in HRP SOP #105 *Soil Sample Collection for VOC Analysis*. For such samples, 40-milliliter (ml) vials are obtained in advance from the laboratory filled with the appropriate amount of methanol and/or sodium bisulfate, and the vials are filled with the appropriate amount of soil specified by the SOP or the laboratory (if different).

2.2 Liquids

Several types of containers are available for liquid samples. The type(s) of container to be used are determined by the analyses to be performed and the nature and chemical properties of the liquid. Another factor that influences the type of container used for storage and transport of liquids is the sample volume requirements for the specific analyses to be performed. For example, oil samples may be contained in wide-mouth glass jars, similar to containers used for unconsolidated samples. Since samples collected for VOC analysis may undergo a loss of volatile constituents, vials used for water samples collected for subsequent VOC analysis must be fitted with Teflon™ septa and must be overfilled before closing to ensure that no headspace (air) is present in the vial. Other constituents may be subject to photochemical degradation and thus require collection into amber glass containers. Preservatives that must be used for liquid samples are specific to the nature and chemical properties of the specific analytes for which analysis is to be conducted. Information on sample collection requirements are provided in the QAPP and/or project-specific work plan.

2.3 Gasses

Gasses are intrinsically mobile and must be contained in fully-enclosed containers. The following types of container are available: Tedlar™ bags and glass bulbs with Teflon™ septa to allow insertion of hypodermic syringes. Summa® canisters are also typically used, especially for sub-slab soil vapor samples and indoor air samples that are used to evaluate vapor intrusion. Specifications for sample collection devices for gas samples should be selected based on data quality objectives for the project and will be specified in the project-specific QAPP and work plan.

3.0 PRESERVATION

Preservation requirements are provided in the QAPP and/or site-specific work plan that is developed for a project. Should there be any questions regarding preservation of samples, the analytical laboratory should be contacted or the most current update of EPA SW-846 should be consulted.

3.1 Refrigeration

Samples which do not require refrigeration are: oil samples; gaseous samples; and water samples to be analyzed only for metals. All other samples must be kept cool (ideally at 4°C ± 2°C) until delivery to the lab for analysis. Soil samples intended for VOC analysis should be preserved and otherwise managed in accordance with HRP SOP # 105.

Samples must not be allowed to freeze in cold weather. The jars/vials could break and the samples will be lost. Storage and transport containers and modes of transport must take the potential for freezing into account.

3.2 pH Adjustment and Other Preservatives

The pH of water samples should be adjusted in the field, as necessary, using the preservatives which are specified in the QAPP and/or site-specific work plan or the most recent SW-846 promulgated method for the requisite analytical parameter. Questions on preservatives should be directed to the analytical testing laboratory.

Gaseous samples do not require preservatives or pH-adjusting compounds to be added. In general, samples of unconsolidated material (soil, concrete, sediment) or sludge do not require the addition of a preservative. The exception is analysis for VOCs, in which case soil and sediment samples should be collected using EPA Method 5035A. These samples should be collected in vials pre-preserved with methanol and/or sodium bisulfate. The soil/preservative ratio should be indicated on the sampling container prior to sample collection or obtained directly from the testing laboratory. Additional detail on sample collection for subsequent VOC analysis is provided in HRP's SOP #105, as noted in Section 2.1.

3.3 Holding Times

Holding times for various parameters are specifically indicated in the most recent EPA SW-846 promulgated method for the requisite analytical parameter. Questions on holding times should be directed to the analytical laboratory. Additional information regarding sampling containers, preservation, and holding times will be made available in the QAPP and/or site-specific work plan.

4.0 SAMPLE COLLECTION AND PREPARATION

Samples will collected into appropriate, laboratory-supplied containers recommended for the media and analytical methods, as indicated in Section 2.0, and other relevant documents, such as the QAPP and site-specific work plan.

4.1 Filtration

Groundwater samples should not be filtered prior to analysis, except as allowed in accordance with regulatory guidance. The appropriateness of filtration for water samples and filter size is based on a number of factors, including objectives for the sampling effort, data quality objectives for the project, and regulatory considerations related to filtration of water samples. The need for filtration of groundwater samples must be discussed in the project-specific work plan, and the discussion must include the rationale for collection of filtered groundwater samples, as well as the procedures that would be used for collection of the filtered samples. Unless specifically indicated otherwise in a project-specific work plan (and the rationale for such a decision must be provided), an unfiltered sample should always be collected for analysis in addition to the filtered sample.

Whenever possible, an in-line filter should be used to filter groundwater samples as the water is withdrawn from the well. The selection of which, if any, filter should be used depends on the data quality objectives for the project and will be specified in the QAPP and/or site-specific work plan. A 0.45-micron filter is used for samples for which the objective is to obtain results for dissolved constituents (usually metals). A 10-micron filter is used to distinguish analytical results for dissolved plus colloidal constituents vs. analytical results that include constituents that might be absorbed onto fine-grained particles that are present in the water sample.

In some cases, water samples other than groundwater samples must be filtered in the field prior to sample collection into appropriate sampling bottles. To accomplish this, a sample of the water to be filtered is collected into a clean container with sufficient volume to fill all sampling containers for which a filtered sample is necessary. If electric power is unavailable, battery packs are required to operate the peristaltic pump. A ring stand with clamp to hold the in-line filter is optional but may be useful.

The procedure for filtration of water samples from a source other than a monitoring well is as follows:

- A sufficient length of new Tygon™ tubing (or tubing of other appropriate inert material) is inserted into a peristaltic pump.
- The input end of the tubing is then inserted into the unfiltered water sample, and an in-line filter (0.45-micron or 10-micron filter, as appropriate, depending on the objective for the sampling event) is inserted into the output end of the tubing.
- An additional length of tubing is connected to the other end of the in-line filter to better direct the filtered water into the sample bottle(s). The flow direction shown on the filter must match the actual flow direction.
- Once the in-line filter is placed over the sample container, the pump is then turned on and run until sample collection is complete.

As noted above for filtration of groundwater samples from monitoring wells, the selection of which, if any, filter should be used depends on the data quality objectives for the project and will be specified in the QAPP and/or site-specific work plan.

4.2 Compositing

Compositing of samples for investigation purposes is strongly discouraged. Therefore, compositing of soil or water should only be performed if specifically indicated in the project-specific work plan, and the specific rationale and approach to compositing should be clearly described in that document.

However, compositing of similar materials for the purposes of obtaining waste disposition approvals is generally acceptable, and often required. Careful consideration should be given to the objectives of the sampling before collection of any composite sample is performed.

Those soil samples to be analyzed for non-volatile parameters may be mixed in any convenient, clean container. Soil samples to be analyzed for volatile organic compounds should not be composited.

For waste oil and other wastes, only those of similar appearance (color, viscosity, suspended material, odor if determined) should be composited. Liquid samples may be composited by pouring the appropriate percentages into the sample container to be sent to the laboratory.

4.3 Chain-of-Custody Procedures

4.3.1 Chain-of-Custody Form

A copy of a representative chain-of-custody form is provided in Attachment A. The sampler must fill in all relevant information as indicated on the form, including the "laboratory preparation" section. Any preparation required should be indicated on the form. The sampler must sign the form in the space indicated, including data and time of transfer, when relinquishing samples to another individual or to the laboratory. Each successive handler of the samples must also sign the form with data and time when relinquishing samples, and the receiving entity must acknowledge receipt.

4.3.2 Sample Labeling Nomenclature

Samples shall be labeled with the following information:

- Date
- HRP
- HRP Job #
- Sample identification. Samples from test borings must have, in addition to the test boring identification, the depth from which the sample was retrieved.
- Special labeling requirements may also be required for certain jobs. These requirements should be detailed in the QAPP and/or project-specific work plan.

4.3.3 Delivery/Receipt Procedures

As noted above, the chain-of-custody forms must be signed by both the person delivering the samples and the person receiving them. The time and date of transfer must be indicated.

5.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

5.1 Blanks

Field, trip, and equipment blanks are slightly different from one another. For preparation of an equipment blank, an appropriate blank material (deionized water) is brought in contact with the pre-cleaned sampling tools used for "real" samples. Equipment blanks, in theory, indicate whether the sampling equipment has been properly decontaminated. Field blanks are prepared by carrying the blank material to the sampling site and placing it in appropriate containers. Field blanks are used to determine whether airborne contamination is present at the sampling site. Field blanks are collected only when airborne contamination is suspected. Trip blanks are prepared at the analytical laboratory and transported to the site in sealed containers. They are used to evaluate the potential for contamination that may be attributed to shipping and handling procedures. Temperature blanks are prepared prior to sampling. They document the temperature preservation of samples upon receipt at the laboratory.

Blank samples are typically used for quality control and quality assurance. They provide qualitative information concerning contamination, handling and shipping procedures which may affect the quality of data that is collected. The rate at which blank samples are collected depends on the DQOs established for the project, but are typically prepared at a rate of 5% (i.e., 1 per 20 samples). For VOC analyses, trip blanks are prepared at a rate of 1 per shipping container in which samples for VOC analysis are transported. In some cases, blank samples may be collected at a rate of 1 per day if less than 20 samples have been collected. A group of samples that are transported together generally constitutes the sample delivery group (SDG). Specific requirements for collection of blank samples should be provided in the project-specific QAPP and work plan.

Water: Water for blanks shall consist of analyte-free water. The blank sample should be collected in the same kind of container used for the other water samples. Blank samples should be given plausible "well" identifications such as "MW-28". Trip blanks are typically analyzed only for VOCs. Analysis of equipment and field blanks are generally determined on a site-by-site basis or as specified in a site-specific work plan or QAPP.

Soil: Due to difficulties in preparing representative samples, blanks comprised of soil are uncommon.

5.2 Duplicates

True duplicates of samples cannot really be obtained, but replicate samples (which are commonly referred to as “duplicates”) should be collected as near as possible, both in time as well as space, to their principal samples. Depending on project objectives, sampling identification may indicate to the laboratory that the sample is a duplicate of another sample or the sample may be submitted to the laboratory as a “blind duplicate,” i.e., with no indication in the sample identifier that the sample is a duplicate or replicate of another sample.

Information regarding the collection of duplicate samples will be specified in the QAPP and/or project-specific work plan.

6.0 REFERENCES

New York State Department of Environmental Conservation (NYSDEC). 2010. *DER-10, Technical Guidance for Site Investigation and Remediation*, Division of Environmental Remediation. May 2010.

NYSDEC, Technical Procedure Guidance, Quality Assurance/Quality Control Procedures, *Spill Guidance Manual*, Section 2.4.

USEPA. 2015. *Standard Operating Procedure - Sample Receiving, Handling, and Storage,* SERAS SOP No. 1008, Rev. 2.1, Scientific, Engineering, Response and Analytical Services, December 9, 2015.

ATTACHMENT A

Representative Chain-of-Custody Form

HRP Associates, Inc.

STANDARD OPERATING PROCEDURE
for

Low-flow Groundwater Sampling

SOP # 107

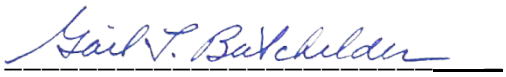
Revision Date: August 31, 2019

LIST OF REVISIONS

Date	Summary of Changes	Approval
	Original document preparation	
8/2019	Multiple revisions throughout document	Gail L. Batchelder, Ph.D.

Reviewed by

HRP Quality Assurance Officer:

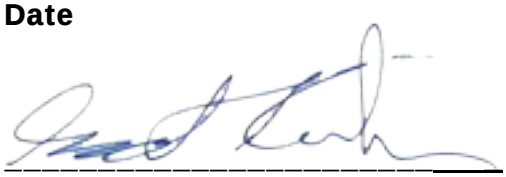


Gail L. Batchelder, Ph.D., P.G., L.E.P.

August 31, 2019

Date

Vice President /
Practice Leader - Environmental:



Scot Kuhn, P.G., L.E.P.

August 31, 2019

Date

This Standard Operating Procedure (SOP) provides the general procedures for Low-flow Groundwater Sampling for environmental investigation- and remediation-related activities. The SOP was developed based on a number of sources that represent prevailing standards and guidelines typically used in the field of environmental investigation and remediation. However, the procedures described herein are not intended to supersede any applicable local, State or Federal regulations. Nor can the procedures described in this SOP take into account every condition that might be encountered in the field or every project-specific data quality objective. An important component of this SOP is the need to document those instances where the procedures described herein are not followed for a specific project, the rationale for not following the procedures described in the SOP, and a description of the alternative procedures that were used instead.

1.0 INTRODUCTION

This SOP describes a low-flow, low-stress methodology for collecting groundwater samples in a manner that minimizes turbidity during sampling and improves the likelihood of collecting samples that are representative of groundwater quality in the aquifer at ambient flow conditions. The SOP was developed in general accordance with the U.S. EPA Region I SOP #GW 0001 rev. 2: *Low Stress (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitor Wells*, July 30, 1996, as well as other U.S. EPA protocols and guidance. The sampling protocol emphasizes the need to minimize changes to water chemistry by maintaining minimal water-level drawdown and flow rates during the sampling process. The low-flow protocol was originally developed by EPA for the collection of groundwater samples for analysis for total (unfiltered) metals, but can also be applied to samples collected for analysis volatile and semivolatile organic compounds, total petroleum hydrocarbons, herbicides/pesticides, polychlorinated biphenyls (PCBs), inorganic constituents, and other analytes.

This procedure may not be appropriate for collecting samples from wells containing non-aqueous phase liquids (NAPLs) or wells in which drawdown of the water level cannot be controlled under minimal stress conditions.

The applicability of this SOP to meet sampling data quality objectives must be evaluated the project manager prior to initiating sampling activities. Furthermore, the relevance of this sampling methodology must be considered on an individual project-specific basis in careful consideration of the regulatory authority involved (e.g., state agency vs. United States Environmental Protection Agency) and the overall objectives for the sampling effort. As with all standard operating procedures, careful consideration must be given to the equipment used, the field parameters to be measured, and the analyses to be performed to ensure that data quality objectives for the project will be met.

Attached to this SOP is a Monitoring Well Data Sheet, which must be completed for each well at the time of sampling. Also attached to this SOP is a Low-Flow Groundwater Sampling Work Scope Summary form. The purpose of this form and supporting documentation is to specify the equipment, stabilization parameters, and site-specific information necessary to support the decision-making process used during the sampling event(s). This summary is intended to accompany the low-flow sampling SOP and must be completed for each project in which low-flow sampling will be conducted.

1.1 Equipment List

- Extraction Device (pumps)

Groundwater purging and sampling will be conducted using a variable speed pump. The type of pump used will depend on the sampling objectives, target analytes, and depth to water in the well. The types of pumps that might be considered include:

  - **Variable speed, positive displacement or submersible pumps** - Applicable to wells with shallow or deep groundwater elevations. Includes centrifugal or bladder pumps constructed of stainless steel or Teflon.
  - **Variable speed, peristaltic pumps or suction pumps** – Applicable to wells in which the measured groundwater elevation is less than approximately 20 to 25 feet from the top of the well.

- Tubing
  - **Polyethylene tubing (1/4-inch outer diameter)**. An equipment blank (which includes the tubing) should be collected for sampling events in which one or more groundwater samples will be analyzed for volatile organic compounds in order to demonstrate that the tubing materials do not add contaminants to the sample.
  - **Tygon® tubing (1/4-inch inner diameter)** for groundwater sample collection when phthalates are a known constituent of concern. An equipment blank should be collected for analysis for phthalates.

A 12" length of ¼-inch inner diameter pharmaceutical grade CFLEX®, Tygon®, or silicon tubing for the section around the rotor head of a peristaltic pump, to minimize gaseous diffusion.

- Electronic water-level measuring device, capable of measuring to 0.01' accuracy.
- Flow measurement supplies – 120 milliliter (ml) calibrated plastic beaker, graduated cylinder, or equivalent, and stop watch.
- Power sources (at least one of the following) –
  - available 110V AC electrical source
  - lead/acid automobile battery
  - alternative field battery pack
  - gasoline-fueled generator – must be located >30' downwind from well(s)
- Compressed air or nitrogen source, if needed to operate the pump selected
- Use of a flow-through cell is strongly recommended to measure specific field parameters (temperature, pH, specific conductance, oxidation-reduction potential, dissolved oxygen) during purging.
- Turbidimeter to measure turbidity in the field
- Meter calibration supplies
- Decontamination supplies
  - solution of Liquinox™ with tap water or Alconox™ for mixing
  - <10% methanol/water solution

- <10% nitric acid/water solution
- Deionized water
- 5-gallon buckets

- Logbook(s) and Low-Flow Groundwater Sampling form
- Sample bottles – appropriate for the analyses to be conducted
- Sample preservation supplies (as required by the analytical methods), if not pre-supplied by laboratory in sampling containers.
  - Nitric acid (metals)
  - Hydrochloric acid (VOCs)
- Container labels
- Well keys
- Personal protection equipment (PPE)
- Tool kit (wrenches, pliers, etc.)
- Cooler with ice (**strongly recommended**) or ice packs
- Container(s) for purge and decontamination fluids, as applicable

1.2 Documentation

- Site plan
- Health & Safety Plan (HASP)
- Site-specific Work Plan
- Quality Assurance Project Plan (QAPP), as applicable
- Monitoring Well Data Sheet(s)
- Sample Log
- Sample collection sheet
- Notebook - sketch pad
- Chain of custody record

2.0 PROCEDURE

2.1 Preliminary Activities

1. Review information from previous investigations, HASP, and site-specific Work Plan, as well as the project-specific QAPP, as applicable, prior to performing any field activity to understand the site history, possible chemical and physical hazards, anticipated groundwater quality, any potential or known releases, and well development history and previous groundwater sampling records.
2. Pre-label sampling jars, if acceptable, given knowledge of the site, particularly if the site monitoring wells have been previously sampled. Also, the sampling jars can be pre-preserved in advance as appropriate for the requisite analytical parameter(s). Often the laboratory will provide pre-preserved sampling containers.

3. Check well for security damage, evidence of tampering, condition of well casing, condition of surface seal, and/or presence of insects/wasps/spiders, etc. and record pertinent observations.

4. Lay out sheet of clean polyethylene for monitoring and sampling equipment or use other appropriate containment strategy, such as a clean plastic tub, to protect sampling equipment and contain potential releases.

5. Check monitoring wells for the presence of LNAPL before each sampling round if separate-phase product is a potential based on the substances that may have been released at the site or in the vicinity. Checking wells for the presence of DNAPL must only be performed after samples have been collected from the well to minimize disturbance to the water column prior to sampling.

6. Perform a complete round of water-level measurements round (to the nearest 0.01 foot) in the shortest possible time before any purging and sampling activities begin. This complete round of water-level measurements is a separate event from the measurement of water levels associated with the sampling at each well.

   For capped wells, allow at least 15 to 20 minutes between opening the well and recording of the water level to allow for equilibration of water levels after the well is opened. Minimize water column disturbance. **Measurement of total well depth (to 0.01 foot) is measured after sampling of the well is complete** to minimize disturbance of the water column if the complete round of water-level measurements is performed the same day as groundwater sampling**.**

   All measurements must be taken from an established reference point marked on top of well casing, usually at the highest point of the case or the north center of the casing. Depth-measuring equipment must be decontaminated after measurement of each well. All measurements that are not consistent with prior data should be immediately recorded a second time in order to confirm and document the accuracy of the measurement.

   For low-flow, low-stress sampling events conducted after the first such sampling event from the monitoring well network, water levels measured during the subsequent water-level measurement rounds should be compared to those from prior events to determine the appropriate sampling depths and sampling rates. Efforts should be made to duplicate, to the extent practicable, the intake depth and extraction rate (using the final pump dial setting information) from previous event(s).

7. Field-calibrate meters per manufacturer's specifications. Calibrate instruments at the beginning of each day and perform calibration checks at the middle and end of each day. If calibration check does not indicate the expected reading (within the range specified by the manufacturer), recalibrate the instrument. If it is determined that the meter will not hold calibration, contact the HRP project manager who should authorize one of the following options: a) sampling with a replacement meter that is calibrated properly; b) ceasing the sampling event; or c) continuing to sample with the meter without recording the parameter(s) that will not properly calibrate.

2.2 Purging and Sampling Procedures

Installing Tubing or In-well Pump

Peristaltic Pump

Prepare the pump by placing the CFLEX®, Tygon®, or silicon tubing around the rotor and connecting the tubing that will be placed into the well to the tubing around the rotor.

Lower the in-well tubing slowly into the well (to minimize disturbance of the water column) until the tubing intake is placed at the depth designated to accomplish the site-specific investigation objectives or any state or region-specific requirements. Measure the depth to which the tubing is lowered carefully, to avoid having the end of the tube hit the bottom of the well and If possible, keep the bottom of the tubing at least two feet above the bottom of the well to minimize mobilization of particulates present in the bottom of the well.

The mid-point of the saturated screen length is often used as the location of the pump intake, *unless otherwise specified in the project-specific Work Plan or QAPP*. Should an alternative location/depth be used for the pump intake, the rationale should be clear and carried through the project unless directions to the contrary are provided by the project manager. If the water column in the well is less than 3 feet, particular care must be taken to keep the end of the tubing from being lowered to less than one foot above the bottom of the well, even if the objective of setting the tubing intake at a the mid-point of the saturated portion of the screen cannot be met.

In-well Pump

Lower pump, safety cable, tubing and/or electrical lines slowly (to minimize disturbance) into the well to the midpoint of the zone to be sampled. The intake point of the pump is placed at a depth capable of accomplishing the site-specific investigation objectives. The mid-point of the saturated screen length is often used as the location of the pump intake, *unless otherwise specified in the project-specific Work Plan or QAPP*. If possible, keep the pump intake or pump bottom, whichever is lower, at least two feet above the bottom of the well to minimize mobilization of particulates present in the bottom of the well.

Measurement of Water Levels

Measure the water level in the well after the level has equilibrated following introduction of equipment into the well. Water levels should be measured in each well just prior to initiating purging using the measurement techniques described in Section 2.1 for the complete water-level measurement round.

Purging Well

1. Start the pump at its lowest speed setting and slowly increase the speed until discharge occurs. Check water level. Adjust pump speed until there is little or no drawdown in water level (i.e., less than 0.3 feet) and the amount of drawdown remains stable If the minimal drawdown that can be achieved at the lowest pump setting exceeds 0.3 feet but remains stable, continue purging until indicator field parameters stabilize. Do not allow the water level to be drawn down below the pump intake.
2. Monitor and record water level and pumping rate every five minutes during purging. Record any pumping rate adjustments (both time and flow rate). Pumping rates should be adjusted to the maximum flow rate that the well can sustain while maintaining drawdown at 0.3' or less. Adjustments are best made in the first fifteen minutes of pumping in order to help minimize purging time. Do not allow the water level to fall to the intake level (if the static water level is above the well screen, avoid lowering the water level into the screened interval).
3. The final purge volume must be greater than the stabilized drawdown volume plus the extraction tubing volume:

$$V_P > 28.32 ((3.14*r_t^2 l_t) + (3.14*r_w^2 h_w))$$

Where,

V_P = purge volume (milliliters)
r_t = inner diameter of sampling tube (0.021 feet for ¼" tubing)
l_t = length of sampling tube (feet)
r_w = Radius of the monitor well (0.083 feet for 2" PVC well)
h_w = Change in water level elevation or stabilized depth to water minus the initial depth to water (feet)

Change in Head Volumes			
Well Dia.	Vol./ft (mL)	Vol./ft (L)	Vol./ft (gal)
1"	154	0.15	0.04
2"	620	0.62	0.16
4"	2,471	2.47	0.65
6"	5,560	5.56	1.47
Tubing Volumes			
Tubing ID	Vol./ft (mL)	Vol./ft (L)	Vol./ft (gal)
0.17"	4.5	0.004	0.001
0.19"	5.6	0.006	0.0015
0.25"	9.7	0.010	0.003
0.375"	21.7	0.022	0.006

4. If the drawdown does not stabilize at 0.3 feet or less at the lowest possible flow rate, the well may be sampled as soon as the water level has recovered, provided that the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples (ideally the intake should not be moved during this recovery period). Samples may then be collected even though the indicator field parameters have not stabilized. The following table indicates the necessary sample volumes based on the well diameter and volume of the sample container.

Sample Container Vol (ml)	well diam (inch)	Minimum water column height to fill sample container	
		inches	feet
40	2	0.78	0.1
250	2	4.86	0.4
1000	2	19.42	1.6
40	1	3.11	0.3
250	1	19.42	1.6
1000	1	77.70	6.5
40	0.75	5.53	0.5
250	0.75	34.53	2.9
1000	0.75	138.13	11.5

2.3 Monitoring Field Indicator Parameters

Monitor indicator field parameters (turbidity, temperature, specific conductance, pH, oxidation/reduction potential [ORP], dissolved oxygen [DO]) every five minutes during well purging. Should conditions exist at a specific well where such monitoring is not feasible due to low yield of the well, the conditions must be thoroughly documented, and an alternative approach may be used after consultation with the project manager. However, during the very early stage of purging, emphasis should be minimizing and stabilizing pumping stress, and recording those adjustments to document stability of water levels and demonstrating that the pumping rate is within the specified limits. Purging is considered complete and sampling may begin when the indicator field parameters have stabilized. Stabilization is considered to be achieved when at least three consecutive readings, taken at five-minute intervals, are within the following limits for the measured parameters (or other parameters established by state-specific or region-specific requirements):

- pH (± 0.1 unit)
- Temperature (3%)
- Specific conductance (3%)
- DO (10%)
- ORP/Eh (± 10 millivolts)
- Turbidity (10% for values greater than 1 NTU).

The order in which the above parameters will stabilize is dependent on a number of factors including, but not limited to, aquifer matrix, well screen and filter-pack design, and whether the well has been developed. **Turbidity is often the last parameter to stabilize**.

Use a flow-through cell to obtain measurements of any indicator field parameter, except turbidity. Transparent flow-through cells are preferred, because they allow field personnel to monitor particulate build-up within the cell. This build-up may affect indicator field parameter values measured within the cell. Such build-up may also affect turbidity values if the sample aliquot used to measure turbidity is collected after moving through the flow-through cell. Therefore, aliquots of groundwater used to measure turbidity should be collected from water that has not yet entered the flow-through cell. If the cell needs to be cleaned during purging operations, continue

pumping and disconnect cell for cleaning, then reconnect after cleaning and note monitoring activities.

When measuring parameters other than turbidity, a flow-through cell that prevents air bubble entrapment in the cell should be used. When the pump is turned off or cycling on/off (when using a bladder pump), water in the cell must not drain out. Monitoring probes must be submerged in water at all times during operation. If two flow-through cells are used in series, the one containing the dissolved oxygen probe should come first (this parameter is most susceptible to error if air leaks into the system). If there are state-specific or region-specific requirements for measurements of any parameter, such as the use of down-hole equipment, explanations must be provided. The use of any down-hole measurement instruments can be particularly problematic, since the lowering of any instrument, tubing, or measurement device through the water in the well has the potential to disturb the water column, which is counter to the intent of low-flow, low-stress sampling, which is an undisturbed water column. Therefore, if such activity is required, special care must be taken to minimize disturbance of the water column prior to sample collection.

2.4 Collecting Water Samples

1. Collect the water samples for laboratory analyses before water has passed through the flow-through cell (use a by-pass assembly or disconnect cell to obtain sample).
2. Collect VOC samples first and directly into 40-ml sample vials pre-preserved with hydrochloric acid. Fill all sample containers by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence to result in no bubbles in the vial when capped.
3. During purging and sampling, maintain the tubing such that it is filled with water in order to minimize possible changes in water chemistry upon contact with the atmosphere. Use tubing with 1/4" inner diameter to help insure that the sample tubing remains water-filled. If the pump tubing is not completely filled to the sampling point, add a clamp to constrict sampling end of tubing.
4. Label each sample as collected unless samples are pre-labeled. Samples requiring cooling (VOCs, cyanide, etc.) will be placed into a cooler with ice or refrigerant for delivery to the laboratory.

2.5 Post-Sampling Activities

- As determined by the work scope and data quality objectives, the pump and/or tubing may either be dedicated to the well for re-sampling or removed after collection of the samples. Tubing removed from a well after sampling should be properly discarded immediately after use.
- Following sample collection, measure depth to the bottom of the well (to 0.01 foot) and record the well depth on the Monitoring Well Data Sheet.
- Secure the well
- Decontaminate sampling equipment as indicated below in Section 2.6.

2.6 Decontamination Procedures

- The HRP representative will ensure that all necessary non-disposable sampling equipment that is n contact with the well is decontaminated prior to use in the first well and following sampling of each subsequent well in accordance with the following procedures.
- Decontamination procedures may vary slightly from those presented below, dependent upon the particular types of contaminants encountered

- Decontamination Supplies
  - Solution of Alconox™ and water prepared in a 5-gallon bucket (approximately 2.5 gallons). Another 5-gallon bucket will contain potable water (approximate 2.5 gallons).
  - Deionized water
  - 5-gallon buckets
  - Spray bottles
  - Brushes
  - Paper towels
  - Isopropyl alcohol/water solution (as appropriate based on contaminants and analyses to be performed)
  - <10% nitric acid/water solution (as appropriate based on contaminants and analyses to be performed)
- Sampling Devices (typically split spoons or Macro-Core®-type sampling devices) will be decontaminated between each sample. The order of decontamination solutions and procedures for split-spoon and other multi-use sampling devices is as follows:
- Decontamination will be conducted in the following order:
  - Wipe or scrub excess dirt from equipment, as needed, using brush or paper towels
  - Rinse/scrub in potable water (in a 5-gallon bucket) to remove additional loose debris, as necessary
  - Wash in a solution of Alconox™ and potable water (in a 5-gallon bucket)
  - Rinse with potable water
  - Rinse with analyte-free water
- The following steps may be required by a QAPP or project-specific Work Plan, by a regulatory agency, or necessary due to the nature of the contaminants:
  - Spray with <10% isopropyl/water solution when organics are potential constituents of concern
  - Rinse with potable water
  - Rinse with <10% nitric acid/water solution when metals are potential constituents of concern
  - Rinse with potable water
  - Rinse with deionized water
  - Wipe with a clean paper towel (optional, depending on weather conditions)
  - Air Dry (as appropriate)

Alternative methods of cleaning may more appropriate (or necessary) for an individual pieces of equipment, based on site conditions, site contaminants, Quality Assurance Project Plan (QAPP), or site-specific work plan requirements, Alternative decontamination solutions must be consistent with overall objectives for the project, and use of alternative decontamination solutions or decontamination procedures must be made after consultation with the HRP project manager and must be documented in field paperwork as to rationale and appropriateness. Decisions regarding alternative

decontamination procedures or solutions must be made in coordination with the HRP Project Manager and/or Quality Assurance Officer for the project.

At the end of the project day, all HRP equipment which is used on the site shall be decontaminated. Disposal of all spent decontamination solutions shall be in accordance with the requirements of the site work plan and state and federal requirements.

3.0 FIELD QUALITY CONTROL

- Collect quality control samples according to the project-specific QAPP or work plan. All field quality control samples must be prepared the same manner as regular investigation samples with respect to sample volume, containers, and preservation. As an additional quality assurance approach, collect samples in order -- from wells with lowest contaminant concentration to those with the highest concentration, if such information is known or can be anticipated. Collect equipment blanks after sampling from contaminated wells and not after background wells.
- Operate all monitoring instruments in accordance with EPA analytical methods and manufacturer's operating instructions. EPA analytical methods are listed in 40 CFR 136, 40 CFR 141, and SW-846 with exception of ORP, for which the manufacturer's instructions are to be followed.
- Where used, instruments shall be calibrated at the beginning of each day and a calibration check should be conducted at the middle and end of each day, or whenever measurements appear anomalous. If a measurement falls outside the calibration range, the instrument should be re-calibrated so that all measurements fall within the calibration range. Instruments used to measure temperature (i.e., thermometers and thermistors) need not be calibrated with the above frequency. They should be checked for accuracy prior to field use according to EPA Methods and the manufacturer's instructions.

4.0 DOCUMENTATION

- Document all groundwater field monitoring activities (see attached matrix) in a field log that includes the following:
    - Job Number
    - Site location
    - Date of sampling
    - Weather conditions
    - Field personnel
    - Objective of visit
    - Well identification
    - Well depth and measurement technique (list any measurement correction factors)

- Static water-level depth, date, time and measurement technique. Presence and thickness of immiscible liquid (NAPL) layers and detection method
- Pumping rate, drawdown, indicator parameters values, and clock time, at the appropriate time intervals; calculated or measured total volume pumped
- Well sampling sequence and time of each sample collection
- Types of sample bottles used and sample identification numbers
- Preservatives used
- Parameters requested for analysis
- Field observations during sampling event
- Name of sample collector(s)
- Equipment cleaning and calibration information
- QA/QC data for field instruments
- Description of all sampling equipment used

o Any problems encountered should be identified, and methods taken to minimize or correct problems should be documented.

o All deviations from sampling procedures outlined in the SOP and/or work plan, including rationale for any modifications and potential impact on data quality objectives for the sample(s).

o Complete all data reporting in accordance with the project-specific QAPP and/or work plan.

5.0 REFERENCES FOR LOW-FLOW GROUNDWATER SAMPLING PROCEDURES

New York State Department of Environmental Conservation (NYSDEC). 2010. *DER-10, Technical Guidance for Site Investigation and Remediation*, Division of Environmental Remediation. May 2010.

Puls, R.W. and Barcelona, M.J. 1996. *Low-flow (minimal Drawdown Groundwater Sampling Procedures*, Ground Water Issue, U.S. EPA, EPA/540/S-95/504, April 1996.

USEPA Region I. 2010. *Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells*, Region 1 SOP rev. 3, July 30, 1996, rev. January 19, 2010.

USEPA Region 4. 2013. *Groundwater Sampling*, SESDPROC-301-R3, SESD Operating Procedure, Region 4 SOP rev. 3, March 6, 2013.

USEPA, Region 4. 2015. *Operating Procedure: Field Equipment Cleaning and Decontamination*. SESDPROC-205-R3. Science and Ecosystem Support Division. Athens, GA.

Yeskis, D. and Zavala, B. (2002). *Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers*, U.S. EPA Office of Solid Waste and Emergency Response, EPA 542-S-02-001, May 2002.

HRP Associates, Inc.
197 Scott Swamp Road
Farmington, Connecticut 06032
(860) 674-9570

Monitor Well Data Sheet

Page ____ of ____

Well ID:

Site Background Information

Site Location:		**Sampling Dates:**	
Job Number:		**Field Team Leader:**	
Weather:		**Team Personnel:**	

Ground Water Elevation Data

Date	Time	Sampler Name	Equipment Model		Depth to Water (ft)		Depth to Bottom (ft)	
					uncorrected		uncorrected	
			corr. factor		corrected		corrected	

Measurement Point: _____

Well Condition

General Condition	Visible Well ID	Well Cap Present	Well Plumbness	Lock

Concrete Collar	Ponded Water	Comments:

Well Purging Data

Date	Time						Sampler Initials	Instrument Calibration Date
	Equipment Set-up		Purging		Sample Collection			
	Start	Finish	Start	Finish	Start	Finish		

Instrument Mfg & Model	
pH	
Temp.	
Sp. Cond.	
ORP	
DO	
Turbidity	

Initial Water Depth (ft):				Time:				
Time	Water Depth (ft)	Flow Rate (ml/min)	pH (s.u.)	Temp (^{o}C)	Sp Con (uS)	ORP (mV)	DO (mg/l)	Turbidity (ntu)
Req. Limits for Last 3 Readings								

Pump Mfg & Model	Color	Odor	Purge Vol (ml)	Sample Depth (ft.)

Sample Containers

Type & No.	Volume	Preservative

Type & No.	Volume	Preservative

HRP Associates, Inc.
197 Scott Swamp Road
Farmington, Connecticut 06032
(860) 674-9570

Monitoring Well Data Sheet

Well ID:

Site Background Information

Site Location: _____
Job Number: _____
Weather: _____

Sampling Dates: _____
Field Team Leader: _____
Team Personnel: _____

Time	Water Depth (ft)	Flow Rate (ml/min)	pH (s.u.)	Temp (^{o}C)	Sp. Cond. (uS)	ORP (mV)	DO (mg/l)	Turbidity (NTUs)
Req. Limits for Last 3 Readings								

Low-Flow Ground Water Sampling Work Scope Summary

Site Name / Location: **Project Manager / Requested By:**

Job Number: **Urgency of Project:**

Sampling Objectives: _____

_____

_____

Pumps

Specify Wells

- ☐ Peristaltic _____
- ☐ Bladder (1 3/4" for 2"pvc) _____
- ☐ Bladder (3/4" for 1"pvc) _____
- ☐ grundfos _____
- ☐ Whale _____
- ☐ Other-specify type: _____

Tubing type / Dia.

- ☐ **FTS standard 1/4" OD polyethylene / silicone through pumphead**
- ☐ Polyethylene
- ☐ Tygon
- ☐ Silicone
- ☐ 1/4"
- ☐ 3/8"

- ☐ Dedicate tubing to well
- ☐ Remove tubing after sampling

Sample depths

- ☐ Mid - water column / mid - screen
- ☐ Specify well depths/sample collection depth

Well ID - DTW / DTB(ft.)-screen lengths/tubing depth

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Stabilization / Geochemistry evaluation parameters

	Parameters and/or Stabilization Ranges if Different from those Listed
☐ pH ($^{+}$/- 0.10)	☐ _____
☐ Temp ^{0}C (3%)	☐ _____
☐ Spec. Cond. (3%)	☐ _____
☐ ORP ($^{+}$/- 10mv)	☐ _____
☐ DO (10%)	☐ _____
☐ Turbidity (10% > 1ntu)	☐ _____

Equipment / Meters Specify applicable wells

- ☐ YSI - 600 XL with flow-cell (pH, Temp.,Spec. Cond., ORP, DO) _____
- ☐ YSI - 600 XLM with flow-cell (same as above with memory storage) _____
- ☐ YSI-6920 w/ flow-cell (pH, Temp., Spec. Cond., ORP, DO, Turbidity) _____
- ☐ HF Scientific (Turbidity meter) _____
- ☐ Product probe - check if product is expected

*** Please provide drill logs (for new jobs / new wells)**

Additional information / other specifics:

_____

_____

_____

_____

HRP Associates, Inc.

STANDARD OPERATING PROCEDURE
for

Field Screening

SOP #108

Revision Date: August 31, 2019

LIST OF REVISIONS

Date	Summary of Changes	Approval
	Original document preparation	
8/2019	Multiple revisions throughout document	Gail L. Batchelder, Ph.D.

Reviewed by

HRP Quality Assurance Officer:

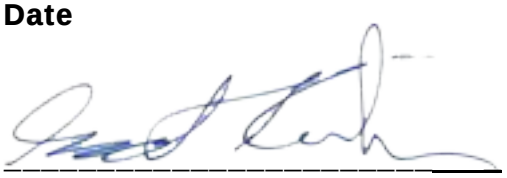


Gail L. Batchelder, Ph.D., P.G., L.E.P.

August 31, 2019

Date

Vice President /
Practice Leader - Environmental:



Scot Kuhn, P.G., L.E.P.

August 31, 2019

Date

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 FIELD SCREENING PHYSICAL METHODS 2

2.1 Visual Observations 2
2.2 Olfactory Observation 2

3.0 NON-AQUEOUS PHASE LIQUID (NAPL) DETERMINATION KITS (SOILS) 3

4.0 FIELD INSTRUMENT SCREENING 4

4.1 Photoionization Detector (PID) 4
4.1.1 Specific Equipment List 4
4.1.2 Documentation 4
4.1.3 Procedure 4
4.2 Gas Chromatograph 5
4.2.1 Specific Equipment List 5
4.2.2 Documentation 5
4.2.3 Procedure 5
4.3 Specific Conductance, pH, Dissolved Oxygen, Oxidation/reduction Potential 7
4.3.1 Specific Conductance 7
4.3.1.1. Specific Equipment List 7
4.3.1.2. Procedure 7
4.3.2 pH 8
4.3.2.1. Specific Equipment List 8
4.3.2.2. Procedure 8
4.3.3 Dissolved Oxygen Meter 8
4.3.3.1. Specific Equipment List 8
4.3.3.2. Procedure 8
4.3.4 Oxidation/reduction Potential 8
4.3.4.1. Specific Equipment List 8
4.3.4.2. Procedure 9
4.4 Turbidity 9
4.4.1 Specific Equipment List 9
4.4.2 Procedure 9

5.0 EQUIPMENT CALIBRATION METHODS 11

5.1 Photoionization Detector (PID) 11
5.2 Temperature/Conductance Meter 11
5.3 pH Meter 12
5.4 Dissolved Oxygen Meter 12
5.5 Equipment Deficiency/Operational Status Reporting 12

6.0 PREVENTATIVE MAINTENANCE 13

6.1 Routine Maintenance 13
6.2 Documentation 13
6.3 Contingency 13

7.0 REFERENCES FOR FIELD SCREENING METHODS 14

1.0 INTRODUCTION

This SOP identifies the general procedures to be used for screening of soil and water samples during the performance of field activities. Field-screening procedures include use of tool, instrument, or technique that results in the collection of real-time or near real-time environmental data.

Equipment: Equipment used for field screening varies by the type of screening to be performed. The types of equipment needed for each field screening technique are identified in the specific sections of this SOP associated with the individual types of field screening procedures.

Documentation: Field notebook, map, and/or field work sheets, including geologic boring logs, to detail location of sampling points and relevant information related to sample collection and field screening measurements.

This SOP has been prepared to describe standard procedures that will be used in most cases during the performance of field screening activities. However, nothing in this standard operating procedure is intended to preclude the application of sound professional judgement during the performance of field activities. Should situations arise that require alternative procedures to those described herein in order to accomplish overall project objectives or to meet data quality objectives, field personnel should document the rationale for changes to the standard procedures in the field paperwork and describes the procedures that were followed instead. In some cases, the need for changes to standard protocols may be recognized ahead of time, in which case, the procedures to be followed should be described in project-specific work plans or work instructions.

Similarly, the procedures described herein are not intended to conflict with any specific federal, state, or local statutes, regulations, guidance, protocols, or specific instructions of a regulatory authority. If changes to the SOP are needed, such changes should be identified in project-specific work plans or other similar document that will be maintained in the project record.

2.0 FIELD SCREENING PHYSICAL METHODS

2.1 Visual Observations

Visual observations of samples being collected during environmental investigations can be an important tool in understanding the hydrogeology and/or geochemistry at and in the vicinity of the location where the sample was collected and provide useful information for development of the conceptual site model and selection of individual samples for subsequent laboratory analysis. Therefore, detailed descriptions of soil and water characteristics are considered to be an important component of field screening procedures.

For soil, observations should include such characteristics as color, texture and grain-size distribution, relative moisture content, and relative density. Characterization of soil samples should be recorded in the field on geologic boring logs for soil samples collected from soil borings. Descriptions of soil samples for other collection methods should be recorded on appropriate field paperwork designated for that purpose.

Visual observations should be in accordance with one or more standard protocols for visual identification of soil samples based on grain-size distribution and physical characteristics of the soil sample. Specifically, soil descriptions and classifications should be performed in accordance with ASTM Standard D2488-17, *Practice for Description and Identification of Soils (Visual-Manual Procedure)* and ASTM Standard D2487-17*, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System),* and/or HRP's SOP #103 *Soil Logging Using a Modified Burmister Classification System,* as appropriate based on the data quality objectives for the project and any regulatory requirements or guidance.

For water, the sampler should record such observations as color; turbidity; and amount, nature, and color of any suspended material as settling occurs. If a sheen or separate-phase non-aqueous-phase liquid (NAPL) is observed, that should be noted, and the nature of the observation with respect to color, general appearance, and density relative to the water sample (i.e., whether the separate-phase accumulates at the top of a container of the water or at the bottom), which would indicate whether the separate-phase liquid is light NAPL (LNAPL) or dense NAPL (DNAPL).

2.2 Olfactory Observation

Olfactory observations should be noted only if odors are evident in ambient air conditions. Under no circumstances are personnel allowed to directly smell samples from containers. Only if the nature of the odor is clearly recognizable as attributable to a certain type of chemical (such as petroleum product or chlorinated solvent, for example), is it permissible to record that aspect of the olfactory observation on the field boring log or in field notes.

3.0 NON-AQUEOUS-PHASE LIQUID (NAPL) DETERMINATION KITS (SOILS)

Where NAPL is suspected based upon historical site knowledge or elevated screening levels for volatile organic compounds, project-specific DQOs for data collection may include an evaluation of the presence NAPL in the field. Commercial NAPL detection/screening products will be used by HRP personnel. In all cases, manufacturer's instructions will be followed. Non-Sudan IV based dyes will be preferentially selected as a non-toxic, hydrophobic indicator of the presence NAPL. Sudan IV based dyes should not be selected unless specifically required by a state of federal agency, due to the recent determination that Sudan IV dye is a mutagen. The limitations of the specific products selected should be well understood prior to use, and it should be recognized that any product is more likely to yield a false-negative result than a false-positive result, so information gained during field screening for the presence of NAPL must be reviewed in conjunction with other data available for each sample and for the investigation area as a whole.

Personal protective equipment (PPE) should be donned and maintained in accordance with the site-specific work plan and/or health and safety plan during the sampling and screening procedures. In the event that no PPE has been specified for a particular sampling event, disposable latex gloves should be donned, at a minimum, during all sampling procedures. Gloves must be changed after each individual sample collection event.

Sampling/screening equipment will be largely determined by manufacturer's instructions. Commercial test kits may consist of pre-measured dye packets that are enclosed in clean sampling cups. Specified quantities of soils are emplaced in the sampling cups, taking care not to disturb the dye package. Clean tap water is then added to the container. The container is sealed and shaken vigorously. If NAPL is present at a concentration generally greater than 500 ppm, it will separate from the soils and change color. The color of the NAPL will be dependent on the test kit selected. The sampling kits and soils should be containerized and properly disposed.

4.0 FIELD INSTRUMENT SCREENING

4.1 Photoionization Detector (PID)

PIDs are used during the performance of field activities for general screening of soil, water, or air for the presence of volatile organic compounds (VOCs). The instrument is used only to screen for the presence of total concentrations of VOCs, not for the presence of individual constituents, and not all constituents of interest may be detected by the instrument.

PIDs can only monitor air quality, and no water/soil should be introduced into sample line. This method has limited use in high humidity or in the presence of methane or other compounds that have high ionization potentials. However, performance may be improved by using a vapor trap in PID models that may be equipped with one.

Users should refer to the operation manual for the instrument being used to ensure that electron voltage for the bulb used is appropriate for compounds to be detected. Halogenated alkanes, such as 1,1,1-trichloroethane, or higher molecular weight aromatic compounds traditionally use a higher electron volt bulbs (11.7 ev) due to the increased strength of bonding force of these chemicals. For general screening of matrices, use a 10.6 electron volt bulb as an "all purpose" bulb; but a predetermination of compounds to be detected is helpful before making this decision. Generally, straight-chain hydrocarbon carbons are not ionizable using a PID, and therefore, the presence of those compounds will not be detected by the instrument.

4.1.1 Specific Equipment List

- Photoionization detector
- Sealable plastic/polyethylene bags
- Personal protection equipment
- Calibration gas

4.1.2 Documentation

- Site plan
- Activity log/sample log
- Notebook – sketch pad

4.1.3 Procedure

Following calibration of instrument:

1. Record background reading.
2. Place a small quantity of matrix to be tested into a sealable plastic/polyethylene bag.
3. Let matrix warm to room temperature.
4. Insert probe tip into bag (do not insert probe into matrix).
5. Record reading.

Samples that are wet may give a false positive reading. This effect is present when readings gradually increase with no discernable leveling off. If this effect is observed, the instrument

bulb should be cleaned, and the instrument recalibrated, prior to re-testing the sample. If the response persists, the screening results should be noted as suspect. However, to help minimize the effect of moisture on screening results, some PID models may be equipped with a moisture trap to remove at least some of the moisture as the air enters the instrument.

For air monitoring purposes one can either wear the monitor with straps or have monitor in the exclusion zone close and at the breathing zone level. Instrument readings will be recorded through time at intervals specified in the health and safety plan.

For water samples, place approximately 10 milliliters (ml) of water in a non-preserved glass 40 ml VOA vial. Shake vigorously and allow to settle. Open vial and tip cap slightly sideways to allow entrance of instrument probe. Do not insert probe into water, as the instrument pump will draw water into the sample line and to the bulb, which will ruin the instrument and bulb.

4.2 Gas Chromatograph

4.2.1 Specific Equipment List

- Portable gas chromatograph with a pre-column, backflush oven, and PID detector
- Ultra-zero air
- Water standards/blanks
- Syringes

4.2.2 Documentation

- Site plan
- Activity log
- Organic vapor headspace form
- Notebook – sketch pad

4.2.3 Procedure

A portable gas chromatograph with a pre-column, backflush oven, and PID/FID detector is used to analyze the "headspace gas" obtained from each soil sample. The peak amplitudes and retention times obtained from each sample are compared to standard peaks and retention times obtained from prepared in-house standards from a suite of volatile organic compounds expected, or likely, to be present in the media sampled. Based on a comparison of the sample results with the standards, the amounts and types of contaminants in each sample are determined.

The headspace screening is performed on-site in a mobile trailer laboratory, a support vehicle, or in a designated location in a site building. This is an initial semi-quantitative "headspace" screening only and is not a state-certified laboratory analysis performed using standard EPA methods.

"Ultra-zero air" certified to contain less than 0.1 parts per million (ppm) total hydrocarbons is used as the carrier gas. The gas chromatograph's oven runs isothermally at 40ºC. The total run time for each sample is sufficient to allow analysis of the targeted volatile organics. Both sample

and standard injection volumes are recorded to allow direct quantification between standards and unknowns. The carrier gas flow rate is also held constant at approximately 10 cubic centimeters (cc)/minute to assure constant retention times.

During the screening, a Quality Assurance/Quality Control (QA/QC) program is followed. The purpose of the QA/QC program is to assure that any soil contamination detected in the soil samples did not arise from interferences and to provide semi-quantitative basis for sample evaluation.

The QA/QC program consists of a periodic injection of "headspace" gas obtained from water standards and analysis of "blanks". Calibration standards of specific compounds and a range of concentrations for certain targeted volatile organic compounds will be obtained from a state-certified laboratory or prepared by HRP (determined on a site-specific basis). These standards are injected into the GC, and results for the targeted compounds are then stored in the GC's "memory" prior to sample collection. Various "blank" analyses were performed to evaluate potential avenues of cross-contamination.

"Blank" analyses consist of:

1. Instrument blanks (no injection) to check the potential for column carry-over and "ultra-zero air" cleanliness;
2. Syringe blanks to check the potential for needle carry-over;
3. Soil sample container blanks to determine container cleanliness (although sample containers are pre-tested for contaminants under a QA/QC program which is completed by the manufacturer of the containers); and
4. Ambient "background" air blanks in both the sample collection and instrument areas to check the potential for cross-contamination from airborne contaminant sources.

All chromatograms are stored on a computer library and are later downloaded to a hard copy. Peak areas are integrated by the GC's computer by comparison with standards pre-programmed into the library. Preparations containing selected potential site contaminants are generally injected into the GC to "check" retention times on a twice daily basis.

The objectives of the QA/QC program are achieved on the sampling dates when:

1. GC column carry-over is not found to be significantly interfering with any of the analyses;
2. Carry-over syringe contamination is not detected after any sample injection;
3. No interference due to volatile organic contamination is detected in any container blanks (e.g. 40 ml VOA septa soil sampling jar);
4. Ambient air in the sample analysis area and outside the building is not found to be significantly interfering with the soil sample screening results; and
5. The "ultra-zero air" used in the gas chromatograph has no contaminants present before testing.

4.3 Specific Conductance, pH, Dissolved Oxygen, Oxidation/reduction Potential

Screening-level measurements of the standard water-quality parameters of specific conductance, pH, dissolved oxygen (DO), and oxidation/reduction potential (ORP), may be made using stand-alone instruments specific to the parameter being measured, or by combination instruments that measure one or more of the parameters at the same time. The most common type of combination measurement technique currently used is a flow-through cell that is used in conjunction with low-flow groundwater sampling techniques. When using a flow-through cell, measurements are made using specific electrodes within a closed cell as groundwater is pumped from a well at a low flow rate moves through the cell. In contrast, most stand-alone meters require that separate aliquots of water be collected into a container that is exposed to the atmosphere as the electrodes equilibrate in the solution and measurements are recorded.

Although the equipment varies depending on the instrument(s) used, documentation is the same for all types or combinations of instruments. Documentation needs include the following:

- Activity Report
- Notebook
- Monitor Well Data Sheet or field sampling log (for water samples other than groundwater).

In all cases, instruments should be used, calibrated, and maintained in accordance with manufacturer's instructions. Information provided in the following sub-sections is provided as an overview of information related to measurement of specific parameters. Additional, more detailed information can found in the operating manuals for the specific equipment and in the references provided in Section 7.0 of this SOP.

4.3.1 Specific Conductance

Conductivity/salinity meters are used to determine the electrical conductance and salinity of water/wastewater. Values are generally expressed in µmhos/cm or µS/cm (µSiemens/cm).

4.3.1.1. Specific Equipment List

- Instrumentation for measurement of specific conductance (e.g., conductivity/salinity meter, hand-held conductivity meter)
- Calibration solution

4.3.1.2. Procedure

Calibration of the instrument must be performed prior to measurement of specific conductance for individual samples. All calibration procedures and measurements of specific conductance for samples will be conducted in accordance with manufacturer's instructions for the specific instrument being used. Specific conductance readings are affected by temperature, so it is important that the instrument settings are adjusted to take the temperature into account or to ensure that the specific conductance meter uses an automatic temperature compensator.

4.3.2 pH

The pH meter is used for determining the acidity of water and wastewater as expressed in pH units.

4.3.2.1. Specific Equipment List

- Instrumentation used to measure pH (may be a combination meter that measures other parameters or may be a stand-alone, hand-held pH meter).
- Standard pH calibration solutions (pH 4.0, pH 7.0, pH 10.)

4.3.2.2. Procedure

Following calibration procedures, immerse end of probe into liquid sample (an aliquot of sample not used for laboratory analysis). Allow probe to acclimate to sample. Meter will provide digital read-out of pH in standard pH units.

4.3.3 Dissolved Oxygen Meter

The dissolved oxygen (DO) meter is used for determining the dissolved oxygen content in milligrams per liter.

4.3.3.1. Specific Equipment List

- DO Meter
- Potassium chloride (KCl) solution
- Probe membranes

4.3.3.2. Procedure

Following calibration procedures, immerse end of probe into liquid sample (aliquot of sample not used for laboratory analysis). Allow probe to acclimate to sample. Meter will provide a digital read-out in mg/l or %. The probe should be slowly raised and lowered while remaining completely submersed in the sample in order to obtain an accurate reading.

4.3.4 Oxidation/reduction Potential

An oxidation/reduction potential measurement indicates the difference in electric potential between an indicator electrode and an appropriate reference electrode. Oxidation/reduction potential is a useful indicator of the equilibrium oxidation state of a chemical species in the water sample being tested, particularly when evaluated in conjunction with the pH of the solution. ORP is reported in millivolts (mV).

4.3.4.1. Specific Equipment List

- Instrumentation for measurement of ORP (meter, indicator electrode, reference electrode)
- Calibration solution (Zobell solution)

4.3.4.2. Procedure

ORP is temperature dependent, so the meter should have automatic temperature compensation and the probe must be allowed to equilibrate to the ambient temperature of the solution before the measurement is recorded (calibration solution must be at ambient temperature), or a separate temperature measurement must be made and the value measured by the instrument must be corrected based on the recorded temperature of the solution.

In some cases, the instruction manual will indicate that the instrument is calibrated at the factory. If so, the Zobell solution should be used to verify the factory calibration. If the two measurements do not agree, the first step is to use a new Zobell solution. If the measured value still does not agree with the value for the Zobell calibration solution, the instrument will need to be recalibrated by the manufacturer.

4.4 Turbidity

Instruments that measure turbidity measure the difference between the intensity of light scattered by a liquid sample, generally water, compared to the intensity of light scattered by a standard reference suspension. Turbidity measurements indicate the amount of suspended or colloidal material in a water sample, and results may be affected by the color of the water sample. A turbidity meter (turbidimeter) provides results in nephelometric turbidity units (NTUs).

4.4.1 Specific Equipment List

- Turbidimeter
- Calibration solution (for example, a commercially available polymer primary standards (AMCO-AEPA-1)

4.4.2 Procedure

The calibration standard (or standards if the instrument uses more than one standard) should be allowed to equilibrate to the ambient temperature. Initially, a standard with a low turbidity value (0.0 or 0.02 NTU) should be used to calibrate the instrument in accordance with the manufacturer's instructions. A 0 NTU standard solution can be prepared by filtering distilled water through a 0.45-micron filter. The instrument should read the standard value to within the specifications of the instrument. If the instrument accepts more than one standard, at least one additional standard at a relatively high turbidity value should be used. If the instrument accepts only one standard, the higher standard should be used as a check standard for the instrument to ensure that the instrument identifies the value of the check standard within the specifications of the instrument.

An important consideration when using a turbidimeter is ensuring that the cuvettes in which the water samples and calibration solution are placed for measurement are free from scratches and that the outside surface are dry and the clarity is not affected by such things as fingerprints or

dust. If the cuvette cannot be cleaned, it should be discarded. Therefore, it is important to have a number of cuvettes available for each sampling event.

5.0 EQUIPMENT CALIBRATION METHODS

All field equipment will be calibrated immediately prior to use in the field. The calibration procedures will follow standard manufacturer's instructions or routine HRP procedures to assure that the equipment is functioning within tolerances established by the manufacturer and required by the project. Field personnel will document all instrument calibrations in bound field notebooks and on specific calibration forms. All records generated will be maintained by field personnel and are subject to audit by the Task or Project Manager.

The detailed calibration, operation, and maintenance procedures for field instrumentation routinely used by HRP personnel are specific to manufacturer's instructions. The following sections will briefly summarize these procedures.

Calibration standards and pH buffer solutions used for field instrumentation calibration checks will be obtained from scientific products supply companies (e.g., Fisher Scientific; American Scientific Products, etc.). All buffer and calibration standards obtained will be certified and standardized against or traceable to a reliable primary reference standard. All solutions are stored according to manufacturer's suggestion for optimal shelf-life. Chemical container labels must also include the date received, date opened, as well as the initials of the analyst who first opened the container. Stock solutions will be marked with expiration date and replaced with new solutions when the recommended shelf-life is exceeded.

5.1 Photoionization Detector (PID)

HRP uses several types of PIDs made by different manufacturers. Calibration procedures which are specific to each instrument can be found in the manufacturer's operation manual. The PIDs will be calibrated in the field, under the working temperature conditions where it is to be used. The calibration gas typically used is isobutylene at a concentration of 100 ppm. Calibrations should be recorded in the field notebook and on the calibration log of the Health and Safety Plan. Calibration records should note the date, instrument manufacturer and model, calibration gas and concentration, and operator.

5.2 Temperature/Conductance Meter

Calibration is performed at the start of each sampling day using potassium chloride (KCl) standard solutions. Calibrations are recorded in either a bound field notebook or on field calibration forms. Specific conductance standards are selected to bracket the range of values expected in the samples. If the unit has a calibration adjustment, the meter is calibrated in the same manner as the pH meter. Internal automatic adjustments are made on meters which lack a designated calibration knob. The meter must read within 10 percent of the standard to be considered in control and acceptable.

If the calibration indicates the meter is out of calibration, a backup unit should be employed. Readings from conductivity meters lacking calibration adjustments are limited to checks at the beginning and end of the sampling day. All calibrations may be recorded in a bound field notebook along with conclusions as to the acceptability of readings.

Temperature is measured using a glass thermometer. Field thermometers must be periodically checked against a National Institute of Standards Technology (NIST) thermometer. Acceptance criteria are ±1°C. Any thermometers exceeding these limits should not be used to record temperature readings. The calibration frequencies noted above are the minimum requirements. Additional checks should be performed if the unit experiences harsh conditions or if readings become erratic.

5.3 pH Meter

Calibration is performed at the start of each sampling day using at least two standard calibration solutions which bracket the pH range expected in the samples. Standard calibration solutions are available as pH 4, pH 7, and pH 10. Calibration is recorded in either a bound field notebook or on field calibration forms. Calibration knobs are used to set the meter to read the value of the standard. The meter is then checked during the sampling period, using at least one standard, at a frequency which results in little or no calibration adjustment. If the reading varies by more than one-tenth of a unit between calibration checks, the frequency of the checks must be increased. Temperature and pH must be taken on an aliquot of the sample that is not used for laboratory analysis.

5.4 Dissolved Oxygen Meter

Calibration is performed at the start of each sampling day following instructions in the operation manual. The DO probe uses potassium chloride (KCl) solution contained within a membrane. This membrane and solution should be changed as part of daily calibration procedures. If a bubble is present behind the membrane, if the solution is not present, or if the solution has not been recently changed, accurate DO readings will not be obtained, and the membrane and solution will require replacement. For calibration, place the probe in its storage/calibration chamber within the instrument housing. Using the calibration mode, the instrument is self-calibrating. Calibrations should be recorded in a field notebook or on field calibration forms.

5.5 Equipment Deficiency/Operational Status Reporting

All calibrations will be recorded in a field notebook. These calibration records become part of the individual project files as documentation of the attainment of QA objectives.

6.0 PREVENTATIVE MAINTENANCE

6.1 Routine Maintenance

HRP personnel routinely maintain field equipment for optimal results. All maintenance procedures are documented in control logbooks designated for each piece of equipment. Any field activities involving routine maintenance will be recorded in field logbooks by the individual performing the adjustment of the equipment. Maintenance performed at an authorized repair service will be documented in the maintenance log, including service location, specific repair, and method of transport. Methods of routine maintenance depend on the instrument and manufacturer. The manufacturers' operations manuals will be the primary source of information for these procedures.

6.2 Documentation

Field Services Managers maintain all documentation concerning routine maintenance and non-routine repairs. All pertinent information regarding instrument status is recorded in personnel field log books along with calibration documentation.

6.3 Contingency

In the event that the primary field equipment is inoperable as determined by calibration difficulties, back-up field instruments will be obtained from other sources. These instruments will be calibrated prior to recording data. In no event shall instruments be used to record data unless the performance of the equipment has been documented.

7.0 REFERENCES FOR FIELD SCREENING METHODS

New York State Department of Environmental Conservation (NYSDEC). 2010. "DER-10, Technical Guidance for Site Investigation and Remediation", Division of Environmental Remediation. May 2010.

NYSDEC. Technical Procedural Guidance, Equipment Training, Calibration, and Maintenance, “Spill Guidance Manual” Section 2.2.

USEPA. 2017. “Standard Operating Procedure Calibration of Field Instruments (temperature, pH, dissolved oxygen, conductivity/specific conductance, oxidation/reduction potential [ORP], and turbidity)”, USEPA, Region 1, Quality Assurance Unit, Revision Number 3, Revised March 23, 2017.

APPENDIX C

Pace Analytical Laboratory SOPs

Test Method Standard Operating Procedure (SOP): Pace® Analytical Services

Pace ANALYTICAL SERVICES	**ENV-SOP-ELON-0025 v05_EPA 8260D**
	Effective Date: 07/25/2024

Management Approval:
Spencer Bunting Approved on 7/3/2024 8:44:45 AM
Francis Derose Approved on 7/24/2024 3:28:03 PM
Tod Kopyscinski Approved on 7/3/2024 3:11:42 PM
Katherine Allen Approved on 7/25/2024 7:22:29 AM

© 2019-2024, Pace® Analytical Services, LLC

1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the laboratory procedure used for the determination of Volatile Organic Compounds (VOCs) by Purge and Trap Gas Chromatography/Mass Spectrometry (GC/MS) by Method EPA 8260D.

The method is intended for the analysis of volatile compounds in all types of solid waste matrices, soils, sediment, sludges, TCLP extracts, waste solvents, oils, and ground and surface water.

1.1 Target Analyte List and Limits of Quantitation (LOQ)

The target analytes that can be determined by this SOP and the associated LOQ is provided in Table 1, Appendix A.

LOQ are established in accordance with Pace policy and SOPs for method validation and for the determination of detection limits (DL) and quantitation limits (LOQ). DL and LOQ are routinely verified and updated when needed. The current LOQ for each target analyte that can be determined by this SOP as of the effective date of this SOP is provided in Table 1, Appendix A.

2.0 SUMMARY OF METHOD

Volatile organic compounds are introduced into the gas chromatograph by a purge-and trap method. The analytes are purged from a 5-ml water sample with helium (nitrogen – VOA7) at ambient temperature. The volatiles are transferred from the aqueous phase to the vapor phase and are swept through a sorbent trap where volatiles are trapped. At the completion of the purge time, the trap is rapidly heated and back flushed with helium (nitrogen – VOA7) to drive out the trapped analytes. The analytes are transferred into the inlet of a capillary gas chromatography column. The carrier gas flow through the column is controlled and the temperature is increased according to a set program to achieve optimum separation of purged analytes. The mass spectrometer is operated in a repetitive scan mode. Analytes are identified by the GC/MS retention times and by a comparison of their mass spectra with spectra of authentic standards. Analytes are quantified by comparing the response of a selected primary ion relative to an internal standard against a calibration curve. Solid samples are analyzed via procedures outlined in Methods EPA 5030B/C and EPA 5035A. Samples can be handled in a closed loop system according to Method EPA 5035A.

3.0 INTERFERENCES

- Purge gas contamination
- Sample contamination due to septum diffusion
- Cross contamination
- Column contamination: bake

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

- Trap contamination: bake
- Purge and trap system contamination: wash purging chamber, bake out spargers, extended dry purges

Major contaminant sources are volatile materials in the laboratory and impurities in the inert purging gas and in the absorbent trap. The use of polytetrafluoroethylene (PTFE, Teflon) as thread sealants, tubing, or in flow controllers is highly recommended since other materials can be sources of contamination which may concentrate in the trap during the purging.

All materials utilized during this analysis and the GC/MS system must be demonstrated to be free from contamination. Running frequent instrument blanks and method blanks along with using purge and trap grade solvents will assist with the monitoring of laboratory contaminants within the analytical system. When potential interfering peaks are noted in laboratory reagent blanks, the analyst must determine the source of contamination and correct the problem before analysis of samples may continue.

A common source of interfering contamination is carryover. This may occur when a sample containing low concentrations of volatile organic compounds is analyzed immediately after a sample containing high concentrations of volatile organic compounds. The preventive action to this condition is rinsing the purging apparatus and sample syringes with two or more portions of organic free water between samples. Analyze one or more blanks to check for cross contamination prior to sample analysis.

Since methylene chloride and acetone are common laboratory solvents, special precautions must be taken. The volatiles analysis and sample storage area should be located as far as possible from areas where these solvents are used or stored. Where possible, the volatiles analysis and sample storage area should be served by a separate HVAC system and maintained under positive pressure to prevent intrusion of contaminants. Laboratory clothing previously exposed to methylene chloride fumes during extraction procedures can contribute to sample contamination.

Chloroform is an interference from Chlorinated town water, which the DI system does not completely remove. Purging DI water prior to use eliminates interference.

4.0 DEFINITIONS

Refer to the Laboratory Quality Manual for a glossary of common lab terms and definitions.

5.0 HEALTH AND SAFETY

Contact your supervisor or local safety coordinator with questions or concerns regarding safety protocol or safe handling procedures for this procedure

The following sections provide general health and safety information about chemicals and materials that may be present in the laboratory.

- The toxicity or carcinogenicity of each chemical material used in the laboratory has not been fully established. Each chemical should be regarded as a potential health hazard and exposure to these compounds should be as low as reasonably achievable.
- The laboratory maintains documentation of hazard assessments and OSHA regulations regarding the safe handling of the chemicals specified in each method. Safety data sheets for

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

all hazardous chemicals are available to all personnel. Employees must abide by the health, safety and environmental (EHS) policies and procedures specified in this SOP and in the Pace® Chemical Hygiene / Safety Manual (COR-MAN-0001)

- Personal protective equipment (PPE) such as safety glasses, gloves, and a laboratory coat must be worn in designated areas and while handling samples and chemical materials to protect against physical contact with samples that contain potentially hazardous chemicals and exposure to chemical materials used in the procedure.
- Concentrated corrosives present additional hazards and are damaging to skin and mucus membranes. For procedures that require use of acids, use acids in a fume hood whenever possible with PPE designed for handing these materials. If eye or skin contact occurs, flush with large volumes of water. When working with acids, always add acid to water to prevent violent reactions. For procedures that that emit large volumes of solvents (evaporation/concentration processes), these activities must be performed in a fume hood or apparatus that reduces exposure.

6.0 .SAMPLE COLLECTION, PRESERVATION, HOLDING TIME & STORAGE

The laboratory provides containers for the collection of samples upon client request. Refer to laboratory SOP ENV-SOP-ELON-0017_*Bottle Prep* for procedures related to preparation of bottle kits for the test method(s) associated with this SOP.

The laboratory does not perform sample collection or field measurements for this test method. Samples should be collected in accordance with a sampling plan and sampling procedures appropriate to achieve the regulatory, scientific, and data quality objectives for the project.

Container Type, Minimum Sample Amount, Preservation, and Holding Time Requirements:

Matrix	Container Size & Type	Required Sample Amount[1]	Preservation	Holding Time
Aqueous	40mL VOA vials with Teflon-lined septa screw caps	5mL	Thermal: ≤6℃ Chemical: Acidified with 1:1 HCL to pH <2 (3-4 drop), no headspace	14 Days
Soil/Sediment Samples High-Level Analysis (EPA 5035A/5030)	40mL VOA vials with Teflon-lined septa screw caps	5grams/10grams/15grams	Thermal: ≤6℃ Chemical: 1mL purge and trap grade methanol for every gram soil/sediment. (5g/5mL, 10g/10mL, or 15g/15mL) -Protect from sunlight	14 Days
Soil/Sediment Samples Low-Level Analysis (EPA 5035A)	40mL VOA vials with Teflon-lined septa screw caps	5grams	Thermal: ≤6℃ Chemical: 5grams soil to5 mL sodium bisulfate solution, Teflon-coated magnetic stir bar; protect from light OR freeze sample in vial (containing 5mLs of purged DI water) within 48 hours of collection	14 Days
Soil/Sediment Samples Low-Level Analysis (EPA 5035A)	5 g EnCore® samplers or other suitable coring device.	5grams	Cool to ≤ 6ºC in field; 48 hours from date collected until extrusion in reagent water followed by freezing	14 Days

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

	Extrude 5 grams of sample directly into (2) x preweighed 40 ml VOC vials containing 5 mL of reagent water (with or without chemical preservation; see Note and a Teflon-coated magnetic stir bar		(< -7ºC) or analysis within 48 hours of sample collection (see Notes). Alternatively, samples may be frozen to < -7ºC in the field using gel packs or Cool to ≤ 6ºC in field and deliver to laboratory for freezing (< -7ºC) or analysis, both within 48 hours of sample collection. Alternatively, samples may be frozen to < -7ºC in the field using gel packs.	

[1] *Amount of sample required for each discrete test.*

All samples should be collected straight into VOA vials in the field. When this is not done a lab prep will be performed and data will be qualified.

Notes:

1) A number of acceptable alternative preservation techniques requiring close communication with the receiving laboratory that require field cooling (≤ 6ºC) with subsequent laboratory preservation.

(freezing, methanol, NaHSO4, etc.) and/or expedited analysis (48 hours) are presented in Appendix A, “Collection and Preservation of Aqueous and Solid Samples for Volatile Organic Compounds

(VOC) Analyses” of the document entitled, “Closed System Purge-and-Trap and Extraction for Volatile Organics In Soil and Waste Systems”, an updated version of SW-846 Method 5035A

published by US EPA In July 2002. https://www.epa.gov/hw-sw846/validated-test-method-5035a-closed-system-purge-and-trap-and-extraction-volatile-organics

2) If samples were received by the laboratory on the same day of collection and were stored and transported to the laboratory on ice, cooler temperatures above 6ºC are acceptable.
3) Holding time is calculated from the time of sample collection and only applies to samples that have been frozen and chemically preserved.
4) EnCore® Sampler may not be suitable for certain soil types; refer to guidance in SW-846 Method 5035A.
5) Not required if closed system purge-and-trap device employs a means of stirring the sample other than a magnetic stirrer.
6) Any samples which are frozen must be analyzed within 48 hours of thawing.

Thermal preservation is checked and recorded on receipt in accordance with laboratory SOP ENV-SOP-ELON-0100_*Sample Log-in Procedures*. Chemical preservation is checked and recorded at time of receipt or prior to sample preparation.

After receipt, samples are stored at ≤6°C until sample preparation. Prepared samples (extracts, digestates, distillates, other) are stored at ≤6°C until sample analysis.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

After analysis, samples are retained as stated in the Pace® standard terms and conditions, unless otherwise specified in the analytical services contract. Samples are then disposed of in accordance with Federal, State, and Local regulations.

7.0 EQUIPMENT & SUPPLIES

7.1 Equipment

- Purge and trap systems:
    - EST Encon concentrator and EST Archon Autosampler
    - EST Encon Evolution concentration and EST Centurion WS Autosampler
- GC/MS systems
    - HP 6890/HP5973 and
    - HP7890/HP5975
    - HP7890/HP5977
- GC/MS data system: Windows NT or 2000 and Windows 7
- Teledyne Tekmar Atomx Autosampler/concentrator
- Calibrated analytical balance; capable of accurately weighing 0.01g

7.2 Supplies

- GC column
    - Restek DB- 624 capillary 20m, 0.18mm ID, 1um thickness
    - Restek DB-VRX capillary 20m, 0.18mm ID, 1um thickness
- Analytical Trap: VOCARB3000 or equivalent
- 40-ml vials/cap and Teflon silicone septum
- Micro syringes
- Volumetric glassware
- 2-ml vials/caps and Teflon silicone septum
- 50mL Gastight Syringe
- 5mL Gastight Syringe

8.0 REAGENTS & STANDARDS

8.1 Reagents

- Organic free water: distilled and purged with ultra-high purity nitrogen for 30min
- Methanol: purge and trap grade

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Ultra-high purity helium: carrier and purge gas

8.2 Standards

8.2.1 Internal Standard/Surrogate Stock:

Purchased as certified solutions from Agilent. IS solutions have a 6-month expiration date and should be refrigerated when not in use.

The internal standard stock solution (cat # STM-341N) contains pentafluorobenzene, d4-dichlorobenzene, chlorobenzene-d5, and 1.4-difluorobenzene-d4: all are at a concentration of 2000 ug/mL in methanol.

The surrogate stock solution (cat #STM-260) contains 4-bromofluorobenzene, 1, 2-dichloroethane-d4, and toluene-d8: all are at a concentration of 2500 ug/mL in methanol.

All client samples, blanks, and quality control samples contain the internal standard compounds at a concentration of 30ug/L and the surrogate standards at 25ug/L.

***Note**: 1.0uL of the working internal standard/surrogate solution is added by the Archon Autosampler directly to all client samples, blanks, and quality control samples before purging is initiated*.

***Note**: 5.0uL of the working internal standard/surrogate solution is added by the Centurion WS Autosampler directly to all client samples, blanks, and quality control samples before purging is initiated.*

***Note**: IS solutions have a 6-month expiration date and should be refrigerated when not in use.*

8.2.2 GC/MS Volatile Organic Standards

The GC/MS VOA (8260) Working Stock is prepared from the following stocks and is used for calibration, CCV, LCS and MS:

Stock	Vendor	Stock Conc. (mg/mL)	uL Stock Added into 10 mLs MeOH	Working Stock Conc. (ug/mL)
M-8260-ADD-10X	AccuStandard	2.0	500	100
M-502	AccuStandard	2.0	50	10
M-8015B/5031-03	AccuStandard	10	100	100
S-17412-R2	AccuStandard	2/20	50	10/100
70174	Absolute	1	1000	100
V-028S-20X	AccuStandard	2.0	50	10
30631 (TAA)	RESTEK	10	100	100
30617 (TAEE)	RESTEK	2	50	10

Methanol solutions prepared from liquid analytes are stable for at least 4 weeks when stored at 4℃. Methanol solutions prepared from gaseous analytes are not stable for more than one week.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Standards for the permanent gases should be monitored frequently by comparison to the initial calibration curve. Fresh standards should be prepared if this check exceeds a 20% drift. Standards for gases usually need to be replaced after one week or as recommended by the standard manufacturer unless the acceptability of the standard can be documented. The light gases including Dichlorodifluoromethane, Chloroethane, chloromethane, bromomethane and vinyl chloride will usually be the first compounds to evaporate from the standard and should, therefore, be monitored very closely when standards are held beyond one week.

Standards for the non-gases should be monitored frequently by comparison to the initial calibration. Fresh standards should be prepared if this check exceeds a 20% drift. Standards for non-gases need to be replaced after six months or as recommended by the standard manufacturer unless the acceptability of the standard can be documented. Standards of reactive compounds such as 2-chloroethyl vinyl ether and styrene may need to be prepared more frequently.

All three xylene isomers will be included at a concentration of 0.5 ppb each in the low concentration initial calibration standard. The RL for each of the xylene isomers will be 0.5 ppb or the lowest standard in the initial calibration.

Note: m+p xylenes reported together (co-elute) (1.0 ppb RL) o-xylene reported separately (0.5 ppb R.L)

8.2.3 Calibration Standards

Standard concentrations are prepped daily from the working solution.

For 8260 Water (Stock = 10ug/mL); 5mL of std. is purged on the autosampler:

Working Stock (uLs)	Final Volume D.I. water (mLs)	Final Conc. (ppb)
4uL	100mL	0.4ppb
5uL	100mL	0.5ppb
10uL	100mL	1.0ppb
20ul	100mL	2.0ppb
50uL	100mL	5.0ppb
100uL	100mL	10ppb
200uL	100mL	20ppb
100uL (50ug/mL)	100mL	50ppb
200uL (50ug/mL)	100mL	100ppb
400uL (50ug/mL)	100mL	200ppb

For 8260 Soil (Stock = 50ug/mL); 5mL of water is added to 5mL of std. before purge by the autosampler:

Working Stock (uLs)	Final Volume D.I. water (mLs)	Final Conc. (ppb)
4uL (10ug/mL)	100mL	0.2ppb (for VOA4 only)

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

8uL (10ug/mL)	100mL	0.4ppb (for VOA1 and VOA7 only)
2uL (50ug/mL)	100mL	0.5ppb
4uL (50ug/mL)	100mL	1.0ppb
20uL (50ug/mL)	100mL	5.0ppb
40uL (50ug/mL)	100mL	10ppb
80uL (50ug/mL)	100mL	20ppb
10uL (50ug/mL)	5mL	50ppb
16uL (50ug/mL)	5mL	80ppb
20uL (50ug/mL)	5mL	100ppb (for VOA1 and VOA7 only)
40uL (50ug/mL)	5mL	200ppb (for VOA4 only)

Note: After the calibration standards are prepared in 100 mL volumetric flasks, they are transferred to 40-mL vials and placed into the Autosampler.

8.2.4 QC Check – Second Source Stock used for ICV and Optionally for the LCS

Stock	Vendor*	Cat # *	Stock Conc. ug/mL	uL Stock Added Into 10 mLs MeOH	Final Working Conc. (ug/mL)
VOC Mixture with MTBE	Agilent	DWM-596-1	2000	100	20
Custom Gas Mix	Agilent	CUS-28408	Various concentrations	100	20/200
Vinyl Acetate	RESTEK	30216	2000	1ml	200
Ethanol	RESTEK	30288	2000	1mL	200
Custom Mix	Agilent	CUS-28609, CUS-00002161, or CUS-00004852 or equiv.	2000/20000	100	20/200
1,2,3-Trimethylbenzene	Phenova	ALO-101810	2000	100	20
TAA	Absolute	97944	5000	400	200
TAEE	Absolute	72609	1000	200	20

*Or equivalent

8.2.5 Internal Standards/Surrogates

624/8260 H2O IS/SURR mix VOA 2,3,5,6,7:

Stock	Vendor	Stock Conc. (mg/mL)	µL Stock added into 50mLs	Working Stock Conc. (µg/mL)
STM-341N(IS)	Agilent	2.0	750	30
STM-262(SURR)	Agilent	2.5	500	25

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

8260 Soil IS/SURR mix VOA 4:

Stock	Vendor	Stock Conc. (mg/mL)	µL Stock added into 25mLs	Working Stock Conc. (µg/mL)
STM-341N(IS)	Agilent	2.0	750	60
STM-262(SURR)	Agilent	2.5	500	50

9.0 PROCEDURE

9.1 Analysis Sequence

The order of analysis for each 12-hour analysis shift is as follows:

Time 0: BFB Instrument Performance Check

Calibration Verification Standard

LCS/LCSD

Method Blank

Last Reported Sample

Runs at 12Hrs: Samples

The last sample in the sequence must be injected within 12 hours of the time that the BFB instrument performance check was injected at the start of the sequence.

***Note**: For 8260D BFB is only required to pass before ICAL, not every 12 hours.*

If more than 20 samples are run during any 12-hour shift, then additional batch QC samples must be analyzed to achieve an overall frequency of 5 percent (1 set of QCs and blank for every 20 samples) during each analysis shift.

The analysis sequence is documented on an analysis run log maintained by the analyst.

9.2 MS Calibration and Tuning

Auto tune with PFTBA with column temperature at 45℃

Tune with 50ng of BFB with column temperature at 125℃ and meet the following criteria:

Mass	m/z abundance criteria
50	**15 to 40% of Mass 95**
75	**30 to 60% of Mass 95**
95	**Base Peak, 100% relative abundance**
96	**5 to 9% of Mass 95**
173	**<2% of Mass 174**
174	**>50% but <200% of Mass 95**
175	**5 to 9% of Mass 174**

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

176 95% but <101% of Mass 174
177 5 to 9% of Mass 176

Note: These limits are tighter than the method required limits. See Table 3 of 8260D.

The mass spectrum of BFB that is evaluated against the acceptance criteria is obtained in the following manner: three scans (the peak apex and the scans immediately preceding and following the apex) are averaged, and a single scan no more than 20 scans prior to the BFB peak is subtracted. No part of the BFB peak itself may be background-subtracted.

The BFB relative abundance criteria must be met before any standards, site samples, or quality control samples are analyzed.

9.3 Default Archon/Centurion and Encon Instrument Conditions (VOA Instruments #2, 4, 5 and 7)

9.3.1 Encon concentrator:

Flow rate: 40.0 ml/min.
Purge ready temp.: 35℃
Purge time: 11min.
Desorb time: 1.0 min.
Desorb temp: 250℃
Bake time: 8 min.
Bake temp: 260 ℃
Dry Purge: 2 min.
Water Management: Ready – 40°C
Bake – 260°C

9.3.2 Archon Autosampler:

Sample volume: 5 mL
Rinse volume: 5 ml (waters only).
Rinses: 2 (waters only).
Syringe flushes: 1
Preheat temp: 40 (soils only).
Preheat time: 0.5 min (soils only).
Purge time: 11 min.
Desorb time: 0.5-1.0 min.

9.3.3 Gas Chromatogram

Injector temp.: 200℃
Detector temp.: 230℃
Interface temp: 180-230℃ (instrument dependent)
Oven equilibration time: 0.5min.
Column program: 45℃ for 3 min.,
Ramp at 15-28℃/min.,
final temp. 210-220℃for 1-2 min.
Run time: 12-15 min.
Splitless valve time: 0.0

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Split flow: 50-90ml/min
Split ratio: 50-60:1

9.3.4 Mass Spec

Mass range: 35 to 300
Number of A/D samples: 16
Peak threshold: 10000
Threshold: 20 counts
Scan start time: 0.5-1.4 min.

The use of selected ion monitoring (SIM) is acceptable in situations requiring detection limits below the normal range of full EI spectra. However, SIM may provide a lesser degree of confidence in the compound identification unless multiple ions are monitored for each compound, and compounds quantitated by SIM must be noted in the final report

9.4 Default Tekmar Instrument Conditions (VOA Instruments #3 and 6)

9.4.1 Purge

Valve Oven Temp: 140°C
Transfer Line Temp: 140°C
Sample Mount temp: 90°C
Water Heater Temp: 90°C
Sample Vial Temp: 20°C
Sample Equilibrate Time: 0.00 min
Soil Valve Temp: 50°C
Standby Flow: 10mL/min
Purge Ready Temp: 40°C
Condensate Ready Temp: 45°C
Pre-sweep Time: 0.25 min
Prime Sample Fill Volume: 3.0mL
Sample Volume: 5.0mL
Sweep Sample Time: 0.25 min
Sweep Sample Flow: 100mL/min
Sparge Vessel Heater: Off
Sparge Vessel Temp: 20°C
Pre-purge Time: 0.00 min
Pre-purge Flow: 0mL/min
Purge Time: 11.00 min
Purge Flow: 40mL/min
Purge Temp: 20°C
Condensate Purge Temp: 20°C
Dry Purge Time: 0.50 min
Dry Purge Flow: 100mL/min
Dry Purge Temp: 20°C

9.4.2 Desorb

Methanol Needle Rinse: Off
Methanol Needle Rinse Volume: 3.0mL

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Water Needle Rinse Volume: 7.0mL
Sweep Needle Time: 0.25 min
Desorb Preheat Temp: 245°C
GC Start Signal: Start of Desorb
Desorb Time: 1.00 min
Drain Flow: 250mL/min
Desorb Temp: 250°C

9.4.3 Bake

Methanol Glass Rinse: Off
Number of Methanol Glass Rinses: 1
Methanol Glass Rinse Volume: 3.0mL
Number of Water Bake Rinses: 1
Water Bake Rinse Volume: 7.0mL
Bake Rinse Sweep Time: 0.25 min
Bake Rinse Sweep Flow: 100mL/min
Bake Rinse Drain Time: 0.40min
Bake Time: 8.00 min
Bake Flow: 200mL/min
Bake Temp: 280°C
Condensate Bake Temp: 200°C

9.5 Sample Preparation and Analysis

9.5.1 Low Level Water Samples

Low level water samples need no preparation. 5 mL of the sample is transferred from the 40mL vial and transferred to the concentrator. Internal standards and surrogates are added by the autosampler. 1.0uL of IS/Surr standard is added by the Archon AS or 5.0uL of IS/Surr standard is added by the Centurion AS.

9.5.2 High Level Water Samples

High level water samples are diluted in a volumetric flask by analyst. The diluted sample is then transferred to a 40 ml VOA vial. 5 mL of the sample is transferred from the 40mL vial and to the concentrator for analysis. Internal standards and surrogates are added by the autosampler. 1.0uL of IS/Surr standard is added by the Archon AS or 5.0uL of IS/Surr standard is added by the Centurion AS.

9.5.3 Low Level Soils

If low level soil samples are not preserved, then lab analyst will weigh samples to nearest 0.1 gram using approximately 5 grams and record in the 8260soil prep excel spreadsheet.

OR

Method 5035A: Low concentration soil method (generally applicable to soils and other solid samples with VOC concentrations in the range of 0.5 to 200 ug/kg).

Volatile organic compounds (VOCs) are determined by collecting an approximately 5-g sample, weighed in the field at the time of collection, and placing it in a pre-weighed vial

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

with a septum-sealed screwcap that already contains sodium bisulfate preservative solution. The vial is sealed and shipped to a laboratory or appropriate analysis site. The entire vial is then placed, unopened, into the instrument carousel. **When running samples which have been preserved with sodium bisulfate, a MB, LCS, LCSD (if required) must also be preserved with sodium bisulfate.** Immediately before analysis, organic-free reagent water, surrogates, and internal standards (if applicable) are automatically added without opening the sample vial. The vial containing the sample is heated to 40 degrees C and the volatiles purged into an appropriate trap using an inert gas. Purged components travel via a transfer line to a trap. When purging is complete, the trap is heated and backflushed with helium to desorb the trapped sample components into a gas chromatograph for analysis by an appropriate determinative method.

Method 5035A: Low concentration soil method for frozen soil samples

Samples are taken in the field with DI vials provided by the lab and then vials are frozen within 48 hours. These vials are sampled with approximately 5 grams; same procedure as the above 5035. Frozen samples are to be allowed to warm up to room temperature for ~ 30 minutes prior to analysis.

9.5.4 High Level Soils/Wastes/Oils

High level samples are extracted with methanol in a 40 mL vial. Samples are weighed, between 0.1g and 10g, recorded in the 8260soil prep excel spreadsheet, (to the nearest 0.1g) in a 40 mL vial and 15mls of purge&trap methanol are added. 1mL of surrogate solution is added through the septum, using a 1mL syringe, when requested by client, otherwise surrogate is added through the auto-sampler. The sample is shaken for two minutes and allowed to settle. After settling a portion of the methanol extract, between 5uL and 500uL is added to a final volume of 100mL. (Varied amounts depending on sample matrix) and Transfer 40mL to VOA vial. 5 mL of the sample is transferred from the 40mL vial and transferred to the concentrator. Internal standards and surrogates are added by the autosampler. Note: the amount of sample used, and the amount of extract analyzed may vary depending on the expected concentration of the sample.

OR

Method 5035A: High concentration soil method (generally applicable to soils and other solid samples with VOC concentrations greater than 200 ug/kg).

Samples are preserved in pre-weighed vials containing methanol in the field. Analysis proceeds as above.

The low-level sample introduction technique listed above is not applicable to all samples, particularly those containing high concentrations (generally greater than 200 ug/kg) of VOCs which may overload either the volatile trapping material or exceed the working range of the determinative instrument system. In such instances, this method describes two collection options and the corresponding sample purging procedures.

The first option is to collect a bulk sample in a vial or other suitable container without the use of preservative solution. A portion of that sample is removed from the container in the laboratory and is dispersed in a water-miscible solvent to dissolve the volatile organic constituents. An aliquot of the solution is added to 5 mL of reagent water in a purge tube.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Surrogates and internal standards (if applicable) are added to the solution, then purged using Method 5030, and analyzed by an appropriate determinative method. Because the procedure involves opening the vial and removing a portion of the soil, some volatile constituents may be lost during handling.

The second option is to collect an approximately 15-g sample in a pre-weighed vial with a septum-sealed screwcap that contains 15mL methanol. At the time of analysis, an aliquot of the solvent is removed from the vial, diluted w/ H20, and purged using Method 5030 and analyzed by an appropriate determinative method.

High concentration oily waste method (generally applicable to oily samples with VOC concentrations greater than 200ug/kg that can be diluted in a water-miscible solvent).

Samples that are comprised of oils or samples that contain significant amounts of oil present additional analytical challenges. This procedure is generally appropriate for such samples when they are soluble in a water-miscible solvent.

9.5.5 TCLP Extracts

The TCLP extract is diluted 10x with zero headspace in a 40 ml VOA vial. 5 mL of the sample is transferred from the 40mL vial and transferred to the concentrator. Internal standards and surrogates are added by the autosampler.

10.0 DATA ANALYSIS & CALCULATIONS

10.1 Calculations

Water Sample Calculation:

Sample concentration, ppb = (direct reading from instrument) X (dilution factor, if any dilutions were required).

Soil Sample Calculation:

$$\frac{\text{(ug/L from instrument) X (0.010 L sparger volume)}}{\text{(g/mL, from sample prep) X (mL of sample used)}} = \text{ug/gram = mg/Kg (ppm)}$$

Internal Standard Calculation from Response Factor 8260 Method Calculation:

$$RF = \frac{As \times Cis}{Ais \times Cs}$$

Where:

As = Peak area (or height) of the analyte or surrogate.
Ais = Peak area (or height) of the internal standard.
Cs = Concentration of the analyte or surrogate.
Cis = Concentration of the internal standard.

Relative Error (%RE)

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Relative error is minimally checked at the concentration of the lowest standard in the curve and at the standard near the mid-point of the curve. %RE is calculated as follows:

$$\% \text{ Relative Error} = \frac{x`i - xi}{Xi}$$

xi = True Value of the Calibration Standard

x`i = Measured Concentration of the Calibration Standard

% RE must be ≤30% for the midpoint standard and ≤ 50% for the low-point standard.

10.2 Data Analysis

A minimum signal-to-noise ratio of 3:1 (based on peak height) must be achieved for any peak used in a calibration standard, client sample, or quality control sample.

To prevent overwriting manual integrations, the analyst should not re-quantitate calibration standard files, unless dictated by certain regulations to validate the calibration.

When preparing to establish a new initial calibration, to prevent carry-over of numbers from previous calibrations, the analyst should “clear all response factors” (which is a function in the software) from old calibration curves prior to processing the new curve.

10.3 Data Processing

10.3.1 GC/MS VOA files

Data files numbered sequentially starting with instrument, date, and file number.

10.3.2 Reporting Package

The reporting package that is delivered to clients will consist of the sample results, the surrogate recovery results and any matrix spikes, blanks, duplicates, and lab fortified blanks that pertain to the clients’ samples.

MCP Data Enhancement and Connecticut RCP projects will include required deliverables plus a case narrative and certification form.

10.3.3 Data Filing

Injection logs and bench sheets are filed in File Boxes and all raw data are archived on the A: drive as a pdf.

Data to be saved on CD or DVD.

All data batch files from instruments.

10.4 Tentatively Identified Compounds (TICs)

Initially include all the non-target compounds that have a peak area count of ≥ 10% of the nearest internal standard.

Use the following guidelines for making tentative identification:

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

The spectral library match must be ≥80% for a tentative identification to be made.

For 8260 MA MCP match must be ≥85%

The relative intensities of major ions in the reference spectrum (ions greater than 10% of the most abundant ion) should be present in the sample spectrum.

The relative intensities of the major ions should agree within ± 20%.

Molecular ions present in the reference spectrum should be present in the sample spectrum.

Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of co-eluting compounds.

Ions present in the reference spectrum, but not in the sample spectrum should be reviewed for possible subtraction from the sample spectrum because of background contamination or co-eluting peaks.

Quantitative analysis:

The nearest internal standard shall be the one that is used to calculate concentration, and the RF for the compound should be assumed to be 1.

The resulting concentration should be reported indicating that the value is an estimate.

10.4.1 Manual Integration

Manual integration is sometimes necessary to correct inaccurate automated integrations but must never be used to meet QC criteria or to substitute for proper instrument maintenance and/or method set-up. To assure that all manual integrations are justified and proper all manual integrations must be performed, documented, reviewed, and approved in accordance with corporate SOP ENV-SOP-CORQ-0006, *Manual Integration.* Refer to this SOP for guidance on manual integration techniques and required procedures.

When performing manual integration of any peak in a calibration standard, client sample, or quality control sample, the integration must be performed in conformance with the procedures outlined in the Manual Integration SOP. In summary:

The most appropriate instrument parameters should be used during method development to allow for automatic integration by the data system in most cases.

All data must be integrated consistently for all standards, samples, and QC samples.

In those instances when the automated software does not integrate a peak correctly, manual integration may be used to correct the improper integration performed by the data system. Manual integration should always be performed to create the analyst's best estimate of the actual peak area discerned from the chromatogram.

All manual integrations must be documented by printing before and after, initialing and dating the manual integrations as well as by recording the reasons for the manual integrations.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

11.0 QUALITY CONTROL & METHOD PERFORMANCE

11.1 Quality Control

Prepare the following QC samples with each batch of samples. Refer to Appendix B for acceptance criteria and required corrective action(s). An analytical batch is defined as up to 20 client samples of a similar matrix for the same analysis. All quality control samples are assigned to and associated with a particular analytical batch, which is designated at the time samples are logged-in or at the time of sample preparation. All quality control samples must be traceable to the associated analytical batch for review and evaluation purposes.

QC Check	Acronym	Frequency
Method Blank	MB	1 per batch of 20 or fewer samples. If batch exceeds 20 samples, every 20 samples.
Laboratory Control Sample	LCS	1 per batch of 20 or fewer samples. If batch exceeds 20 samples, every 20 samples.
LCS Duplicate	LCSD	1 per batch of 20 or fewer samples. If batch exceeds 20 samples, every 20 samples.
Matrix Spike	MS	As Requested, or 1 per batch of 20 or fewer samples, if provided sufficient sample. If batch exceeds 20 samples, every 20 samples
Matrix Spike Duplicate	MSD	As Requested, or 1 per batch of 20 or fewer samples, if provided sufficient sample. If batch exceeds 20 samples, every 20 samples
Sample Duplicate	SD	Client requested
Trip Blank	TB	Client requested
Surrogate	SSTD	Added to all blanks, standards, client samples, and quality control samples
Internal Standards	ISTD	Internal standards are monitored in each client sample, blank, quality control sample analysis.

11.1.1 Surrogates

Surrogates are added to all blanks, standards, client samples, and quality control samples. The surrogates are checked and documented. Percent recoveries must be 70-130% for individual surrogate compounds. If the %R is outside of control limits, the sample must be reanalyzed unless interference is noted. One high surrogate standard recovery associated with a sample that has all target compounds “non-detected” is permissible.

11.1.2 Internal Standards

Internal standards are monitored in each client sample, blank, quality control sample analysis. Acceptable criteria for the internal standards response is 50-200% of the response in the associated continuing calibration standard. Retention times of internal standards must be within ±30 seconds of retention times in the associated continuing calibration standard.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

The internal standard selected for calculation of the RRF for the concentration of each target analyte should be the internal standard with a retention time closest to the analyte being measured.

11.1.3 Method Blank (MB)

A matrix-specific method blank must be analyzed 1 per batch of 20 samples or less, prior to running samples and after calibration standards. Target analytes must be <RL (MA MCP ≤1/2 RL) except for common laboratory contaminants (such as acetone, chloroform, methylene chloride, toluene, and MEK which must be <5x the RL). Flag any contamination to qualify the sample results.

If the method blank does not meet these criteria, appropriate corrective action is taken (bake the trap or column, flush the transfer lines, etc.). An acceptable method blank must be analyzed prior to sample analyses.

11.1.4 Laboratory Control Sample (LCS)

A matrix specific LCS and duplicate is analyzed 1 per batch of 20 samples or less, or for each new window. The LCS is prepared from a different stock than that of the calibration curve, and is matrix matched to the samples of that batch. The concentration should be between the low and mid-level standard and must contain all analytes. The percent recoveries must be 70-130%R for most compounds (document exceedances for "difficult compounds"). Difficult compounds are evaluated regularly. MA MCP and CT RCP cite 40-160% for difficult analytes. See MA MCP and CT RCP methods for listing of difficult analytes. Reduction in the number of difficult compounds is a laboratory goal through corrective action and technical improvements. No greater than 10% of the total targets can be outside of control limits for analysis to proceed.

LCS/LCSD RPD criteria = ≤20% for waters and soils.

8260D states that matrix spikes and laboratory control samples should be prepared from the **same source as the ICAL**(Section 7.12 of 8260D Method). When the LCS is prepared in the same manner as the CCV, the same standard can be used as both LCS and CCV. However, when done this way MA MCP & CT RCP requires it to pass same criteria as CCV. 8260D only suggests to use the CCV criteria.

11.1.5 Matrix Spike (MS)

Analyzed at a frequency equivalent to 1 per batch of 20 samples or less. The MS working stock is prepared at a concentration of 20 ug/mL (from a source different than that of the calibration curve). Must contain all the target analytes.

Water prep: 20uL working stock into 40 mL sample (when enough sample is collected) True value = 10 ppb

Soil prep: 5uL working stock into sample vial with either DI or Bisulfate (when enough sample is collected). The Archon adds another 5mL purge&trap water; final volume = 10mL. True value = 10 ppb

The %R must be 70-130. If percent recoveries exceed these limits, check the LCS: if recoveries are acceptable in the LCS, narrate nonconformance.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

11.1.6 Matrix Spike Duplicates (MSD)

Analyze MS in duplicate at a frequency of 1 per batch of 20 samples or less when additional VOA vial is available. RPDs must be ≤20% for waters and ≤30% for solids.

11.1.7 TCLP Method Blank

A TCLP method blank must be analyzed with each set of TCLP extracts. The TCLP method blank is diluted 10x with zero headspace in a 40 ml volumetric VOA vial, I.S./Surr. Std. is added via autosampler and the sample is purged.

11.1.8 TCLP Matrix Spike

A representative TCLP matrix spike must be analyzed with each set of TCLP samples. The TCLP matrix spike is diluted 10x with zero headspace in a 40ml VOA vial, 40uL of the matrix spike solution and I.S./Surr. Std. is added via autosampler and the sample is purged.

11.2 Instrument QC

Perform the following checks to verify instrument performance. Refer to Appendix B for acceptance criteria and required corrective action.

Instrument Check	Acronym	Frequency
Tune (MS Only)		Required before calibration – Lab performs daily
Initial Calibration Verification	ICV	After each new ICAL
Continuing Calibration Verification	CCV	At the start of each 12-hour analysis sequence

11.2.1 Calibration Curve

Initial calibration is performed before any samples are analyzed. Initial calibration must also be performed when major instrument maintenance is performed.

Calibration Criteria for samples run by Method 8260 D protocols:

A minimum (5)-point calibration curve is used to calibrate the system for all target analytes and surrogates. The low concentration initial calibration standard must be less than or equal to the reporting limit (RL). Target analytes detected in a sample at concentrations below the concentration of the low initial calibration standard should not be reported as quantitative results. If reported, they must be qualified as estimates.

The %RSD for all target analytes compounds over the working range must be ≤20% for the average RRF to be used for subsequent calculations.

A minimum response factor for compounds in TABLE 4.0, is for guidance, it is neither expected nor required that these minimum RFs be meet. However, is recommended that if RF is <0.01, that the concentration of said analyte be increase.

If %RSD is >20% for any target analyte, then a linear regression must be established using the calibration data for that compound (see EPA Method 8000D, Section 11.5.2). For the linear regression to be acceptable for quantitative purposes, when using r must be ≥0.995 and when using r^2 must be ≥0.99. If this criterion is met, the linear regression analysis must be incorporated into the curve used to calculate results. When calculating

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

the calibration curves using linear regression, a minimum quantitation check should be performed by re-fitting the response from the low concentration calibration standard back into the curve (SEE Method 8000D). The recalculated concentration of the low calibration point should be within ± 50% of the standards true calculation if it is the lowest point and ± 30% for all others (i.e., above the low standard). Analytes which do not meet the minimum quantitation calibration criteria should be considered "Out of control" and corrective action such as redefining the lower limit and/or reporting "Out of control" analytes as estimated.

If linear regression is used, calculate the Relative Error (%RE) for the low and mid calibration points. The low point must recover 50-150% and the midpoint must recover between 70-130%. Refer to ENV-POL-CORQ-0005 for additional information on calculating the relative error.

Additional Calibration Criteria for samples run by MA MCP protocols:

A minimum response factor for compounds in TABLE 4.0, must be demonstrated for each individual calibration level. Meeting the minimum response factor criteria for the lowest calibration standard is critical in establishing and demonstrating the desired sensitivity. **Compounds not meeting criteria should be considered estimated. If the RF of any compound is <0.01 data is to be qualified, as it affects all non-detected results.**

Additional Calibration Criteria for samples run by CT RCP protocols:

The %RSD for all target analytes compounds over the working range must be **<20%** for the average RRF to be used for subsequent calculations.

If %RSD is >20% for any target analyte, then a linear regression must be established using the calibration data for that compound (see EPA Method 8000D, Section 11.5.2). For the linear regression to be acceptable for quantitative purposes, when using r must be ≥0.99 and when using r^2 must be ≥0.99. If this criterion is met, the linear regression analysis must be incorporated into the curve used to calculate results. When calculating the calibration curves using linear regression, a minimum quantitation check should be performed by re-fitting the response from the low concentration calibration standard back into the curve (SEE Method 8000D). The recalculated concentration of the low calibration point should be within **± 30%** of the standard's true calculation. Analytes which do not meet the minimum quantitation calibration criteria should be considered "Out of control" and corrective action such as redefining the lower limit and/or reporting "Out of control" analytes as estimated.

For all 8260 methods:

If any initial calibration standard analysis is determined to be unusable (e.g., a bad injection), the standard may be re-analyzed before any samples are run. The re-analysis results may be incorporated into the initial calibration in their entirety, in place of the original analysis. If the initial calibration still does not meet acceptance criteria, even with the replacement standard, then the entire initial calibration should be performed again.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

If the initial calibration still does not meet acceptance criteria for a particular analyte, the analyst may consider dropping the lowest or highest point for that analyte and recalculating the average RRF and %RSD or linear regression. Note that ONLY the lowest or highest data point may be dropped – a data point from the middle of the calibration range may NOT be dropped. Note also that if the low standard is dropped, the RL for that analyte must be adjusted so that the lowest standard used for the calibration is less than or equal to the RL.

When the instrument data system is updated to reflect the new initial calibration, the analyst verifies that it has been properly set up to calculate each target analyte according to the actual model used to establish the initial calibration (i.e., average RRF or linear regression) and to reflect any abbreviated ranges established for individual analytes.

High level soil surrogate calibration for MeOH preservation samples is run on a 7pt curve: 1ppb, 2ppb, 5ppb, 10ppb, 25ppb, 50ppb, and 100ppb. The criteria are the same as initial calibration curve for method 8260.

The initial calibration curve is verified immediately, using a second source standard (ICV). The acceptable limits are 70-130%. Analytes outside of criteria should be considered estimated.

Note: ICV for MA MCP & CT RCP does allow for difficult compounds to exhibit percent recoveries of 40-160%. However, data is still to be qualified.

11.2.2 Continuing Calibration Check (CCC/CCV)

Continuing Calibration Criteria for samples run by Method 8260 D protocols:

At the start of each 12-hour analysis sequence, before any samples are analyzed, a 10ppb calibration check standard is analyzed to check the calibration curve. The percent difference or percent drift must be ±20%. Exceedances are noted in a case narrative.

Additional Continuing Calibration Criteria for samples run by MA MCP protocols:

At the start of each 12-hour analysis sequence, before any samples are analyzed, a 10ppb calibration check standard is analyzed to check the calibration curve. The percent difference or percent drift must be ≤20%. **"Difficult" analytes must exhibit %D of ≤60%.** Exceedances are noted in a case narrative.

A minimum response factor for compounds in TABLE 4.0, must be demonstrated for the calibration level. Compounds not meeting criteria should be considered estimated.

Additional Continuing Calibration Criteria for samples run by CT RCP protocols:

A minimum response factor for compounds in TABLE 4.0, must be demonstrated for the calibration level. Compounds not meeting criteria should be considered estimated.

For all 8260 methods:

If the minimum RRF or percent difference/drift criteria are not met for any target analyte based on the data quality objectives for the samples, then the analytical system should

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

be evaluated for problems and corrective action taken as appropriate (change septa, compressed gas cylinders, syringes, column fittings, etc.; clean the MS source, changing an injector port or filament, cleaning the inlet, etc.). If corrective action that may affect instrument response is taken, then the calibration verification standard must be rerun before samples are analyzed. If the corrective actions do not resolve the problem(s) with the calibration verification standard, then a new initial calibration must be performed.

Any non-conformance associated with initial or continuing calibration that affects the usability of the data or otherwise as specified in an associated QAPP or the data quality objectives must be narrated and the data qualified.

Internal Standard (IS) retention times must be evaluated in the calibration check standard. The IS retention times should be within + 30 seconds of the retention times from the midpoint standard of the initial calibration. If the retention times shift more than 30 seconds, the system is inspected for malfunctions and corrections made as required. When corrections are made, a new calibration check standard is run.

IS areas must be evaluated in the calibration check standard. If the IS areas change by more than a factor of two (-50% to +100%) from the areas in the midpoint standard of the most recently analyzed initial calibration, then the system is inspected for malfunctions and corrections made as required. When corrections are made, a new calibration check standard is run.

If corrective action requires major instrument maintenance, then performing a new initial calibration is automatically required.

If two calibration check standards are run in succession, one immediately following the other, and neither is deemed to have been a bad injection, then the one closest in injection time to the associated sample analyses, or both standards, must be evaluated for and pass method performance criteria for sample analyses to continue. In addition, the two calibration check standards are documented by the analyst for evaluation of reproducibility.

11.3 Method Performance

11.3.1 Method Validation

Refer to corporate SOP ENV-SOP-CORQ-0011 for general requirements and procedures for method validation.

Establish detection limits (DL) and limits of quantitation (LOQ) at initial method set up and verify the DL and LOQ on an on-going basis thereafter. Refer to corporate policy and/or SOP for DL and LOQ requirements and procedures.

11.3.2 Method Detection Limit Studies (MDLs)

Initial MDLs are conducted when new methodology is being implemented. After an initial MDL is performed, on-going verifications are performed quarterly. Procedure is performed in accordance with 40CFR Part 136 Appendix B Rev2. Refer to ENV-MAN-ELON-0001 *Quality Assurance Manual* and ENV-SOP-ELON-0132 *LOQ_LOD_MDL Determination*.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

12.0 DATA REVIEW & CORRECTIVE ACTION

12.1 Data Review

The data review process of Pace® Analytical Services includes a series of checks performed at different stages of the process by different people to ensure that SOPs were followed, the analytical record is complete, and properly documented, QC criteria were met, proper corrective actions were taken for QC failure and other nonconformance(s), and test results are reported with proper qualification, when necessary.

The review and checks that are performed by the employee performing the task is called primary review.

All data and test results are also peer reviewed.

This process, known as secondary review is performed to verify SOPs were followed, that calibration, instrument performance, and QC criteria were met and/or proper corrective actions were taken, qualitative ID and quantitative measurement is accurate, all manual integrations are justified and documented, and approved in accordance with the Pace® Analytical Services SOP for manual integration, calculations are correct, the analytical record is complete and traceable, and that results are properly qualified.

Lastly, a third-level review, called a completeness check, is performed by reporting or project management staff to verify the test report is complete.

Refer to laboratory SOP ENV-SOP-ELON-0035 *Data Review* for specific instructions and requirements for each step of the data review process.

12.2 Corrective Action

Corrective action is required when QC or sample results are not within acceptance criteria.

Refer to Appendix B for a complete summary of QC, acceptance criteria, and recommended corrective actions for QC associated with this test method.

If corrective action is not taken or was not successful, the decision/outcome must be documented in the analytical record. The primary analyst has primary responsibility for taking corrective action when QA/QC criteria are not met. Secondary data reviewers must verify that appropriate action was taken and/or that results reported with QC failure are properly qualified.

Corrective action is also required when carryover is suspected and when results are over range.

Samples analyzed after a high concentration sample must be checked for carryover and reanalyzed if carryover is suspected. Carryover is usually indicated by low concentration detects of the analyte in successive samples analyzed after the high concentration sample.

Sample results at concentrations above the upper limit of quantitation must be diluted and reanalyzed. The result in the diluted samples should be within the upper half of the calibration

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

range. Results less than the mid-range of the calibration indicate the sample was over diluted and analysis should be repeated with a lower level of dilution. If dilution is not performed, any result reported above the upper range is considered a qualitative measurement and must be qualified as an estimated value.

13.0 POLLUTION PREVENTION & WASTE MANAGEMENT

Pace® proactively seeks ways to minimize waste generated during work processes. Some examples of pollution prevention include but are not limited to reduced solvent extraction, solvent capture, use of reusable cycletainers for solvent management, and real-time purchasing.

The EPA requires that laboratory waste management practices comply with all applicable federal and state laws and regulations. Excess reagents, samples, and method process wastes are characterized and disposed of in an acceptable manner in accordance with the Pace® Chemical Hygiene Plan / Safety Manual. Refer to this manual for these procedures.

14.0 MODIFICATIONS

The procedures in this SOP have not been modified from the reference test method(s) cited.

When applicable, comparability and/or equivalency studies necessary to validate the modification as required per corporate SOP ENV-SOP-CORQ-0011 are retained by local quality personnel for historical reference.

15.0 RESPONSIBILITIES

- All employees of Pace® Analytical Services that perform any part this procedure in their work activities must have a signed Read and Acknowledgement Statement (R&A) in their training file for the version(s) of the SOP that were in effect during the time the employee performed the activity.
- Local quality personnel are responsible for tracking the currency of the R&A on this SOP for employees at the locations they are assigned to and for notifying the General Manager (GM), however named, when R&A are overdue or outstanding. The GM and the employee's direct supervisor are responsible for ensuring the employee completes the R&A assignments as required.
- The supervisors and managers of Pace® Analytical Services, however named, are responsible for training employees on the procedures in this SOP, implementing the SOP in the work area, and monitoring on-going adherence to the SOP the work area(s) they oversee.
- All employees of Pace® Analytical Services are responsible for following the procedures in this SOP. Unauthorized deviations or departures from this SOP are not allowed except with documented approval from the local Quality Manager and only when those deviations do not violate the Pace® Code of Ethics or Professional Conduct (COR-POL-0004) or associated policy and procedure(s). Hand-edits or manual change to the SOP are not permitted. If a change is desired or necessary, Pace® employees must follow the procedures for document revision specified in corporate SOPs ENV-SOP-CORQ-0015 *Document Management* and ENV-SOP-CORQ-0016 *SOP for Creation of SOP and SWI*.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

- Local quality personnel are responsible for monitoring conformity to this SOP during routine internal audits of work areas that utilize this SOP and for communicating gaps and deviations found during monitoring to the work area supervisor, who is responsible for correction of the situation.

16.0 ATTACHMENTS

- Appendix A: Routine Analyte List and LOQ
- Appendix B: QC Summary & Corrective Action Table

17.0 REFERENCES

- ENV-SOP-CORQ-0006, *Manual Integration*, current version.
- ENV-SOP-CORQ-0011, *Method Validation*, current version.
- ENV-SOP-CORQ-0015, *Document Management*, current version.
- ENV-SOP-CORQ-0016, *SOP for SOP and SWI,* current version.
- COR-POL-0004, *Code of Ethics and Professional Conduct*, current version.
- COR-MAN-001, *Pace® Safety Manua*l, current version.
- ENV-MAN-ELON-0001, *Quality Assurance Manual*, current version.
- EPA, Test Methods for Evaluation of Solid Waste, Physical/Chemical Methods, SW-846, Rev.4, June 2018, Method 8260D.
- MA DEP, MCP Data Enhancement Program, “Quality Control Requirements and

  Performance Standards for the Analysis of Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) in support of Response Actions under the Massachusetts contingency Plan (MCP)”, Rev.2, November 2021.
- CT DEP. Recommended Reasonable Confidence Protocol. Quality Assurance and Quality Control Requirements. VOC Method 8260, SW-846, Ver. 4.0, May 2024.
- EPA, Test Methods for Evaluation of Solid Waste, Physical/Chemical Methods, SW-846, Rev 1, July 2002, Method 5035A.
- EPA, Test Methods for Evaluation of Solid Waste, Physical/Chemical Methods, SW-846, Rev. 3 May 2003, Method 5030C.
- EPA, Test Methods 8000D, Determinative Chromatographic Separations, Rev. 5, March 2018.
- HP 5890 Gas Chromatograph Operating Manual, Edition 5, October 1991.
- HP 5970 Gas Chromatograph Operating Manual, 1991
- Encon Purge & Trap Operating Manual, EST Analytical, 2002
- Archon Purge & Trap Autosampler System Operating Manual, Varian, 2000, p/n 03-914642

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

18.0 REVISION HISTORY

Revisions Made from Prior Version

Section	Description of Change
7.1	Replaced 4-place balance with 2-place balance.
8.2.5+9.3	Addition of VOA 7 and deletion of VOA 1.
11.1	Table updated for LCSD frequency to 1 per batch of 20 samples or less.
11.1.3	Added MCP MB criteria of ≤1/2 RL.
11.1.4	Added Difficult compound criteria of 40-160% and added LCSD RPD criteria.
11.2.1	Added CT RCP r limit of ≥0.99.
App. B	Added ICV difficult limits, updated CCV frequency, and added LCSD.

Document Succession: This version replaces the following documents:

Document Number & Version	Document Title	Effective Date:
ENV-SOP-ELON-0025 v04	EPA 8260	02/21/2024

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix A: Target Analyte List and LOQ

Analyte	CAS #	LOQ[1] Aqueous (ug/L)	LOQ[1] Soils and P/S (mg/kg)
1,1,1,2 TETRACHLOROETHANE	630-20-6	1.0	0.002
1,1,1 TRICHLOROETHANE	71-55-6	1.0	0.002
1,1,2,2 TETRACHLOROETHANE	79-34-5	0.5	0.001
1,1,2 TRICHLOROETHANE	79-00-5	1.0	0.002
1,1,2TRICHLORO-1,2,2 TRIFLUOROETHANE "NR"	76-13-1	1.0	0.01
1,1 DICHLOROETHANE	75-34-3	1.0	0.002
1,1 DICHLOROETHENE	75-35-4	1.0	0.004
1,1 DICHLOROPROPENE	563-58-6	2.0	0.002
1,2,3 TRICHLOROBENZENE	87-61-6	5.0	0.002
1,2,3 TRICHLOROPROPANE	96-18-4	2.0	0.002
1,2,4 TRICHLOROBENZENE	120-82-1	1.0	0.002
1,2,4 TRIMETHYLBENZENE	95-63-6	1.0	0.002
1,2 DIBROMO-3-CHLOROPROPANE	96-12-8	5.0	0.002
1,2 DIBROMOETHANE	106-93-4	0.5	0.001
1,2-DICHLOROBENZENE	95-50-1	1.0	0.002
1,2 DICHLOROETHANE	107-06-2	1.0	0.002
1,2 DICHLOROETHENE (TRANS)	156-60-5	1.0	0.002
1,2 DICHLOROPROPANE	78-87-5	1.0	0.002
1,3,5-TRICHLOROBENZENE	108-70-3	1.0	0.002
1,3,5 TRIMETHYLBENZENE	108-67-8	1.0	0.002
1,3-DICHLOROBENZENE	541-73-1	1.0	0.002
1,3 DICHLOROPROPANE	142-28-9	0.5	0.001
1,4-DICHLORO-2-BUTENE(trans) "NR"	110-57-6	2.0	0.004
1,4-DICHLORO-2-BUTENE(cis) “NR”	1476-11-5	1.0	0.002
1,4-DICHLOROBENZENE	106-46-7	1.0	0.002
1,4-DIOXANE	123-91-1	50.0	0.1
2,2 DICHLORPROPANE	594-20-7	1.0	0.002
2 BUTANONE (METHYL ETHYL KETONE, MEK)	78-93-3	20.0	0.04
2 CHLOROTOLUENE	95-49-8	1.0	0.002
2 HEXANONE	591-78-6	10.0	0.02
4 CHLOROTOLUENE	106-43-4	1.0	0.002
ACETONE	67-64-1	10.0	0.1
ACRYLONITRILE "NR"	107-13-1	5.0	0.006
BENZENE	71-43-2	1.0	0.002
BROMOBENZENE	108-86-1	1.0	0.002
BROMOCHLOROMETHANE	74-97-5	1.0	0.002
BROMODICHLOROMETHANE	75-27-4	0.5	0.002
BROMOFORM	75-25-2	1.0	0.002
BROMOMETHANE	74-83-9	2.0	0.01
N-BUTYL BENZENE	104-51-8	1.0	0.002
CARBON DISULFIDE	75-15-0	5.0	0.01
CARBON TETRACHLORIDE	56-23-5	5.0	0.002

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

CHLOROBENZENE	108-90-7	1.0	0.002
CHLOROETHANE	75-00-3	2.0	0.02
CHLOROFORM	67-66-3	2.0	0.004
CHLOROMETHANE	74-87-3	2.0	0.01
CIS-1,2-DICHLOROETHENE	156-59-2	1.0	0.002
CYCLOHEXANE	110-82-7	5.0	0.01
CIS 1,3 DICHLOROPROPENE	10061-01-5	0.5	0.001
DIBROMOCHLOROMETHANE	124-48-1	0.5	0.001
DIBROMOMETHANE	74-95-3	1.0	0.002
DICHLORODIFLOUROMETHANE	75-71-8	2.0	0.02
DIETHYL ETHER	60-29-7	2.0	0.02
DIFLUOROCHLOROMETHANE	75-45-6	1.0	0.002
DIISOPROPYL ETHER	108-20-3	0.5	0.001
ETHYL ACETATE	141-78-6	10.0	0.01
ETHYLBENZENE	100-41-4	1.0	0.002
ETHYL TERT-BUTYL ETHER	637-92-3	0.5	0.001
FLUORODICHLOROMETHANE	75-43-4	1.0	0.002
HEXACHLOROBUTADIENE	87-68-3	0.6	0.002
IODOMETHANE	74-88-4	20.0	0.04
ISOPROPYLBENZENE	98-82-8	1.0	0.002
METHYLCYCLOHEXANE	108-87-2	1.0	0.002
METHYL ACETATE	79-20-9	1.0	0.002
M/P XYLENES	108383/ 106423	2.0	0.004
METHYL TERT BUTYL ETHER(MTBE)	1634-04-4	1.0	0.004
METHYLENE CHLORIDE	75-09-2	5.0	0.02
METHYL ISOBUTYL KETONE (MIBK)	108-10-1	10.0	0.02
NAPHTHALENE	91-20-3	2.0	0.004
O XYLENE	95-47-6	1.0	0.002
P ISOPROPYLTOLUENE	99-87-6	1.0	0.002
N-PROPYLBENZENE	103-65-1	1.0	0.002
SEC-BUTYLBENZENE	135-98-8	1.0	0.002
STYRENE	100-42-5	1.0	0.002
TERT-AMYL METHYL ETHER	994-05-8	0.5	0.001
TERT-BUTYL ALCOHOL "NR"	75-65-0	20.0	0.1
TERT-BUTYLBENZENE	98-06-6	1.0	0.002
TETRAHYDROFURAN	109-99-9	10.0	0.01
TETRACHLOROETHENE	127-18-4	1.0	0.002
TOLUENE	108-88-3	1.0	0.002
TRANS 1,3 DICHLOROPROPENE	10061-02-6	0.5	0.001
TRICHLOROFLUOROMETHANE	75-69-4	2.0	0.01
TRICHLOROETHENE	79-01-6	1.0	0.002
VINYL ACETATE	108-05-4	20.0	0.05
VINYL CHLORIDE	75-01-4	2.0	0.01
TERT-AMYL ALCOHOL (TAA)	75-85-4	5.0	0.02
TERT-AMYL ETHYL ETHER (TAEE)	919-94-8	0.5	0.002

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

[1] Values as of effective date of this SOP. LOQ are subject to change, contact quality personnel for most current information.

"NR" = not required for Massachusetts Contingency Plan (MCP)

Appendix B: QC Summary and Corrective Action Table

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
ICAL	At instrument set up, after CCV failures	Must meet one of curve fit options presented in Section 11.2.1. For any curve fit other than Average RF (RSD), curve must also pass RSE test at the low and midpoint calibration standard.	Identify and correct source of problem, repeat	None. Do not proceed with analysis
ICV	After Each ICAL	All analytes must be within ± 30% of the true value. (%R) except difficult compounds within 40-160%.	Identify source of problem, re-analyze. If repeat failure, repeat ICAL. Analysis may proceed if it can be demonstrated that the ICV exceedance has no impact on analytical measurements. For example, the ICV %R is high, CCV is within criteria, and the analyte is not detected in sample(s).	Qualify analytes with ICV out of criteria.
CCV	Every 12 hours prior to sample analysis, after every 20, and at end of analytical window.	Opening CCV: All analytes within ± 20 %D	See Section 11.2.2 for required corrective actions based on circumstance.	Qualify analytes with CCV out of of criteria.
Internal Standards	Every field sample, standard and QC sample	Must meet criteria specified in Section 11.1.2.	Troubleshoot instrument performance. Reanalyze samples.	Qualify outages and explain in case narrative.
Surrogate	Every field sample, standard and QC sample	Must meet criteria specified in Section 11.1.1.	Troubleshoot instrument performance. Reanalyze samples or note if permissible	Qualify outages and explain in case narrative
Method Blank	1 per batch of 20 or less samples	Must meet criteria specified in Section 11.1.3.	Flag any contamination	Qualify outages and explain in case narrative
LCS/LCSD	1 per batch of 20 or less samples	Must meet criteria specified in Section 11.1.4.	Troubleshoot instrument performance. Reanalyze samples or note if permissible	Qualify outages and explain in case narrative
MS/MSD	1 per batch of 20 or less samples	Must meet criteria specified in Section 11.1.5 and 11.1.6.	If LCS is acceptable, narrate nonconformance	Qualify outages and explain in case narrative
Trip Blank	Client Request	<RL	Flag any contamination	Qualify outages and explain in case narrative

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Inductively Coupled Plasma - Atomic Emission Spectrometry

Reference Method No.: **Method 6010D** SW-846, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, EPA SW-846, Update V, July, 2014.

SM 2340B, Hardness by Calculation, Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WPCF, 21st Edition, 1997.

1. Scope and Application

Matrices: Digestates from all matrices.

Definitions: See Alpha Laboratories Quality Manual Appendix A

Inductively coupled plasma-atomic emission spectrometry (ICP-AES) determines trace elements, including metals, in solution. The method is applicable to all of the elements listed in Table 1. All matrices, excluding filtered groundwater samples but including ground water, aqueous samples, TCLP and EP extracts, industrial and organic wastes, soils, sludge, sediments, and other solid wastes, require digestion prior to analysis. Groundwater samples that have been prefiltered and acidified will not need acid digestion unless chemical interferences are suspected. Samples which are not digested are matrix matched with the standards. Refer to Metals Preparation SOPs for the appropriate digestion procedures.

Table 1 lists the elements for which this method is applicable. Detection limits, sensitivity, and the optimum and linear concentration ranges of the elements can vary with the wavelength, spectrometer, matrix and operating conditions. Table 1 lists the recommended analytical wavelengths for the elements in clean aqueous matrices. Table 3 lists the Reported Detection Limits. The reported detection limit data may be used to estimate instrument and method performance for other sample matrices. Elements other than those listed in Table 1 may be analyzed by this method if performance at the concentration levels of interest (see Section 9) is demonstrated.

Users of the method should state the data quality objectives prior to analysis and must document and have on file the required initial demonstration performance data described in the following sections prior to using the method for analysis.

The data report packages present the documentation of any method modification related to the samples tested. Depending upon the nature of the modification and the extent of intended use, the laboratory may be required to demonstrate that the modifications will produce equivalent results for the matrix. Approval of all method modifications is made by one of the following laboratory personnel before performing the modification: Area Supervisor, Metals Manager, Laboratory Services Manager, Laboratory Director, or Quality Assurance Officer.

Use of this method is restricted to spectroscopists who are knowledgeable in the correction of spectral, chemical, and physical interferences described in this method. Each analyst must demonstrate the ability to generate acceptable results with this method by performing an initial demonstration of capability.

.

2. Summary of Method

Prior to analysis, samples must be solubilized or digested using appropriate Sample Preparation Methods. When analyzing groundwater samples for dissolved constituents, acid digestion is not necessary if the samples are filtered and acid preserved prior to analysis.

This method describes multielemental determinations by ICP-AES using sequential or simultaneous optical systems and axial or radial viewing of the plasma. The instrument measures characteristic emission spectra by optical spectrometry. Samples are nebulized and the resulting aerosol is transported to the plasma torch. Element-specific emission spectra are produced by a radio-frequency inductively coupled plasma. The spectra are dispersed by a grating spectrometer, and the intensities of the emission lines are monitored by photosensitive devices. Background correction is required for trace element determination. Background must be measured adjacent to analyte lines on samples during analysis. The position selected for the background-intensity measurement, on either or both sides of the analytical line, will be determined by the complexity of the spectrum adjacent to the analyte line. In one mode of analysis the position used must be as free as possible from spectral interference and must reflect the same change in background intensity as occurs at the analyte wavelength measured. Background correction is not required in cases of line broadening where a background correction measurement would actually degrade the analytical result. The possibility of additional interferences named in Section 4.0 must also be recognized and appropriate corrections made; tests for their presence are described in Section 9.7. Alternatively, users may choose multivariate calibration methods. In this case, point selections for background correction are superfluous since whole spectral regions are processed.

This SOP includes the manual calculations for Total Hardness and Calcium Hardness, according to SM 2340B.

2.1 Method Modifications from Reference

None.

3. Reporting Limits

Refer to Table 3 for method Reporting Limits.

4. Interferences

4.1 Spectral

Spectral interferences are caused by background emission from continuous or recombination phenomena, stray light from the line emission of high concentration elements, overlap of a spectral line from another element, or unresolved overlap of molecular band spectra.

4.1.1 Background emission and stray light can usually be compensated for by subtracting the background emission determined by measurements adjacent to the analyte wavelength peak. Spectral scans of samples or single element solutions in the analyte regions may indicate when alternate wavelengths are desirable because of severe spectral interference. These scans will also show whether the most appropriate estimate of the background emission is provided by an interpolation from measurements on both sides of the wavelength peak or by measured emission on only one side. The locations selected for the measurement of background intensity will be determined by the complexity of the spectrum adjacent to the wavelength peak. The locations used for

routine measurement must be free of off-line spectral interference (interelement or molecular) or adequately corrected to reflect the same change in background intensity as occurs at the wavelength peak. For multivariate methods using whole spectral regions, background scans must be included in the correction algorithm. Off-line spectral interferences are handled by including spectra on interfering species in the algorithm.

4.1.2 To determine the appropriate location for off-line background correction, the user must scan the area on either side adjacent to the wavelength and record the apparent emission intensity from all other method analytes. This spectral information must be documented and kept on file. The location selected for background correction must be either free of off-line interelement spectral interference or a computer routine must be used for automatic correction on all determinations. If a wavelength other than the recommended wavelength is used, the analyst must determine and document both the overlapping and nearby spectral interference effects from all method analytes and common elements and provide for their automatic correction on all analyses. Tests to determine spectral interference must be done using analyte concentrations that will adequately describe the interference. Normally, 100 mg/L single element solutions are sufficient; however, for analytes such as iron that may be found at high concentration, a more appropriate test would be to use a concentration near the upper analytical range limit.

4.1.3 Spectral overlaps may be avoided by using an alternate wavelength or can be compensated by equations that correct for interelement contributions. Instruments that use equations for interelement correction require the interfering elements be analyzed at the same time as the element of interest. When operative and uncorrected, interferences will produce false positive determinations and be reported as analyte concentrations. More extensive information on interferant effects at various wavelengths and resolutions is available in reference wavelength tables and books. Users may apply interelement correction equations determined on their instruments with tested concentration ranges to compensate (off line or on line) for the effects of interfering elements. For multivariate methods using whole spectral regions, spectral interferences are handled by including spectra of the interfering elements in the algorithm. The interferences listed are only those that occur between method analytes. Only interferences of a direct overlap nature are listed. These overlaps were observed with a single instrument having a working resolution of 0.035 nm.

4.1.4 When using inter-element correction equations, the interference may be expressed as analyte concentration equivalents (i.e. false analyte concentrations) arising from 100 mg/L of the interference element. For example, assume that As is to be determined (at 193.696 nm) in a sample containing approximately 10 mg/L of Al. 100 mg/L of Al would yield a false signal for As equivalent to approximately 1.3 mg/L. Therefore, the presence of 10 mg/L of Al would result in a false signal for As equivalent to approximately 0.13 mg/L. The user is cautioned that each instrument may exhibit somewhat different levels of interference. The interference effects must be evaluated for each individual instrument since the intensities will vary.

Major known interferences are Fe, Al, Ca, Mg, V, Ni, Cu, and Cr. To minimize any of these interferences, every analyte is analyzed on each instrument at or near its linear range and corrected for these interferences. This is done on an annual basis, and data is kept on file.

4.1.5 Inter-element corrections will vary for the same emission line among instruments because of differences in resolution, as determined by the grating, the entrance and exit slit widths, and by the order of dispersion. Inter-element corrections will also vary depending upon the choice of background correction points. Selecting a background correction point where an interfering emission line may appear must be avoided when practical. Inter-element corrections that constitute a major portion of an emission signal may not yield accurate data. Users must not forget that some samples may contain uncommon elements that could contribute spectral interferences.

4.1.6 The interference effects must be evaluated for each individual instrument whether configured as a sequential or simultaneous instrument. For each instrument, intensities will vary not only with optical resolution but also with operating conditions (such as power, viewing height and argon flow rate). When using the recommended wavelengths, the analyst is required to determine and document for each wavelength the effect from referenced interferences as well as any other suspected interferences that may be specific to the instrument or matrix. The analyst is encouraged to utilize a computer routine for automatic correction on all analyses.

4.1.7 The primary wavelength for each analyte is based upon the instrument manufacturer's recommendations. An alternate wavelength is chosen if there is an indication of elevated background or overlap of another spectral wavelength. The wavelength for each analyte must be as free from interferences as possible.

4.1.8 If the correction routine is operating properly, the determined apparent analyte(s) concentration from analysis of each interference solution must fall within a specific concentration range around the calibration blank. The concentration range is calculated by multiplying the concentration of the interfering element by the value of the correction factor being tested and divided by 10. If after the subtraction of the calibration blank the apparent analyte concentration falls outside of this range in either a positive or negative direction, a change in the correction factor of more than 10% should be suspected. The cause of the change must be determined and corrected and the correction factor updated. The interference check solutions must be analyzed more than once to confirm a change has occurred. Adequate rinse time between solutions and before analysis of the calibration blank will assist in the confirmation.

4.1.9 When inter-element corrections are applied, their accuracy must be verified, daily, by analyzing the spectral interference check solution. The correction factor or multivariate correction matrices tested on a daily basis. All inter-element spectral correction factors or multivariate correction matrices are verified and updated when an instrumentation change, such as in the torch, nebulizer, injector, or plasma conditions occurs. The standard solution must be inspected to ensure that there is no contamination that may be perceived as a spectral interference.

4.1.10 When inter-element corrections are <u>not</u> used, verification of absence of interferences is required.

4.1.10.1 One method is to use a computer software routine for comparing the determinative data to limits, files for notifying the analyst when an interfering element is detected in the sample at a concentration that will produce either an apparent false positive concentration, (i.e., greater than) the analyte

instrument detection limit, or false negative analyte concentration, (i.e., less than the lower control limit of the calibration blank defined for a 99% confidence interval).

4.1.10.2 Another method is to analyze an Interference Check Solution(s) which contains similar concentrations of the major components of the samples (>10 mg/L) on a continuing basis to verify the absence of effects at the wavelengths selected. These data must be kept on file with the sample analysis data. If the check solution confirms an operative interference that is >20% of the analyte concentration, the analyte must be determined using (1) analytical and background correction wavelengths (or spectral regions) free of the interference, (2) by an alternative wavelength, or (3) by another documented test procedure.

4.2 Physical

Physical interferences are effects associated with the sample nebulization and transport processes. Changes in viscosity and surface tension can cause significant inaccuracies, especially in samples containing high dissolved solids or high acid concentrations. If physical interferences are present, they must be reduced by diluting the sample, using a peristaltic pump, use of an internal standard or by using a high solids nebulizer. Another problem that can occur with high dissolved solids is salt buildup at the tip of the nebulizer, affecting aerosol flow rate and causing instrumental drift. The problem can be controlled by wetting the argon prior to nebulization, using a tip washer, using a high solids nebulizer or diluting the sample. Also, it has been reported that better control of the argon flow rate, especially to the nebulizer, improves instrument performance: this may be accomplished with the use of mass flow controllers. The test described in Section 10.3.4.1 will help determine if a physical interference is present.

4.3 Chemical

Chemical interferences include molecular compound formation, ionization effects, and solute vaporization effects. Normally, these effects are not significant with the ICP technique, but if observed, can be minimized by careful selection of operating conditions (incident power, observation position, and so forth), by buffering of the sample, by matrix matching, and by standard addition procedures. Additionally, if filtered samples are found to have an organic or sulfur like odor they are processed by heating after the addition of the acids to matrix match. Chemical interferences are highly dependent on matrix type and the specific analyte element.

4.4 Memory

Memory interferences result when analytes in a previous sample contribute to the signals measured in a new sample. Memory effects can result from sample deposition on the uptake tubing to the nebulizer and from the build-up of sample material in the plasma torch and spray chamber. The site where these effects occur is dependent on the element and can be minimized by flushing the system with a rinse blank between samples. The possibility of memory interferences must be recognized within an analytical run and suitable rinse times must be used to reduce them. The rinse times necessary for a particular element must be estimated prior to analysis. This may be achieved by aspirating a standard containing elements at a concentration ten times the usual amount or at the top of the linear dynamic range. The aspiration time for this sample must be the same as a normal sample analysis period, followed by analysis of the rinse blank at designated intervals. The length of time required to reduce analyte signals to within a factor of two of the method detection limit must be noted. Until the required rinse time is established, this method suggests a rinse period of at least 60 seconds between samples and standards. If memory interference is suspected, the sample must be reanalyzed after a rinse period of sufficient length. Alternate rinse times may be established by the analyst based upon their DQOs.

4.5 Other Interferences

4.5.1 Users are advised that high salt concentrations can cause analyte signal suppressions and confuse interference tests. If the instrument does not display negative values, fortify the interference check solution with the elements of interest at 0.5 to 1 mg/L and measure the added standard concentration accordingly. Concentrations must be within 20% of the true spiked concentration or dilution of the samples will be necessary. In the absence of measurable analyte, overcorrection could go undetected if a negative value is reported as zero.

5. Health and Safety

The toxicity or carcinogenicity of each reagent and standard used in this method is not fully established; however, each chemical compound must be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. A reference file of material data handling sheets is available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available in the Chemical Hygiene Plan.

All personnel handling environmental samples known to contain or to have been in contact with municipal waste must follow safety practices for handling known disease causative agents.

6. Sample Collection, Preservation, Shipping and Handling

6.1 Sample Collection

Samples are collected in plastic bottles.

6.2 Sample Preservation

If samples are for soluble metals analysis, filtration must take place prior to preservation with 1:1 HNO3 to a pH < 2. Soluble samples must be held at pH < 2 for at least 24 hours prior to digestion if not preserved at the time of filtration. Samples for total metals analysis are preserved with 1:1 HNO3 to a pH < 2. Samples must be pH <2 for at least 24 hours prior to digestion if not preserved at the time of collection.

6.3 Sample Shipping

No special shipping requirements.

6.4 Sample Handling

Samples to be analyzed for soluble metals, that have not been filtered, must be filtered and preserved within 24 hours of sample collection.

Preserved samples have a hold time of 6 months, and are stored at ambient temperature.

7. Equipment and Supplies

7.1 Inductively coupled argon plasma emission spectrometer:

- **Thermo Scientific ICAP Duo 6500 (Trace7)**

7.1.1 Computer-controlled emission spectrometer with background correction.

7.1.2 Radio-frequency generator compliant with FCC regulations.

7.1.3 Optional mass flow controller for argon nebulizer gas supply.

7.1.4 Optional peristaltic pump.

7.1.5 Optional Autosampler.

7.1.6 Argon gas supply - high purity.

7.2 Volumetric flasks of suitable precision and accuracy.

7.3 Volumetric pipets of suitable precision and accuracy.

8. Standards and Reagents

Reagent semiconductor and/or trace grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination. If the purity of a reagent is in question, analyze for contamination. If the concentration of the contamination is less than the MDL then the reagent is acceptable.

8.1 Hydrochloric acid (conc), HCl. Stored at room temperature in acid resistant cabinet. Expiration date if defined by vendor.

8.2 Hydrochloric acid (1:1), HCl. Add 500 mL concentrated HCl to 400 mL DI water and dilute to 1 liter in an appropriately sized beaker. Stored at room temperature in polypropylene bottle, expiration date if defined by vendor..

8.3 Nitric acid (conc), HNO_3. Stored at room temperature in acid resistant cabinet. Expiration date if defined by vendor.

8.4 Nitric acid (1:1), HNO_3. Add 500 mL concentrated HNO_3 to 400 mL DI water and dilute to 1 liter in an appropriately sized beaker. Stored at room temperature in polypropylene bottle, expiration date if defined by vendor..

8.5 Reagent Water. All references to water in the method refer to reagent water unless otherwise specified. Reagent water will be interference free. Refer to Chapter One for a definition of reagent water.

8.6 Standard stock solutions may be purchased or prepared from ultra- high purity grade chemicals or metals (99.99% pure or greater). All stock standards are ordered through ISO and American Association for Lab Accreditation vendors. All standards are in aqueous solutions and are generally at concentrations of 1000ppm and 10,000ppm.

8.7 Mixed calibration standard solutions

Prepare mixed calibration standard solutions by combining appropriate volumes of the stock solutions in volumetric flasks. Add the appropriate types and volumes of acids so that the standards are matrix matched with the sample digestates. Care must be taken when preparing the mixed standards to ensure that the elements are compatible and stable together. Transfer the mixed standard solutions to HDPE or polypropylene bottles for storage. Fresh

mixed standards must be prepared, as needed, with the realization that concentration can change on aging as evidenced by failures in the ICV.

NOTE: If the addition of silver to the recommended acid combination results in an initial precipitation, add 15 mL of water and warm the flask until the solution clears. Cool and dilute to 100 mL with water. For this acid combination, the silver concentration must be limited to 2 mg/L. Silver under these conditions is stable in a tap-water matrix for 30 days. Higher concentrations of silver require additional HCl.
Additionally, sulfur standards are stand-alone single element standards and therefore are not to be combined in a mixed calibration standard solution.

8.8 Blanks

Three types of blanks are required for the analysis for samples. The calibration blank is used in establishing the analytical curve, and the method blank is used to identify possible contamination resulting from varying amounts of the acids used in the sample processing. The rinse blank is used to flush the system between all samples and standards.

8.8.1 The calibration blank is prepared by acidifying reagent water to the same concentrations of the acids found in the standards. Prepare a sufficient quantity to flush the system between standards and samples. The calibration blank will also be used for all initial (ICB) and continuing calibration blank (CCB) determinations (see Sections 10.2 and 10.4). Refer to Section 10.4.1.2 for acceptance criteria and/or corrective actions.

8.8.2 The method blank must contain all of the reagents in the same volumes as used in the processing of the samples. The method blank must be carried through the complete procedure and contain the same acid concentration in the final solution as the sample solution used for analysis. Refer to Section 9.1 for acceptance criteria and/or corrective actions.

8.8.3 The rinse blank consists of HNO_3 (1% or 2%) (v/v) in reagent water. Prepare a sufficient quantity to flush the system between standards and samples.

8.9 The Initial Calibration Verification Standard (ICV) and the Continuing Calibration Verification Standard (CCV)

These ICV is prepared by the analyst by combining compatible elements from a standard source different than that of the calibration standard at a concentration at or near the mid-point of the calibration curve. The CCV is prepared from the same source as the calibration standards and must be at a concentration near the mid-point of the calibration curve.

8.10 Low Level of Quantification, (LLOQ)

The LLOQ is initially verified by the analysis of at least 7 replicate samples, spiked at the LLOQ and processed through all preparation and analysis steps of the method at or below the lowest calibration point. The mean recovery and relative standard deviation of these samples provide an initial statement of precision and accuracy at the LLOQ. In most cases the mean recovery should be +/- 35% of the true value and RSD should be < 20%. In-house limits may be calculated when sufficient data points exist. Monitoring recovery of LLOQ over time is useful for assessing precision and bias.

Ongoing LLOQ verification, at a minimum, is on a quarterly basis to validate quantitation capability at low analyte concentration levels. This verification may be accomplished either with clean control material (e.g., reagent water, method blanks. Optimally, the LLOQ should be less than the desired regulatory action levels based on the stated project-specific requirements.

8.11 Spectral Interference Check Solution

These solutions are prepared to contain known concentrations of interfering elements that will provide an adequate test of the correction factors. Analysts are advised that high salt concentrations can cause analyte signal suppressions and confuse interference tests.

Single element interference checks - At a minimum, single element SIC checks must be performed for the following elements: Aluminum 500mg/L; Boron 50mg/L, Barium, 50mg/L, Calcium 500mg/L; Copper 50mg/L; Iron 200mg/L; Magnesium 500mg/L; Manganese 50mg/L; Molybdenum 20mg/L; Sodium 1000mg/L; Nickel 20mg/L; Selenium 20mg/L; Silicon 200mg/L; Tin 20mg/L; Vanadium 20mg/L; Zinc 20mg/L The absolute value of the concentration observed for any unspiked analyte in the single element SIC checks must be less than two times the analytes' LLOQ.

The concentration of the SIC checks are suggested, but become the highest concentration allowed in a sample analysis, and cannot be higher than the highest established linear range. Samples with concentrations of elements higher than the SIC check must be diluted until the concentration is less than the SIC check solution. Note that reanalysis of a diluted sample is required even if the high concentration element is not required to be reported for the specific sample, since the function of the SIC check is to evaluate spectral interferences on other elements. The single element SIC checks are performed when the instrument is setup and periodically (at least once every 6 months) thereafter.

Mixed element interference check - The mixed element SIC solution is analyzed at least once per day, immediately after the initial calibration. The concentration measured for any target analytes must be less than +/- the LLOQ. If this criterion is not met then sample analysis may not proceed until the problem is corrected, or alternatively the LLOQ may be raised to twice the concentration observed in the SIC solution. The only exceptions are those elements that have been demonstrated to be contaminants in the SIC solutions These may be present up to the concentration documented plus the LLOQ.

Mixed element SIC solution: Aluminum, 500mg/L; Calcium, 500mg/L; Iron, 200mg/L; Magnesium, 500mg/L

8.12 Ongoing Low Level of Quantification, (LLOQ)

Ongoing LLOQ verification, at a minimum, is on a quarterly basis to validate quantitation capability at low analyte concentration levels. This verification may be accomplished either with clean control material (e.g., reagent water, method blanks. Optimally, the LLOQ should be less than the desired regulatory action levels based on the stated project-specific requirements.

8.13 Internal Standard

The internal standard consists of a multi-element solution; each internal standard covers a range of the spectrum (low, middle, or high wavelengths) and the elements within that range.

5.0ug/mL Scandium

3.0ug/mL Yttrium

Note: The standard is used to monitor instrument fluctuations including but not limited to nebulization efficiency, plasma variations, environmental temperature changes, peristaltic pump pulsations, etc. Therefore, the solution used to start an analysis calibration cannot be added to or changed out during analysis without requiring subsequent full recalibration.

9. Quality Control

The laboratory must maintain records to document the quality of data that is generated. Ongoing data quality checks are compared with established performance criteria to determine if the results of analyses meet the performance characteristics of the method.

9.1 Blank(s)

Employ a minimum of one method blank per sample batch to determine if contamination or any memory effects are occurring. A method blank is a volume of reagent water carried through the same preparation process as a sample.

The method blank results must be less than ½ of the LLOQ for all analytes of concern. If the results of the method blank exceed the RDL for any analyte, perform re-analysis of a new aliquot of the method blank.

If the results continue to exceed the RDL, proceed as follows:

If all of the samples for the analyte are non-detected, and the method blank is at or above the RDL, no action is required.

If one or more associated samples for that analyte have positive results at or above the RDL, those samples must be considered to be out of control, and are re-digested and reanalyzed.

9.2 Laboratory Control Sample (LCS)

Analyze one LCSW/SRM per sample batch. A LCS/SRM sample is a spiked volume of reagent water that is brought through the entire preparation and analytical process. The LCSW must have a % Recovery of ± 20% within the actual value or within vendor control limits (95% confidence limits) for the solid SRM.

If the LCSW or SRM % Recovery is outside the acceptable limits as stated in Table 2, or outside any vendor control limits, the LCS is rerun once. If upon reanalysis the LCS is still out of control, the failed analytes are re-prepped and re-analyzed. Otherwise, a nonconformance report form is raised to document the exact problem and this form is then authorized by the QA/QC Director and/or the Laboratory Manager(s).

9.3 Initial Calibration Verification (ICV)

For all analytes and determinations, the laboratory must analyze an ICV (Section 8.9), and a calibration blank (ICB, Section 8.8.1), immediately following daily calibration. The results of the ICV are to agree within 10% of the expected value; if not, re-analyze once, if still failing terminate the analysis, correct the problem, and recalibrate the instrument.

9.4 Continuing Calibration Verification (CCV)

A calibration blank (CCB, Section 8.8.1) and a calibration verification standard (CCV, Section 8.9) must be analyzed after every tenth sample and at the end of the sample run. Analysis of the calibration verification (CCV) must verify that the instrument is within 10% of the calibration with the relative standard deviation < 5% from replicate (minimum of two) integrations.

Immediate corrective action for a failing CCV/CCB includes reanalyzing the failing standard. If the standard passes the second time then the analysis may be continued. The batch sheet is noted. If the standard fails again, instrument maintenance must be performed and the CCV/CCB standard is reanalyzed. If the standard passes, then all samples run after the last passing CCV/CCB pair must be re-analyzed.

If the standard fails after instrument maintenance, the instrument is recalibrated. A new ICV/ICB is performed, and all previous data after the last passing CCV/CCB is reanalyzed.

9.5 Matrix Spike

Analyze matrix spike samples at a frequency of one per matrix batch. The matrix spike is the same solution as used for the LCS (Table 4). A matrix spike sample is a sample brought through the entire sample preparation and analytical process.

9.5.1 The percent recovery is to be calculated as follows:

$$\% \text{ Recovery} = \frac{MS - S}{C} \times 100$$

where:

MS = Matrix Spike value
S = Sample value.
C = Concentration of the Spiking solution.

9.5.2 If the Matrix Spike falls outside of the limits as stated in Table 2, or outside any historical documentation for analytes of interest a post analytical spike is performed for the failed analytes. The same sample from which the MS/MSD aliquots were prepared should be spiked with a post digestion spike at a minimum level of 10 times and a maximum of 100 times the lower limit of quantitation. The acceptable % Recovery of the post analytical spike is 75-125%%. A nonconformance is noted in the LIMS and approved in secondary peer review and/or by the Metals Manager.

9.5.3 If the Post Spike fails the dilution test should be performed**.** If the analyte concentration is sufficiently high (minimally, a factor of 25 above the lower limit of quantitation after dilution), an analysis of a 1:5 dilution should agree within ± 20% of the original determination. If not, then a chemical or physical interference effect should be suspected.

9.6 Laboratory Duplicate

A duplicate sample is analyzed once per matrix batch. This sample is brought through the entire sample preparation and analytical process.

9.6.1 The relative percent difference between duplicate determinations is to be calculated as follows:

$$RPD = \frac{|D_1 - D_2|}{(|D_1 + D_2|)/2} \times 100$$

where:

RPD = relative percent difference.
D_1 = first sample value.
D_2 = second sample value (replicate).

9.6.2 If the Duplicate falls outside of the limits as stated in Table 2, or outside any historical documentation and the concentrations of the failing analytes are less than 5x the RL or a matrix interference is found a nonconformance is noted in the LIMS and approved in secondary peer review and/or by the Metals Manager.

9.7 Method-specific Quality Control Samples

9.7.1 Spectra Interference Check Standard

A mixed check solution is analyzed once daily (section 8.11). One solution (SIC) has only elevated concentrations of Fe, Al, Ca, Mg to ensure no interferences occur. The concentrations of the analytes of interest must have an absolute value of the LLOQ. This solution is analyzed at the beginning of the first analytical run of the day.

The high level interferences are not evaluated for recovery. If the SIC fails take corrective action which may include re-evaluation of the inter-element correction values (IECs) after running single element SIC. The instrument calibration routine must then be performed and confirmed by the ICV/ICB pair and the SIC re-analyzed before proceeding with analysis. Otherwise, the nonconformance issue is raised to the Department Supervisor and/or the QA Department.

9.7.2 Internal Standard

The internal standards are added prior to the nebulizer and corrects for intensity differences in the instrument response between the standard's and sample's matrix. They are monitored for any variation in response during the sample analyses and used to ratio the sample response to the internal standard response of the calibration blank. The ratio is applied to compensate for instrument conditions in the plasma or nebulization caused by the matrix. The internal standard is monitored for 50-150% recovery or laboratory generated control ranges difference from the calibration blank IS response to ensure the proper functioning of the internal standard introduction system and matrix interferences. If an injection falls outside of this acceptance range the sample or QC check is rerun once to check for an introduction error.

If a sample continues to fail it's to be run on successive increasing dilutions until the internal standards associated with the elements of interest are within range. If a QC check fails on the single rerun the analysis is stopped, the root cause investigated, corrected and the instrument re-calibrated/verified. The analysis begins again with all samples that were run after the last acceptable CCV/CCB pair.

9.7.3 LDR Check Solution: A multiple element or single element solution run at a point above the highest calibration standard under the same calibration used to quantify the associated sample data. The LDR check must be within +/-10% of the true value of each element of interest to be considered valid.

9.8 Method Sequence

- Calibration of instrument
- Initial Calibration Verification Standard
- Initial Calibration Blank
- Mixed SIC Solution
- Continuing Calibration Verification Standard
- Continuing Calibration Blank

- 10 samples
- Continuing Calibration Verification Standard
- Continuing Calibration Blank
- 10 Samples
- Continuing Calibration Verification Standard
- Continuing Calibration Blank

10. Procedure

10.1 Equipment Set-up

10.1.1 Sample Preparation

Preliminary treatment of most matrices is necessary because of the complexity and variability of sample matrices. Groundwater samples which have been prefiltered and acidified will not need acid digestion. Samples which are not digested must be matrix matched with the standards.

NOTE: Sample digestates intended for Silver analysis must be analyzed as soon as possible.

10.1.2 Instrument Set-Up

Set up the instrument with proper operating parameters established as detailed below. The instrument must be allowed to become thermally stable before beginning (usually requiring at least 30 minutes of operation prior to calibration).

Startup Procedures

For iCAP Duo 6500

- Turn on power to the chiller
- Click on ThermoSpec Icon; enter analyst initials in login screen
- Click on Plasma icon to start instrument
- Allow to warm up for 30 minutes
- Enter analytical workgroup number (obtained from LIMS) globally under the Instrument menu by selecting Tools, then Options, then Analyst.
- Click on the Sequence tab and enter the sequence by selecting New Autosampler Table, Add Sequence, Add # of spaces.
- Enter the sample locations and IDs
- Press Run Auto-Session button (►) in menu bar.

10.1.2.1 Specific wavelengths are listed in Table 1. Other wavelengths may be substituted if they can provide the needed sensitivity and are corrected for spectral interference. The instrument and operating conditions utilized for determination must be capable of providing data of acceptable quality to the program and data user.

Operating conditions for axial plasma will vary from 1100 – 1500 watts forward power, 15-19 Liters/min argon coolant flow, 0.5 – 0.7 L/min argon nebulizer flow, 140 – 200 rpm pump rate and a default 1 minute preflush time and 10 second measurement time is recommended for all simultaneous instruments.

10.1.2.2 The plasma operating conditions need to be optimized prior to use of the instrument. This routine is not required on a daily basis, but only when first setting up a new instrument or following a change in operating conditions. The following procedure is recommended or follow manufacturer's recommendations. The purpose of plasma optimization is to provide a maximum signal to background ratio for some of the least sensitive elements in the analytical array. The use of a mass flow controller to regulate the nebulizer gas flow or source optimization software greatly facilitates the procedure.

10.1.2.2.1 The Thermo ICP's typically use a Meinhard Nebulizer. The nebulizer flow for each instrument is 1.0 +/- 0.2 mL/min.

10.1.2.2.2 The 6500 Duo instruments automatically perform a wavelength check at start up without user interaction.

10.1.2.2.3 The instrument operating condition finally selected as being optimum must provide the lowest reliable instrument detection limits and method detection limits.

10.1.2.2.4 If either the instrument operating conditions, such as incident power or nebulizer gas flow rate are changed, or a new torch injector tube with a different orifice internal diameter is installed, the plasma and argon pressures must be reoptimized.

10.1.2.2.5 After completing the initial optimization of operating conditions, but before analyzing samples, the laboratory must establish and initially verify an interelement spectral interference correction routine to be used during sample analysis. A general description concerning spectral interference and the analytical requirements for background correction in particular are discussed in the section on interferences. Criteria for determining an interelement spectral interference is an apparent positive or negative concentration for the analyte that falls within ± ½ LLOQ. The upper control limit is the analyte instrument detection limit. Once established, the entire routine is periodically verified every six months. In between that time, IEC's are done on a need be basis per analyte. Only a portion of the correction routine must be verified more frequently or on a daily basis. Initial and periodic verification of the routine must be kept on file. Special cases where continual verification is required are described elsewhere.

10.1.2.3 Sensitivity, instrumental detection limit, precision, linear dynamic range, and interference effects must be established for each individual analyte line on each particular instrument. All measurements must be within the instrument linear range where the correction equations are valid.

10.1.2.3.1 Method detection limits must be established for all wavelengths utilized for each type of matrix commonly analyzed. The matrix used for the MDL calculation must contain analytes of known concentrations within 3-5 times the anticipated detection limit.

10.1.2.3.2 Determination of limits using reagent water MDLs represent a best case situation and do not represent possible matrix effects of real world samples.

10.1.2.3.3 If additional confirmation is desired, reanalyze the seven replicate aliquots on two more non-consecutive days and again calculate the method detection limit values for each day. An average of the three values for each analyte may provide for a more appropriate estimate.

10.1.2.3.4 The upper limit of the linear dynamic range must be established for each wavelength utilized by determining the signal responses with 10% of the true value of each element from a concentration standard at the upper limit of the range run on the same calibration as required by the sample responses above the calibration range. The range which may be used for the analysis of samples must be no more than 90% of the resulting data. Determined analyte concentrations that are above the upper range limit must be diluted and reanalyzed. The analyst must also be aware that if an inter-element correction from an analyte above the linear range exists, a second analyte where the inter-element correction has been applied may be inaccurately reported.

NOTE: Many of the alkali and alkaline earth metals have non-linear response curves due to ionization and self-absorption effects. These curves may be used if the instrument allows; however the effective range must be checked and the second order curve fit must have a correlation coefficient of 0.995 or better. Third order fits are not acceptable. These curves are much more sensitive to changes in operating conditions than the linear lines and must be checked whenever there have been moderate equipment changes.

10.1.2.4 The analyst must (1) verify that the instrument configuration and operating conditions satisfy the analytical requirements and (2) maintain quality control data confirming instrument performance and analytical results.

10.2 Initial Calibration

Calibrate the instrument according to the instrument manufacturer's recommended procedures, using the typical mixed calibration standard solutions described in Section 8.7. Flush the system with the calibration blank (Section 8.8.1) between each standard or as the manufacturer recommends. (Use the average intensity of multiple exposures for both standardization and sample analysis to reduce random error.) The calibration curve consists of a calibration blank, RL standard and a high level standard. Calibration curve verification is accomplished through the analysis of the ICV, ICB and SIC standards.

10.3 Equipment Operation and Sample Processing

10.3.1 For all analytes and determinations, the laboratory must analyze an ICV (Section 8.9), and a calibration blank (ICB, Section 8.8.1), immediately following daily calibration.

A calibration blank (CCB, Section 8.8.1) and a calibration verification standard (CCV, Section 8.9) must be analyzed after every tenth sample and at the end of the sample run. Analysis of the calibration verification (CCV) must verify that the instrument is within 10% of the calibration with the relative standard deviation < 5% from replicate (minimum of three) integrations.

If the calibration cannot be verified within the specified limits, the sample analysis must be discontinued, the cause determined and the instrument recalibrated. All samples following the last acceptable ICV/ICB, or CCV/CCB must be reanalyzed. The analysis

data for the calibration blank, check standard, and ICV or CCV must be kept on file with the sample analysis data.

10.3.2 Rinse the system with the rinse blank solution (Section 8.8.3) before the analysis of each sample. The suggested default rinse time is one minute. Each ICP instrument may establish a reduction in this rinse time through a suitable demonstration.

10.3.3 Dilute and reanalyze samples that exceed the linear range or use a calibrated alternate, less sensitive line for which quality control data is already established.

10.3.4 If less than acceptable accuracy and precision data are generated a series of tests are performed prior to reporting concentration data for analyte elements. At a minimum, these tests should be performed with each batch of samples prepared/analyzed with corresponding unacceptable data quality results. These tests, as outlined in Sections 10.3.5 and 10.3.6, will ensure that neither positive nor negative interferences are operating on any of the analyte elements to distort the accuracy of the reported values.

10.3.5 **Post Digestion Spike Addition:** If the sample concentrations are insufficient to perform a dilution test a post digestion spike added to a portion of a prepared sample, or its dilution for the elements failing the matrix spike recoveries must be run, recovery limits equal to 75% to 125% of the known spike value. If the spike is not recovered within the specified limits If the post-digestion recovery fails to meet the acceptance criteria, the sample results must be reported as estimated values

10.3.6 **Dilution Test:** If the analyte concentration is sufficiently high (minimally, a factor of 25 above the lower limit of quantitation after dilution), an analysis of a 1:5 dilution must agree within ± 20% of the original determination. Elements that fail the dilution test are reported as estimated values.

10.3.7 **CAUTION:** If spectral overlap is suspected, use of computerized compensation, an alternate wavelength, or comparison with an alternate method is recommended.

10.4 Continuing Calibration

10.4.1 Check calibration with an ICV following the initial calibration (Section 8.9). Verify calibration with the Continuing Calibration Verification (CCV) Standard (Section 8.9) at the end of the initial calibration sequence (ICV, ICB), after every ten samples, and at the end of an analytical run. Use a calibration blank (Section 8.8.1) immediately following daily calibration, after every 10 samples and at the end of the analytical run.

10.4.1.1 The results of the ICV are to agree within 10% of the expected value, and CCVs are to agree within 10% of the expected value; if not, terminate the analysis, correct the problem, and recalibrate the instrument. Each may be rerun once to confirm or cure the initial failure.

10.4.1.2 The results of the calibration blank should be below ½ of LLOQ or RL (whichever is lower). If not, repeat the analysis and if the failure is repeated terminate the analysis, correct the problem, recalibrate, and reanalyze the previous 10 samples. If the blank is less than 1/10 the concentration of the action level of interest, and no sample is within ten percent of the action limit, analyses need not be rerun and recalibration need not be performed before continuation of the run.

10.4.2 Verify the inter-element and background correction factors at the beginning of each analytical run. Do this by analyzing the SIC (Section 8.10). Results must be less than +/- LLOQ for all non-spiked elements.

10.4.3 When low-level sensitivity is required, a check standard at the requested limit of quantitation is analyzed to confirm the reported detection limit (RDL). This is performed on a project-by-project basis.

10.5 Preventive Maintenance

Whenever instrument maintenance is performed, it is noted in the instrument's Maintenance Logbook.

10.5.1 Daily

Inspect the nebulizer pump tubing from the Autosampler to the Nebulizer. Replace if necessary.

10.5.2 Monthly or as needed

Remove the torch, "shot glass", nebulizer and spray chamber. Clean each with 10% Nitric Acid and rinse with tap water. Coat the inside of the spray chamber and shot glass with concentrated Sulfuric Acid and soak for one hour, then rinse well with DI water. Soak the torch and nebulizer in aqua regia overnight, then rinse with DI water.

10.5.3 Every 6 months

Preventive Maintenance is performed by the Vendor or in-house personnel as follows:

- check the cooling system
- flush/refill the chiller with distilled water and antibacterial conditioner
- clean the instrument to regain intensity
- clean/replace air filters.

11. Data Evaluation, Calculations and Reporting

11.1 If dilutions were performed, the appropriate factors must be applied to sample values. All results must be reported with up to three significant figures.

11.2 Soil samples

Soil samples are calculated as follows:

$$\mathbf{A} = \frac{\text{Sample weight (grams)}}{\text{Final Volume (mL)}}$$

$$\mathbf{B}\ (\text{concentration in mg/Kg}) = \frac{\text{Concentration of analyte (mg/L)}}{\mathbf{A}}$$

11.2.1 Dry weight correction

The LIMS calculates the dry weight correction, however it is calculated as follows:

$$\text{Final concentration in mg/Kg dry weight} = \frac{B}{\%\ \text{Solids}}$$

11.3 Liquid samples

Liquid samples are calculated as follows:

$$\text{Dilution Factor} = \frac{\text{Final Volume (mL)}}{\text{Sample Volume (mL)}}$$

Final concentration in mg/L = Concentration of analyte (mg/L) x Dilution Factor

11.4 Calculations for Hardness

The method for determining hardness is to compute it from the results of separate determinations of Calcium and Magnesium on aqueous samples.

11.4.1 Total Hardness

Total Hardness, mg equivalent $CaCO_3$/L = [2.497 (Ca, mg/L)] + [4.118 (Mg, mg/L)]

11.4.2 Calcium Hardness

Calcium Hardness, mg equivalent $CaCO_3$/L = [2.497 (Ca, mg/L)]

12. Contingencies for Handling Out-of-Control Data or Unacceptable Data

Also refer to Section 9 for Quality Control and acceptance criteria.

If the SIC is outside of the recovery window, then the standard is reanalyzed. If the standard failure continues, the IECs for the element/elements in question are reviewed and recalculated if necessary.

Immediate corrective action for a failing CCV/CCB includes reanalyzing the failing standard. If the standard passes the second time then the analysis may be continued. The raw data is noted. If the standard fails again, the problem must be found and corrected and the instrument is recalibrated. The ICV/ICB standard is reanalyzed and all previous data that had failed back to the previous passing CCV/CCB is reanalyzed.

The reanalysis procedure outline above is also conducted for a failing LCS or Method Blank; they may be rerun alone on the new or any subsequent passing bracket. The LCS or Method Blank do not qualify a bracket of samples but the batch run itself.

If the Matrix Spike does not meet acceptance criteria, a dilution test is performed. If the levels of the native sample is inadequate (see section 10.3.6) The RPD must be within 20% of the true value of the native sample. If the dilution test fails or the concentrations in the native sample are inadequate, the post spike is analyzed and evaluated (section 10.3.5). If these criteria are met, then the Matrix Spike data is reported, with the post spike narrated on the final report. If the post spike fails the data is reported as estimated.

If sample Duplicates are outside of the acceptance criteria, the analyst examines the sample for homogeneity. If the sample is not homogenous, this is narrated on the final report. Clean, homogenous samples are reanalyzed and if still outside of the acceptance limits, redigested and reanalyzed.

Sample nonconformance regarding a Matrix Spike recovery or a duplicate %RSD is narrated on the final report along with the corrective action(s) taken.

The mixed element SIC solution is analyzed at least once per day, immediately after the initial calibration. The concentration measured for any target analytes must be less than +/- the LLOQ. If this criterion is not met then sample analysis may not proceed until the problem is corrected, instrument is recalibrated, verified with the ICV/ICB and the SIC is then re-analyzed. Alternatively, the LLOQ may be raised to twice the concentration observed in the SIC solution if approved by the Department Manger or QA Department and the level is below the regulatory action limit or project specific requirements. The only exceptions are those elements that have been demonstrated to be contaminants in the SIC solutions These may be present up to the concentration documented plus the LLOQ. If failure continues notify the Department Supervisor or Manager.

Silver is only slightly soluble in the presence of chloride unless there is a sufficient chloride concentration to form the soluble chloride complex. Therefore, low recoveries of silver may occur in samples, matrix spikes and even laboratory control samples.

Silver is flagged in our data software during analysis if the concentration of silver is >100ug/L. Liquid samples that exceed 100ug/L will be redigested at dilution. Soil and solid samples that exceed 500ug/L (approximately 20mg/kg) will be re-digested at a reduced weight of 0.625g to allow more silver to become soluble during digestion.

13. Method Performance

13.1 Method Detection Limit Study (MDL) / Limit of Detection Study (LOD) / Limit of Quantitation (LOQ)

The laboratory follows the procedure to determine the MDL, LOD, and/or LOQ as outlined in Alpha SOP/08-05 unless supersede within this SOP. These studies performed by the laboratory are maintained on file for review.

13.2 Demonstration of Capability Studies

Refer to Alpha SOP/08-12 for further information regarding IDC/DOC Generation.

13.2.1 Initial (IDC)

The analyst must make an initial, one-time, demonstration of the ability to generate acceptable accuracy and precision with this method, prior to the processing of any samples.

13.2.2 Continuing (DOC)

The analyst must make a continuing, annual, demonstration of the ability to generate acceptable accuracy and precision with this method.

14. Pollution Prevention and Waste Management

Refer to Alpha's Chemical Hygiene Plan and Waste Management and Disposal SOP for further pollution prevention and waste management information.

15. Referenced Documents

Chemical Hygiene Plan

SOP #1732 MDL/LOD/LOQ Generation

SOP# 1739 IDC/DOC Generation

SOP# 1728 Waste Management and Disposal

16. Attachments

TABLE 1: Element Wavelengths

TABLE 2: Precision and Accuracy Acceptance Criteria

TABLE 3: Reporting Limits

TABLE 4: LCS and Matrix Spike Concentrations

TABLE 1
ELEMENT WAVELENGTHS

Element	6500 Duo wavelength (nm)
Pb	220.3
Se	196.0
Sb	206.8
As	189.0
Ba	455.4
Be	313.0
Cd	214.4
Co	228.6
Cu	324.7
Cr	267.7
Fe	259.9
Mn	257.6
Mo	202.0
Ni	231.6
Ag	328.0
Tl	190.8
V	292.4
Zn	206.2
Al	396.1
Ca	315.8
Mg	279.0
B	208.9
Si	212.9
Sn	189.9
Sr	421.5
Ti	334.9
Bi	223.0
Na	589.5
K	766.4
S	180.7
Li	

TABLE 2
PRECISION AND ACCURACY ACCEPTANCE CRITERIA

	% Recovery LCS		Aqueous % Recovery MS		Soil % Recovery SRM *		Duplicate	
Element	**Lower Control Limit**	**Upper Control Limit**	**Lower Control Limit**	**Upper Control Limit**	**Lower Control Limit**	**Upper Control Limit**	**Aqueous %RPD**	**Soil %RPD**
Aluminum	80	120	75	125	29	171	20	20
Antimony	80	120	75	125	4	196	20	20
Arsenic	80	120	75	125	81	119	20	20
Barium	80	120	75	125	83	118	20	20
Beryllium	80	120	75	125	83	117	20	20
Boron	80	120	75	125	70	129	20	20
Cadmium	80	120	75	125	82	117	20	20
Calcium	80	120	75	125	83	117	20	20
Chromium	80	120	75	125	80	119	20	20
Cobalt	80	120	75	125	83	117	20	20
Copper	80	120	75	125	83	117	20	20
Iron	80	120	75	125	51	150	20	20
Lead	80	120	75	125	80	120	20	20
Lithium	80	120	75	125	80	120	20	20
Magnesium	80	120	75	125	74	126	20	20
Manganese	80	120	75	125	83	117	20	20
Molybdenum	80	120	75	125	81	119	20	20
Nickel	80	120	75	125	82	117	20	20
Potassium	80	120	75	125	74	126	20	20
Sulfur	80	120	75	125	NA	NA	20	20
Selenium	80	120	75	125	80	120	20	20
Silica (SiO_2)	80	120	75	125	NA	NA	20	20
Silver	80	120	75	125	66	134	20	20
Sodium	80	120	75	125	74	127	20	20
Strontium	80	120	75	125	80	120	20	20
Thallium	80	120	75	125	79	120	20	20
Tin	80	120	75	125	69	131	20	20
Titanium	80	120	75	125	82	118	20	20
Vanadium	80	120	75	125	79	121	20	20
Zinc	80	120	75	125	82	119	20	20

** Ranges of the SRM are presented as an example of a typical SRM; actual limits may vary by lot provided by the vendor.

TABLE 3
REPORTING LIMITS

Element	Aqueous (mg/L)	Soil (mg/Kg)
ALUMINUM	0.10	4.0
ANTIMONY	0.05	2.0
ARSENIC	0.005	0.40
BARIUM	0.01	0.40
BERYLLIUM	0.005	0.20
BORON	0.03	1.2
CADMIUM	0.005	0.40
CALCIUM	0.10	4.0
CHROMIUM	0.01	0.40
COBALT	0.02	0.80
COPPER	0.01	0.40
IRON	0.05	2.0
LEAD	0.01	2.0
LITHIUM	0.009	0.36
MAGNESIUM	0.10	4.0
MANGANESE	0.01	0.40
MOLYBDENUM	0.05	2.0
NICKEL	0.025	1.0
POTASSIUM	2.5	100
SULFUR	0.25	10
SELENIUM	0.01	0.80
SILICA	0.50	20
SILVER	0.007	0.40
SODIUM	2.0	80
STRONTIUM	0.01	2.0
THALLIUM	0.02	0.80
TIN	0.05	4.0
TITANIUM	0.01	0.40
VANADIUM	0.01	0.40
ZINC	0.05	2.0

TABLE 4
LCS and Matrix Spike

Analyte	Liquid Concentration (mg/L)	Soil Concentration * (MS spike only) (mg/Kg)
Antimony	0.5	160
Arsenic	0.12	160
Barium	2.00	160
Beryllium	0.05	80
Cadmium	0.051	80
Chromium	0.20	160
Copper	0.25	160
Lead	0.51	160
Nickel	0.50	160
Selenium	0.12	160
Silver	0.05	40
Thallium	0.12	160
Zinc	0.50	160
Iron	1.00	800
Manganese	0.50	160
Calcium	10.0	800
Magnesium	10.0	800
Potassium	10.0	800
Sodium	10.0	800
Silica	1.0	800
Aluminum	2.00	800
Cobalt	0.50	160
Vanadium	0.50	160
Boron	1.0	NA
Molybdenum	1.0	NA
Lithium	1.0	800
Titanium	1.0	NA

*MS spike of a solid based on 1.25g and a final volume of 50 mL.

Note: Solids LCS is an SRM with certified value provided by the vendor on a lot basis.

Mercury in Solid or Semisolid Waste
(Manual Cold-Vapor Technique)

Reference Method No.: **EPA 7471B**

Reference: SW-846, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, EPA SW-846, Update III, February 2007.

1. Scope and Application

Matrices: Method 7471 is approved for measuring total mercury (organic and inorganic) in soils, sediments, bottom deposits, and sludge-type materials. All samples must be subjected to an appropriate dissolution step prior to analysis. If this dissolution procedure is not sufficient to dissolve a specific matrix type or sample, then this method is not applicable for that matrix.

Definitions: Refer to Alpha Analytical Quality Manual.

The data report packages present the documentation of any method modification related to the samples tested. Depending upon the nature of the modification and the extent of intended use, the laboratory may be required to demonstrate that the modifications will produce equivalent results for the matrix. Approval of all method modifications is by one or more of the following laboratory personnel before performing the modification: Area Supervisor, Department Supervisor, Laboratory Director, or Quality Assurance Officer.

This method is restricted to use by or under the supervision of analysts experienced in the operation of the Mercury Analyzer and in the interpretation of Mercury data. Each analyst must demonstrate the ability to generate acceptable results with this method by performing an initial demonstration of capability..

2. Summary of Method

Prior to analysis, the solid or semi-solid samples must be prepared according to the procedures discussed in this method.

Method 7471, a cold-vapor atomic absorption method, is based on the absorption of radiation at the 253.7-nm wavelength by mercury vapor. The mercury is reduced to the elemental state and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of an atomic absorption spectrophotometer. Absorbance (peak height) is measured as a function of mercury concentration.

2.1 Method Modifications from Reference

Alpha analyzes only one 0.3g aliquot of sample. The original method does not address the automated instrument procedure. A reduced volume of sample is digested in disposable digestion tubes on a hot block digestor.

3. Reporting Limits

The reporting limit for this method is 0.08mg/Kg.

4. Interferences

Potassium permanganate is added to eliminate possible interference from sulfide. Concentrations as high as 20 mg/Kg of sulfide, as sodium sulfide, do not interfere with the recovery of added inorganic mercury in reagent water.

Copper has also been reported to interfere; however, copper concentrations as high as 10 mg/Kg had no effect on recovery of mercury from spiked samples.

Samples high in chlorides require additional permanganate (as much as 25 mL) because, during the oxidation step, chlorides are converted to free chlorine, which also absorbs radiation of 253 nm. Care must therefore be taken to ensure that free chlorine is absent before the mercury is reduced and swept into the cell. This may be accomplished by using an excess of hydroxylamine sulfate reagent (25 mL).

Certain volatile organic materials that absorb at this wavelength may also cause interference. A preliminary run without reagents should determine if this type of interference is present.

5. Health and Safety

The toxicity or carcinogenicity of each reagent and standard used in this method is not fully established; however, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. A reference file of material safety data sheets is available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available in the Chemical Hygiene Plan.

All personnel handling environmental samples known to contain or to have been in contact with municipal waste must follow safety practices for handling known disease causative agents.

Because mercury vapor is toxic, precaution must be taken to avoid its inhalation.

6. Sample Collection, Preservation, Shipping and Handling

6.1 Sample Collection

Samples may be collected in plastic or glass containers.

6.2 Sample Preservation

None.

6.3 Sample Shipping

No special shipping requirements.

6.4 Sample Handling

Samples are stored under refrigeration at 4°C and analyzed as soon as possible after collection. The samples have a 28-day holding time from the time of collection.

7. Equipment and Supplies

7.1 Instrumentation:

Perkin Elmer FIMS 100 Atomic absorption spectrophotometer: Use instrument settings recommended by the manufacturer. The PE FIMS is designed specifically

for the measurement of mercury using the cold-vapor technique with BOC (background offset correction) performed by a survey scan prior to each sample introduction. PE S10 autosampler is coupled to the instrument.

Cetac M-6100 Atomic absorption spectrophotometer: Use instrument settings recommended by the manufacturer. This instrument employs a reference cell off-set correction and full automation through the CETAC software. A Cetac ASX-260 autosampler is coupled to the instrument.

Nippon Instrument model# RA-4300A analyzer with integrated 80 position autosampler:

The instrument adds a stannous chloride (II) solution to the sample post digestion, the divalent mercury ion (Hg2+) is reduced to zero-valent metallic mercury and turns into mercury gas by bubbling. $Hg2{+}{+}SnCl2 \rightarrow Hg0 \uparrow$

After removing the acid mist and water vapor generated by bubbling with an electronic cooling unit, the instrument measures the absorbance of mercury at 253.7 nm absorption wavelength. It measures the known mercury amount, creates a calibration curve, and then calculates the mercury amount from the absorbance.

7.2 Hot Block Digestor: Environmental Express, 54 position, capable of maintaining a temperature of 95°C +/-3°C.

7.3 Graduated cylinder. Rinse once with 50% Nitric Acid, then rinse with reagent water prior to use.

7.4 Volumetric Flasks, Class A, various volumes. Rinse once with 50% Nitric Acid, then rinse with reagent water prior to use.

7.5 Polypropylene Digestion Vessels: 50 mL volume, with plastic screw caps

7.6 Pump Tubing: Environmental Express, three stop and two stop tubing in various IDs.

7.7 PTFE membranes: Pall TF1000 disks

7.8 Dilution vials: 20mL capacity, used when making analytical dilutions.

7.9 Laboratory Wipes

7.10 Compressed Air

7.11 Whatman 41 or equivalent filter paper

7.12 Eppendorf pipets: Accurate means to make trace standards

8. Reagents and Standards

8.1 Reagent Water: Reagent water is DI water shown to be interference free. All references to water in this method refer to reagent water unless otherwise specified.

8.2 Aqua regia: Prepare immediately before use by carefully adding three volumes of concentrated HCl to one volume of concentrated HNO_3.

8.3 Concentrated Nitric Acid, (HNO_3): Trace grade. Store at room temperature in the appropriately marked acid cabinet.

8.4 Concentrated Hydrochloric Acid, (HCl): Trace grade. Store at room temperature in the appropriately marked acid cabinet.

8.5 Reductant, Stannous Chloride in 3% HCl: This is the ***reductant*** for the Instrument. In a 1L volumetric flask, add 30mL concentrated trace grade HCl and 11g $SnCl_2 \cdot 2H_20$. Mix to dissolve the solid and bring to volume with reagent water. Store at room temperature, prepare as needed.

8.6 Carrier, Hydrochloric Acid, 3%: This is the ***carrier*** for the instrument. In a 1L volumetric flask, add 30mL concentrated trace grade HCl (Section 8.4). Bring to volume with reagent water. Store at room temperature, prepare as needed.

8.7 Potassium permanganate, mercury-free, 5% solution (w/v): Dissolve 5 g of potassium permanganate in 100 mL of reagent water. Store at room temperature.

8.8 Sodium chloride-hydroxylamine hydrochloride solution: Dissolve 12 g of sodium chloride and 12 g of hydroxylamine hydrochloride in reagent water and dilute to 100 mL. Store at room temperature.

8.9 Mercury stock solution, 1000ppm: This solution is purchased commercially prepared with a certificate of analysis. Three solutions are purchased, each from a different source. Store at room temperature. Expires according to manufacturer's specifications.

8.9.1 10ppm Mercury Stock Standard: To a 100mL volumetric flask, add 5mL of concentrated HNO_3 and 1.0mL of 1000ppm Mercury Stock Solution (Section 8.9). Bring to volume with reagent water. Store at room temperature. Expires one month from date of preparation.

8.9.1.1 0.1ppm Mercury Working Stock / Matrix Spike Solution: To a 500mL volumetric flask, add 5mL of concentrated HNO_3 and 5 mL of 10ppm Mercury Stock Standard (Section 8.9.1). Bring to volume with reagent water. Store at room temperature. Expires one week from date of preparation.

8.9.2 10ppm Mercury ICV Stock Standard: To a 100mL volumetric flask, add 5mL of concentrated HNO_3 and 1.0mL of Mercury Stock Solution (Section 8.9, from an alternate source than that used in Section 8.9.1). Bring to volume with reagent water. Store at room temperature. Expires one month from date of preparation.

8.9.2.1 0.3ppm Mercury ICV Working Stock: To a 100mL volumetric flask, add 5mL of concentrated HNO_3 and 3.0mL of 10ppm Hg ICV Stock Standard (Section 8.9.2). Bring to volume with reagent water. Store at room temperature. Expires one week from date of preparation.

8.9.3 10ppm Mercury LCS Stock Standard: To a 100mL volumetric flask, add 5mL of concentrated HNO_3 and 1.0mL of 1000ppm Mercury Stock Solution (Section 8.9, from an alternate source than that used in Sections 8.9.1 and 8.9.2). Bring to volume with reagent water. Store at room temperature. Expires one month from date of preparation.

8.9.3.1 0.1ppm Mercury LCS Working Stock: To a 100mL volumetric flask, add 5mL of concentrated HNO_3 and 1.0mL of 10ppm Mercury LCS Stock Standard (Section

8.9.3). Bring to volume with reagent water. Store at room temperature. Expires one week from date of preparation.

8.10 SRM: Purchased from ERA in 300-500g lots.

9. Quality Control and Data Assessment

The laboratory must maintain records to document the quality of data that is generated. Ongoing data quality checks are compared with established performance criteria to determine if the results of analyses meet the performance characteristics of the method.

9.1 Blank(s)

The Method Blank consists of the 0ppm standard as prepared in Section 10.1.2.1.1. Analyze one Method Blank per analytical batch of twenty samples or less. The Method Blank must be less than the Reporting Limit (RL). See Section 12.1 for corrective action.

9.1.1 PBS

A preparation blank is analyzed once per batch of twenty samples or less. It is prepared in the same manner as the 0ppm standard (Section 10.1.2.1.1). The PBS must be recovered within ± 0.2 µg/L.

9.1.2 ICB

The ICB is analyzed after the ICV, and is prepared in the same manner as the 0ppm standard (Section 10.1.2.1.1). The ICB must be recovered within ± 0.2 µg/L.

9.1.3 CCB

The CCB is analyzed after the CCV. It is prepared in the same manner as the 0ppm standard (Section 10.1.2.1.1). The CCB must be recovered within ± 0.2 µg/L.

9.2 Laboratory Control Sample (LCS)

The LCS is analyzed once per each analytical batch of twenty samples or less. It is prepared in the same manner as in Section 10.1.2.3. The LCS must be recovered within 80 – 120% of the true value. See Section 12.3 for corrective action.

9.3 Initial Calibration Verification (ICV)

The ICV is analyzed after the calibration curve. It is prepared in the manner specified in Section 10.1.2.2. The ICV must be recovered within ± 10% of the true value. See Section 12.2 for corrective action.

9.4 Continuing Calibration Verification (CCV)

The CCV is analyzed after every ten analytical samples. It is prepared in the same manner as the 5.0ppb calibration standard (Section 10.1.2.1.5). The CCV must be recovered within 20% of the true value. See Section 12.2 for corrective action.

9.5 Matrix Spike

Analyze one matrix spike per twenty or less analytical samples. The recovery of the matrix spike must be between 80 – 120%. Calculate percent recovery using Section 11.2.

If the recovery of the matrix spike is out of range, a post-analytical spike is analyzed. Prepare the post analytical spike by adding 1.25mL of 0.020ppm Calibration Standard

(Section 10.1.2.1.6) and 1.25mL of the sample digestate to a 15mL centrifuge tube for a final concentration of 0.0105mg/L. Analyze the post spike as outlined in Section 10.3.

Calculate the post spike concentration as follows:

Post Analytical Spike Sample Concentration (mg/L) =

[Sample Concentration (mg/L) x (0.5)] + 0.010mg/L

The percent recovery of the post-analytical spike must be between 75 – 125%.

See Section 12.4 for corrective action.

9.6 Laboratory Duplicate

Analyze one sample in duplicate per twenty or less analytical samples. The RPD between the sample and its duplicate must be ≤ 20% (as calculated in Section 11.3). See Section 12.5 for corrective action.

9.7 Method-specific Quality Control Samples

None

9.8 Method Sequence

- Sample preparation
- Sample digestion
- Standards preparation:
  - Calibration standards
  - ICV standard
  - LCS standard
- Standards digestion
- Analysis of calibration standards
- Generation of calibration curve
- Analysis of samples and standards:
  - ICV
  - ICB
  - analytical samples
  - CCV
  - CCB
  - analytical samples
  - CCV
  - CCB
  - etc.

10. Procedure

10.1 Equipment Set-Up

10.1.1 Sample preparation: Weigh a 0.3-g portion of untreated and homogenized sample and place in the bottom of a polypropylene digestion vessel. Record the weight in the laboratory notebook. NOTE: When preparing the batch, include one sample duplicate aliquot to be prepared in the same manner.

Add 2.5 mL of reagent water and 2.5 mL of aqua regia (Section 8.2). Heat 2 min on a hot block at 95°C +/-3°C. Cool; then add 15 mL reagent water, and 7.5 mL potassium permanganate solution (Section 8.7) to the digestion vessel. Wait 15 minutes to be sure the potassium permanganate is not exhausted (purple color disappears), if it does add additional potassium permanganate to all samples and QC until stable. Mix thoroughly and place in the hot block for 30 min at 95°C +/-3°C. Cool and add 3 mL of sodium chloride-hydroxylamine hydrochloride (Section 8.8) to reduce the excess permanganate.

CAUTION: Perform this addition under a hood, as Cl_2 could be evolved.

Bring up to a final volume of 50 mL with reagent water. Continue as described under Section 10.3.1.

10.1.2 Standard preparation: Standard preparation is performed each time samples are digested.

10.1.2.1 Calibration Standards

10.1.2.1.1 0 ppb: Add 10mL of reagent water to a polypropylene digestion vessel. This aliquot may be used for the CCB. Another separate aliquot is prepared for use as the ICB and the diluent for any samples with concentration greater than 90% the highest calibration standard used to determine the linear range.

10.1.2.1.2 0.5ppb: Add 10 mL of reagent water to a polypropylene digestion vessel. Using a volumetric pipet, add 0.25 mL of 0.1ppm Mercury Working Stock (Section 8.9.1.1) to the digestion vesel.

10.1.2.1.3 1.0ppb: Add 10 mL of reagent water to a polypropylene digestion vessel.. Using a volumetric pipet, add 0.5 mL of 0.1ppm Mercury Working Stock (Section 8.9.1.1) to the digestion vessel.

10.1.2.1.4 2.0ppb: Add 10 mL of reagent water to a polypropylene digestion vessel.. Using a volumetric pipet, add 1.0mL of 0.1ppm Mercury Working Stock (Section 8.9.1.1) to the digestion vessel.

10.1.2.1.5 5.0ppb/CCV: Add 10 mL of reagent water to a polypropylene digestion vessel.. Using a volumetric pipet, add 2.5 mL of 0.1ppm Mercury Working Stock (Section 8.9.1.1) to the digestion vessel.

10.1.2.1.6 10ppb: Add 10 mL of reagent water to a polypropylene digestion vessel.Using a volumetric pipet, add 5.0 mL of 0.1ppm Mercury Working Stock (Section 8.9.1.1) to the digestion vessel.

10.1.2.1.7 20ppb: Add 10 mL of reagent water to a polypropylene digestion vessel.Using a volumetric pipet, add 10.0 mL of 0.1ppm Mercury Working Stock (Section 8.9.1.1) to the digestion vessel.

10.1.2.2 ICV Standard, 3.0ppb: This standard is used for calibration verification.

Add 10.0 mL of reagent water to a digestion vessel. Using a volumetric pipet, add 0.5 mL of 0.3ppm Mercury Working Stock (Section 8.9.2.1) to the digestion vessel. Digest the ICV Standard as in Section 10.1.3.

10.1.2.3 LCS Standard, 1.0ppb: This standard is prepared and analyzed with each analytical batch.

Add 5.0mL of reagent water to a digestion vessel. Add 0.15g of SRM (Section 8.10). Digest the LCS Standard as in Section 10.1.3.

10.1.2.4 Matrix Spike, 0.001mg/L: Weigh two aliquots of the sample designated to be the batch matrix spike.

Add 10.0 mL of the reagent water to the digestion vessel containing the weighed sample aliquot. Add a 5 mL aliquot of 0.1ppm Mercury LCS Working Stock (Section 8.9.3.1). Digest the MS as in Section 10.1.3.

10.1.3 Standard Digestion:

To each standard (Sections 10.1.2.1 through 10.1.2.3), add 2.5 mL of reagent water and 2.5 mL of aqua regia (Section 8.2) and heat 2 min on the hot block at 95°C +/- 3°C. Allow the standard to cool; add 15 mL reagent water and 7.5 mL of $KMnO_4$ solution (Section 8.7) to each bottle and return to the hot block for 30 min. Cool and add 3 mL of sodium chloride-hydroxylamine hydrochloride solution (Section 8.8) to reduce the excess permanganate. Bring up to final volume of 50 mL with reagent water, continue as described in Section 10.3.3.

Note: Alternate volumes of standards may be made base on need as long as they are made with the same proportions as describe above.

10.2 Initial Calibration

Construct a calibration curve by plotting the absorbances of prepared standards (Section 10.1.2) versus micrograms of mercury. (See Section 11.1.) Determine the peak height of the unknown from the absorbance maxima on the spectrometer, and read the mercury value from the standard curve.

The curve correlation coefficient (cc) must be greater than or equal to 0.995 in order for the curve to be linear. If the correlation coefficient is less than 0.995, find and correct the problem. When the problem has been corrected, re-analyze either the previous standards or new standards. When the curve has generated an acceptable cc, then the analysis can continue with the ICV/ICB.

Analyze an Initial Calibration Verification Standard (ICV) (Section 9.3), an Initial Calibration Blank sample (ICB) (Section 9.1.2) at the start of the analytical run. The results for the ICV must be within 10% of the true value. If results are outside this range, refer to Section 12.2 for corrective action.

10.3 Equipment Operation and Sample Processing

10.3.1 Instrument Setup

10.3.1.1 Turn the instrument on. The autosampler will initialize itself.

10.3.1.2 Choose the instrument software from the desktop menu. The autosampler will initialize again.

FIMS 100 NOTE: The instrument must be turned on before the application is started. Otherwise, an error message will result.

10.3.1.3 Enter the appropriate fields for sample identification, and data storage.

10.3.1.4 Fill the carrier and reductant bottles.

10.3.1.4.1 The Carrier is 3% HCl (Section 8.6).

10.3.1.4.2 The Reductant is 1.1% $SnCl_2$ in 3% HCl (Section 8.5).

10.3.1.5 Allow the instrument to warm up while clearing samples. Samples that are cloudy or with particulate present after clearing must be filtered through Whatman 41 filter paper (Section 7.11) before analysis.

10.3.1.6 Place carrier uptake line and reductant uptake line.

10.3.1.7 Load carrier and reductant lines into pump magazines

10.3.1.8 Load the two waste lines into the pump magazines below the roller.

10.3.1.9 Lock the magazines into place.

FIMS100 only:

10.3.1.10 Remove the cap from the liquid/vapor separator and wipe dry with a Lab Wipe (Section 7.9). Compressed air (Section 7.10) through the vapor transfer line to dry it out.

10.3.1.11 Place a PTFE membrane (Section 7.7), rough side up, in the liquid/vapor separator; replace the cap and reattach the vapor transfer line to the sample absorption cell.

10.3.1.12 Adjust the gas flow by turning the black knob below the air flow meter to obtain a reading of just over 50.

10.3.2 Calibration and Sample Analysis

10.3.2.1 The instrument will now run the calibration standards; verify a CC of 0.995 or better before proceeding with the ICV and ICB. Ten analytical samples, a CCV and CCB, ten analytical samples, CCV, CCB, etc. The CCBs and CCVs must be recovered within the proper ranges (Sections 9.4 and 9.1.3) for analysis to continue.

10.3.2.2 If the sample result is beyond 90% of the concentration of the highest point on the calibration curve or LDR study used to establish the linear range, dilute the sample extract with a portion of one of the prepared blanks (ICB, CCB or PBS) to produce an analytical result that is within the range.

10.3.3 Instrument Shut Down

10.3.3.1 When analysis is complete place reagent uptake lines in a beaker of DI water.

10.3.3.1.1 Continue to run the pumps for several minutes to flush reagents out of the lines.

10.3.3.1.2 Continue to run the pumps for several more minutes to flush the lines thoroughly with DI water.

10.3.3.2 Pull the reagent uptake lines out of the DI water beaker to allow the pump to draw air completely through the lines.

10.3.3.3 Unlock the top and bottom pump magazines and remove tubing from the magazines.

10.3.3.4 Exit from the software application.

Note: This procedure must be followed every time the instrument is shut down to prevent water or reagents from being draw back into the instrument which can cause severe damage.

10.3.3.4.1 Dump the samples and instrument waste in the Metals/WetChem waste drum located in the transfer room only after all data has been processed through final review and package generation.

10.4 Continuing Calibration

After every 10 samples, analyze a Continuing Calibration Verification Standard (CCV), and a Continuing Calibration Blank sample (CCB). Determine the concentrations from the calibration curve. The results for the CCV must be within 20% of the true value.

10.5 Preventive Maintenance

Preventative maintenance is conducted per the manufacturer's instructions. All preventative maintenance is recorded in the Instrument Maintenance Logbook.

11. Data Evaluation, Calculations and Reporting

11.1 Calculate Mercury Concentration From the Daily Calibration Curve

The curve is generated utilizing a straight-line equation defined as:

$$A = k_1 + k_2C$$

Where:

A = Average peak height of the sample/standard integrations
C = Sample/Standard Concentration, µg/L
k_1 = y-intercept
k2 = slope

The instrument will plot peak height against concentration (µg/L). The result is generated in µg/L. This value is divided by 1000 to convert the units to mg/L. The mg/L units are converted to mg/Kg by multiplying by L/Kg. A dilution factor (DF) is applied if necessary. The Result is then divided by the % Total Solids prior to release to the client.

$$\text{Result, mg/Kg} = (\text{concentration, µg/L}) \times (1\text{mg}/1000\mu\text{g}) \times (\text{DF}) \times (\text{L/Kg})$$

Where:

$$\text{L/Kg} = \frac{\text{Final volume of digestate, in L}}{\text{Weight of original sample, in Kg}}$$

11.2 Calculate Percent Recovery for the Matrix Spike corrected for concentrations measured in the unfortified sample. Percent recovery is calculated using the following equation:

$$\%\ \text{Recovery} = \frac{(Cm - C)}{s} \times 100$$

Where:

Cm = measured Mercury in the fortified sample
C = measured native mercury sample concentration
S = concentration equivalent of spike added to sample

11.3 Calculate the Relative Percent Difference (RPD) for each Duplicate of the initial quantitated concentration (IC) and duplicate quantitated concentration (Dc) using the following formula:

$$RPD = \frac{|(IC - Dc)|}{\{(IC + Dc) / 2\}} \times 100$$

12. Contingencies for Handling Out-of-Control Data or Unacceptable Data

12.1 Method Blank Failure

When a prep blank mercury concentration is ≥10% of the mercury concentration determined for any associated sample, or is greater than 2.2x the MDL value (whichever is greater), the entire batch associated with the prep blank must be redigested.

12.2 ICV / CCV Failure

If the ICV %Recovery is outside of acceptance criteria, analysis is terminated until the problem is found and corrected. If the CCV %Recovery is outside of acceptance criteria, all samples analyzed since the last acceptable CCV must be reanalyzed following correction of the problem.

12.3 LCS Failure

If the LCS is not recovered within acceptance criteria, the associated batch and another LCS must be redigested (Section 10.1).

12.4 Matrix Spike/Post Digestion Spike Failure

If the recovery of the matrix spike is outside of the acceptance criteria of 80 – 120%, a post digestion spike is performed (Section 9.5). If the post digestion spike is beyond 75 – 125%, the sample and its spike are redigested (Section 10.1).

12.5 Duplicate Failure

If the RPD between the sample and its duplicate is greater than 20%, visually evaluate the sample matrix. If the sample matrix appears clean, the sample and its duplicate are removed from the batch and redigested (Section 10.1). If the matrix appears problematic, the sample digestate may be diluted and reanalyzed, or a narrative included with the data to explain the matrix problem.

13. Method Performance

13.1 Method Detection Limit Study (MDL) / Limit of Detection Study (LOD) / Limit of Quantitation (LOQ)

The laboratory follows the procedure to determine the MDL, LOD, and/or LOQ as outlined in Alpha SOP 1732. These studies performed by the laboratory are maintained on file for review.

13.2 Demonstration of Capability Studies

Refer to Alpha SOP 1739 for further information regarding IDC/DOC Generation.

13.2.1 Initial (IDC)

The analyst must make an initial, one-time, demonstration of the ability to generate acceptable accuracy and precision with this method, prior to the processing of any samples.

13.2.2 Continuing (DOC)

The analyst must make a continuing, annual, demonstration of the ability to generate acceptable accuracy and precision with this method.

14. Pollution Prevention and Waste Management

Refer to Alpha's Chemical Hygiene Plan and Waste Management and Disposal SOP for further pollution prevention and waste management information.

15. Referenced Documents

Chemical Hygiene Plan

SOP/1732 DL/LOD/LOQ Generation

SOP/1739 IDC/DOC Generation

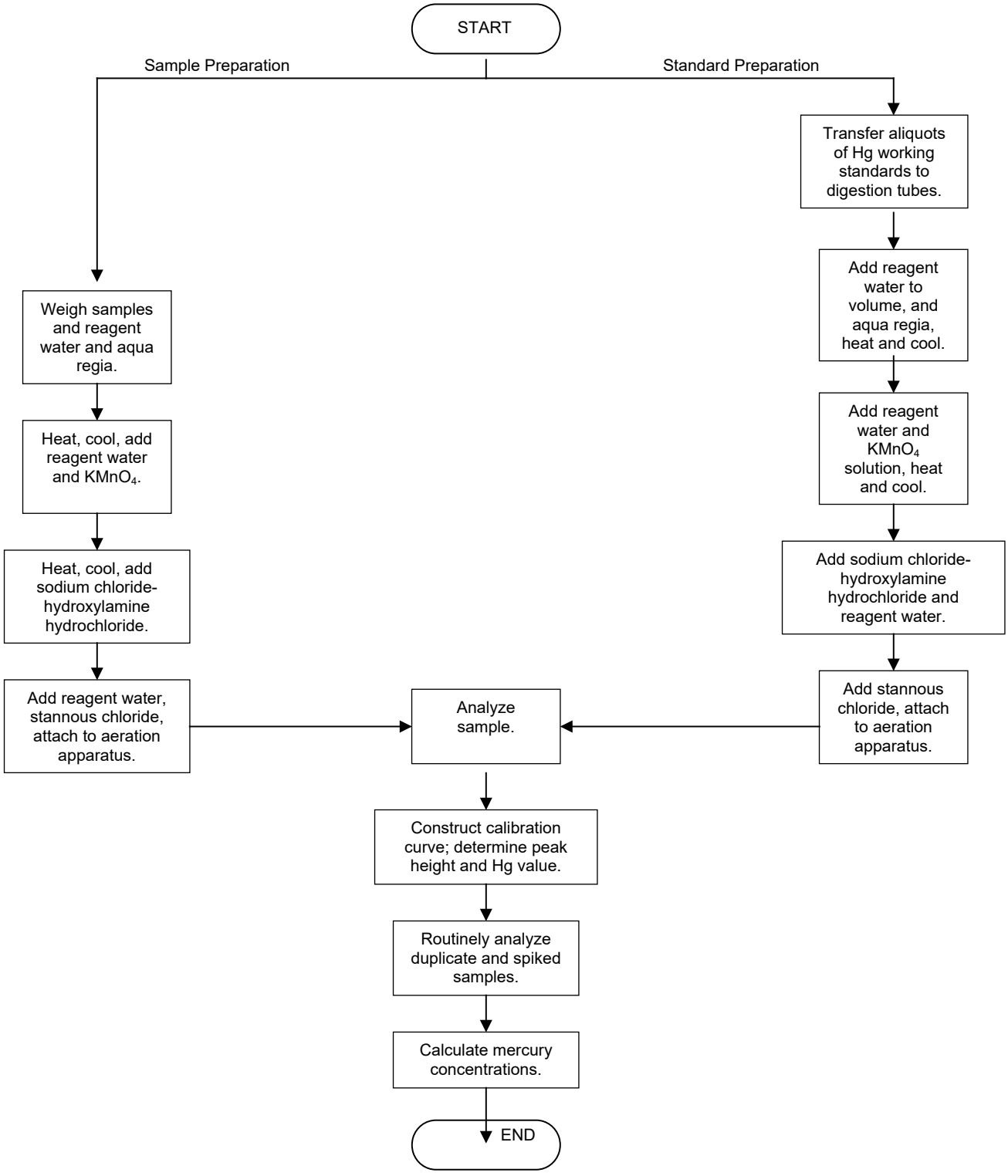
SOP/1797 Waste Management and Disposal SOP

16. Attachments

FIGURE 1: Flow Chart for Method 7471B

Figure 1

Method 7471B Flow Chart



Test Method Standard Operating Procedure (SOP): Pace® Analytical Services

Pace ANALYTICAL SERVICES	**ENV-SOP-ELON-0034 v04_EPA 8082A**
	Effective Date: 08/27/2024

Management Approval:
Peter Gryszkiewicz Approved on 8/20/2024 4:52:54 PM
Francis Derose Approved on 8/26/2024 11:22:51 AM
Tod Kopyscinski Approved on 8/26/2024 9:17:49 AM
Katherine Allen Approved on 8/27/2024 9:19:47 AM

© 2023-2024, Pace® Analytical Services, LLC

1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the laboratory procedure used for the determination of Polychlorinated Biphenyls (PCBs) as Aroclors by Gas Chromatography which is based off Method EPA 8082A.

The method is intended for the analysis of PCB Aroclors extracts from all types of solid and aqueous matrices. The method also may be applied to other matrices such as oils and wipe samples, if appropriate sample extraction procedures are employed. Open-tubular, capillary columns are employed with electron capture detectors (ECD). When compared to packed columns, these fused-silica, open-tubular columns offer improved resolution, better selectivity, increased sensitivity, and faster analysis. The target compounds may be determined by either a single- or dual-column analysis system.

1.1 Target Analyte List and Limits of Quantitation (LOQ)

The target analytes that can be determined by this SOP and the associated LOQ is provided in Table 1, Appendix A.

LOQs are established in accordance with Pace policy and SOPs for method validation and for the determination of detection limits (DL) and quantitation limits (LOQ). DL and LOQ are routinely verified and updated when needed. The current LOQ for each target analyte that can be determined by this SOP as of the effective date of this SOP is provided in Table 1, Appendix A.

2.0 SUMMARY OF METHOD

A measured volume, weight of sample (approximately 1-Liter for liquids, 100mL for low-volume liquids, 10 grams for soils; 0.200 grams for paint; 0.500 grams for caulking; 2.0 grams for product solid), or one wipe is extracted using the appropriate matrix-specific sample extraction technique (e.g. Microwave -3546 or Soxhlet -3540C or Liq-Liq 3510C). Aqueous samples are extracted at pH 5-9 with methylene chloride, solid and wipe samples are extracted with 1:1 Acetone: Hexane. Extracts for PCB analysis are subjected to a sulfuric acid clean-up, which will remove many single component organochlorine or organophosphorus pesticides. Therefore, Method EPA 8082A is not applicable to the analysis of such compounds. Instead, use Method EPA 8081B. After clean-up, the extract is analyzed by injecting an aliquot into a gas chromatograph with a narrow bore fused silica capillary column and electron capture detector (GC/ECD).

3.0 INTERFERENCES

Interferences co-extracted from the samples will vary from matrix-to-matrix:

-Contaminated solvents, reagents, or sample processing hardware.
-Contaminated GC carrier gas, parts, column surfaces, or detector surfaces.
-Compounds extracted from the sample matrix to which the detector will respond.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

-Co-elution of target analytes.

Clean-up procedures include Advanced Florisil clean-up, Florisil cartridge clean-up, TBA clean-up (for sulfur interferences: used for either PCBs or pesticides), and sulfuric acid clean-up (only performed for PCBs, never for pesticides).

Interferences by phthalate esters can pose a major problem in PCB determination. Common flexible plastics contain varying amounts of phthalates. These phthalates are easily extracted or leached from such materials during laboratory operations. For this reason, avoid the use of plastics in the laboratory.

Cross-contamination of clean glassware routinely occurs when plastics are handled during extraction steps, especially when solvent-wetted surfaces are handled. Glassware must be scrupulously cleaned.

NOTE: Oven-drying of glassware used for PCB analysis can increase contamination because PCBs are readily volatilized in the oven and spread to other glassware. Therefore, exercise caution, and do not dry glassware from samples containing high concentrations of PCBs with glassware that may be used for trace analyses.

Subtracting blank values from sample results is not permitted.

4.0 DEFINITIONS

Refer to the Laboratory Quality Manual for a glossary of common lab terms and definitions.

5.0 HEALTH AND SAFETY

Contact your supervisor or local safety coordinator with questions or concerns regarding safety protocol or safe handling procedures for this procedure

The following sections provide general health and safety information about chemicals and materials that may be present in the laboratory.

- The toxicity or carcinogenicity of each chemical material used in the laboratory has not been fully established. Each chemical should be regarded as a potential health hazard and exposure to these compounds should be as low as reasonably achievable.
- The laboratory maintains documentation of hazard assessments and OSHA regulations regarding the safe handling of the chemicals specified in each method. Safety data sheets for all hazardous chemicals are available to all personnel. Employees must abide by the health, safety and environmental (EHS) policies and procedures specified in this SOP and in the Pace® Chemical Hygiene / Safety Manual (COR-MAN-0001)
- Personal protective equipment (PPE) such as safety glasses, gloves, and a laboratory coat must be worn in designated areas and while handling samples and chemical materials to protect against physical contact with samples that contain potentially hazardous chemicals and exposure to chemical materials used in the procedure.
- Concentrated corrosives present additional hazards and are damaging to skin and mucus membranes. For procedures that require use of acids, use acids in a fume hood whenever possible with PPE designed for handing these materials. If eye or skin contact occurs, flush with large

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

volumes of water. When working with acids, always add acid to water to prevent violent reactions. For procedures that that emit large volumes of solvents (evaporation/concentration processes), these activities must be performed in a fume hood or apparatus that reduces exposure.

6.0 SAMPLE COLLECTION, PRESERVATION, HOLDING TIME & STORAGE

The laboratory provides containers for the collection of samples upon client request. Refer to laboratory SOP ENV-SOP-ELON-0017 *Bottle Prep* for procedures related to preparation of bottle kits for the test method(s) associated with this SOP.

The laboratory does not perform sample collection or field measurements for this test method. Samples should be collected in accordance with a sampling plan and sampling procedures appropriate to achieve the regulatory, scientific, and data quality objectives for the project.

Container Type, Minimum Sample Amount, Preservation, and Holding Time Requirements:

Matrix	Container Size & Type	Required Sample Amount[1]	Preservation	Holding Time
Aqueous*	1-Liter amber glass bottle with Teflon-lined screw cap or 100mL amber glass bottle with Teflon-lined screw cap	1-Liter Or 120mL	Thermal: Cool to 4℃ **	Extract within 1 year and 40 days from extraction to analysis. For states following SW846 guidelines = 1 year
Soils/Sediments	8-16 oz wide-mouthed amber glass jar with Teflon-lined screw cap	10 grams	Thermal: Cool to 4℃ **	Extract within 1 year and 40 days from extraction to analysis. For states following SW846 guidelines = 1 year
Concentrated Waste Samples	125-mL wide-mouth glass with Teflon-lined cap	2 grams	None Required**	Extract within 1 year and 40 days from extraction to analysis. For states following SW846 guidelines = 1 year
Wipe Sample media (Gauze pads)	2-8 oz wide-mouthed amber glass jar with Teflon-lined screw cap	1 wipe	Hexane on media prior to sampling	Extract within 1 year and 40 days from extraction to analysis. For states following SW846 guidelines = 1 year

[1] *Amount of sample required for each discrete test.*

* *For aqueous samples with a chlorine residual, add 1-3 mL 10% sodium thiosulfate to sampling container prior to filling.*

*** MCP Data Enhancement: Store PCB sample extracts at 4℃, protect from sunlight, and store in sealed vials (screw-cap or crimp-cap vials) with un-pierced PTFE-lined septa.*

Thermal preservation is checked and recorded on receipt in accordance with laboratory SOP ENV-SOP-ELON-0100 *Sample Login Procedures*. Chemical preservation is checked and recorded at time of receipt or prior to sample preparation.

After receipt, samples are stored at 4°C until sample preparation. Prepared samples (extracts, digestates, distillates, other) are stored at 4°C until sample analysis.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

After analysis, samples are retained as stated in the Pace® standard terms and conditions, unless otherwise specified in the analytical services contract. Samples are then disposed of in accordance with Federal, State, and Local regulations.

7.0 EQUIPMENT & SUPPLIES

7.1 Equipment

- Capillary column, gas chromatograph with splitless injector, auto injector, ECD and data system.
- Vortex

7.2 Supplies

- Micro syringes
- Pipettes - 1-mL, volumetric, class A
- Vials, 2-mL snap top
- Pasteur pipettes
- 4-mL screw top vials

8.0 REAGENTS & STANDARDS

8.1 Reagents

- Sulfuric Acid (concentrated): ACS grade
- Tetrabutylammonium hydrogen sulfate: sulfite reagent
- Sodium sulfite: pesticide quality
- Copper Granules

8.2 Standards

8.2.1 Stock Standards:

Purchased as certified solutions from AccuStandard (or equivalent), 100µg/mL in isooctane Aroclor - 1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, 1268.

8.2.2 Working Stock, 1 ug/mL (1000 ppb):

Add 500µL of PCB 1260 and PCB 1016 stock solution [AccuStandard (or equivalent) 100µg/mL] and 250µL of Pesticide Surrogate Mix [Restek (or equivalent) 200µg/mL] to final volume of 50mL in isooctane. Prepared fresh for each new curve; expiration = 6 months. Expiration date to be written on vial.

8.2.3 Calibration Standards:

Dilution	Working Stock (mL)	Isooctane (mL)	Final Conc. (µg/L)
2x	20	20	500

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

5x	8	32	200
10x	4	36	100
20x	2	38	50
50x	0.8	39.2	20
100x	0.4	39.6	10
200x	0.2	39.8	5*

*In surrogate curve only

8.2.4 Soil Spiking Stock, 2000µg/L:

Add 1mL of 1000µg/mL of Aroclor 1016/1260 Mix, to a final volume of 500mL with acetone. Spiking standards are obtained from a different source than calibration standards.

8.2.5 Water and Wipe Spiking Stock, 500 ug/L:

Add 0.25mL of 1000µg/mL of Aroclor 1016/1260 Mix, to a final volume of 500 mL with acetone. Spiking standards are obtained from a different source than calibration standards.

8.2.6 Surrogate Standard, 2000µg/L:

Add 20mL of Restek (or equivalent) stock (200µg/mL in Acetone) to a final volume of 2000mL with Acetone.

9.0 PROCEDURE

9.1 Equipment Preparation

9.1.1 Instrument Setup

HP 6890 (ECD 1 #US10135015)
HP 6890 (ECD 3 #CN10426061)
HP 7890 (ECD 4 #10715067)
HP 7890 (ECD 5 #10805007)
HP 7890 (ECD 9 #11321159)
HP 7890 (ECD 10 #CN1341002)
HP 7890 (ECD 11#CN13503023)

Oven:

Initial Temp: 125°C Maximum Temp: 330°C
Initial Time: 0.25 min Equilibration time: 0.50min
Ramps:

#	Rate	Final temp	Final time
1	30.00	200	0.00
2	20.00	260	0.00
3	45.00	320	2.00
4	0.0 (off)		

Post temp: 0°C
Post time: 0.00min
Run time: 9.08min

Front Inlet

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Initial Temp: 210°C (On)
Pressure: 13.89 psi (On)
Purge flow: 12.5 mL/min
Purge time: 1.00 min
Total Flow: 25.0 mL/min
Gas type: Hydrogen

Column 1

Model Number: RTX-CL Pesticides: 11139
340°C 30m x 0.32mmID x 0.5um df

Column 2

Model Number: RTX-CL Pesticides 2: 11324
340°C 30m x 0.32mmID x .25um df

Front Detector	Back Detector
Temperature: 320°C	Temperature: 320°C
Combined Flow: 60.0 mL/min	Combined Flow: 60.0 mL/min
Make-up Gas Type: Nitrogen	Make-up Gas Type: Nitrogen

9.2 Calibration

A 6-point calibration curve is used to calibrate the system. The curve must contain Aroclors 1016 and 1260. The low standard must be <RL. The average response factor over the working range must be <20%. or ("r" should be >0.99). If linear regression is used, calculate the Relative Error (%RE) for the low and mid calibration points. The low point must recover 50-150% and the midpoint must recover between 70-130%. Refer to ENV-POL-CORQ-0005 for additional information on calculating the relative error.

If the initial calibration does not meet the acceptability criteria it may not be used for quantitative analyses. Investigate the cause of the problem and perform instrument maintenance if necessary. Then repeat the initial calibration.

If a peak is not properly integrated by the data system, manual integration may be necessary. The integration of the peaks for the samples and quality control samples must be as consistent as possible with the integration used with the initial calibration. All manual integrations must be documented. In particular, the chromatogram must be expanded to clearly show the specific peak being integrated. A “before” integration is printed, showing the software integration, or lack thereof. An “after” integration showing the action taken by the analyst is printed. The analyst initials and dates both records and they are included with the rest of the documentation for that data file.

The method file used by the data system for the initial calibration should be named with a unique identifier for initial calibration. The initial calibration method file includes a “C” as a suffix to denote that it is the original file. When the retention times change for target compounds due to daily instrument maintenance, the original file is copied to (saved as) a new file with the “C” suffix removed. The method file without the “C” suffix indicates that the retention times have been

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

changed from the initial calibration. The original initial calibration method file with the "C" as a suffix must not be changed.

9.2.1 Initial Calibration Verification (ICV)

The curve must be verified with an independent standard (ICV) prior to sample analysis, (100ug/L), which must pass 80-120%. All other Aroclors will also be quantitated from a six-point calibration curve.

9.2.2 Continuing Calibration Verification (CCV)

Performed every 12 hours and after no more than 20 samples, and at the end of the analytical sequence. Must be at the mid-point of the curve and contain at least Aroclors 1016 and 1260. % RSD must be < 20%. An Aroclor hit in a sample must have calibration verified with a one-point standard of that Aroclor within 12 hours.

The calibration check standard must meet the acceptance criteria before any samples are run. If the calibration check does not meet the acceptance criteria, corrective action is required including instrument maintenance. If the calibration check still fails the acceptance criteria, a new initial calibration is required.

9.3 Sample Extraction

- Microwave Extraction (Soils and Wipes) – Method EPA 3546 (refer to ENV-SOP-ELON-0001 *Microwave Extraction SW846 3546*)
- Soxhlet Extraction (Soils, Wipes, TO-10A) – Method EPA 3540C (refer to ENV-SOP-ELON-0074 *Soxhlet Extraction SW846 3540C*)
- Water Extraction Method SW-846 3510C (Waters) – Method EPA 3510C (refer to ENV-SOP-ELON-0005 3510C *Water Extraction*)

9.4 Sample Extract Clean-up

9.4.1 Acid Clean-up

An acid clean-up is performed on all PCB samples and their corresponding QC. Never do an acid clean-up on the same sample aliquot that is to be analyzed for pesticides. Pipette approximately 2mL of sample extract into a 4-mL screw cap vial that contains about 1 mL of sulfuric acid. Cap the vial and vortex for approximately 30 seconds. Allow the layer to separate, then pipette off about 1- mL of sample and transfer to a labeled crimp top vial.

9.4.2 TBA Clean-up

Sulfur is removed by Method 3660B; Tetrabutylammonium (TBA) sulfite reagent.

Prepare reagent by dissolving 13.56g Tetrabutylammonium hydrogen sulfate in 400mL organic-free reagent water. To remove impurities, extract this solution three times with 80mL portions of hexane. Discard the hexane extracts and add 100g sodium sulfite to the water solution. Store the resulting solution, which is saturated with sodium sulfite, in an amber bottle with a PTFE-lined screw cap. This solution can be stored at room temperature for at least one month. Note: All Low Volume Water Sample extracts need to be TBA cleaned.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Transfer 1.0mL of sample extract to a 10mL clear vial with a PTFE-lined screw cap.

Add 1.0mL TBA sulfite reagent and 2mL 2-propanol, cap vial, and shake for 1 min. If the sample is colorless or if the initial color is unchanged, and if clear crystals (precipitated sodium sulfite) are observed, sufficient sodium sulfite is present.

Add 5mL organic free reagent water and shake for at least 1 min. Allow sample to stand for 5-10 min. Transfer the hexane layer (top) to a 1mL auto sampler vial.

9.4.3 Florisil Clean-up

Florisil Clean-up- Refer to SOP ENV-SOP-ELON-00176 *Florsil EPA 3620C*.

9.5 Sample Analysis

Analyze samples by GC along with solvent blanks, calibration standards, method blanks (extracted blanks) and all appropriate quality control samples.

Sample extracts are generally injected by an auto sampler. If an auto sampler stalls, lab analysts will restart the analysis using two blanks and an acceptable continuing calibration verification standard.

All Aroclor standards must be run for pattern recognition before running samples. Patterns are established before any sample analysis at the beginning of a sequence.

10.0 Data Analysis & Calculations

10.1 Qualitative Identification

Aroclors are identified based on retention time and PCB pattern matching. All samples are analyzed on a confirmation to verify the correct aroclor is identified. Retention times must fall within established windows on both columns.

10.1.1 Confirmations

Confirm any hits on a second dissimilar column; report the higher of the two results, unless obvious interference is present on one of the columns, or there were QC outliers on one of the columns. RPD between primary and confirmatory column should be <40%. All QA/QC parameters (e.g., calibrations, LCSs, etc.) must be met on the 2° column as well. For samples the higher of the two results is reported unless requested by client or obvious interference is present from one of the columns.

10.1.2 Manual Integration

Manual integration is sometimes necessary to correct inaccurate automated integrations but must never be used to meet QC criteria or to substitute for proper instrument maintenance and/or method set-up. To assure that all manual integrations are justified and proper all manual integrations must be performed, documented, reviewed, and approved in accordance with corporate SOP ENV-SOP-CORQ-0006, *Manual Integration*. Refer to this SOP for guidance on manual integration techniques and required procedures.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

10.1.3 Data Processing

GC files:

A file naming convention is used that allows differentiation between updates to the calibration file performed to adjust target retention times for the changes brought about by daily chromatographic maintenance (no file suffix) and updates due to analysis of a new calibration curve (addition of a "C" suffix to the file identifier)

Reporting Package:

The reporting package that is delivered to clients will consist of the sample results, the surrogate recovery results and any matrix spikes, blanks, duplicates, and lab fortified blanks that pertain to the clients' samples.

MCP Data Enhancement and RCP projects will include required deliverables plus a case narrative and appropriate checklists.

Data Filing:

Data to be filed in File Boxes labeled as Pest/PCB (date range) - All raw data

Data to be filed in Laboratory logbooks - Records for all types of spike solutions

Backup electronic data filed on DVD.

10.2 Calculations

Soil concentration, mg/Kg = $\frac{\text{ug/L (from instrument) x (final prep volume, L)}}{\text{initial sample weight, g}}$

Water concentration, ug/L = $\frac{\text{ug/L (from instrument) x (final prep volume, L)}}{\text{initial sample volume, L}}$

Wipe sample concentration, Total ug = ug/L (from instrument) X (final prep volume, L)

ug/area = $\frac{\text{Total ug}}{\text{Area Wiped}}$ ex. ug/100 cm2 or ug/ft2

10.2.1 Relative Error (%RE)

Relative error is minimally checked at the concentration of the lowest standard in the curve and at the standard near the mid-point of the curve. %RE is calculated as follows:

$$\% \text{ Relative Error} = \frac{x`i - xi}{Xi}$$

xi = True Value of the Calibration Standard
x`i = Measured Concentration of the Calibration Standard

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

% RE must be ≤30% for the midpoint standard and ≤ 50% for the low-point standard.

11.0 QUALITY CONTROL & METHOD PERFORMANCE

11.1 Quality Control

Prepare the following QC samples with each batch of samples. Refer to Appendix B for acceptance criteria and required corrective action(s).

QC Check	Acronym	Frequency
Method Blank	MB	1 per batch of 20 or fewer samples. If batch exceeds 20 samples, every 20 samples.
Laboratory Control Sample	LCS	1 per batch of 20 or fewer samples. If batch exceeds 20 samples, every 20 samples.
LCS Duplicate	LCSD	1 per batch of 20 or fewer samples. If batch exceeds 20 samples, every 20 samples.
Matrix Spike	MS	1 per batch of 20 or fewer samples. If batch exceeds 20 samples, every 20 samples.
Matrix Spike Duplicate	MSD	1 per batch of 20 or fewer samples. If batch exceeds 20 samples, every 20 samples.
Surrogate	SSTD	Added to all blanks, standards, samples, and spikes

11.1.1 Method Blank

Analyzed on each working day to demonstrate that no contamination is present. The method blank is matrix specific and extracted with every batch of 20 samples or less. The target compounds and ranges must be <RL. If MB >RL and sample is not detected, data is qualified. If MB>RL and sample is detected at >10X the MB, then data is qualified. IF MB>RL and sample is detected <10X the MB, then sample is re-extracted if possible.

11.1.2 Laboratory Control Samples (LCS)/Quality Control Check Samples

Matrix-specific LCS/LCSD's are extracted and analyzed with every batch of 20 samples or less. The concentration should be between the low and mid-level standard and must contain at least Aroclors 1016 and 1260. Percent recoveries must fall within control limits. Percent recoveries must be 40-140 %R to meet MCP Data Enhancement and RCP criteria. RPD between LCS and LCSD is <20% for waters and <30% for soils.

Water prep: 1mL of appropriate 500ppb spike to a final volume of 10mL.

True value = 50µg/L off the instrument.

Soil/Solid prep: Add 1mL of Spike 2000ppb to 10grams of sample, to a final volume of 10mL.

True value = 200µg/Kg = 200µg/L off the instrument.

Wipe prep: Add 1mL of 500ppb spike to a final volume of 10mL.

True Value = 50µg/L off the instrument

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

11.1.3 Matrix Spikes/Matrix Spike Duplicates

A matrix-specific MS/MSD is extracted and analyzed with every batch of 20 samples or less. It must contain at least Aroclors 1016 and 1260. Percent recoveries must fall within control limits established from historical data. Percent recoveries must be 40-140 %R and MS RPD must be <50%

11.1.4 Surrogates

Surrogates are added to all blanks, standards, samples, and spikes. Analyze a minimum of two, one that elutes at the beginning of the run and one that elutes at the end of the run (TCMX and DCB). Percent recoveries must fall within control limits established from historical data. Percent recoveries must be 30-150%R to meet MCP and RCP criteria. If the %R is outside of control limits on both columns for the same surrogate, re-extract the sample. If both surrogates are outside limits on one column only, then report any sample results from column within control criteria. If a surrogate is diluted to a concentration below that of the lowest calibration standard, no corrective action, aside from narration, is necessary.

11.2 Instrument QC

Perform the following checks to verify instrument performance. Refer to Appendix B for acceptance criteria and required corrective action.

Instrument Check	Acronym	Frequency
Initial Calibration Verification	ICV	Analyzed immediately after each new calibration
Initial Calibration Blank	ICB	Analyzed immediately after each new calibration
Continuing Calibration Verification	CCV	Performed every 12hours and after no more than 20 samples and at the end of an analytical sequence.
Retention Time Windows	RTW	Will be determined by calculating the mean and standard deviation of the absolute retention times of the surrogate compounds and three (minimum) to five major peaks for each Aroclor
Relative Retention Time	RRT	The retention times used for these calculations should be taken from three injections of the Aroclor standards made over a 72-hour period.

11.2.1 Retention Time Windows

Retention time windows will be determined by calculating the mean and standard deviation of the absolute retention times of the surrogate compounds and three (minimum) to five major peaks for each Aroclor.

For the Aroclors, each selected peak will be characteristic of that Aroclor, will be at least 25% of the height of the largest Aroclor peak, and will include at least one peak that is unique to that Aroclor. The retention times used for these calculations should be taken from three injections of the Aroclor standards made over a 72-hour period.

If the standard deviation of the retention times for any peak is 0.000, a default standard deviation of 0.03 minutes may be used. The width of the retention time window for each

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

surrogate and Aroclor peak will be ±3 times the standard deviation of the mean absolute retention time established during the 72-hour period.

11.3 Method Performance

11.3.1 Method Validation

Refer to corporate SOP ENV-SOP-CORQ-0011 for general requirements and procedures for method validation.

Establish detection limits (DL) and limits of quantitation (LOQ) at initial method set up and verify the DL and LOQ on an on-going basis thereafter. Refer to corporate policy and/or SOP for DL and LOQ requirements and procedures.

12.0 DATA REVIEW & CORRECTIVE ACTION

12.1 Data Review

The data review process of Pace® Analytical Services includes a series of checks performed at different stages of the process by different people to ensure that SOPs were followed, the analytical record is complete, and properly documented, QC criteria were met, proper corrective actions were taken for QC failure and other nonconformance(s), and test results are reported with proper qualification, when necessary.

The review and checks that are performed by the employee performing the task is called primary review.

All data and test results are also peer reviewed.

This process, known as secondary review is performed to verify SOPs were followed, that calibration, instrument performance, and QC criteria were met and/or proper corrective actions were taken, qualitative ID and quantitative measurement is accurate, all manual integrations are justified and documented, and approved in accordance with the Pace® Analytical Services SOP for manual integration, calculations are correct, the analytical record is complete and traceable, and that results are properly qualified.

Lastly, a third-level review, called a completeness check, is performed by reporting or project management staff to verify the test report is complete.

Refer to laboratory SOP ENV-SOP-ELON-0035 *Data Review* for specific instructions and requirements for each step of the data review process.

12.2 Corrective Action

Corrective action is required when QC or sample results are not within acceptance criteria.

Refer to Appendix B for a complete summary of QC, acceptance criteria, and recommended corrective actions for QC associated with this test method.

If corrective action is not taken or was not successful, the decision/outcome must be documented in the analytical record. The primary analyst has primary responsibility for taking

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

corrective action when QA/QC criteria are not met. Secondary data reviewers must verify that appropriate action was taken and/or that results reported with QC failure are properly qualified.

Corrective action is also required when carryover is suspected and when results are over range.

Samples analyzed after a high concentration sample must be checked for carryover and reanalyzed if carryover is suspected. Carryover is usually indicated by low concentration detects of the analyte in successive samples analyzed after the high concentration sample.

Sample results at concentrations above the upper limit of quantitation must be diluted and reanalyzed. The result in the diluted samples should be within the upper half of the calibration range. Results less than the mid-range of the calibration indicate the sample was over diluted and analysis should be repeated with a lower level of dilution. If dilution is not performed, any result reported above the upper range is considered a qualitative measurement and must be qualified as an estimated value.

13.0 POLLUTION PREVENTION & WASTE MANAGEMENT

Pace® proactively seeks ways to minimize waste generated during work processes. Some examples of pollution prevention include but are not limited to reduced solvent extraction, solvent capture, use of reusable cycletainers for solvent management, and real-time purchasing.

The EPA requires that laboratory waste management practices comply with all applicable federal and state laws and regulations. Excess reagents, samples, and method process wastes are characterized and disposed of in an acceptable manner in accordance with the Pace® Chemical Hygiene Plan / Safety Manual. Refer to this manual for these procedures.

14.0 MODIFICATIONS

The procedures in this SOP have not been modified from the reference test method(s) cited.

15.0 RESPONSIBILITIES

- All employees of Pace® Analytical Services that perform any part this procedure in their work activities must have a signed Read and Acknowledgement Statement (R&A) in their training file for the version(s) of the SOP that were in effect during the time the employee performed the activity.
- Local quality personnel are responsible for tracking the currency of the R&A on this SOP for employees at the locations they are assigned to and for notifying the General Manager (GM), however named, when R&A are overdue or outstanding. The GM and the employee's direct supervisor are responsible for ensuring the employee completes the R&A assignments as required.
- The supervisors and managers of Pace® Analytical Services, however named, are responsible for training employees on the procedures in this SOP, implementing the SOP in the work area, and monitoring on-going adherence to the SOP the work area(s) they oversee.
- All employees of Pace® Analytical Services are responsible for following the procedures in this SOP. Unauthorized deviations or departures from this SOP are not allowed except with documented approval from the local Quality Manager and only when those deviations do not violate the Pace® Code of Ethics or Professional Conduct (COR-POL-0004) or associated policy and

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

procedure(s). Hand-edits or manual change to the SOP are not permitted. If a change is desired or necessary, Pace® employees must follow the procedures for document revision specified in corporate SOPs ENV-SOP-CORQ-0015 *Document Managemen*t and ENV-SOP-CORQ-0016 *SOP for Creation of SOP and SWI*.

- Local quality personnel are responsible for monitoring conformity to this SOP during routine internal audits of work areas that utilize this SOP and for communicating gaps and deviations found during monitoring to the work area supervisor, who is responsible for correction of the situation.

16.0 ATTACHMENTS

- Appendix A: Routine Analyte List and LOQ
- Appendix B: QC Summary & Corrective Action Table

17.0 REFERENCES

- ENV-POL-CORQ-0005, *Acceptable Calibration Practices*, current version.
- ENV-SOP-CORQ-0006, *Manual Integration*, current version.
- ENV-SOP-CORQ-0011, *Method Validation and Instrument Verification*, current version.
- ENV-SOP-CORQ-0015, *Document Management*, current version.
- ENV-SOP-CORQ-0016, *Standard Operating Procedures and Standard Work Instructions,* current version.
- COR-POL-0004, *Code of Ethics and Professional Conduct*, current version.
- COR-MAN-001, *Pace® Safety Manua*l, current version.
- ENV-MAN-ELON-0001, *Quality Manual*, current version.
- EPA, Test Methods for Evaluation of Solid Waste, Physical/Chemical Methods, SW- 846, Rev.7, December 2007, Method 8082, Method 3545, and Method 3546 Rev 0 February 2007.
- EPA, Test Methods for Evaluation of Solid Waste, Physical/Chemical Methods, SW- 846, Rev.1, February 2007, Method 8082A.
- MA DEP, MCP Data Enhancement Program, "Quality Control Requirements and Performance Standards for the Analysis of Polychlorinated Biphenyls (PCBs) by Gas Chromatography (GC) in Support of Response Actions under the Massachusetts Contingency Plan (MCP)", Rev 2, February 15, 2024.
- Connecticut DEP, Reasonable Confidence Protocol, Method 8082, Ver.3.0 May 2024
- USEPA – "Determinative Chromatographic Separations", SW846, 3rd edition, March 2003, Method 8000C.
- USEPA - – "Determinative Chromatographic Separations", SW846, 2nd edition, December 1996, Method 8000B.
- HP 6890 Series Gas Chromatograph Operating Manual, Edition 1, January 1990

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

- Agilent Technologies 7890 Series II Gas Chromatography Operating Manual, Online

18.0 REVISION HISTORY

Revisions Made from Prior Version

Section	Description of Change
All	Fixed various typos and formatting issues throughout.
8.2.1	Change source from Restek to Accustandard.
8.2.2	Updated with Accustandard.
8.2.5	Removed "Restek ensures a second source from their primary stock standard.
9.3	Updated Extraction SOP references.
9.4.3	Updated SOP reference.
17.0	Updated corporate SOP references.

Document Succession: This version replaces the following documents:

Document Number & Version	Document Title	Effective Date:
ENV-SOP-ELON-0034 v03	EPA 8082A	06/12/2024

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix A: Target Analyte List and LOQ

Table 1: Standard Analyte List and LOQ

Analyte	CAS #	LOQ[1] Water (µg/L) 20 Off Inst. and 0.2 calculated	LOQ[1] Soils (mg/kg) 20 Off Inst. and 0.02 calculated	LOQ[1] P/S (mg/kg) 20 Off Inst. and 0.1 calculated	LOQ[1] Wipes 20 and Caulking 10 (mg/kg) Off Inst. And 0.2 calculated	LOQ[1] 10 Paint (mg/kg) Off Inst. And 0.5 calculated
PCB-1016	12674-11-2	20 and 0.2	20 and 0.02	20 and 0.1	20 wipe/10 caulk and 0.2 calc.	10 and 0.5
PCB-1221	11104-28-2	20 and 0.2	20 and 0.02	20 and 0.1	20 wipe/10 caulk and 0.2 calc.	10 and 0.5
PCB-1232	11141-16-5	20 and 0.2	20 and 0.02	20 and 0.1	20 wipe/10 caulk and 0.2 calc.	10 and 0.5
PCB-1242	53469-21-9	20 and 0.2	20 and 0.02	20 and 0.1	20 wipe/10 caulk and 0.2 calc.	10 and 0.5
PCB-1248	12672-29-6	20 and 0.2	20 and 0.02	20 and 0.1	20 wipe/10 caulk and 0.2 calc.	10 and 0.5
PCB-1254	11097-69-1	20 and 0.2	20 and 0.02	20 and 0.1	20 wipe/10 caulk and 0.2 calc.	10 and 0.5
PCB-1260	11096-82-5	20 and 0.2	20 and 0.02	20 and 0.1	20 wipe/10 caulk and 0.2 calc.	10 and 0.5
PCB-1262	37324-23-5	20 and 0.2	20 and 0.02	20 and 0.1	20 wipe/10 caulk and 0.2 calc.	10 and 0.5
PCB-1268	11100-14-4	20 and 0.2	20 and 0.02	20 and 0.1	20 wipe/10 caulk and 0.2 calc.	10 and 0.5

[1] Values as of effective date of this SOP. LOQ are subject to change, contact quality personnel for most current information.

**Reduced Volume water RL, 10ug/L off instrument and 0.138ug/L (calculated).*

**MA CAM RL's = 0.25ug/L and 0.1 mg/kg*

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix B: QC Summary and Corrective Action Table

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
ICAL	At instrument set up, after CCV failure, after major maintenance	Must meet one of curve fit options presented in Section 11.3.2. For any curve fit other than Average RF (RSD), curve must also pass RSE test at the low and midpoint calibration standard.	Identify and correct source of problem, repeat	None. Do not proceed with analysis
ICV	After Each ICAL	All analytes must be within ± 20% of the true value. (%R)	Identify source of problem, re-analyze. If repeat failure, repeat ICAL. Analysis may proceed if it can be demonstrated that the ICV exceedance has no impact on analytical measurements. For example, the ICV %R is high, CCV is within criteria, and the analyte is not detected in sample(s).	Qualify analytes with ICV out of criteria.
RT Window Position (Daily)	Once per ICAL and at the beginning of the analytical window.	The width of the retention time window for each surrogate and Aroclor peak will be ±3 times the standard deviation of the mean absolute retention time established during the 72-hour period. See section 11.3.3	NA	NA
RT Window Study	At method set-up and after major instrument maintenance	Window is ± 3 times the standard deviation	NA	NA
CCV	Performed every 12 hours and after no more than 20 samples and at the end of the analytical sequence.	All analytes within ± 20 %D	See Section 11.3.4 for required corrective actions based on circumstance.	Qualify analytes with CCV out of of criteria.
Surrogate	Added to all blanks, standards, samples, and spikes	TCMX and DCB must be between 30-150%	See Section 11.3.8 for required corrective actions based on circumstance.	Qualify if outside criteria
Method Blank	1 per batch of 20 or less samples	<RL	See Section 11.3.5 for required corrective actions based on circumstance.	Qualify if outside criteria
LCS/LCSD	1 per batch of 20 or less samples	All analytes must be within ± 40% of the true value. (%R) RPD = <20% waters and <30% soils	See Section 11.3.6 for required corrective actions based on circumstance.	Qualify if outside criteria
MS/MSD	1 per batch of 20 or less samples	All analytes must be within ± 40% of the true value. (%R) RPD = <50%	See Section 11.3.7 for required corrective actions based on circumstance.	Qualify if outside criteria

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Pace ANALYTICAL SERVICES	**ENV-SOP-ELON-0180 v03_PFAS EPA 1633**
	Effective Date: 01/15/2025

Management Approval:
Brianna Henriquez Approved on 1/8/2025 9:03:37 AM
Francis Derose Approved on 1/15/2025 1:15:09 PM
Tod Kopyscinski Approved on 1/8/2025 9:48:39 AM
Katherine Allen Approved on 1/15/2025 2:16:41 PM

© 2024 Pace® Analytical Services, LLC (PAS)

1.0 SCOPE & APPLICATION

This standard operating procedure (SOP) specifies the laboratory procedure used by PAS-ELON for the determination of the per- and Polyfluoroalkyl substances (PFAS) in various matrices using LC-MS/MS by EPA Test Method 1633.

1.1 Applicable Matrices

The matrices that can be tested using this SOP include:

Aqueous Matrices	Solid Matrices	Other Matrices
Non-Potable Water	Soil/Sediment	Biphasic (Aqueous/Solid)
Landfill Leachate	Biosolid	
TCLP / SPLP Leachate		
Aqueous Film Forming Foam (AFFF)		
Fluorine-Free Foam (F3)		

1.2 Routine Analyte List and Limits of Detection & Quantitation

This SOP uses abbreviations for the analyte name. A cross-reference of analyte name to CAS# and abbreviation is provided in Appendix A, Table 1.

The routine analyte list and limit of quantitation (LOQ) that can be determined by this SOP for each matrix is provided in Appendix A, Table 2.

Detection limits for each analyte are kept on file by the laboratory's Quality Department.

Unless otherwise specified, nominal limits of detection and the LOQ used during testing are adjusted on a per-sample basis to account for actual sample quantities used, percent moisture, and dilution factors.

1.3 Statutory and Program Specific Requirements

When statutory or regulatory program requirements for EPA Method 1633 differ from the procedures outlined in the main body of this SOP, the program specific requirements are called out in the relevant section of the SOP or are provided in appendices to the SOP. These requirements take precedence over the main SOP and must be adhered to when performing work under that jurisdiction, unless otherwise specified on a project-specific basis.

2.0 SUMMARY OF METHOD

Samples are prepared and extracted using solid phase extraction (SPE). Extracts are cleaned using carbon cleanup prior to analysis by LC-MS/MS in the multiple reaction monitoring (MRM) mode.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Sample concentrations are determined by isotope dilution or extracted internal standard quantification using isotopically labeled compounds added to the samples before extraction.

This test procedure is based on USEPA Method 1633, January 2024, and includes allowable modifications from the reference method to improve performance.

Refer to Section 14 for a detailed list of modifications and their rationale. Supporting documentation to demonstrate equivalency and comparability, when required, is maintained by the laboratory's Quality Department.

3.0 INTERFERENCES

Solvents, reagents, glassware, and other sample processing hardware may yield artifacts and elevated baselines causing misinterpretation of chromatograms. This SOP includes procedures for equipment cleaning to mitigate these interferences.

Interferences co-extracted from samples will vary considerably from source to source, depending on the diversity of the site being sampled. Interfering compounds may be present at concentrations several orders of magnitude higher than the native PFAS. Because low levels of PFAS are measured by this method, elimination of interferences using proper cleanup techniques is essential and these steps are incorporated into the procedural sections of this SOP.

The most frequently encountered interferences are fluoropolymers; however, bile salts (e.g., Taurodeoxycholic Acid [TDCA]) may be present in various matrices, including fish and wastewaters, and can interfere in the chromatography. For this reason, the laboratory procedure includes analysis of a standard (bile interference check) containing TDCA is required when establishing the initial chromatographic conditions and with each analytical sequence.

4.0 DEFINITIONS

The definitions of common laboratory terms are provided in the Glossary section of the Laboratory Quality Manual. Refer to the Quality Manual as needed. Key terms relevant to this procedure include:

Articles of Commerce: Solid consumer and related product materials.

Extracted Internal Standard (EIS) quantification: The response of the target compound is compared to the response of the isotopically labeled analog of another compound with chemical and retention time similarities.

Isotope dilution (ID) quantitation: A means of determining a naturally occurring (native) compound by reference to the same compound in which one or more atoms has been isotopically enriched. The labeled PFAS are spiked into each sample and allow identification and correction of the concentration of the native compounds in the analytical process.

Isotopically labeled compound: An analog of a target analyte in the method which has been synthesized with one or more atoms in the structure replaced by a stable (non-radioactive) isotope of that atom. Common stable isotopes used are 13C (Carbon-13) or Deuterium (D or 2H). These labeled compounds do not occur in nature, so they can be used for isotope dilution quantitation or other method-specific purposes.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

5.0 HEALTH & SAFETY

Contact your supervisor or local safety coordinator with questions or concerns regarding safety protocol or safe handling procedures for this procedure.

The following sections provide general health and safety information about chemicals and materials that may be present in the laboratory.

- The toxicity or carcinogenicity of each chemical material used in the laboratory has not been fully established. Each chemical should be regarded as a potential health hazard and exposure to these compounds should be as low as reasonably achievable.
- The laboratory maintains documentation of hazard assessments and OSHA regulations regarding the safe handling of the chemicals specified in each method. Safety data sheets for all hazardous chemicals are available to all personnel. Employees must abide by the health, safety and environmental (EHS) policies and procedures specified in this SOP and in the Pace® Chemical Hygiene / Safety Manual (COR-MAN-0001).
- Personal protective equipment (PPE) such as safety glasses, gloves, and a laboratory coat must be worn in designated areas and while handling samples and chemical materials to protect against physical contact with samples that contain potentially hazardous chemicals and exposure to chemical materials used in the procedure.
- Concentrated corrosives present additional hazards and are damaging to skin and mucus membranes. For procedures that require use of acids, use acids in a fume hood whenever possible with PPE designed for handing these materials. If eye or skin contact occurs, flush with large volumes of water. When working with acids, always add acid to water to prevent violent reactions. For procedures that that emit large volumes of solvents (evaporation/concentration processes), these activities must be performed in a fume hood or apparatus that reduces exposure.

6.0 SAMPLE COLLECTION, PRESERVATION, HOLDING TIME & STORAGE

6.1 Sample Collection & Bottle Kits

PAS does not offer sample collection services for this test method. The customer's sampling contractor should collect samples in accordance with a sampling plan and collection procedures appropriate to meet regulatory requirements and data quality objectives for the project.

Refer to Appendix A, Table 3 for sample collection, preservation, and holding time requirements for each matrix.

PAS will provide containers for sample collection per customer request. Refer to laboratory SOP ENV-SOP-ELON-0017 *Bottle Prep* for general instruction on bottle kit preparation and refer to Appendix A, Table 3 for sample collection, preservation, and holding time requirements for each matrix.

PFAS Bottle Kit Specifications:

- If the request includes containers for surface wipes, provide a copy of the Pace® PFAS Wipe Sampling Guide in each sampling kit.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

- Kits for aqueous sample kits should include the instruction to fill the container to the gradation marked on the container, or to the shoulder of the container if no gradations are provided.
- If matrix spikes are requested (or required by program), provide additional containers for the collection of MS/MSD and remind the customer to designate the sample for use on the chain-of-custody (COC).

  For example, if an MS/MSD is requested on an aqueous matrix, the customer must collect and provide seven (7) 500 mL containers, two (2) each for the MS, MSD, and parent sample, plus one (1) 125 mL container for prescreening.
- AFFF Concentrate: Customers should notify PAS at the time of request for quote or sampling containers if the matrix of any sample is an AFFF concentrate. Due to the specific handling requirements needed for this matrix, pre-notification ensures that the laboratory is prepared to handle the sample properly to prevent the sample from contaminating the work area and/or other test samples.
- DoD Projects: Testing may only be done by DoD accredited laboratories. Ensure sample kits include additional containers to collect sample material for laboratory duplicates and/or matrix spikes as required by DoD QSM or as specified in the Project QAPP (Quality Assurance Project Plan).

6.2 Sample Receipt, Storage and Disposal

Laboratory sample receiving personnel check thermal preservation and compliance with the PAS Sample Acceptance Policy on receipt following the procedures specified in SOP ENV-SOP-ELON-*0100 Sample Log-in Procedures*. Refer to the Laboratory Quality Manual for the PAS Sample Acceptance Policy.

Unless otherwise specified by contract, samples and extracts are retained for the timeframe specified in the Pace® standard terms and conditions then disposed of in accordance with Federal, State, and Local regulations.

7.0 EQUIPMENT & SUPPLIES

See Appendix A for a complete list of equipment and supplies needed to perform this procedure.

Substitution of instrumentation, equipment, and supplies is permissible only if the replacement meets the specifications outlined in the SOP. If an alternative item does not meet these specifications, it may impact the procedure's performance, necessitating an update and/or revalidation of the procedure.

Plastic containers must be used for all standard, sample, and extraction preparations due to potential adsorption of analytes onto glass. Do not substitute glass for plastic containers.

7.1 Suitability Checks

Verify the suitability of SPE cartridges, solvents, cryovials, and autosampler vials on a lot- basis by analysis of a method blank; maintain records of the verification for readily available historical access.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

8.0 REAGENTS & STANDARDS

See Appendix B for a complete list of standards and reagents needed to perform this procedure and for formulations of standard solutions prepared by the laboratory.

Substitution of reagents and standards from those listed in Appendix B are permissible only if the replacement meets the specifications outlined in the SOP. If an alternative item does not meet these exact same specifications for purity, composition, or concentration, any formulation in this SOP must be modified to match the material used. If the substitution is permanent, the SOP and formulations in this SOP must be updated.

All purchased standard solutions must be received with a Certification of Analysis (COA). The COA must be maintained on-site in laboratory possession; access to a COA via the vendor's website is generally not acceptable to external regulatory bodies because the COA must be traceable to each lot received. Refer to laboratory SOP ENV-SOP-ELON-0008 *Inventory and Chemical Receipt*, for instructions for receipt and traceability.

9.0 PROCEDURE

9.1 Equipment & Instrument Setup

9.1.1 Support Equipment

9.1.1.1 Top Loading & Analytical Balance

Prior to use on each day of use, verify the calibration verification check on the analytical and/or top loading balance has been performed with working reference weights that bracket the measurements of weights that will be taken.

Verify the balance calibration is within its annual calibration timeframe. If the calibration sticker is missing or the calibration has expired, do not use the balance and notify the quality department of the situation.

If an alternate balance is used: ensure the balance used has been checked for tolerances that bracket the entire range of weight measurements.

9.1.1.2 Drying Oven

Verify the oven is equipped with a calibrated thermometer prior to use.

If the thermometer is missing a calibration label or the calibration has expired, notify the quality department. Do not use the oven until it is equipped with a calibrated thermometer appropriate for the temperature ranges required for the test and the gradients required to record temperatures of use.

If the thermometer used is assigned a correction factor (CF), record the original observation and the temperature corrected for the CF. If the logbook or electronic log does not have a location to record both temperatures, notify the quality department of the gap in traceability.

9.1.1.3 Mechanical Pipettes

Prior to use, check the calibration label of the pipette(s) to verify the accuracy

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

check has not expired. If expired or the calibration label is missing, notify the quality department. Do not use the pipette until its calibration status has been verified.

If a different pipette is used, ensure its calibration has been verified at the volume of use before using the pipette.

9.1.1.4 Refrigerators / Freezers

Ensure samples and extracts, and reagents and standards, if stored refrigerated or frozen, are stored separately and the temperature of the units are monitored daily, including weekends and holidays. Refer to the laboratory's SOP, however named, for monitoring procedures and recording of temperature measurements.

9.1.2 Extraction Equipment

9.1.2.1 Suitability Checks

Verify the suitability of SPE cartridges and other disposable plasticware by lot prior to use. Review results of initial batch blanks performed.

These supplies are acceptable for use if no target analytes are detected above the detection limit (DL AKA MDL).

9.1.2.2 Cleaning Procedures

Rinse all glassware prior to use with methanolic ammonium hydroxide (1%) and methanol solvent. Air dry after the solvent rinse.

9.1.2.3 SPE Manifold Setup & Use

Inspect sample manifold ports and transfer tubing (if used) prior to use for signs of wear and/or discoloration. Replace manifold ports and transfer tubing as needed.

Clean all parts of the SPE manifold including the chamber prior to use and between samples with methanolic ammonium hydroxide (1%). Air dry before use.

9.1.3 Analytical Instrumentation

9.1.3.1 Instrument Operating Conditions

Set the instrument operating conditions to the following specifications:

LC Gradient					MS Parameters	
Step	**Total Time (min)**	**Flow Rate (µL/min)**	**A (%)**	**B (%)**	**Parameter**	**Setting/Value**
1	0.00	400	80	20	Sample Loop	40 µL
2	7.00		0	100	Injection Volume	3 µL
3	7.01		80	20	Column Oven Temperature	40° C
4	8.50		80	20	Nebulizer psi	40
					Gas Temp ºC	250

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

					Gas Flow	11 L/min
					Sheath Gas Temp ºC	300
					Sheath Gas Flow	11 L/min
					Capillary (V)	2500
					Nozzle Voltage	0

A: 5% Acetonitrile w/ 10mM Ammonium Acetate / B: Acetonitrile

9.1.3.2 Mass Calibration & Mass Calibration Verification

Perform mass calibration and mass calibration verification following the instrument manufacturer instructions prior to first use and at least annually thereafter to check instrument sensitivity and selectivity. Repeat following major instrument maintenance, movement of the instrument, or when other quality control (QC) failures suggest the need.

Ensure the procedures used for mass calibration and mass calibration verification evaluate an ion range that encompasses the ion range (Q1 and Q2 m/z) of the analytes of interest in this method. If the manufacturer's instructions include options for evaluation of mass resolution, the tightest resolution requirements (typically called unit resolution) must be met.

9.2 Calibration Design

Unless otherwise specified, instrument calibration procedures must comply with the PAS Corporate Policy for *Acceptable Calibration Practices for Instrument Testing* (POL ENV-POL-CORQ-0005). Refer to this policy as needed to learn more about policies and requirements for calibration and calibration verification.

9.2.1 Calibration Model

This SOP includes two (2) calibration models. Each option uses isotopically labeled compounds added to the samples prior to extraction. Option 1 is required for any analytes for which there is a stable isotope analogue.

Option 1: Isotope Dilution Quantification (ID): the response of the target compound is compared to the response of its isotopically labeled analog. Twenty-four (24) target compounds are quantified in this way.

Option 2: Extracted Internal Standard quantification (EIS): the response of the target compound is compared to the response of the isotopically labeled analog of another compound with chemical and retention time similarities; sixteen (16) target compounds are quantified in this way.

9.2.2 Calibration Design

The design of the curve specified in this SOP includes analysis of nine (9) calibration standards; however, not all standards must be included in the final curve.

More than the minimum number of calibration points specified in the published reference method are analyzed to extend the calibration range and to permit exclusion of the lowest or highest standards when needed; the calibration set is designed to leave enough standards remaining to meet the minimum number required for the curve fit, and to ensure

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

that eliminating standards at the low or high end of the calibration does not alter the established LOQ.

- When linear calibration is used, the calibration curve must minimally include 6 calibration levels, with at least 5 within the quantitation range, and the lowest standard at or below the LOQ.
- When non-linear calibration (Quadratic) is used, the calibration curve must minimally include 7 calibration levels, with at least 6 within the quantitation range, and the lowest standard at or below the LOQ.

Weighting is allowed for linear and non-linear regressions, so long as the weighting is inversely proportional to concentration and is not forced through zero.

When considering the range of quantitation, ensure the LOQ routinely achieves a signal to noise ratio of 3:1, and meets the requirements for the confirmation ion and the ion ratio requirements specified in the published reference method. If a confirmation ion is not specified in the published method for the analyte, the signal to noise ratio must be minimally 10:1.

Each calibration sequence must also include the analysis of a second source standard (ICV); however, this standard is never included in the curve – it is used to evaluate accuracy and/or potential bias of calibration standard preparation and curve fit.

Refer to Appendix B for the formulations for each working calibration standard.

Acceptance criteria for the curve are provided later in this SOP.

9.2.3 Calibration Frequency

Calibrate the instrument at initial setup, when calibration verification (ICV, ISC, CCV) results indicate the calibration is no longer valid, when changes made to the operating conditions may affect calibration performance, after major instrument maintenance, or after any other event that may affect instrument performance, such as moving the instrument.

9.2.4 Calibration Sequence

Prepare the calibration standards and the ICV following the instructions in Appendix B.

Prepare an instrument blank (IBLK) by adding 4950 µL of the IBLK Mix and 25 µL each of EIS and NIS to a plastic centrifuge tube; vortex to mix.

Analyze calibration standards L1-L9 in order from lowest to highest concentration.

Analyze the instrument blank (IBLK) after the highest concentration calibration standard, followed by the ICV.

9.3 Calibration Evaluation

Evaluate the calibration for linearity, accuracy, sensitivity, and carryover. If any criteria are not met, troubleshoot to identify and correct the problem, then repeat calibration. All criteria must be met before analysis of test samples.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Suggested Actions:

a) Perform instrument maintenance and reanalyze the calibration sequence.

b) Remake the standards and analyze a new calibration sequence.

c) Reduce the range of calibration by excluding the highest concentration calibration standards or the first calibration standard. Since CAL L1 is not routinely included in the curve and CAL 2 is the LOQ, no other standards at the low end may be removed. Removal of standards in the interior of the curve is not permitted unless an obvious error with the standard is observed.

9.3.1 Linearity Evaluation

Use one of the following options to evaluate the linearity of the calibration curve. When using a weighted regression, assess linearity with option 2 below.

1) Linear Calibration: calculate the relative standard deviation (RSD) of the Relative Response (RR) or Response Factor (RF) values of the initial calibration standards for each target analyte and isotopically labeled compound. The RSD must be ≤ 20%.

2) Non-Linear Quadratic (2nd Order Fit): calculate the relative standard error (RSE) for each native compound and EIS compound for all the initial calibration standards that were analyzed. The RSE for all target and EIS compounds must be ≤ 20%. See Section 10.4.6 for the equation to calculate RSE. Maintain a record of the calculation and evaluation with the curve for historical recordkeeping and reference.

9.3.2 Initial Calibration Verification (ICV)

To verify the accuracy of the calibration, check the recovery of the ICV. The recovery should be within ±30% of the expected value.

When criteria are not met, it is likely there is a problem with the quality or preparation of the calibration standards and/or the ICV; correct the problem prior to sample analysis.

Suggested actions include:

1) Remake and reanalyze the ICV

2) Remake calibration standards and repeat the calibration sequence.

3) If instrument maintenance is performed: in addition to reanalyzing the ICV, the calibration sequence may need to be reanalyzed if the conditions under which the acceptability of the calibration curve was evaluated have changed.

9.3.3 Instrument Sensitivity Check (ISC)

Check instrument sensitivity daily at the lowest calibration standard included in the quantitation range (CAL L2).

The signal-to-noise ratio of the ISC must be ≥ 3:1 for the quantification ions and the confirmation ions, or ≥ 10:1 if the analyte only has a quantification ion. Recovery of the native and EIS compounds for the ISC must be within 70-130%. If the requirements cannot be met, the problem should be corrected before analyses can proceed.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

If an individual target compound recovery in an ISC is above the upper control limit and all associated samples are ND for that compound, the data for those samples may be reported. In such cases, a narrative statement must be included in the report indicating the specific compound result that was biased high in the ISC, and that samples were ND for that compound and thus reportable.

See Appendix A, Table 6 for ion associations for each target analyte.

9.3.4 Bile Salts Interference Check

Verify the bile salt peak (TDCA) is detected >1 min outside RT window for PFOS. TDCA is added to multiple calibration standards to facilitate this evaluation.

9.3.5 Initial & Continuing Calibration Blanks (ICB & CCB)

Calibration blanks are used to assess carryover and/or contamination in the instrument system and are included in the initial calibration sequence and each daily analytical sequence thereafter.

In analytical sequences that include calibration, analyze the ICB following the highest concentration ICAL standard before the ICV. In sequences without calibration, analyze a CCB each day prior to sample analysis after the opening CCV.

The concentration of each analyte must be ≤ the MDL.

- If contamination is suspected, troubleshoot to identify and eliminate the source.
- If the failure is due to carryover from a prior standard, either reduce the upper range of the calibration or increase column flush time to reduce potential for carryover.

9.3.6 Continuing Calibration Verification (CCV)

Verify the calibration at the beginning of each analytical sequence, after every ten environmental samples, and at the end of the sequence. The ISC may serve as the daily opening CCV. Do not include quality control (MB, LCS), instrument performance check standards (CCV), sample-specific matrix spikes, MS/MSD, field duplicates (FD), or trip blanks in the count of environmental samples.

Use ICAL Level 5 as the CCV and analyze it under the same conditions as the calibration standards.

The recovery of each target analyte and the EIS compounds for the CCVs must be within 70 – 130% to meet CCV criteria.

See Appendix A, Table 6 for ion associations for each target analyte.

If criteria are not met, take corrective action and reanalyze any extracts that were analyzed between the last passing CCV and the one that failed, unless the CCV result is above the upper limit and all associated samples are not detected (ND), in which case, reanalysis is not required.

Alternately, immediately analyze two CCVs for confirmation. If both confirmation CCV analyses meet the recovery criteria, proceed with analysis; however, samples that were

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

analyzed after the failing CCV and before the 2 passing CCVs must be re-analyzed. If either of the 2 confirmation CCV analyses fails to meet the acceptance criteria, recalibrate the instrument.

9.4 Sample Preparation: General Requirements

9.4.1 Contamination Prevention

To reduce potential contamination or bias, do not use any fluoropolymer articles or task wipes during sample preparation or extraction procedures. Use only HDPE or polypropylene containers; reagents and solvents used for cleaning purposes may be stored in glass containers.

9.4.2 Pre-Screening Procedures

Samples may be pre-screened at the discretion of the laboratory prior to sample preparation and/or analysis. Results of the screen may be used to determine if reduced volume extraction is needed or to target dilution of extracts prior to analysis.

Refer to Appendix C for instructions to prepare screening extracts when screening has been scheduled.

9.4.3 Homogenization, Subsampling, and/or Pre-Preparation Requirements

Different matrices require or may require homogenization, subsampling or pre-preparation as specified in the following subsections before sample preparation and extraction.

9.4.3.1 Aqueous: Non-Potable Water and Landfill Leachate

The sample volume used for preparation and extraction may be subsampled from the original container received when it is known that the sample requires a dilution of >10X or when EIS criteria cannot be met due to matrix interference. When subsampling is required to manage high concentrations, no less than 250 µL of aqueous or leachate samples may be subsampled - if greater dilution is required, serial dilution must be employed. When subsampling is required to manage challenging matrices, no less than 1 mL of samples may be subsampled.

Subsampling must be performed with customer knowledge to confirm the protocol used by the laboratory meets their project-specific requirements.

Refer to Appendix D for subsampling instructions.

9.4.3.2 Aqueous: TCLP or SPLP Leachates

The TCLP or SPLP leachates are generated using the laboratory's routine protocol for leachate generation. The leachate solutions provided by the work area performing this step are used as samples for PFAS extraction and analysis. TCLP/SPLP leachates are prepared following the Landfill Leachate protocol, with nominally 100 mL of sample extracted.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

9.4.3.3 Aqueous: AFFF or F3

Samples composed of AFFF, F3, or other matrices KNOWN to require a large dilution prior to extraction will be subsampled consistently, with approximately 0.02 g of material aliquoted for each discrete sample preparation/analysis; each AFFF or F3 concentrate sample must be prepared in duplicate. After creating and documenting the subsample aliquot in a 125 mL HDPE PFAS sample bottle, add approximately 60 mL of reagent water, cap the vessel, and shake vigorously by hand for 20-30 seconds. After adding the reagent water and agitating, allow at least 3 hours for the subsample aliquot to fully dissolve in the water. If dissolution is incomplete after 3 hours, agitate again and wait another 3 hours; consider applying continuous agitation (orbital shaker) if full dissolution of the aliquot into water requires extended time. Following the extended dissolution time, prepared AFFF/F3 samples should be extracted and analyzed following the routine protocols for aqueous sample processing. Aqueous reporting limits will be used, with values adjusted to account for the actual sample aliquot, assuming 1 g/mL; this constitutes a 25,000X nominal adjustment factor for AFFF/F3 reporting limits, relative to nominal aqueous reporting limits.

Pace STRONGLY DISCOURAGES clients from sending AFFF concentrate material for analysis; this protocol is designed for “as-prepared” AFFF materials (i.e. pre-diluted to application concentration) and newer generation ‘Fluorine Free Foam’ (F3) concentrates. If F3 material (concentrate or as-prepared) or AFFF “as-prepared” material is received, follow the normal routines described in the paragraph above. If an AFFF concentrate material (usually of a thick gel-like consistency) is received for analysis, the above protocol may not be enough of a dilution to protect lab systems; in these cases, the lab shall prepare a serial dilution prior to extraction. First, the protocol above is followed (0.02 g of material fully dissolved into 60 mL water). Then a 6 mL aliquot of the initial aqueous solution is diluted into water, with a final volume of 60 mL (i.e., dilute 6 mL of sample solution into 54 mL of water). This serial dilution constitutes a 250,000X nominal adjustment factor for the AFFF concentrate reporting limits, relative to nominal aqueous reporting limits. Handling of AFFF concentrate should ideally be done in an isolated area outside of the PFAS processing area to prevent gross lab contamination.

9.4.3.4 Solid: Soils and Sediments

If a reduced mass extraction is scheduled, use at least 0.5 g (dry weight) for all solid matrices to ensure the amount used for sample preparation is representative of the total mass of sample collected.

9.4.3.5 Solid: Biosolid

If a reduced mass extraction is scheduled, use at least 0.05 g (dry weight) for all biosolid matrices to ensure the amount used for sample preparation is representative of the total mass of sample collected.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

9.4.3.6 Biphasic

If the sample is biphasic and the customer has requested phase separation: centrifuge the sample to separate the phases following the procedure specified in Appendix F, then prepare and extract each phase separately.

9.5 Percent Solids Determination

9.5.1 Aqueous Matrices

A percent solids determination is not conducted for aqueous matrices. Instead, the laboratory visually assesses the sample matrix during sample preparation and employs alternative strategies to mitigate the effect of any solids present.

9.5.2 Solid Matrices (excluding tissues and Articles of Commerce)

Percent solids must be determined on all solid and biosolid samples prior to preparation and analysis to determine the sample mass used for extraction in accordance with SOP ENV-SOP-ELON-0069 *Percent Solids*. Percent solids are logged-in and determined by the same personnel that normally generate this data daily. The percent solids analysis will follow the Method SM2540G protocol.

Percent solids are not determined for tissue, surface wipes or the solid phase of a biphasic sample. These matrices are always reported on a wet weight basis.

9.6 Sample Preparation: Procedure

9.6.1 Aqueous Matrices

Do not filter samples at any point prior to sample preparation.

Unless a reduced volume extraction is necessary, use the following amounts for sample preparation and analysis:

Routine Extraction Volume for Aqueous Matrices[1]

Non-Potable Water	Landfill Leachate	TCLP/SPLP Leachate	AFFF or F3
500 mL	100 mL	100 mL	0.02 g

[1]Nominal amount on which LOQ in Table 2 is derived. When different sample volumes are used, detection limits and the LOQ are adjusted for the actual amount used.

- For NPW: Use the entire volume from one (1) of the 500 mL containers provided.
- Landfill Leachates: Use entire volume from one (1) of the 125 mL containers provided.
- TCLP/SPLP Leachate: Subsample 100 mL of the filtered leachate generated by pouring the leachate from the container into a 125 mL HDPE PFAS sample bottle. Use the gradations on the bottle as a measuring guide.
- AFFF or F3: Subsample 0.02 g of the material received into a 125 mL HDPE PFAS sample bottle and dilute in 60 mL of reagent water; see Section 9.4.3.3 for the complete pre-extraction preparation protocol.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Create separate preparation batches for aqueous matrices that use different initial volumes because the volume used for the MB and LCS/LLLCS must match the amount used for samples.

Preparation Steps:

1) Remove the sample container from storage. Pull additional containers for each MS/MSD and for the laboratory duplicate, when a duplicate is requested or required, and an additional container has been provided to perform the analysis.

   DoD Accredited Laboratories: If the matrix is AFFF or F3, a duplicate must be performed with each sample. Confirm that there is enough sample available to take the duplicate from the same container.

2) Invert the sample container 3-4 times to homogenize the sample and then allow the sample to settle.

3) Visually inspect each settled sample for settled or suspended solids. Consider any visible indications of particulate matter including settled solids collected on the bottom of the container, cloudiness and/or dark color of the sample, suspended solids within the sample, increased viscosity, etc. If uncertain, seek a second opinion from another analyst, team lead, or supervisor; these matrix characteristics may require reduced-volume extraction.

   a. If potential interferences other than settled solids are observed, take action to mitigate the impacts on data quality. Examples of other sample characteristics that could necessitate precautionary measures with a field sample (i.e., prepare from reduced volume) include presence of standing foam in the sample after shaking, thick/viscous matrix, samples from known highly contaminated sites/projects, client notes indicating potential high concentrations, and knowledge of potential hazards to safety, equipment performance, or process integrity due to sample composition. In such cases, confer with a team lead or supervisor to determine the best approach. Use the largest volume possible (i.e., the smallest reduction possible) when performing a reduced-volume extraction to manage challenging matrix characteristics; use no less than 1 mL of sample.

   b. If none of these conditions are observed or if the solids observed are less than ½ cm in depth, proceed to Step 4.

   c. If settled solids are observed at a depth greater than ½ cm, skip Section 9.6.1 and follow the preparation and extraction instructions specified in Appendix E.

   d. If settled or suspended solids appear to be more than 5% of the total volume of the sample:

      - Recap the container and shake to homogenize; uncap the container.
      - Using a pipet calibrated to quantitatively measure 1 mL, transfer 1 mL of sample into a pre-labeled 50 mL centrifuge tube.
      - Add 40 mL of reagent water to the tube.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

- Record 1 mL for the volume used for sample preparation and extraction.
- Proceed with Step 5 after initial weight has been determined for all samples in the batch.

4) Weigh the container+sample on the top-loading balance and record the weight measurement in the preparation record to the nearest 0.1 g. This measurement will be used later to calculate the actual volume of sample extracted.

5) Prepare a method blank (MB), laboratory control sample (LCS), and low-level laboratory control sample (LLLCS) by measuring the volume of blank matrix specified into a 500 mL HPDE container. For TCLP / SPLP, prepare 2 MB.

- NPW: Use 500 mL of reagent water.
- Landfill Leachate: Use 100 mL of reagent water.
- TCLP / SPLP Leachate: Use 100 mL of TCLP or SPLP blank solution for the LCS, LLCS and Leachate MB. Prepare another MB using 100 mL of reagent water.
- AFFF / F3: can be batched with NPW; if batched separately, prepare batch QC following NPW routines.

6) Quantitatively add 64 µL of the STK-10X standard mix to LLLCS and 40 µL of EPA-1633STK mix to the LCS.

7) Add 20 µL of EIS solution to each container (all samples and QC).

8) If the batch includes matrix spikes, add 40 µL of EPA-1633STK mix to each matrix spike.

9) Cap each container and invert to mix.

10) Check the pH of each container using a pH indicator strip to verify the pH is 6.5 ± 0.5. If necessary, adjust the pH with 50% formic acid or ammonium hydroxide (or with 5% formic acid and 3% aqueous ammonium hydroxide). Do not insert the strip into the sample container: use a disposable pipette to transfer a small amount of sample onto the pH indicator strip instead.

11) Proceed to Section 9.7 for extraction and extract cleanup.

9.6.2 Solid Matrices (Non-Tissue)

Unless a reduced mass extraction is necessary, use the following amounts for sample preparation and analysis:

Routine Target Mass for Solid Matrices[1]

Soil/Sediment	Biosolid	Surface Wipe
5 g dry weight	0.5 g dry weight	1 wipe

[1]Nominal amount on which LOQ in Table 2 is derived. When different sample mass is used, detection limits and the LOQ are adjusted for actual amount used.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Do not combine biosolids in the same preparation batch as soils/sediments or articles of commerce due to the difference in amount of material used.

Skip Steps 2-4 if the sample matrix is a surface wipe or article of commerce.

1) Remove the sample from storage.

2) Using a wooden tongue depressor, mix each sample in its original jar by stirring from the bottom of the container to the top and in a circular motion along the sides of the jar, breaking particles up by pressing against the side of the container (to <1 mm). The homogenized sample will be even in color and have no separate layers. Store the homogenized material in its original container. If it is not practical to mix the sample within its container, transfer the sample to a larger container to mix.

3) Check the LIMS to obtain the percent solids result for each sample in the batch.

   - If the test results are not available, check to see if a percent solids analysis is included in the work order; if not, notify the Project Manager (PM) they will need to add the test to the log-in.
   - If test results are not available because the department performing the test has not completed the determination, notify your supervisor or contact the leader of the department performing the test to obtain the status. Preparation may not begin until this information is available.
   - If the percent solids result is <50%, notify the PM and request that the matrix in the work order be changed to biosolid; prepare the sample as a biosolid.
   - If the percent solids result is <5%, notify the PM and request the matrix be changed to landfill leachate; prepare the sample as a landfill leachate.

     If none of these scenarios apply, proceed to Step 4.

4) Determine the target mass for extraction for soils/sediments and biosolids by dividing the target weight for sample preparation by the percent solids in decimal form.

   For example, if a soil sample is 90% percent solids, the mass used for extraction must be within the range of 5.4-5.8 g.

   a) Convert 90% percent solids to decimal form by dividing 90 by 100. (90/100 = 0.9)

   b) Divide 5 g (target mass) by the percent solids in decimal form (5/0.9=5.555…)

   c) Round 5.5555 to the same significance of measurement as the top loading balance[1] (5.6).

   d) Add ± 0.2 g to the target result of 5.6 g to obtain the target weight range of 5.4 to 5.8 g.

   [1]For biosolids, use an analytical balance and convert the result to the significance of the analytical balance (0.01 g)

5) Place a 50 mL polypropylene centrifuge tube on the balance and tare the balance.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Measure the target weight of sample into the tube so that the weight is within the range determined in the prior step. Record the amount used to the nearest 0.1 g (top loading) or 0.01 g (analytical).

NOTE: *Surface wipes should have been received in a 50 mL centrifuge tube. If the wipe was received in a different container, transfer the wipe to a 50 mL centrifuge tube using clean forceps.*

If matrix spikes or a laboratory duplicate were requested or are required, prepare separate containers for each.

If the sample is extremely dry, wet the sample with 2.5 g of reagent water, which is the same amount always used to wet the clean matrix used for the MB and LCS.

6) Prepare the MB, LCS and LLLCS using Ottawa Sand wetted with reagent water by adding the clean matrix and water to a 50 mL polypropylene centrifuge tube.
   - Soil/sediment: Use 5 g Ottawa Sand and 2.5 g of reagent water
   - Biosolid: Use 0.5 g of sand and 0.25 g of reagent water
   - Surface Wipe: Use a new ghost wipe from a pre-tested lot
   - Articles of Commerce: Can be batched with soil/sediment; if batched separately, prepare batch QC following soil/sediment routines.
7) Quantitatively add 80 µL of the STK-10X standard mix to LLLCS and 40 µL of EPA-1633STK mix to the LCS.
8) If the batch includes matrix spikes, add 40 µL of EPA-1633STK mix to each matrix spike sample.
9) Add 20 µL of EIS solution to each container (all samples and QC)
10) Using a vortex mixer, vortex the tube to disperse the spike solution and allow to equilibrate for approximately 30 minutes. Alternatively, shake by hand.
11) First Extraction: Add 15 mL of 0.3% methanolic ammonium hydroxide to each centrifuge tube. Vortex to disperse, then shake for 30 minutes on a variable speed mixing table. Next, centrifuge each tube for 10 minutes at 3000 rpm (~2000 RCF) then transfer the supernatant to a clean, labeled 50 mL polypropylene centrifuge tube.
12) Second Extraction: Add 15 mL of 0.3% methanolic ammonium hydroxide to the remaining solid sample in each centrifuge tube. Vortex to disperse, then shake for 30 minutes on a variable speed mixing table. Centrifuge each tube at 3000 rpm (~2000 RCF) for 10 minutes and decant the supernatant from the second extraction into the same centrifuge tube containing the supernatant from the first extraction.
13) Adjust the extraction solution to 50 mL volume using reagent water. A validated comparison bottle may be used to make this adjustment.
14) Check the pH of each sample solution using a pH indicator strip to verify the pH is 4.0 ± 0.5. If necessary, adjust the pH with 50% formic acid or ammonium hydroxide (or with 5% formic acid and 3% aqueous ammonium hydroxide). Do not insert the strip

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

into the sample container: use a disposable pipette to transfer a small amount of sample onto the pH indicator strip instead.

15) Proceed to Section 9.7 for extraction and extract cleanup.

9.7 SPE Extraction & Carbon Cleanup

Use the same procedure for all matrices.

1) Prepare an SPE cartridge for each sample and QC by packing clean silanized glass wool into the bottom of a WAX SPE cartridge barrel, to a height of ~1 cm. Ensure the glass wool is not densely packed to allow for proper sample flow.

2) Set up the vacuum manifold with one prepared WAX SPE cartridge, with a reservoir adaptor and reservoir stacked on each cartridge, ensuring all connections are tight. If using plastic transfer lines instead of reservoirs, ensure the connecting caps are snug in each cartridge and the transfer lines are placed within the appropriate sample. Label each reservoir or cartridge tube with the associated sample ID.

3) Pre-condition the cartridges with 15 mL of 1% methanolic ammonium hydroxide followed by 5 mL of 0.3M formic acid. Perform each rinse separately. Do not allow the WAX SPE to go dry. Discard the wash solvents.

4) Pour the sample into the reservoir taking care to avoid splashing while loading; or, if using transfer lines, begin opening the stopcocks on the vacuum manifold. Do not pipette the sample in this step. Adjust the vacuum/stopcocks to pass each sample through the cartridge at a rate of approximately 5-10 mL/min; discard the eluate. Retain the empty sample bottle for solvent rinsing.

   If the SPE cartridge becomes clogged during sample transfer, refer to Appendix G for troubleshooting steps and mitigation strategies.

5) Rinse the walls of the reservoir twice with 5 mL reagent water, followed by 5 mL of 1:1 0.1M formic acid/methanol. Pass each rinse through the cartridge using vacuum. If using sample transfer lines for loading, add the 3 rinses to the original sample container and load each rinse through the transfer lines to the cartridge, one reagent at a time. Discard the rinse solutions.

6) Dry the cartridges by pulling air through them for ~ 5 minutes.

7) While the WAX cartridges are drying, condition the carbon cartridges (GCB) by rinsing with two aliquots of 5 mL of MeOH. Perform this step on a separate vacuum manifold or on the unused ports of the same manifold as the WAX cartridges.

   Insert the narrow end of a 5 mL or 10 mL plastic pipette tip into the top of the GCB cartridge and use it like a reservoir for the rinse solvent. Apply a light vacuum to pull the rinse solvent through the cartridge; discard the rinsates. Do not allow the GCB cartridges to go completely dry during/after this step. Remove the pipette tip from the GCB cartridge and discard.

8) When the WAX cartridges are sufficiently dry, remove each WAX cartridge and reservoir out of its manifold port and stack it on a conditioned GCB cartridge by inserting the outlet of the WAX cartridge into the inlet of the GCB cartridge. Place the dual cartridge-reservoir stack back in the same manifold port that the WAX cartridge originally occupied. This

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

cartridge stacking should be done one cartridge at a time to avoid mixing up manifold locations.

If using transfer lines: follow the same cartridge stacking process but ensure that the transfer line connecting caps are snug in each cartridge and the transfer lines are placed within the appropriate sample bottle after stacking the two cartridges.

9) Place a clean collection tube in the manifold rack for each cartridge so that the extract delivery needles are not touching the walls of the tubes. Resume vacuum and ensure a proper seal is achieved. DO NOT add NIS to these collection tubes.

10) Rinse the inside of each sample container using 5 mL of 1% methanolic ammonium hydroxide. Then pour the rinse from each sample container to transfer the rinse to the associated SPE reservoir to wash the walls of the reservoir. If using sample transfer lines, transfer the container rinse from each sample container to its associated cartridge using vacuum. Whether using reservoirs or transfer lines, allow the elution solvent to soak the SPE sorbent for 2 minutes, then use vacuum to pull the elution solvent through the cartridge and into the collection tubes in a slow, dropwise manner.

11) Aqueous samples: air dry the empty sample container after the rinse is transferred. Weigh the empty container with the cap on and subtract that from the weight of the bottle with sample, determined in Section 9.6.1, step 4.

12) Add 25 µL of concentrated acetic acid and 20 µL of NIS mix to each collection tube and vortex to mix. Transfer a portion of each extract into an autosampler vial for LC-MS/MS analysis. Cap the collection tubes containing the remaining extract and store the extract at 0 - 6°C.

13) Proceed to Section 9.8 for analysis.

9.8 Analysis

Analyze the extracts by LC-MS/MS in multiple reaction monitoring (MRM) mode, with unit mass resolution. Allow the extracts to warm to room temperature prior to aliquoting into autosampler vials and loading on the instrument.

On each day of analysis:

1) Flush the column with 100% Acetonitrile for at least 30 minutes to clear any accumulated impurities and interferences from the sample pathway and to equilibrate the system. Open the purge valve(s) on the pumps for the first ~1 minute of flush time and/or use the “purge” function available as part of the pump functionality and purge the autosampler injector flow path using the “purge” function, if available.

2) Equilibrate the column by flushing the column for ~15 mins with 50:50 Mobile Phase A: Mobile Phase B followed by ~15 minutes of 98:2 Mobile Phase A: Mobile Phase B.

3) Verify system pressure is stable.

4) Bring standards and samples to room temperature, vortex to homogenize, then transfer a portion to an autosampler vial in preparation for analysis.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

5) Following any initial priming injections on days when a calibration is not needed, an ISC and an instrument blank (IBLK) will be analyzed to demonstrate system suitability and the absence of system contamination prior to sample analysis.

6) After acceptable ISC and IBLK results are confirmed, load and submit extracted samples for analysis, typically starting with batch QC with field samples following. A CCV and CCB must be analyzed after every 10 (or fewer) field samples.

Arrange standards and samples in an autosampler to run in sequence as follows:

Order of Sequence with ICAL	Order of Sequence w/o ICAL
Cal L1-9 in order of lowest to highest	Opening ISC/CCV
IBLK	IBLK
ICV	MB
Follow same sequence as w/o ICAL, starting at MB	LLLCS
	LCS
	Samples (10 or fewer)
	CCV
	CCB
	Samples (10 or fewer)
	Closing CCV

[1]*The closing CCV analysis may be used as the opening solution for the next analytical sequence when criteria for the opening CCV are also met.*

10.0 DATA ANALYSIS & CALCULATIONS

Data is reduced using the acquisition software provided by the instrument manufacturer.

10.1 Retention Time (RT) Window

Establish RT Windows for all analytes, EIS and NIS with each ICAL event and at the beginning of each analytical sequence thereafter. Analytical conditions must be set to allow a separation of at least 1 minute between TDCA and the retention time window of PFOS. If this is not achieved the problem must be corrected. The RT window used must be of sufficient width to detect earlier-eluting branched isomers.

- In sequences that include an initial calibration curve (ICAL) use the midpoint standard of the curve to set the RT for analytes, EIS and NIS.
- In sequences that do not include ICAL, use the beginning CCV retention times to set the RT for analytes, EIS and NIS.

10.2 Qualitative Identification

The presence of target analytes, EIS, and NIS compounds are qualitatively confirmed when the criteria in Sections 10.2.1. through 10.2.5. are met.

If identification criteria are not met and, based on analyst discretion, the analyte may be present, the presence of a target analyte may be reported. In such cases, data will be reported with a qualifier alerting the data user that qualitative identification could not be confirmed because the

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

detection did not meet the method-required criteria but based on analyst discretion, the compound may be present and should be considered an estimated value.

If the criteria listed below are not met for the standards, the laboratory must stop analysis of samples and correct the issue.

10.2.1 Integration

The response of all isomers in the quantitative standards should be used to define integration parameters and ion ratios.

In samples, the total integrated response should include the branched isomer peaks that have been identified in the quantitative standard, if present. For compounds with identified branched and linear isomer peaks, the reported concentration is the sum of all isomers. If standards (either quantitative or qualitative) containing a mix of isomers are not available for purchase for a particular compound, only the linear isomer can be identified and quantitated in samples.

10.2.1.1 Manual Integration

Manual integration is sometimes necessary to correct inaccurate automated integrations but must never be used to meet QC criteria or to substitute for proper instrument maintenance and/or method set-up. To assure that all manual integrations are justified and proper, all manual integrations must be performed, documented, reviewed, and approved in accordance with corporate SOP ENV-SOP-CORQ-0006, *Manual Integration*. Refer to this SOP for guidance on manual integration techniques and required procedures.

10.2.2 Retention Time (RT)

The RTs for the target analytes, EIS, and NIS compounds must fall within ±0.4 minutes of the predicted retention times from the midpoint standard of the ICAL or initial daily CCV, whichever was used to establish the RT window position for the analytical batch. All branched isomer peaks identified in the calibration standards also must fall within 0.4 minutes of the retention times set for the analytical batch.

For all target analytes with exact corresponding isotopically labeled analogs, target analytes must elute within ±0.1 minutes of the associated EIS compound.

10.2.3 Signal-to-Noise Ratio (S/N)

Peak responses of the quantitation and confirmation ions must be at least three times the background noise level (S/N 3:1); if there is no confirmation ion, S/N must be >10:1.

If the S/N ratio is not met in a standard or QC sample due to high background noise, correct the problem (e.g., perform instrument maintenance).

If the S/N ratio is not met in a blank or sample, then detection of the analyte cannot be confirmed; the analyte is “not detected”.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

10.2.4 Ion Ratio Criteria

For any compound that meets S/N and RT criteria, the ratio of the total (branched and linear isomer) quantification ion response to the total (branched and linear isomer) confirmation ion response – referred to as the Ion Ratio – must fall within ± 50% of the ratio observed in the mid-point ICAL standard.

The ion ratio requirement does not apply for PFBA, PFPeA NMeFOSE, NEtFOSE, PFMPA, or PFMBA because suitable secondary transitions are unavailable (not detectable or inadequate S/N).

10.2.5 Detection Limit

The calculated concentration (see Section 10.4) of the target analyte must be greater than the adjusted detection limit (DL) to be reported. Quantified results below the DL cannot be confirmed and will be reported as "not detected."

10.3 Quantitative Analysis

Test results are quantified by automated data reduction software using the equations in Section 10.4.

10.4 Calculations

All data is reduced by automated software, no manual calculations are performed for this test.

10.4.1 Target Analyte Concentration

Concentrations of the target analytes are determined with respect to the extracted internal standard (EIS) which is added to the sample prior to extraction (see Appendix A, Table 6). Other equations may be used if the laboratory demonstrates that those equations produce the same numerical result as produced by the equation below.

$$\boldsymbol{Concentration\ (ng/L\ or\ ng/g) = \frac{Area_N M_{EIS}}{Area_{EIS}(\overline{RR}\ or\ \overline{RF})}\ x\ DF\ x\ \frac{Vf}{Vi}}$$

$Area_N$	The measured area of the quantitation ion for the unlabeled PFAS target analyte
$Area_{EIS}$	The measured area of the quantitation ion for the EIS compound
M_{EIS}	The expected concentration of the EIS in the extract (ng/L)
RR	Average response ratio used to quantify target compounds by the isotope dilution method
RF	Average response factor used to quantify target compounds by the extracted internal standard method
DF	Extract Dilution Factor; if no extract dilution was performed, DF=1
Vf	Final extract volume (L)
Vi	Initial sample volume (L) or weight (g)

10.4.2 EIS Concentration

The EIS compounds are quantitated with respect to an NIS, as shown in Appendix A Table 6, using the response factors from the most recent initial calibration. Other equations may

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

be used if the laboratory demonstrates that those equations produce the same numerical result as produced by the equation below.

$$\boldsymbol{Concentration\,(ng/L\ or\ ng/g) = \frac{Area_{EIS}M_{NIS}}{Area_{NIS}\overline{RF_S}}\ x\ DF\ x\ \frac{Vf}{Vi}}$$

$Area_{EIS}$	The measured area of the quantitation ion for the EIS compound
$Area_{NIS}$	The measured area of the quantitation ion for the associated NIS compound
M_{NIS}	The expected concentration of the NIS in the extract (ng/L)
$\overline{RF_S}$	Average response factor used to quantify the EIS compound by the non-extracted internal standard method
DF	Dilution Factor; if no extract dilution was performed, DF=1.
Vf	Final extract volume (L)
Vi	Initial sample volume (L) or weight (g)

10.4.3 ICAL Relative Response (RR)

Used to calculate the response ratio (RR) for each target analyte calibrated by isotope dilution quantitation.

$$\boldsymbol{RR = \frac{Area_t M_{EIS}}{Area_{EIS} M_t}}$$

$Area_t$	Measured area of the quantitation ion for the target analyte
$Area_{EIS}$	Measured area of the quantitation ion for the corresponding labeled PFAS used as the EIS in the calibration standards
M_{EIS}	Concentration of the isotopically labeled PFAS used as the EIS in the calibration standards (ng/L)
M_t	Concentration of the target analyte in the calibration standard (ng/L)

10.4.4 ICAL Response Factor (RF): Target Analyte

Used to calculate the response factor (RF) for each target analyte calibrated by extracted internal standard quantitation.

$$\boldsymbol{RF = \frac{Area_t M_{EIS}}{Area_{EIS} M_t}}$$

$Area_t$	Measured area of the quantitation ion for the target analyte
$Area_{EIS}$	Measured area of the quantitation ion for the corresponding labeled PFAS used as the EIS in the calibration standards
M_{EIS}	Concentration of the isotopically labeled PFAS used as the EIS in the calibration standards (ng/L)
M_t	Concentration of the target analyte in the calibration standard (ng/L)

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

10.4.5 ICAL Response Factor (RF): EIS

$$RF_S = \frac{Area_{EIS} M_{NIS}}{Area_{NIS} M_{EIS}}$$

$Area_{EIS}$	Measured area of the quantitation ion for the EIS compound in the calibration standard
$Area_{NIS}$	Measured area of the quantitation ion for the NIS compound in the calibration standard
M_{NIS}	Concentration of the NIS compound in the calibration standard (ng/L)
M_{EIS}	Concentration of the EIS compound in the calibration standard (ng/L)

10.4.6 ICAL Relative Standard Error (RSE)

Used to assess linearity of quadratic curve fits.

$$RSE = 100\,x \sqrt{\sum_{i=1}^{n} \frac{\left[\frac{x_i' - x_i}{x_i}\right]^2}{n - p}}$$

x_i	Nominal concentration (true value) of each calibration standard
x_i'	Measured concentration of each calibration standard
n	Number of standard levels in the curve
p	Type of curve (2 = linear, 3 = quadratic)

10.4.7 Other Calculations

For common calculations such as percent recovery and relative percent difference, refer to ENV-MAN-ELON-0001 *Quality Manual*.

10.5 Reporting Specifications

Unless otherwise specified on a project basis, report final test results as follows:

Matrix	Units	Comment
Aqueous: All Matrices	ng/L	If alternate protocols are used to manage matrix characteristics or high concentrations, narrate sample data accordingly.
Soils/Sediments & Biosolids	ng/g dry weight	Test results are adjusted for percent moisture. Include the test information from percent solids determination in the test report.
Biphasic: Solid phase	ng/g wet weight basis	
Surface Wipe	ng/wipe	

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Adjust the DL and LOQ for sample volume or mass and any dilution factor before using it as the threshold value for reporting quantitative test results. Unless otherwise specified, test results between the DL and the LOQ, when reported, are qualified as estimated.

The recovery of associated EIS compounds for each target analyte must be included for each sample in the test report, regardless of the type of deliverable provided.

If the sample was diluted, include the DF in the test report to identify the factor by which the final test results were adjusted. Results for any analyte found in a sample or extract that has been diluted will be reported at the least dilute level for which the measured concentration is within the calibration range (e.g., above the LOQ for the analyte and below the highest calibration standard) and in which isotopically labeled compound recoveries are within their respective QC acceptance criteria. This may require reporting results for some analytes in the same sample from different analyses.

For compounds with identified branched and linear isomer peaks, the reported concentration is the sum of all isomers. If standards (either quantitative or qualitative) containing a mix of isomers are not available for purchase for a particular compound, only the linear isomer can be identified and quantitated in samples.

11.0 QUALITY CONTROL & METHOD PERFORMANCE

11.1 Method Performance Validation

The performance of this SOP was verified in accordance with the PAS corporate SOP for Method Validation and Instrument Verification. Records of verification are kept by the Quality Department in accordance with the PAS policy for Record Management (ENV-POL-0013).

Detection limits (DL or MDL, including LOD for DoD) and limits of quantitation (LOQ) were established in accordance with SOP ENV-SOP-ELON-0132 *LOQ_LOD_MDL_Determination* during initial method setup.

These limits are continuously verified and updated in accordance with USEPA procedures for determining method detection limits, as well as the requirements specified in the TNI Standard and DoD/DOE QSM, as applicable. Customers should be informed that the laboratory is obligated to update these limits when verification checks reveal a change in sensitivity or method performance, regardless of customer approval.

11.1.1 Initial Precision and Recovery (IPR)

To verify the performance of the laboratory's SOP against the specifications of the test method, a demonstration of capability (DOC) must be conducted for each matrix following the procedure outlined in Section 9.2.1 of EPA Method 1633. Refer to the method published in January 2024 by the USEPA Office of Water (Document EPA 821-R-24-001) for detailed instructions. In summary, the lab must follow the SOP protocol to extract and analyze four (4) samples prepared as LCS, along with at least one MB, for each matrix to be tested. The average percent recovery and RSD of the target analyte results are tabulated and compared to method acceptance criteria.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

The results of the IPR must be within the accuracy and precision limits specified in Appendix A, Table 10. There are no IPR mean or RSD criteria for EIS compounds; %REC of each IPR sample must meet the criteria in Appendix A, Table 9.

11.2 Analyst Demonstration of Capability (DOC)

Before conducting unsupervised (independent) work on any client samples, analytical personnel (including sample preparation) must demonstrate their ability to achieve accurate and precise test results using the procedures specified in this SOP (IDOC) and redemonstrate this capability on an annual basis thereafter (ODOC).

Refer to the laboratory's Quality Manual and to laboratory SOP ENV-SOP-ELON-0134 *Training Requirements* for more information about the requirements and procedure for IDOC and CDOC.

The average recovery of the target analytes in the DOC samples must be within the accuracy limits for LCS specified in Appendix A, Table 8 and the RSD must be within the precision limits for IPR specified in Appendix A, Table 10. There are no mean or RSD criteria for EIS compounds in the DOC; %REC of each DOC sample must meet the criteria in Appendix A, Table 9.

The IPR study may also suffice as IDOC for the analyst who performed the study.

11.3 Matrix Impact (MS/MSD)

Matrix spikes are used to assess potential impact of matrix interference on the accuracy or precision of the procedure on samples of the same or similar matrix – samples of similar matrix are usually classified as samples of the same matrix type collected from the same sampling site.

According to EPA Method 1633, matrix spikes (MS/MSD) generally are not required for methods that employ isotopic dilution because the recovery of the EIS compounds spiked into every sample reflects the effect the matrix has on recovery of target compounds.

Therefore, matrix spikes are not required for compliance monitoring. However, the EPA method acknowledges that some projects or programs may be interested in this information.

Customers interested in using information from matrix spikes to understand potential matrix impact on their samples must request MS/MSD, provide additional sample material to the laboratory to perform the test, and identify which sample to use on the chain-of-custody (COC).

If no customer has requested MS/MSD on any sample in the preparation batch, an MS/MSD is not performed.

NOTE for DoD Projects: Some DoD QSM versions require 1 MS/MSD pair per preparation batch. Customers performing work that requires compliance with a version of the QSM that requires MS/MSD must provide additional sample material for the laboratory to perform this test.

11.4 Sampling Impact (Field Duplicate)

A field duplicate (FD) refers to the testing of a replicate container of sample collected with all other samples from a sampling event and used to measure precision of the field sampling technique.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Customers requiring a field duplicate must request this analysis and provide a separate container for analysis. The FD must be logged in as a routine environmental sample; it may not be subsampled from the same container of any other sample.

11.5 Quality Control (QC)

The laboratory prepares and analyzes the following QC at the frequency specified in the table below. Refer to Appendix A, Table 7 for acceptance criteria and requirements for corrective action(s) and/or data qualification.

Item[1]	Acronym	Frequency
Mass Calibration		Annually and as needed
Mass Calibration Verification		After mass calibration
Initial Calibration	ICAL	Initially at instrument setup, then as needed
Initial Calibration Verification	ICV	With each ICAL, prior to sample analysis
Instrument Blank	IBLK/ICB	Daily prior to analysis and after high concentration standards
Instrument Sensitivity Check	ISC	Daily prior to analysis
Continuing Calibration Verification	CCV	At the beginning (ISC) and every 10 samples
Continuing Calibration Blank	CCB	After each bracketing CCV
RT Window	RTW	During ICAL and at the beginning of each analytical sequence
Bile Check	TDCA	With each ICAL and daily with each CCV
Method Blank	MB	1 per batch of 20 or fewer samples
Laboratory Control Samples	LCS & LLLCS	1 pair per batch of 20 or fewer samples
Laboratory Duplicate	DUP	See Section 11.5.1

[1]*Extracted (EIS) and Non-extracted Internal Standards (NIS) are included in each QC item.*

11.5.1 Laboratory Duplicate (AKA Matrix Duplicate)

A laboratory duplicate is a duplicate preparation and analysis of a sample whose aliquot was taken from the same container as the parent sample and used to measure precision.

EPA Method 1633 does not require laboratory duplicates for NPDES compliance monitoring, but the method acknowledges that a duplicate may be needed on a project-specific basis. Some accreditation programs, such as DoD ELAP, require a duplicate for each sample of certain matrices, such as AFFF or F3.

To support project needs, the laboratory will perform a duplicate when the customer has requested this measure, designated which sample from their sampling event to use as the duplicate on the chain-of-custody (COC), and have provided sufficient additional sample material for the test.

However, customers should be advised that when the duplicate is taken from a different container, which is necessary for certain matrices, the duplicate effectively becomes a field duplicate and the results for precision are inclusive of potential bias from sampling error.

Instructions for DUP to Laboratory Personnel by Matrix:

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

- **NPW:** Laboratory duplicates must be prepared from a separate container because the entire sample is consumed during routine preparation and extraction and subsampling is only allowed for primary dilutions of samples expected to have high concentrations of target analytes, or to manage sample matrix characteristics.

  If a duplicate is requested and no sample has been designated for use, confer with the PM to determine which sample to use and verify that more than two (2) 500 mL containers were received. If two or less containers were received; there is insufficient sample volume available to perform the duplicate – notify the PM of the sampling nonconformity. If more than two (2) 500 mL containers were received, use one (1) for the parent sample and one (1) for the duplicate.

  Do not perform reduced volume extraction to provide a DUP.

- **Surface Wipes**: The entire sample is consumed during preparation and extraction. Given the nature of the matrix and collection technique, this sample matrix is not suitable for analysis of a laboratory duplicate.

  If a duplicate is requested, notify the PM that the matrix is not suitable for this determination and cancel the request.

- **AFFF/F3, Soil/Sediment, Biosolid, Articles of Commerce, and Tissue**: A laboratory duplicate is performed when requested by the customer and when there is enough material to take the duplicate aliquot from the same container. Note that DoD QSM 6.0 requires a laboratory duplicate on a sample basis for AFFF and F3 matrices. Thus, for DoD project work, customers must provide sufficient mass for each sample to meet this program requirement.

11.5.2 Extracted Internal Standards (EIS)

To assess method performance on the sample matrix, the laboratory must spike all samples and QC with the EIS solution. Analyze each sample according to the procedures in this SOP. Compute the percent recovery of the EIS compound concentration using the NIS quantitation method; see Appendix A, Table 9 for acceptance criteria.

If the recovery of any EIS compound is outside of the acceptance limits in the original, undiluted analysis, prepare and analyze a limited extract dilution and/or a re-extraction using a reduced sample amount.

Prior to calculating EIS percent recovery, the calculated concentration of the EIS are always adjusted to account for any extract dilutions prepared for analysis.

11.5.3 Non-extracted Internal Standard (NIS)

To assess method performance, the laboratory must spike all sample extracts with the NIS solution prior to analysis. Percent recovery of the NIS compound is calculated by comparing the measured response in each analysis to the average response of the same compound measured in the ICAL.

Calculate the ratio of the NIS peak areas from the QC and field samples relative to the mean area of the corresponding NIS in the most recent initial calibration to check for

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

possible bad injections of NIS solution or loss of instrument sensitivity. If the NIS areas are low for all the field samples and QC samples in the analytical batch, it suggests a loss of instrument sensitivity, while low areas in only some field or QC samples suggests a possible bad injection. See Appendix A, Table 9 for acceptance criteria.

11.5.4 Sample Dilutions

Samples with quantified target analytes exceeding the upper calibration range must be diluted and reanalyzed to bring the result within the calibration range. However, if it is known that the analytes are not compounds of concern for the project, test results may be reported over the calibration range, if they are qualified to disclose the situation and documented client consent for reporting this way is obtained.

If the extract dilution required is greater than 10X, repeat sample preparation using a reduced sample amount, guided by the magnitude of the original over-range results.

The response of the EIS in the diluted extract must meet the S/N and RT requirements for qualitative identification and must be within the limits specified in Appendix A, Table 9. If EIS criteria are not met, then the compound cannot be measured reliably in the diluted extract, and sample preparation and analysis must be repeated with a smaller subsample.

The amount used for re-extraction should be consistent with the dilution applied to the original extract. For example, if a 10X dilution was needed for an aqueous sample, 50 mL of sample should be subsampled for re-prep and extraction. (Divide the original amount of sample prepared by 10 – this is the sample amount.)

12.0 Data Review & Corrective Action

12.1 Data Review

Review all data and test results before releasing the test report to ensure that the analytical record is complete and properly documented, criteria were met, appropriate corrective actions were taken for QC failures or other nonconformances, and test results are properly qualified when necessary.

Initial review, known as primary review, is done by the individual who performed the task.

Review of the data and test results done by someone other than the person who performed the task is known as secondary review, and it is done by a qualified peer or supervisor. Secondary review is done to ensure any errors missed during primary review are caught and corrected before the test report is delivered. Secondary review is also done to ensure that SOPs were followed, calibration and instrument performance met specifications, QC criteria were satisfied, and/or proper corrective actions were implemented, qualitative identification and quantitative measurements are accurate, any manual integrations are justified, documented, and approved per the PAS Corporate SOP for manual integration, calculations are accurate, and the analytical record is complete and traceable, with final test results properly qualified.

In addition to primary and secondary review, a completeness check is performed by project management personnel to confirm that the test report is complete and ready for release.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Refer to laboratory SOP ENV-SOP-ELON-0035 *Data Review* for specific instructions and requirements for each step of the data review process.

12.2 Corrective Action

Corrective action is required when QC or sample results fall outside the acceptance criteria. For a complete summary of QC parameters, acceptance criteria, and recommended corrective actions associated with this test method, refer to Appendix A, Table 7. The primary analyst has primary responsibility for taking corrective action when QA/QC criteria are not met. Secondary data reviewers must verify that appropriate action was taken and/or that results reported with QC failure are properly qualified.

Corrective action is also required when instrumental carryover contamination is suspected. Samples analyzed after a sample with a detection above the working calibration range must be checked for carryover and reanalyzed if carryover is suspected. If field sample analyte concentrations exceed the highest calibration standard and the same analytes in the following field sample or in consecutive following field samples also exceed the MB acceptance criteria, the affected samples should be reanalyzed using a fresh aliquot of the sample extract.

If corrective actions are not taken or are unsuccessful, the decision and outcome must be documented in the analytical record and test results qualified to alert the end data user of the nonconformity.

13.0 Pollution Prevention & Waste Management

Refer to laboratory SOP ENV-SOP-ELON-0013 *Hazardous Waste* and ENV-SOP-ELON-0144 *Sample Disposal*, or however named, for waste handling and management practices pertaining to the waste streams created at this facility.

Pace® proactively seeks ways to minimize waste generated during work processes. Some examples of pollution prevention include but are not limited to reduced solvent extraction, solvent capture, use of reusable cycletainers for solvent management, and real-time purchasing.

The EPA requires that laboratory waste management practices comply with all applicable federal and state laws and regulations. Excess reagents, samples, and method process wastes are characterized and disposed of in an acceptable manner in accordance with the Pace® Chemical Hygiene Plan / Safety Manual. Refer to this manual for these procedures.

14.0 Modifications

The procedures in this SOP have been modified from the reference method to improve overall performance. Supporting documentation to demonstrate equivalency and comparability, when required, is maintained by the Quality Department.

Modification	Section of Reference Method Modified	Justification for Modification	Validation of Modification
Changed EIS quantitation association for PFMPA,	Section 20, Table 10	Improved performance (allowable modification),	MDL, IPR, PT

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Modification	Section of Reference Method Modified	Justification for Modification	Validation of Modification
7:3FTCA, ADONA, 9Cl-PF3ONS, & 11Cl-PF3OUdS		more appropriate correlation	
Updated product ion used for measurement of 13C4-PFOA from m/z 172 to m/z 372	Section 20, Table 10	Match ion transition used for EIS 13C8-PFOA and native PFOA	MDL, IPR, PT
Increased the size of the SPE sorbent bed to 250 mg and tube size to 20 mL	Section 6.7.1	Improved performance (allowable modification); wider cartridge improves sample loading, reduces chances of clogs	MDL, IPR, PT
Increased flow rate to allow up to 10 mL/min	Section 12.1.4	Comparable and validated performance	MDL, IPR, PT
TSS determination by visual inspection for aqueous samples.	Section 11.1 & 11.2.4	Allowable modifications per method	Not applicable.
Solid matrix extraction: eliminated 3rd liquid-solid extraction step and omitted concentration step	Section 11.3.4, 11.3.6, and 11.3.9	Improved performance & reduced sample processing time	MDL, IPR, PT
Use pre-packed GCB cartridges; omit syringe filtration	All refences to carbon cleanup	Improved performance, reduced sample processing time, & ease of use	MDL, IPR, PT

15.0 RESPONSIBILITIES

PAS employees that perform any part this procedure in their work activities must have a signed Read and Acknowledgement Statement (R&A) in their training file for the version(s) of the SOP that were in effect during the time the employee performed the activity.

PAS supervisors and managers, however named, are responsible for training employees on the procedures in this SOP, implementing the SOP in the work area, and monitoring on-going adherence to the SOP in the work area(s) they oversee.

PAS employees are responsible for following the procedures in this SOP. Unauthorized deviations or departures from this SOP are not allowed except with documented approval from the local QM and only when those deviations do not violate the Pace® Code of Ethics or Professional Conduct (COR-POL-0004) or associated policy and procedure(s). Hand-edits or manual changes to the SOP are not permitted. If a change is desired or necessary, Pace® employees must follow the procedures for document revision specified in corporate SOPs ENV-SOP-CORQ-0015, *Document Management* and ENV-SOP-CORQ-0016, *SOP for Creation of SOP and SWI.*

16.0 ATTACHMENTS

- **Appendix A: Tables**

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

- Table 1: Analyte Name / Abbreviation / CAS Number Cross-Reference Table
- Table 2: Routine Analyte List and LOQ by Matrix
- Table 3: Sample Collection, Preservation, and Holding Time Requirements
- Table 4: Required Instruments, Equipment, and Supplies
- Table 5: Prepared Concentration of Working Calibration Standards
- Table 6: Identification and Quantitation Ions by Analyte, EIS, and NIS
- Table 7: QC Acceptance Criteria, Corrective Action and Data Qualification Requirements
- Table 8: LCS/LLLCS Acceptance Limits
- Table 9: EIS and NIS Acceptance Limits
- Table 10: IPR Limits for Method Validation

- **Appendix B: Reference Materials – Reagents, Standards & Formulations**
- **Appendix C: Sample Screening Protocol**
- **Appendix D: Subsampling Procedure for Aqueous Matrices**
- **Appendix E: Aqueous Sample Preparation – Settled Solids Depth > ½ cm**
- **Appendix F: Biphasic Sample Separation Procedure**
- **Appendix G: SPE Clog Mitigation Procedure**

17.0 REFERENCES

- EPA. Method 1633, Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS. January 2024.
- DoD-EDQW and DOE-DQW. DoD/DOE Quality Systems Manual (QSM) for Environmental Laboratories, Version 6.0, 2021 – Table B-24)
- Standard Method for the Examination of Water and Wastewater, 23rd and 24th Edition, 2017/2023 – Total, Fixed, and Volatile Solids in Solid and Semisolid Samples, Method 2540G.
- ENV-POL-CORQ-0005, *Acceptable Calibration Practices*, current version.
- ENV-SOP-CORQ-0006, *Manual Integration*, current version.
- ENV-SOP-CORQ-0011, *Method Validation and Instrument Verification*, current version.
- ENV-SOP-CORQ-0015, *Document Management*, current version.
- ENV-SOP-CORQ-0016, *Standard Operating Procedures and Standard Work Instructions,* current version.
- COR-POL-0004, *Code of Ethics and Professional Conduct*, current version.
- COR-MAN-001, *Pace® Safety Manua*l, current version.
- ENV-MAN-ELON-0001, *Quality Manual*, current version.

18.0 REVISION HISTORY

Revisions Made from Prior Version

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Section	Description of Change
14.0	Changed modification to read “TSS determination by visual inspection for aqueous samples” in reference to method sections 11.1 & 11.2.4
Appendix G	Rewrote the third bullet point for clarification. Added the following to the fifth bullet point “Ensure this fact is also documented in the sample narrative and that the project manager is notified.”

Document Succession: This version replaces the following document(s):

Document Number	Version	Document Title	Effective Date:
ENV-SOP-ELON-0180	02	PFAS EPA 1633	10/18/2024

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix A: Tables

Table 1: Analyte Name / Abbreviation / CAS Number Cross-Reference Table

Analyte Name	Abbreviation	CAS #
Perfluorobutanoic acid	PFBA	375-22-4
Perfluoropentanoic acid	PFPeA	2706-90-3
Perfluorohexanoic acid	PFHxA	307-24-4
Perfluoroheptanoic acid	PFHpA	375-85-9
Perfluorooctanoic acid	PFOA	335-67-1
Perfluorononanoic acid	PFNA	375-95-1
Perfluorodecanoic acid	PFDA	335-76-2
Perfluoroundecanoic acid	PFUnA	2058-94-8
Perfluorododecanoic acid	PFDoA	307-55-1
Perfluorotridecanoic acid	PFTrDA	72629-94-8
Perfluorotetradecanoic acid	PFTeDA	376-06-7
Perfluorobutanesulfonic acid	PFBS	375-73-5
Perfluoropentanesulfonic acid	PFPeS	2706-91-4
Perfluorohexanesulfonic acid	PFHxS	355-46-4
Perfluoroheptanesulfonic acid	PFHpS	375-92-8
Perfluorooctanesulfonic acid	PFOS	1763-23-1
Perfluorononanesulfonic acid	PFNS	68259-12-1
Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluorododecanesulfonic acid	PFDoS	79780-39-5
1H,1H, 2H, 2H-Perfluorohexane sulfonic acid	4:2 FTS	757124-72-4
1H,1H, 2H, 2H-Perfluorooctane sulfonic acid	6:2 FTS	27619-97-2
1H,1H, 2H, 2H-Perfluorodecane sulfonic acid	8:2 FTS	39108-34-4
Perfluorooctanesulfonamide	PFOSA	754-91-6
N-methyl perfluorooctanesulfonamide	NMeFOSA	31506-32-8
N-ethyl perfluorooctanesulfonamide	NEtFOSA	4151-50-2
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA	2355-31-9
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6
N-methyl perfluorooctanesulfonamidoethanol	NMeFOSE	24448-09-7
N-ethyl perfluorooctanesulfonamidoethanol	NEtFOSE	1691-99-2
Hexafluoropropylene oxide dimer acid (GenX)	HFPO-DA	13252-13-6
4,8-Dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4
Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Analyte Name	Abbreviation	CAS #
Perfluoro-4-methoxybutanoic acid	PFMBA	863090-89-5
Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-6
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	9Cl-PF3ONS	756426-58-1
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9
Perfluoro(2-ethoxyethane)sulfonic acid	PFEESA	113507-82-7
3-Perfluoropropyl propanoic acid (FPrPA)	3:3 FTCA	356-02-5
2H,2H,3H,3H-Perfluorooctanoic acid (FPePA)	5:3 FTCA	914637-49-3
3-Perfluoroheptyl propanoic acid (FHpPA)	7:3 FTCA	812-70-4
Extracted Internal Standards (EIS)		
Perfluoro-n-[13C4] butanoic acid	13C4-PFBA	NA
Perfluoro-n-[13C5] pentanoic acid	13C5-PFPeA	NA
Perfluoro-n-[1,2,3,4,6-13C5] hexanoic acid	13C5-PFHxA	NA
Perfluoro-n-[1,2,3,4-13C4] heptanoic acid	13C4-PFHpA	NA
Perfluoro-n-[13C8] octanoic acid	13C8-PFOA	NA
Perfluoro-n-[13C9] nonanoic acid	13C9-PFNA	NA
Perfluoro-n-[1,2,3,4,5,6-13C6] decanoic acid	13C6-PFDA	NA
Perfluoro-n-[1,2,3,4,5,6,7-13C7] undecanoic acid	13C7-PFUnA	NA
Perfluoro-n-[1,2-13C2] dodecanoic acid	13C2-PFDoA	NA
Perfluoro-n-[1,2-13C2] tetradecanoic acid	13C2-PFTeDA	NA
Perfluoro-1-[2,3,4-13C3] butanesulfonic acid	13C3-PFBS	NA
Perfluoro-1-[1,2,3-13C3] hexanesulfonic acid	13C3-PFHxS	NA
Perfluoro-1-[13C8] octanesulfonic acid	13C8-PFOS	NA
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2] hexanesulfonic acid	13C2-4:2FTS	NA
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2] octanesulfonic acid	13C2-6:2FTS	NA
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2] decanesulfonic acid	13C2-8:2FTS	NA
Perfluoro-1-[13C8] octanesulfonamide	13C8-PFOSA	NA
N-methyl-D3-perfluoro-1-octanesulfonamide	D3-NMeFOSA	NA
N-ethyl-D5-perfluoro-1-octanesulfonamide	D5-NEtFOSA	NA
N-methyl-D3-perfluoro-1-octanesulfonamidoacetic acid	D3-NMeFOSAA	NA
N-ethyl-D5-perfluoro-1-octanesulfonamidoacetic acid	D5-NEtFOSAA	NA
N-methyl-D7-perfluorooctanesulfonamidoethanol	D7-NMeFOSE	NA

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Analyte Name	Abbreviation	CAS #
N-ethyl-D9-perfluorooctanesulfonamidoethanol	D9-NEtFOSE	NA
Tetrafluoro-2-heptafluoropropoxy-13C3-propanoic acid	13C3-HFPO-DA	NA
NIS		
Perfluoro-n-[2,3,4-13C3] butanoic acid	13C3-PFBA	NA
Perfluoro-n-[1,2-13C2]hexanoic acid	13C2-PFHxA	NA
Perfluoro-n-[1,2,3,4-13C4]octanoic acid	13C4-PFOA	NA
Perfluoro-n-[1,2,3,4,5-13C5] nonanoic acid	13C5-PFNA	NA
Perfluoro-n-[1,2-13C2]decanoic acid	13C2-PFDA	NA
Perfluoro-1-hexane[18O2]sulfonic acid	18O2-PFHxS	NA
Perfluoro-n-[1,2,3,4-13C4] octanesulfonic acid	13C4-PFOS	NA

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Table 2: Routine Analyte List and LOQ[1] by Matrix

Abbreviation	CAS #	Aqueous (NPW) (ng/L)	Leachate (Landfill/TCLP/ SPLP) (ng/L)	Solids (Soil/Sediment) (ng/g)	Biosolid (ng/g)	Surface Wipe (ng/wipe)
PFBA	375-22-4	6.4	32	0.8	8	1.6
PFPeA	2706-90-3	3.2	16	0.4	4	0.8
PFHxA	307-24-4	1.6	8	0.2	2	0.4
PFHpA	375-85-9	1.6	8	0.2	2	0.4
PFOA	335-67-1	1.6	8	0.2	2	0.4
PFNA	375-95-1	1.6	8	0.2	2	0.4
PFDA	335-76-2	1.6	8	0.2	2	0.4
PFUnA	2058-94-8	1.6	8	0.2	2	0.4
PFDoA	307-55-1	1.6	8	0.2	2	0.4
PFTrDA	72629-94-8	1.6	8	0.2	2	0.4
PFTeDA	376-06-7	1.6	8	0.2	2	0.4
PFBS	375-73-5	1.6	8	0.2	2	0.4
PFPeS	2706-91-4	1.6	8	0.2	2	0.4
PFHxS	355-46-4	1.6	8	0.2	2	0.4
PFHpS	375-92-8	1.6	8	0.2	2	0.4
PFOS	1763-23-1	1.6	8	0.2	2	0.4
PFNS	68259-12-1	1.6	8	0.2	2	0.4
PFDS	335-77-3	1.6	8	0.2	2	0.4
PFDoS	79780-39-5	1.6	8	0.2	2	0.4
4:2 FTS	757124-72-4	6.4	32	0.8	8	1.6
6:2 FTS	27619-97-2	6.4	32	0.8	8	1.6
8:2 FTS	39108-34-4	6.4	32	0.8	8	1.6
PFOSA	754-91-6	1.6	8	0.2	2	0.4
NMeFOSA	31506-32-8	1.6	8	0.2	2	0.4
NEtFOSA	4151-50-2	1.6	8	0.2	2	0.4
NMeFOSAA	2355-31-9	1.6	8	0.2	2	0.4
NEtFOSAA	2991-50-6	1.6	8	0.2	2	0.4
NMeFOSE	24448-09-7	16	80	2.0	20	4
NEtFOSE	1691-99-2	16	80	2.0	20	4
HFPO-DA	13252-13-6	6.4	32	0.8	8	1.6
ADONA	919005-14-4	6.4	32	0.8	8	1.6

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Abbreviation	CAS #	Aqueous (NPW) (ng/L)	Leachate (Landfill/TCLP/ SPLP) (ng/L)	Solids (Soil/Sediment) (ng/g)	Biosolid (ng/g)	Surface Wipe (ng/wipe)
PFMPA	377-73-1	3.2	16	0.4	4	0.8
PFMBA	863090-89-5	3.2	16	0.4	4	0.8
NFDHA	151772-58-6	3.2	16	0.4	4	0.8
9Cl-PF3ONS	756426-58-1	6.4	32	0.8	8	1.6
11Cl-PF3OUdS	763051-92-9	6.4	32	0.8	8	1.6
PFEESA	113507-82-7	3.2	16	0.4	4	0.8
3:3 FTCA	356-02-5	8	40	1.0	10	2
5:3 FTCA	914637-49-3	40	200	5.0	50	10
7:3 FTCA	812-70-4	40	200	5.0	50	10

[1]LOQ effective on SOP effective date; values are subject to change. If you are an external party using this SOP for reference, please contact the laboratory for the most up-to-date information.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Table 3: Sample Collection, Preservation[1] and Holding Time Requirements

Matrix	Container per Sample	Minimum Sample Size[2]	Preservation	Holding Time Collection to Prep	Holding Time Prep to Analysis
Aqueous: Non-potable Water (NPW)	Linerless HDPE 2 x 500 mL + 1 x 125 mL[3]	500 mL	Option 1: 0-6°C Option 2: Frozen	Option 1: 28 Days Option 2: 90 Days	28 Days
Aqueous: Landfill Leachate	Linerless HDPE 2 x 125 mL	100 mL	Option 1: 0-6°C Option 2: Frozen	Option 1: 28 Days Option 2: 90 Days	28 Days
Aqueous: TCLP or SPLP	See TCLP / SPLP SOP(s): Leachates are generated using methods for TCLP and/or SPLP and then processed per this SOP for PFAS				
Solid: Soil / Sediment	Linerless Polypropylene 1 x 3 oz/90 mL wide mouth container	5 g	Option 1: 0-6°C Option 2: Frozen	Option 1: 90 Days Option 2: 90 Days	28 Days
Solid: Biosolid	Linerless HDPE 1x 125 mL	0.5 g	Option 1: 0-6°C Option 2: Frozen	Option 1: 90 Days Option 2: 90 Days	28 Days
Solid: Surface Wipe	Polypropylene Centrifuge Tube 1 x 50 mL, shipped with individually packaged pre-soaked ghost wipe	1 Wipe	0-6°C	90 days	28 days
Aqueous: AFFF/F3	Linerless HDPE 1 x 125 mL or 1 x 90 mL	0.02 g	0-6°C	28 Days	28 Days

[1:] *Preservation at time of collection and on receipt at laboratory. Unless otherwise specified, samples are stored after receipt in the laboratory under the same conditions as preservation until time of preparation or analysis.*
[2:] *Nominal amount of sample required for each discrete test. Solid and biosolid sample amounts reflect dry weight.*
[3:] *Used for pre-screening analyses.*

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Management Approval:
Brianna Henriquez Approved on 1/8/2025 9:03:37 AM
Francis Derose Approved on 1/15/2025 1:15:09 PM
Tod Kopyscinski Approved on 1/8/2025 9:48:39 AM
Katherine Allen Approved on 1/15/2025 2:16:41 PM

Table 4: Required Instruments, Equipment, and Supplies

Item	Specification	Vendor	Model	Catalog #
LC MS/MS	Tandem Quadrapole Mass Spectrometer	Agilent	6495C	Call Agilent
Analytical Column	2.1 x 50 mm (1.8 µm)	Agilent	Zorbax RRHD Eclipse Plus	959757-902
Guard Cartridge/Column	2.1 x 5 mm, 1.8 um	Agilent	Zorbax Eclipse Plus C18	821725-901
Trap / Delay Colum	4.6 x 30 mm	Agilent	Infinity Lab PFC Delay Column	5062-8100
Oven	Stable Temperature of 103±2°C	Varied	Varied	Varied
Analytical Balance	Measurement to 0.0001g	Varied	Varied	Varied
Top Loading Balance	Measurement to 0.01g	Varied	Varied	Varied
Ultrasonic Mixer (Sonicator)		Varied	Varied	Varied
Vortex Mixer	Single Tube	Fisher Scientific	Fisherbrand™ Mini Vortex Mixer	14-955-151
Mixing Table	Variable Speed	Eberbach	E6010.00	See Catalog
Centrifuge	3000 RPM (~2000 RCF)	Fisher	Sorvall ST4 Plus-MD	See Catalog
Centrifuge Bottles	Sterile, Polypropylene, Conical, 500mL	Fisher Scientifc	Corning™ Polypropylene Centrifuge Tubes, Sterile	07-200-621
Vacuum Manifold	Designed for SPE Cartridges	Millipore	Visiprep™ SPE	57265
Manifold Liners	Compatible with SPE manfiold	Millipore Sigma	Disposable Liners for Visiprep DL	57059
		Restek	Quick Replace Liners, PTPE or Resprep QR Vacuum Manifolds	28310
Vacuum Pump	Vacuum of ~10-15 inches of mercury	Gast	DOA-P704-AA	See Catalog
Vacuum Tubing	1/4”ID, 5/8” OD, 3/16” Wall	Fisher Scientific		14-176-6B
SPE Cartridges	Designed for PFAS	Phenomenex (locally approved)	Strata-X-AW 33uM Polymeric Weak Anion-PFAS 250mg/20m Tubes	8B-S541-FEG (formerly CSO-9216)
SPE Reservoirs	60mL, polypropylene	Phenomenex	Empty SPE Tubes 60cc	AHO-7189
Adapter Caps	To fit 12, 20, 60mL SPE tubes	MilliporeSigma	Cartridge Adapter	57267
Adjustable-volume Mechanical Pipettes	10uL to 10mL	Various	Various	Various
Disposable Pipette Tips	HDPE or Polypropylene:	Various	Various	Various

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Item	Specification	Vendor	Model	Catalog #
	volume of 10uL to 5mL			
Solvent Evaporator	Nitrogen Evaporation	Various	Automated: TurboVap®LV	
Carbon Cartridges	Graphitized Carbon Black Solid Phase Extraction Absorbent	Phenomenex	Strata GCB, 25mg/1mL Pass Through Cartridge	8B-S528-CAJ
Glass Wool	Silanized	Various	Corning Pyrex 3950	
Water System		Millipore	Direct-Q® 3 UV	ZRQSVR3WW
pH Indicator Strips	Range 0-14, Sensitivity 0.5 pH unit 0 to 9, 1 pH unit 9-14	MilliporeSigma	Whatman Panepha™	WHA0360005
Bottles	HDPE or Polypropylene with linerless caps of same material	QEC (Pace Approved)	90 mL	6214-003PPGBC-P
			125 mL	6213-U004BC-P
			250 mL	6212-Q008BC-P
			500 mL	6212-Q016/BC-150 PACE
Tubes	HDPE or Polypropylene with linerless caps of same material	Fisher Scientific	Falcon™ 15 mL conical	05-527-90
			Falcon™ 50 mL conical	14-432-22
Containers	Narrow Mouth HDPE	Thermo	4 mL	2002-9125
			8 mL	2002-9025
			15 mL	2002-9050
	Polyethylene	Grainger	Cryogenic Vial 2 mL	6EMV1
	Microcentrifuge Tube	Fisher	1.5 mL	05-408-129
Screw Top Vials	Polypropylene vial	Waters	Polypro 12x32mm screw neck 300 µL insert vial	186004112
Screw Top Cap	9mm clear propylene, thin polypropylene-silicone septa	Phenomenex	Verex 9mm screw caps with silicone preslit opening	AR0-89P7-13
Single-step Filter Vials	0.2 µm nylon membrane	Restek	SINGLE StEP® Standard Filter Vials	25891
Surface Wipe	Pre-wetted with methanol	Environmental Express (locally approved)	Ghost Wipes for Methamphetamine testing	SC5000
Ottawa Sand		Fisher		S23-3

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Management Approval:
Brianna Henriquez Approved on 1/8/2025 9:03:37 AM
Francis Derose Approved on 1/15/2025 1:15:09 PM
Tod Kopyscinski Approved on 1/8/2025 9:48:39 AM
Katherine Allen Approved on 1/15/2025 2:16:41 PM

Table 5: Prepared Concentration of Working Calibration Standards (ng/mL)[1]

Compound	L1	L2[2]	L3	L4	L5	L6	L7	L8	L9
Perfluoroalkyl carboxylic acids									
PFBA	0.4	0.8	2	10	20	50	100	200	250
PFPeA	0.2	0.4	1	5	10	25	50	100	125
PFHxA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
PFHpA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
PFOA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
PFNA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
PFDA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
PFUnA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
PFDoA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
PFTrDA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
PFTeDA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
Perfluoroalkyl sulfonic acids									
PFBS	0.0888	0.178	0.444	2.22	4.44	11.1	22.2	44.4	55.5
PFPeS	0.094	0.188	0.470	2.35	4.70	11.75	23.5	47.0	58.8
PFHxS	0.091	0.182	0.456	2.28	4.56	11.4	22.8	45.6	57.0
PFHpS	0.0952	0.190	0.476	2.38	4.76	11.9	23.8	47.6	59.5
PFOS	0.0928	0.186	0.464	2.32	4.64	11.6	23.2	46.4	58.0
PFNS	0.096	0.192	0.480	2.40	4.80	12.0	24.0	48.0	60.0
PFDS	0.0964	0.193	0.482	2.41	4.82	12.1	24.1	48.2	60.3
PFDoS	0.097	0.194	0.484	2.42	4.84	12.1	24.2	48.4	60.5
Fluorotelomer sulfonic acids									
4:2FTS	0.375	0.750	1.87	9.37	18.7	46.85	93.7	187	234
6:2FTS	0.380	0.761	1.90	9.51	19.0	47.55	95.1	190	238
8:2FTS	0.384	0.768	1.92	9.6	19.2	48	96	192	240
Perfluorooctane sulfonamides									
PFOSA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
NMeFOSA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
NEtFOSA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
Perfluorooctane sulfonamidoacetic acids									
NMeFOSAA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
NEtFOSAA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
Perfluorooctane sulfonamide ethanols									
NMeFOSE	1	2	5	25	50	125	250	500	625

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Compound	L1	L2[2]	L3	L4	L5	L6	L7	L8	L9
NEtFOSE	1	2	5	25	50	125	250	500	625
Per- and polyfluoroether carboxylic acids									
HFPO-DA	0.4	0.8	2	10	20	50	100	200	250
ADONA	0.378	0.756	1.89	9.45	18.9	47.25	94.5	189	236
PFMPA	0.2	0.4	1	5	10	25	50	100	125
PFMBA	0.2	0.4	1	5	10	25	50	100	125
NFDHA	0.2	0.4	1	5	10	25	50	100	125
Ether sulfonic acids									
9Cl-PF3ONS	0.373	0.746	1.87	9.33	18.7	46.65	93.3	187	233
11Cl-PF3OUdS	0.377	0.754	1.89	9.43	18.9	47.15	94.3	189	236
PFEESA	0.178	0.357	0.892	4.46	8.92	22.3	44.6	89.2	112
Fluorotelomer Carboxylic Acids									
3:3FTCA	0.5	1	2.5	12.5	25	62.5	125	250	313
5:3FTCA	2.5	5	12.5	62.5	125	313	625	1250	1560
7:3FTCA	2.5	5	12.5	62.5	125	313	625	1250	1560
Extracted Internal Standards (EIS)									
13C4-PFBA	10	10	10	10	10	10	10	10	10
13C5-PFPeA	5	5	5	5	5	5	5	5	5
13C5-PFHxA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C4-PFHpA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C8-PFOA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C9-PFNA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C6-PFDA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C7-PFUnA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C2-PFDoA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C2-PFTeDA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C3-PFBS	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C3-PFHxS	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C8-PFOS	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C2-4:2FTS	5	5	5	5	5	5	5	5	5
13C2-6:2FTS	5	5	5	5	5	5	5	5	5
13C2-8:2FTS	5	5	5	5	5	5	5	5	5
13C8-PFOSA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
D3-NMeFOSA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
D5-NEtFOSA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
D3-NMeFOSAA	5	5	5	5	5	5	5	5	5
D5-NEtFOSAA	5	5	5	5	5	5	5	5	5
D7-NMeFOSE	25	25	25	25	25	25	25	25	25

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Compound	L1	L2[2]	L3	L4	L5	L6	L7	L8	L9
D9-NEtFOSE	25	25	25	25	25	25	25	25	25
13C3-HFPODA	10	10	10	10	10	10	10	10	10
Non-Extracted Internal Standards (NIS)									
13C3-PFBA	5	5	5	5	5	5	5	5	5
13C2-PFHxA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C4-PFOA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C5-PFNA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C2-PFDA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
18O2-PFHxS	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C4-PFOS	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5

[1] Concentration of each target analyte, EIS, and NIS in each calibration level when the formulations specified in Appendix B are used to prepare the working standards.

[2] L2 is the set LOQ.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Table 6: Identification and Quantification Ions by Analyte, EIS, NIS

Abbreviation	CAS #	Ion Mass			Quantification Reference
		Parent	Quantification	Confirmation	
PFBA	375-22-4	213	169	NA	13C4-PFBA
PFPeA	2706-90-3	263	219	69	13C5-PFPeA
PFHxA	307-24-4	313	269	119	13C5-PFHxA
PFHpA	375-85-9	363	319	169	13C4-PFHpA
PFOA	335-67-1	413	369	169	13C8-PFOA
PFNA	375-95-1	463	419	219	13C9-PFNA
PFDA	335-76-2	513	469	219	13C6-PFDA
PFUnA	2058-94-8	563	519	269	13C7-PFUnA
PFDoA	307-55-1	613	569	319	13C2-PFDoA
PFTrDA	72629-94-8	663	619	169	13C2-PFDoA
PFTeDA	376-06-7	713	669	169	13C2-PFTeDA
PFBS	375-73-5	299	80	99	13C3-PFBS
PFPeS	2706-91-4	349	80	99	13C3-PFHxS
PFHxS	355-46-4	399	80	99	13C3-PFHxS
PFHpS	375-92-8	449	80	99	13C8-PFOS
PFOS	1763-23-1	499	80	99	13C8-PFOS
PFNS	68259-12-1	549	80	99	13C8-PFOS
PFDS	335-77-3	599	80	99	13C8-PFOS
PFDoS	79780-39-5	699	80	99	13C8-PFOS
4:2 FTS	757124-72-4	327	307	81	13C2-4:2FTS
6:2 FTS	27619-97-2	427	407	81	13C2-6:2FTS
8:2 FTS	39108-34-4	527	507	81	13C2-8:2FTS
PFOSA	754-91-6	498	78	478	13C8-PFOSA
NMeFOSA	31506-32-8	512	219	169	D3-NMeFOSA
NEtFOSA	4151-50-2	526	219	169	D5-NEtFOSA
NMeFOSAA	2355-31-9	570	419	483	D3-NMeFOSAA
NEtFOSAA	2991-50-6	584	419	526	D5-NEtFOSAA
NMeFOSE	24448-09-7	616	59	NA	D7-NMeFOSE
NEtFOSE	1691-99-2	630	59	NA	D9-NEtFOSE
HFPO-DA	13252-13-6	285	169	185	13C3-HFPODA
ADONA	919005-14-4	377	251	85	13C4-PFHpA
PFMPA	377-73-1	229	85	NA	13C4-PFBA
PFMBA	863090-89-5	279	85	NA	13C5-PFPeA
NFDHA	151772-58-6	295	201	85	13C5-PFHxA
9Cl-PF3ONS	756426-58-1	531	351	533→353	13C8-PFOS
11Cl-PF3OUdS	763051-92-9	631	451	633→453	13C8-PFOS
PFEESA	113507-82-7	315	135	83	13C5-PFHxA
3:3FTCA	356-02-5	241	177	117	13C5-PFPeA
5:3FTCA	914637-49-3	341	237	217	13C5-PFHxA
7:3FTCA	812-70-4	441	317	337	13C9-PFNA
Extracted Internal Standards (EIS)					
13C4-PFBA	NA	217	172	NA	13C3-PFBA
13C5-PFPeA	NA	268	223	NA	13C2-PFHxA
13C5-PFHxA	NA	318	273	NA	13C2-PFHxA

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Abbreviation	CAS #	Ion Mass			Quantification Reference
		Parent	Quantification	Confirmation	
13C4-PFHpA	NA	367	322	NA	13C2-PFHxA
13C8-PFOA	NA	421	376	NA	13C4-PFOA
13C9-PFNA	NA	472	427	NA	13C5-PFNA
13C6-PFDA	NA	519	474	NA	13C2-PFDA
13C7-PFUnA	NA	570	525	NA	13C2-PFDA
13C2-PFDoA	NA	615	570	NA	13C2-PFDA
13C2-PFTeDA	NA	715	670	NA	13C2-PFDA
13C3-PFBS	NA	302	80	NA	18O2-PFHxS
13C3-PFHxS	NA	402	80	NA	18O2-PFHxS
13C8-PFOS	NA	507	80	NA	13C4-PFOS
13C2-4:2FTS	NA	329	81	NA	18O2-PFHxS
13C2-6:2FTS	NA	429	81	NA	18O2-PFHxS
13C2-8:2FTS	NA	529	81	NA	18O2-PFHxS
13C8-PFOSA	NA	506	78	NA	13C4-PFOS
D3-NMeFOSA	NA	515	219	NA	13C4-PFOS
D5-NEtFOSA	NA	531	219	NA	13C4-PFOS
D3-NMeFOSAA	NA	573	419	NA	13C4-PFOS
D5-NEtFOSAA	NA	589	419	NA	13C4-PFOS
D7-NMeFOSE	NA	623	59	NA	13C4-PFOS
D9-NEtFOSE	NA	639	59	NA	13C4-PFOS
13C3-HFPO-DA	NA	287	169	NA	13C2-PFHxA
Non Extracted Internal Standards (NIS)					
13C3-PFBA	NA	216	172	NA	NA
13C2-PFHxA	NA	315	270	NA	NA
13C4-PFOA	NA	417	372	NA	NA
13C5-PFNA	NA	468	423	NA	NA
13C2-PFDA	NA	515	470	NA	NA
18O2-PFHxS	NA	403	84	NA	NA
13C4-PFOS	NA	503	80	NA	NA

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Table 7: QC Acceptance Criteria, Corrective Action and Data Qualification Requirements

QC Item	Acceptance Criteria	Corrective Action	Qualification
Mass Calibration	Must meet manufacturer's acceptance criteria.	Identify and correct source of problem, repeat Mass Calibration.	None. Do not proceed with analysis.
Mass Calibration Verification	Must meet manufacturer's acceptance criteria.	Identify and correct source of problem, repeat Mass Calibration.	None. Do not proceed with analysis.
Initial Calibration (ICAL)	Must meet linearity requirement specified in Section 9.3.1 for type of curve fit used.	Identify and correct source of problem, repeat.	None. Do not proceed with analysis.
Initial Calibration Verification (ICV)	All analytes must be within ± 30% of their true values. (%R)	Identify and correct source of problem, re-analyze. If repeat failure, repeat ICAL.	If corrective action is not taken, qualify or disclose nonconformity for data user to assess impact on project samples.
Calibration Blank (ICB)	Non-DoD: No targets detected greater than MDL. DoD: No targets detected greater than ½ LOQ	Identify and correct source of contamination or performance issue. Alternately, re-calibrate using a lower concentration standard for the highest point.	None. Do not proceed with analysis.
RT Window Position	Set position using the mid-point of the ICAL on the day ICAL is performed; otherwise, the opening CCV is used. RT Window is ± 60 secs from RT position.	NA	NA
Instrument Sensitivity Check (ISC)	All native and isotopically labelled compounds within ± 30% recovery.	Identify and correct source of problem and reanalyze ISC. If problem persists, repeat ICAL.	None. Do not proceed with analysis.
Bile Salts Check	Bile Salt peak detected >1 min outside RT window for PFOS.	Identify and correct source of problem, then reevaluate Bile Salts separation from PFOS.	None. Do not proceed with analysis.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

QC Item	Acceptance Criteria	Corrective Action	Qualification
Continuing Calibration Verification (CCV)	All native and isotopically labelled compounds within ±30% recovery.	See Section 9.3.6 for required corrective actions based on circumstance.	Qualify test results associated with CCV failure.
Instrument Blank (IBLK) / Continuing Calibration Blanks (CCB)	Non-DoD: No targets detected > MDL. DoD: No targets detected > ½ LOQ	Identify and correct source of contamination or performance issue. Reanalyze IBLK.	No samples shall be analyzed until opening IBLK has met acceptance criteria, unless the samples to be analyzed will not report the compound(s) detected in the IBLK.
Extracted Internal Standards (EIS)	See Table 9.	If batch QC is acceptable, reanalyze to confirm failure. If confirmed, re-extract from reduced sample amount and reanalyze sample, if possible. If failure persists, no further action is needed.	Qualify outages
Non-extracted Internal Standards (NIS)	NIS areas in all samples must be within 50 – 200% of the average area of the corresponding NIS in the ICAL.	Troubleshoot instrument performance. Reanalyze samples.	Qualify outages
Method Blank (MB)	Non-DOD: no targets detected greater than the LOQ or 1/10 of the concentration detected in associated sample(s), whichever is greatest. DoD: No targets detected > ½ LOQ	If IBLK is acceptable, reanalyze MB to confirm. If confirmed, re-extract and reanalyze associated impacted samples if sufficient amount remains and samples are within holding time; otherwise qualify associated test results.	Qualify outages
LCS/LLLCS	%R: See Table 8	If the most recent ISC/CCV is acceptable, reanalyze LCS to confirm. If low-failure results are confirmed, re-extract and reanalyze associated samples (if sufficient sample	Qualify outages

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

QC Item	Acceptance Criteria	Corrective Action	Qualification
		remains). If insufficient sample remains for reprep, narrate and report data associated with low-failure LCS. If high-failure results are confirmed and sample(s) is ND for failing compound, narrate and report sample data.	
MS/MSD	%R: See Table 8 RPD ≤30%		Qualify outages
Laboratory Duplicate	RPD from parent sample ≤30%		Qualify outages.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Table 8: LCS/LLLCS Acceptance Limits (%R)

Analyte	CAS #	Aqueous/Leachate	Solid: All Matrices	Tissue
PFBA	375-22-4	70-140	70-140	60-140
PFPeA	2706-90-3	65-135	60-150	60-145
PFHxA	307-24-4	70-145	65-140	60-160
PFHpA	375-85-9	70-150	65-145	60-145
PFOA	335-67-1	70-150	70-150	60-150
PFNA	375-95-1	70-150	70-155	60-145
PFDA	335-76-2	70-140	70-155	60-150
PFUnA	2058-94-8	70-145	70-155	60-155
PFDoA	307-55-1	70-140	70-150	60-140
PFTrDA	72629-94-8	65-140	65-150	60-150
PFTeDA	376-06-7	60-140	65-150	60-140
PFBS	375-73-5	60-145	65-145	60-150
PFPeS	2706-91-4	65-140	55-160	60-145
PFHxS	355-46-4	65-145	60-150	60-155
PFHpS	375-92-8	70-150	65-155	60-140
PFOS	1763-23-1	55-150	65-160	60-160
PFNS	68259-12-1	65-145	55-140	45-140
PFDS	335-77-3	60-145	40-155	50-140
PFDoS	79780-39-5	50-145	25-160	25-140
4:2 FTS	757124-72-4	70-145	60-150	55-150
6:2 FTS	27619-97-2	65-155	55-200	60-150
8:2 FTS	39108-34-4	60-150	70-150	60-170
PFOSA	754-91-6	70-145	70-140	60-150
NMeFOSA	31506-32-8	60-150	70-155	60-160
NEtFOSA	4151-50-2	65-145	70-140	60-150
NMeFOSAA	2355-31-9	50-140	65-155	60-145
NEtFOSAA	2991-50-6	70-145	65-165	60-145
NMeFOSE	24448-09-7	70-145	70-140	40-180
NEtFOSE	1691-99-2	70-135	70-135	60-205
HFPO-DA	13252-13-6	70-140	70-145	60-145
ADONA	919005-14-4	65-145	70-160	55-165
PFMPA	377-73-1	55-140	30-140	25-145
PFMBA	863090-89-5	60-150	60-150	60-150
NFDHA	151772-58-6	50-150	60-155	60-180
9Cl-PF3ONS	756426-58-1	70-155	70-150	60-170
11Cl-PF3OUdS	763051-92-9	55-160	45-160	50-170
PFEESA	113507-82-7	70-140	70-140	50-150
3:3 FTCA	356-02-5	65-130	45-130	30-140
5:3 FTCA	914637-49-3	70-135	60-130	60-160
7:3 FTCA	812-70-4	50-145	60-150	60-200

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Table 9: EIS and NIS Acceptance Limits (%R)

Labeled Compound	Aqueous	Leachate	Solid:	Biosolid	Tissue
13C4-PFBA	5-130	5-130	8-130	5-130	5-130
13C5-PFPeA	40-130	40-130	35-130	35-130	10-185
13C5-PFHxA	40-130	40-130	40-130	40-130	25-170
13C4-PFHpA	40-130	40-130	40-130	40-130	25-150
13C8-PFOA	40-130	40-130	40-130	40-130	25-150
13C9-PFNA	40-130	40-130	40-130	40-145	35-185
13C6-PFDA	40-130	40-130	40-130	40-130	30-150
13C7-PFUnA	30-130	40-130	40-130	40-130	30-180
13C2-PFDoA	10-130	35-130	40-130	40-130	35-180
13C2-PFTeDA	10-130	25-130	20-130	10-160	20-160
13C3-PFBS	40-135	40-130	40-135	40-150	25-190
13C3-PFHxS	40-130	40-130	40-130	40-140	35-175
13C8-PFOS	40-130	40-130	40-130	40-130	40-160
13C2-4:2FTS	40-200	40-220	40-165	40-300	30-300
13C2-6:2FTS	40-200	40-170	40-215	40-300	35-300
13C2-8:2FTS	40-300	40-145	40-275	40-300	40-365
13C8-PFOSA	40-130	40-130	40-130	20-140	25-180
D3-NMeFOSA	10-130	40-130	10-130	20-130	5-130
D5-NEtFOSA	10-130	35-130	10-130	20-130	5-130
D3-NMeFOSAA	40-170	35-130	40-135	30-150	30-250
D5-NEtFOSAA	25-135	30-130	40-150	20-140	30-235
D7-NMeFOSE	10-130	20-130	20-130	25-130	5-160
D9-NEtFOSE	10-130	20-130	15-130	20-130	5-130
13C3-HFPODA	40-130	40-130	40-130	40-130	20-185
13C3-PFBA	50-200	50-200	50-200	50-200	50-200
13C2-PFHxA	50-200	50-200	50-200	50-200	50-200
13C4-PFOA	50-200	50-200	50-200	50-200	50-200
13C5-PFNA	50-200	50-200	50-200	50-200	50-200
13C2-PFDA	50-200	50-200	50-200	50-200	50-200
18O2-PFHxS	50-200	50-200	50-200	50-200	50-200
13C4-PFOS	50-200	50-200	50-200	50-200	50-200

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Table 10: IPR Limits for Method Verification

Analyte	CAS #	Aqueous/Leachate		Solid: All Matrices		Tissue	
		%R	RPD	%R	RPD	%R	RPD
PFBA	375-22-4	70-135	21	70-140	17	70-135	20
PFPeA	2706-90-3	70-135	23	70-140	26	70-130	20
PFHxA	307-24-4	70-135	24	70-135	23	70-140	20
PFHpA	375-85-9	70-135	28	70-140	21	70-140	20
PFOA	335-67-1	65-155	27	70-140	23	70-130	25
PFNA	375-95-1	70-140	28	65-145	24	70-140	20
PFDA	335-76-2	65-140	26	70-145	26	70-135	20
PFUnA	2058-94-8	70-135	29	70-145	26	70-135	20
PFDoA	307-55-1	70-130	21	70-145	25	70-135	20
PFTrDA	72629-94-8	60-145	29	55-160	26	55-160	20
PFTeDA	376-06-7	70-145	27	70-145	24	70-140	25
PFBS	375-73-5	70-140	23	60-145	25	70-145	20
PFPeS	2706-91-4	70-135	25	65-140	29	70-150	20
PFHxS	355-46-4	70-135	27	65-145	28	70-140	25
PFHpS	375-92-8	70-140	30	70-140	27	70-145	20
PFOS	1763-23-1	70-140	29	70-135	27	70-135	30
PFNS	68259-12-1	70-135	29	70-140	27	60-130	20
PFDS	335-77-3	70-135	30	50-150	31	55-135	20
PFDoS	79780-39-5	45-135	35	40-140	40	25-145	45
4:2 FTS	757124-72-4	70-135	27	70-135	27	65-140	30
6:2 FTS	27619-97-2	70-135	32	60-160	50	70-140	25
8:2 FTS	39108-34-4	70-140	33	70-140	27	70-150	25
PFOSA	754-91-6	70-135	22	70-140	19	70-140	20
NMeFOSA	31506-32-8	70-135	30	65-145	26	70-140	30
NEtFOSA	4151-50-2	70-130	26	70-135	19	70-140	40
NMeFOSAA	2355-31-9	65-140	32	65-145	31	70-140	20
NEtFOSAA	2991-50-6	70-135	28	60-150	31	70-140	25
NMeFOSE	24448-09-7	70-135	29	70-140	19	60-150	20
NEtFOSE	1691-99-2	70-130	21	70-135	17	70-145	40
HFPO-DA	13252-13-6	70-135	23	70-140	25	70-140	25
ADONA	919005-14-4	70-135	23	70-155	26	70-145	20
PFMPA	377-73-1	60-140	23	70-140	25	70-145	40
PFMBA	863090-89-5	65-145	27	55-145	33	70-140	20
NFDHA	151772-58-6	65-140	37	45-145	27	70-155	30
9Cl-PF3ONS	756426-58-1	70-145	30	65-135	23	70-140	20
11Cl-PF3OUdS	763051-92-9	50-150	35	50-135	31	65-140	20
PFEESA	113507-82-7	70-135	25	70-140	20	70-145	25
3:3 FTCA	356-02-5	70-130	23	45-155	32	55-130	25
5:3 FTCA	914637-49-3	70-130	24	70-135	28	70-145	20
7:3 FTCA	812-70-4	55-130	34	70-145	39	70-155	20

END OF APPENDIX

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix B: Reference Materials – Reagents, Standards & Formulations

Purchased Reagents

Name	Grade	Vendor	Catalog	Storage
Acetic Acid	ACS	Fisher	A38-500	Room Temperature
Acetonitrile[1]	UPLC	Fisher	A996SK-4	Room Temperature
Aqueous Ammonium Acetate	5M	Fisher	AM9070G	Manufacturer Specification
Ammonium Hydroxide	Certified ACS+	Fisher	42330-5000	Room Temperature
Formic Acid	>96% purity	Fisher	147932500	Room Temperature
Methanol	HPLC, 99.9% purity	Fisher	A452-4	Room Temperature

[1] Verify Acetonitrile, Methanol, and Laboratory Generated Regent Water by lot/batch before use.

Purchased Standard Solutions[1]

Name	Vendor	Catalog	Purpose
EPA 1633 Native PFAS Mix	Wellington Laboratories	EPA-1633STK	Primary Source Standard
1633-PFCs Calibration Standard Mix	Absolute Standards	65735	Second Source Standard
Mass-labelled PFAS Extraction Standard Mix	Wellington Laboratories	MPFAC-HIF-ES	EIS
Mass-labelled PFAS Injection Standard Mix	Wellington Laboratories	MPFAC-HIF-IS	NIS
Neat Taurodeoxycholic Acid (TDCA)	Cayman Chemical	15935	Bile Salt Interference

[1] Unless other storage conditions are specified by the manufacturer, store the purchased standard solutions in the dark at 4 °C, in tightly sealed screw-capped vials. Place a mark on the vial at the level of the solution after each use so that solvent loss by evaporation can be detected. Replace the solution if solvent loss has occurred. Properly discard or remove from the work area unused material on the expiration date to prevent inadvertent use of expired material.

Purchased standard solutions must be received with a Certificate of Analysis (COA), which must be retained on-site in the laboratory and be traceable to each corresponding lot received. Refer to laboratory SOP ENV-SOP-ELON-0008 *Inventory and Chemical Receipt* for the procedures for standard receipt and traceability.

Substitution of reagents and standards from those listed in these tables is permissible only if the replacement meets the specifications outlined in the SOP. If an alternative item does not meet these exact same specifications for purity, composition, or concentration, any formulation in this SOP must be modified to match the material used. If the substitution is permanent, the SOP and formulations in this SOP must be updated.

Prepared Reagents & Standard Solution Formulations:

Plastic containers must be used for all standard, sample, and extraction preparations due to potential adsorption of analytes onto glass. Do not substitute glass for plastic containers.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

18O-mass labeled perfluoroalkyl sulfonates may undergo isotopic exchange with water under certain conditions, which lowers the isotopic purity of the standards over time - monitor standards for degradation and replace as needed.

Modifications to these formulations are not permitted unless the formulation of the parent component changes, in which case the formulation must be adjusted accordingly.

Laboratory Prepared Reagent Formulation Table

Name	Component	Amount	Volume	Expires
Mobile Phase A: 2mM ammonium acetate in 95:5 water/acetonitrile	5 Ammonium Acetate	0.4 mL	1 L	60 Days
	Acetonitrile	50 mL		
	Reagent Water	949.6 mL		
Instrument Blank Mix (IBLK Mix): Methanol with 4% Water, 1% Ammonium Hydroxide, and 0.625% Acetic Acid	Methanol	94.4 mL	100 mL	30 Days
Instrument Blank Mix (IBLK Mix): Methanol with 4% Water, 1% Ammonium Hydroxide, and 0.625% Acetic Acid Acetic Acid (0.1%)	Ammonium Hydroxide	3.3 mL	100 mL 1 L	30 Days 90 Days
	Acetic Acid	0.625 mL		
	Reagent Water	1.67 mL		
	Acetic Acid	1 mL		
Acetic Acid (0.1%) Ammonium Hydroxide (3%): Aqueous	Reagent Water	999 mL	1 L 100 mL	90 Days 90 Days
	Ammonium Hydroxide	10 mL		
Ammonium Hydroxide (3%): Aqueous Ammonium Hydroxide (0.3%): Methanolic	Reagent Water	90 mL	100 mL 100 mL	90 Days 30 Days
	Ammonium Hydroxide	1 mL		
Ammonium Hydroxide (0.3%): Methanolic Ammonium Hydroxide (1%): Methanolic	Reagent Water	99 mL	100 mL 100 mL	30 Days 30 Days
	Ammonium Hydroxide (30%)	3.3 mL		
Ammonium Hydroxide (1%): Methanolic Ammonium Hydroxide (2%): Methanolic	Methanol	96.7 mL	100 mL 100 mL	30 Days 30 Days
	Ammonium Hydroxide (30%)	6.6 mL		
Ammonium Hydroxide (2%): Methanolic Formic Acid (0.1 M): Aqueous	Methanol	93.4 mL	100 mL 1 L	30 Days 2 Years
	Formic Acid	3.77 mL		

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Name	Component	Amount	Volume	Expires
Formic Acid (0.1 M): Aqueous	Regent Water	996.33 mL	1 L	2 Years
Formic Acid (0.3 M): Aqueous	Formic Acid	11.31 mL	1 L	2 Years
Formic Acid (0.3 M): Aqueous	Regent Water	988.69 mL	1 L	2 Years
Formic Acid (5% v/v): Aqueous	Formic Acid	5 mL	100 mL	2 Years
Formic Acid (5% v/v): Aqueous	Regent Water	95 mL	100 mL	2 Years
Formic Acid (50% v/v): Aqueous	Formic Acid	50 mL	100 mL	2 Years
Formic Acid (50% v/v): Aqueous	Regent Water	50 mL	100 mL	2 Years
Formic Acid (50% v:v): Methanolic	Formic Acid (0.1M)	50 mL	100 mL	2 Years
Formic Acid (50% v:v): Methanolic	Methanol	50 mL	100 mL	2 Years
Potassium Hydroxide (0.05M): Methanolic	Potassium Hydroxide	3.3 g	1 L	90 Days
Potassium Hydroxide (0.05M): Methanolic	Methanol	1 L	1 L	90 Days
Reagent Water (ASTM 1)	Laboratory Generated	60 Days		

Laboratory Prepared Intermediate Standard Solutions

Name	Component	Amount	Volume	Storage	Expires
TDCA Stock (2000 µg/mL)	Neat TDCA	10 mg	5 mL	Frozen <0°C	1 Year
	Methanol	5 mL			
STK-10X (Concentrations Vary)	EPA-1633 STK	300 µL	3 mL	0-6°C	30 Days or with each new lot of parent standard
	Methanol	2.7 mL			

Laboratory Prepared Working Standard Solutions

Name	Component	Amount	Volume	Storage	Expires
ICV	1633-PFCs Calibration Standard Mix	20 µL	4 mL	0-6°C	30 Days
	MPFAC-HIF-ES	20 µL			
	MPFAC-HIF-IS	20 µL			
	IBLK Mix	3940 µL			
CAL L1	STK-10X	10 µL	2.5 mL	0-6°C	30 Days
	MPFAC-HIF-ES	12.5 µL			
	MPFAC-HIF-IS	12.5 µL			
	IBLK Mix	2465 µL			
CAL L2	STK-10X	40 µL	5 mL	0-6°C	30 Days

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Name	Component	Amount	Volume	Storage	Expires
	MPFAC-HIF-ES	25 µL			
	MPFAC-HIF-IS	25 µL			
	TDCA Stock (2000 µg/mL)	25 µL			
	IBLK Mix	4885 µL			
CAL L3	STK-10X	40 µL	2 mL	0-6°C	30 Days
	MPFAC-HIF-ES	10 µL			
	MPFAC-HIF-IS	10 µL			
	IBLK Mix	1940 µL			
CAL L4	EPA-1633STK	20 µL	2 mL	0-6°C	30 Days
	MPFAC-HIF-ES	10 µL			
	MPFAC-HIF-IS	10 µL			
	IBLK Mix	1960 µL			
CAL L5	EPA-1633STK	100 µL	5 mL	0-6°C	30 Days
	MPFAC-HIF-ES	25 µL			
	MPFAC-HIF-IS	25 µL			
	TDCA Stock (2000 µg/mL)	25 µL			
	IBLK Mix	4825 µL			
CAL L6	EPA-1633STK	100 µL	2 mL	0-6°C	30 Days
	MPFAC-HIF-ES	10 µL			
	MPFAC-HIF-IS	10 µL			
	IBLK Mix	1880 µL			
CAL L7	EPA-1633STK	200 µL	2 mL	0-6°C	30 Days
	MPFAC-HIF-ES	10 µL			
	MPFAC-HIF-IS	10 µL			
	IBLK Mix	1780 µL			
CAL L8	EPA-1633STK	400 µL	2 mL	0-6°C	30 Days
	MPFAC-HIF-ES	10 µL			
	MPFAC-HIF-IS	10 µL			
	IBLK Mix	1580 µL			
CAL L9	EPA-1633STK	500 µL	2 mL	0-6°C	30 Days
	MPFAC-HIF-ES	10 µL			
	MPFAC-HIF-IS	10 µL			

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Name	Component	Amount	Volume	Storage	Expires
	TDCA Stock (2000 µg/mL)	10 µL			
	IBLK Mix	1470 µL			

END OF APPENDIX

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix C: Sample Screening Protocol

Samples that are known or suspected to contain high concentrations of target analytes may be pre-screened to determine if a reduced volume or mass should be used for extraction or if an extract dilution should be performed prior to initial analysis. Other pre-screening procedures may be used.

This screen protocol may be used for all matrices included in this SOP, except surface wipes because there is insufficient representative sample to perform the screen procedure.

Aqueous Matrices (Non-Potable Water, Landfill Leachate, TCLP/SPLP Leachate)

Always take the aliquot for screening from the 125 mL container; do not take a subsample from the sample container to be used for sample preparation or analysis (except in the case of TCLP/SPLP).

1) Mix the sample to ensure it is homogenous. Measure 2 mL of sample into a 15 mL centrifuge tube.
2) Add 2 mL of methanol and 20 µL of MPFAC-HIF-EIS and -NIS to the sample and vortex to mix.
3) Filter 1 mL of the sample through 0.2-µm membrane filter into a microvial.
4) Analyze the screen extract and use the test result to determine if a reduced volume should be extracted or if the extract from the routine procedure should be diluted prior to analysis.

Soil/Sediment, Biosolid: (10X Dilution)

1) Measure 1.0 g (±0.1) of sample into a 50 mL polypropylene centrifuge tube.
2) Add 20 mL of 0.3% methanolic ammonium hydroxide to the sample. Vortex to mix for 10 min. Let the sample sit to settle and/or centrifuge to produce a clear extract.
3) Filter using a 0.2 µm filter vial:
    a. Add 20 µL of MPFAC-HIF-EIS to a clean filter vial (chamber).
    b. Add 400 µL of clear extract from step 2 to the vial. Carefully vortex to mix.
    c. Use filter/plunger to filter the extract.
4) Transfer 30 µL of extract to a ~300 µL polypropylene microvial and dilute to 300 µL with 0.3% methanolic ammonium hydroxide. Add 1.5 µL of NIS to the resulting solution.
5) Analyze the screen extract and use the test result to determine if a reduced volume should be extracted or if the extract from the routine procedure should be diluted prior to analysis.

END OF APPENDIX

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix D: Subsampling Procedure for Aqueous Matrices

Due to the propensity of some target analytes to stratify within the sample matrix or to adhere to walls of the sample container, subsampling of aqueous samples may only be done on a project-specific basis, with client approval.

In this context, subsampling refers to the taking of an aliquot of sample from the container provided to the laboratory for extraction in lieu of using the entire sample volume collected. This is sometimes necessary when high concentrations of target analytes are expected in the sample or for other project-specific reasons.

Subsampling Procedure for Non-Potable Water (NPW), Landfill Leachate, TCLP/SPLP:

1) Determine the volume (mL) for extraction based on screen results or project specifications. The amount subsampled must be at least 250 µL. If additional dilutions are needed, these must be made by serial dilution of the sample.
2) Place an uncapped, HDPE bottle onto the weigh pan of a top loading balance and tare the balance. Select an appropriately sized bottle for the volume of sample to be aliquoted. Regardless of volume subsampled, the sample aliquot should be diluted to at least 50 mL prior to SPE.
3) Gently invert the sample to mix 3-4 times then transfer the sample into the HDPE bottle until the target volume is achieved, assuming sample density of 1 g/mL.
    - If foam forms during inversion and more than 5 mL is required, pour the sample to transfer, but avoid the transfer of foam.
    - If foam forms and less than 5 mL is needed, use a pipette to draw sample from ½ cm below the foam.
    - If no foam forms, the transfer may be done by pouring or by pipette.
4) Fill the bottle with reagent water.
5) Proceed to Section 9.6 and prepare the sample using the same stepwise procedure used for aqueous samples.

Subsampling Procedure for AFFF and F3 and Other Challenging Aqueous Matrices

The following protocol is designed for “as prepared” AFF materials and newer generation F3 concentrates and other challenging matrices, such as viscous or cloudy matrices, or those with standing foam. Consult with technical specialist or supervisor to determine when to use this protocol.

If concentrated AFF (thick gel-like matrix) was received, notify the supervisor to determine where to perform the subsampling procedure. Subsampling of the concentrate must be done in an isolated area to prevent the material from contaminating the work area and other samples.

1) Prepare 2 samples for all matrices designated AFFF or F3.
2) Place an uncapped 125 mL HDPE bottle onto the weigh pan of a top loading balance and tare the balance.
3) Measure 0.02 g of sample into the HDPE bottle. Record the actual mass subsampled.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

4) Add approximately 60 mL of reagent water to the bottle, cap the bottle.

5) Shake by hand vigorously for 20-30 seconds.

6) Set the sample aside for at least 3 hours for complete dissolution.

7) Check the sample after 3 hours to verify dissolution is complete. If full dissolution has not occurred, place the sample bottle on an orbital shaker for 15 minutes, then allow the sample to settle for 3 hours.

8) If the sample is an AFFF concentrate gel, go to step 9; otherwise, proceed to Section 9.6 and prepare the sample using the same stepwise procedure used for aqueous samples.

9) Dilute the AFFF concentrate subsample solution by quantitatively measuring 6 mL of the 60 mL solution into a new 125 mL HDPE container and dilute to 60 mL with reagent water. The serial dilution, when the above protocol is followed without deviation, represents a 250,000X primary dilution. Proceed to Section 9.6 and extract the prepared sample using the same stepwise procedure used for aqueous samples.

END OF APPENDIX

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix E: Aqueous Sample Preparation – Settled Solids Depth > ½ cm

As allowed by EPA Method 1633 PAS uses alternate strategies in lieu of the total suspended solids (TSS) determination to mitigate solid materials or other interferences present in aqueous matrices.

Use this procedure in lieu of Section 9.6.1 (steps 1-9) when settled solids in the sample appear to be of a depth > ½ cm and less than 5% of the total volume.

1) Label a 500 mL conical centrifuge bottle with the sample ID. Set the labeled tube in a rack and remove the cap.

2) Spike each sample with 20 µL of MPFAC-HIF-EIS in its original sample container.

3) If the sample is a MS or MSD, add 40 µL of 1633STK to each.

   NOTE: The MS/MSD or laboratory duplicate must be processed the same way as the parent sample and vice versa.

4) Cap the container and vigorously shake to mix.

5) Pour the sample into the labeled centrifuge bottle, taking care to transfer all the solids present in the original sample bottle to the centrifuge bottle. Tightly cap the centrifuge bottle when done.

6) Place the tubes in the centrifuge rotor, ensuring that the carousel is symmetrically balanced. Close the top and centrifuge at 3000 RPM (~2000 RCF) for 6 minutes. Record the start and end time in the preparation log.

7) Decant the centrifuged sample back into its original container, taking care to avoid transfer of the settled solids.

8) Weigh the original sample container + decanted sample and record the weight measurement in the preparation log.

9) Extract the decanted sample using the procedure in Section 9.6.1, starting with step 10. If the SPE cartridge begins to clog during sample transfer, refer to Appendix G for troubleshooting steps and mitigation strategies.

10) When the SPE cartridges have been dried and the carbon cartridges added to the SPE stack, rinse the original sample bottle following the protocol in Step 10 of Section 9.7, but do not start elution.

11) Add 5mL of 1% methanolic ammonium hydroxide to each centrifuge bottle and swirl to rinse. If the condensed solids become re-suspended during this step, centrifuge the container to separate.

12) Using a pipet, transfer the rinsates from the original sample container and the centrifuge bottle to the associated sample's cartridge/reservoir stack. Elute the cartridge with both rinsate volumes; allow the elution solvent to soak the SPE sorbent for 2 minutes, then use vacuum to pull the elution solvent through the cartridge and into the collection tubes in a slow, dropwise manner.

    If using sample transfer lines, add the rinsate from the centrifuge bottle to the original sample bottle for transfer to the cartridge and then elute as above.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

13) Add 5 mL of 1% methanolic ammonium hydroxide directly to the SPE reservoir of all batch QC samples (MB/LCS/LLLCS) and elute with the normal 5 mL bottle rinse described in Step 10 of Section 9.7.

14) Concentrate the extract to ~3.5 mL using nitrogen blowdown at an approximate flow rate of 1.2 L/min. Adjust to final volume to 4 mL with 1% methanolic ammonium hydroxide using a validated comparison vial.

15) Weigh the empty sample bottle with cap and record the weight measurement. Subtract this weight from the initial container+sample weight from Step 8 to determine initial sample volume.

16) Add 25 µL of concentrated acetic acid and 20 µL of NIS mix to each extract and vortex to mix. Transfer a portion of each extract into an autosampler vial for LC-MS/MS analysis. Cap the collection tubes containing the remaining extracts and store at 0 - 6 °C until analysis.

17) Document in the preparation log which samples in the prep batch were centrifuged prior to SPE; these samples must be identified in the test report to alert the customer and data user of the deviation from routine protocol.

18) Record any other observations or anomalies observed during the centrifugation or extraction process, particularly if any issues were encountered during the sample loading step of the SPE process.

END OF APPENDIX

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix F: Biphasic Sample Separation Procedure

Use this procedure when the customer has requested separation of a biphasic sample into aqueous and solid phases.

1) Verify the log-in has been updated to specify sample preparation for each matrix. Be sure the log-in for the solid fraction does not include percent solids determination: the solid phase of a biphasic sample is reported on a wet weight basis.
2) Label a 500 mL conical centrifuge bottle with the sample ID. Set the labeled bottle in a rack and remove the cap.
3) Vigorously shake the sample in its original container then completely transfer the entire sample to the corresponding centrifuge bottle and cap the centrifuge bottle.
4) Place the centrifuge bottle(s) in the centrifuge rotor, ensuring that the carousel is symmetrically balanced. Close the top and centrifuge at 3000 RPM (~2000 RCF) for 6 minutes. Record the start and end time in the preparation log.
5) Transfer the liquid portion of sample back into the original sample container; avoid transferring solid material as much as possible.
6) Tare a top loading balance then weigh the original container + liquid sample and record this measurement to the nearest 0.1 g on the preparation log as initial weight for the aqueous phase.
7) Proceed to Section 9.6.1 to add the sample to a routine NPW preparation batch and complete the preparation process starting with Step 7.
8) Label a 50 mL centrifuge tube with the sample ID.
9) Place the tube on a top loading balance and tare the balance.
10) Using a wooden tongue depressor, transfer the solid material from the 500 mL centrifuge bottle to the 50 mL container.
11) Record the amount transferred to the nearest 0.1 g on the preparation log as initial weight, targeting 5 g for preparation.

END OF APPENDIX

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix G: SPE Clog Mitigation Procedure

This appendix provides instructions on what to do when an SPE cartridge has become clogged.

Indications that an SPE cartridge may be or will become clogged include discoloration of the cartridge frit or absorbent bed, coloration or sedimentation on the bottom of the reservoir, and a slowing of the sample loading rate.

When these conditions are observed do not add any more sample volume to the reservoir of the clogging cartridge. The goal is to stop the process before the cartridge seizes up completely, so that a sample extract can still be collected from the cartridge.

- If there is >10 mL remaining in the reservoir, close the manifold port to stop sample loading. After all other samples have finished loading, carefully remove the cartridge-adaptor-reservoir assembly and transfer the remaining sample volume back into the original sample container.
- If there is <10 mL remaining, allow the sample to continue to load. If the sample has not finished after all other samples have passed through their cartridge, close all other ports except for the sample loading, then apply more vacuum pressure to pull the sample through. Do this step one at a time for each clogged SPE. If it is obvious that the cartridge has seized, do not attempt this step. Instead, remove the cartridge and return the remaining sample volume to its original container.

The extraction process may continue as follows; if QA acceptance criteria are not met for the resulting extract, the sample should be re-extracted with reduced volume.

- Reinstall the original cartridge used for the abandoned sample into the same vacuum manifold port originally used for loading the sample and finish the SPE process (starting with the cartridge wash step in Step 5 from Section 9.7). If the SPE clogs completely (i.e., no flow) during the wash or elution steps, abandon the process; the sample should be re-extracted with reduced volume.
- To obtain the volume of sample used for preparation and extraction, reweigh the empty container and subtract this weight from the original container+sample weight measurement.
- Record in the preparation log that SPE extraction could not be completed with full sample volume. Ensure this fact is also documented in the sample narrative and that the project manager is notified.

Alternatively,

- Option 1: Reprepare and re-extract the sample following the centrifuge procedure in Appendix E. This option may be appropriate when centrifugation was not originally performed on the sample that clogged.
- Option 2: Reprepare the sample using a reduced volume. No less than 1 mL of homogenized sample may be used for extraction in these cases.
- Option 3: With client approval, re-log the sample as a biosolid matrix and prepare following the biosolid matrix extraction protocols, targeting 0.5 g of sample. In this case, the sample results will generally not be corrected for dry weight.
- Option 4: With client approval, re-log and reprepare the sample as two separate phases (aqueous and solid). Attempt phase separation of the aqueous and solid phases of the sample following Appendix F and, if successful, prepare as two separate samples.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

- Option 5: Test procedure is not applicable. This may be the only option when the matrix interference and/or the modification to the procedure become so extreme that the resulting test result is unreliable.

In all cases, the protocol followed must be recorded, disclosed to the customer, and test results adjusted for actual amounts used.

END OF APPENDIX

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Pace ANALYTICAL SERVICES	**ENV-SOP-MANS-0111 v01 Preparation and Analysis of PFAS in Aqueous, Solid, and Tissue by EPA Method 1633**
	Effective Date: 08/07/2024

Management Approval:
John Trimble Approved on 8/7/2024 11:55:41 AM
Laura Vanasse Approved on 8/7/2024 11:32:33 AM
Pete Henriksen Approved on 8/7/2024 10:20:05 AM
Jason Hebert Approved on 8/7/2024 12:02:07 PM

© 2024, Pace® Analytical Services, LLC (PAS)

1.0 SCOPE & APPLICATION

This standard operating procedure (SOP) describes the laboratory procedure used by Alpha, a Pace Analytical Laboratory for the determination of the per- and polyfluoroalkyl substances (PFAS) by liquid chromatography/mass spectrometry (LC-MS/MS) following EPA 1633, published January 2024. This SOP is applicable to aqueous (all non-potable water and leachate), solid (soil, biosolids, sediment), and tissue matrices.

The instrumental portion of this method is for use only by analysts experienced with LC-MS/MS or under the close supervision of such qualified persons. The laboratory must demonstrate the ability to generate acceptable results using the procedures in Sections 11.3.1 and 11.3.2.

By their very nature, many components of PFAS present analytical challenges unique to this class of analytes. For example, PFAS analytes readily adhere to the walls of the sample containers and may also stratify in the container.

1.1 Target Analyte List, Limits of Detection & Quantitation (LOD & LOQ)

The target analytes that can be determined by this SOP and the associated LODs and LOQs are provided in Appendix A, Tables 1, 2, and 3.

LOQs are established in accordance with PAS policies and procedures for method validation, determination of detection limits (LOD), and quantitation limits (LOQ). Refer to laboratory SOP ID 1732 (Detection Limit (DL), Limit of Detection (LOD) & Limit of Quantitation (LOQ)) for additional information. DL and LOQ are routinely verified and updated when needed. DL and LOQ are always adjusted to account for actual sample amounts used and for dilution.

The reporting limit (RL) is the value to which analytes are reported as detected or non-detect in the final report. When the RL is less than the lower limit of quantitation (LLOQ), all detections and non-detects at the RL are qualitative. The LLOQ is the lowest point of the calibration curve used for each target analyte.

1.2 Reference Methods & Documents

This SOP is based on reference method EPA 1633 (2024). If the laboratory procedure is modified from the reference method, a list of modifications and rationale for the modifications is provided in Section 14.0. Modifications are permitted when allowed by the regulatory program for which test results will be used and when the modification has been validated comparable and equivalent to the reference method.

1.3 Quantitation Range

The quantitation range for each target analyte in this procedure is defined in Appendix A, Table 5: Calibration Standard Concentrations.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

1.4 Program Specific Requirements

Not Applicable.

2.0 SUMMARY OF METHOD

Environmental samples are prepared and extracted using method-specific procedures. Sample extracts are subjected to cleanup procedures designed to remove interferences. Analyses of the sample extracts are conducted by LC-MS/MS in the multiple reaction monitoring (MRM) mode. Sample concentrations are determined by isotope dilution or extracted internal standard quantification (see Section 9.2.1) using isotopically labeled compounds added to the samples before extraction.

Individual PFAS analytes are identified through peak analysis of the quantification and confirmation ions, where applicable. Where linear and branched isomers are present in the sample and either qualitative or quantitative standards containing branched and linear isomers are commercially available, the PFAS analyte is reported as a single analyte consisting of the sum of the linear and branched isomer concentrations.

Quantitative determination of target analyte concentrations is made with respect to an isotopically labeled PFAS standard; the concentrations are then used to convert raw peak areas in sample chromatograms to final concentrations.

Results for target analytes are recovery corrected by the method of quantification (i.e., either isotope dilution or extracted internal standard quantification, see Section 9.2.1). Recoveries of isotopically labeled extracted internal standards (EIS) are determined by comparison to the responses of one of seven non-extracted internal standards (NIS) and are used as general indicators of overall analytical quality.

The quality of the analysis is assured through reproducible calibration and testing of the extraction, cleanup, and LC-MS/MS systems.

- Aqueous samples are spiked with isotopically labeled standards (EIS), extracted using solid-phase extraction (SPE) cartridges and undergo cleanup using carbon before analysis.

- Solid samples are spiked with EIS, extracted into basic methanol, and cleaned up by carbon and SPE cartridges before analysis.

- Tissue samples are spiked with EIS, extracted in methanol with potassium hydroxide followed by acetonitrile, and cleaned up by carbon and SPE cartridges before analysis.

3.0 INTERFERENCES

Solvents, reagents, glassware, and other sample processing hardware may yield artifacts and elevated baselines causing misinterpretation of chromatograms. Specific selection of reagents and solvents is required.

Clean all equipment prior to, and after, each use to avoid PFAS cross-contamination. Typical cleaning solvents include water, methanol, and methanolic ammonium hydroxide. The residual PFAS content of disposable plasticware and filters must be verified by batch/lot number and may be used without cleaning if PFAS levels are less than the Method Detection Limit (MDL).

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Prior to use, glassware must be solvent rinsed and then air dried. A solvent rinse procedure using methanolic ammonium hydroxide (1%) and methanol is recommended.

Sample manifold ports and transfer tubing should be inspected regularly for signs of wear and/or discoloration. When such observations are made, the associated components should be replaced.

All parts of the SPE manifold must be cleaned between samples by rinsing with methanolic ammonium hydroxide (1%) and air drying prior to use. Smaller parts, like the needles, adapters, reservoirs, transfer lines, and stopcocks associated with the manifold should be rinsed with tap water prior to rinsing with methanolic ammonium hydroxide (1%) and air drying. After loading the samples but prior to elution procedures, the chamber should be rinsed with methanolic ammonium hydroxide (1%).

All materials used in the analysis must be demonstrated to be free from interferences by running method blanks (Section 11.1.1) at the beginning and with each extraction batch (samples started through the extraction process on a given batch to a maximum of 20 field samples).

Reagent water (Section 8.1) can be used to simulate water samples and Ottawa sand and/or reagent-grade sand (Section 7.3) can be used to simulate soils. Fish fillets (tilapia/ cod), chicken breast or other similar animal tissue (see Section 7.3) may be used as the reference matrix for tissue. The laboratory must verify that the source product used does not contain PFAS in detectable amounts.

Interferences co-extracted from samples will vary considerably from source to source, depending on the diversity of the site being sampled. Interfering compounds may be present at concentrations several orders of magnitude higher than the native PFAS. Because low levels of PFAS are measured by this method, elimination of interferences is essential. The cleanup steps given in Section 9.3 can be used to reduce or eliminate these interferences and thereby permit reliable determination of the PFAS at the levels shown in Tables 1, 2 and 3. The most frequently encountered interferences are fluoropolymers; however, bile salts (e.g., Taurodeoxycholic Acid [TDCA]) may be present in various matrices, including fish and wastewaters, and can interfere in the chromatography. For this reason, analysis of a standard containing TDCA is required as part of establishing the initial chromatographic conditions (see Sections 8.3.2 and 8.3.3) and each analytical sequence (see Section 9.4).

4.0 DEFINITIONS

Refer to the Laboratory Quality Manual for a glossary of common lab terms and definitions.

- **Extracted Internal Standard (EIS) quantification:** The response of the target compound is compared to the response of the isotopically labeled analog of another compound with chemical and retention time similarities.
- **Isotope dilution (ID) quantitation:** A means of determining a naturally occurring (native) compound by reference to the same compound in which one or more atoms has been isotopically enriched. The labeled PFAS are spiked into each sample and allow identification and correction of the concentration of the native compounds in the analytical process.
- **Isotopically labeled compound:** An analog of a target analyte in the method which has been synthesized with one or more atoms in the structure replaced by a stable (non-radioactive) isotope of that atom. Common stable isotopes used are 13C (Carbon-13) or Deuterium (D or 2H). These labeled compounds do not occur in nature, so they can be used for isotope dilution quantitation or other method-specific purposes.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

- **Minimum Level of quantitation (ML):** The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. The ML represents the lowest concentration at which an analyte can be measured with a known level of confidence. It may be equivalent to the concentration of the lowest calibration standard, assuming that all method-specified sample weights, volumes, and cleanup procedures have been employed.
- **PAS:** Acronym for Pace® Analytical Services, LLC

5.0 HEALTH & SAFETY

The following sections provide general health and safety information about chemicals and materials that may be present in the laboratory.

- The toxicity or carcinogenicity of each chemical material used in the laboratory has not been fully established. Each chemical should be regarded as a potential health hazard and exposure to these compounds should be as low as reasonably achievable.
- The laboratory maintains documentation of hazard assessments and OSHA regulations regarding the safe handling of the chemicals specified in each method. Safety data sheets for all hazardous chemicals are available to all personnel. Employees must abide by the health, safety and environmental (EHS) policies and procedures specified in this SOP and in the Pace® Chemical Hygiene / Safety Manual (COR-MAN-0001).
- Personal protective equipment (PPE) such as safety glasses, gloves, and a laboratory coat must be worn in designated areas and while handling samples and chemical materials to protect against physical contact with samples that contain potentially hazardous chemicals and exposure to chemical materials used in the procedure.
- Concentrated corrosives present additional hazards and are damaging to skin and mucus membranes. For procedures that require use of acids, use acids in a fume hood whenever possible with PPE designed for handing these materials. If eye or skin contact occurs, flush with large volumes of water. When working with acids, always add acid to water to prevent violent reactions. For procedures that that emit large volumes of solvents (evaporation/concentration processes), these activities must be performed in a fume hood or apparatus that reduces exposure.

6.0 SAMPLE COLLECTION, PRESERVATION, HOLDING TIME & STORAGE

PAS does not offer sample collection services for this test method. PAS advises customers to collect samples in accordance with a sampling plan and collection procedures appropriate to meet regulatory requirements and data quality objectives for the project. The minimum sample amounts required for the test are provided in this section.

PAS provides containers for the collection of samples upon client request. The routine container type and size is provided in the following table along with requirements for sample size, preservation and holding time. Refer to Bottle Order Preparation (ENV-SOP-WEST-0005), or however named, for procedures related to preparation of bottle kits.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Container Type, Minimum Sample Amount, Preservation, and Holding Time

Matrix	Container Size & Type[1]	Minimum Sample Amount[2]	Preservation	Holding Time
Aqueous (non-potable water)	2 x 500 mL linerless HDPE 1 x 125 mL linerless HDPE[3]	500 mL	Thermal: 0-6°C (or ≤ -20°C)	Collection to Preparation: 28 Days (or 90 Days) Preparation to Analysis: 28 Days
Aqueous (leachate)	2 x 125 mL linerless HDPE	100 mL	Thermal: 0-6°C (or ≤ -20°C)	Collection to Preparation: 28 Days (or 90 Days) Preparation to Analysis: 28 Days
Solid (sediment and soil)	3 oz/ 90 mL linerless polypropylene wide mouth	5 g	Thermal: 0-6°C or ≤ -20°C	Collection to Preparation: 90 Days Preparation to Analysis: 28 Days
Solid (biosolid)	3 oz/ 90 mL linerless polypropylene wide mouth	0.5 g	Thermal: 0-6°C or ≤ -20°C	Collection to Preparation: 90 Days Preparation to Analysis: 28 Days
Tissue[4]	3 oz/ 90 mL linerless polypropylene wide mouth	2 g	Thermal: ≤ -20°C	Collection to Preparation: 90 Days Preparation to Analysis: 28 Days

[1] *Default container type provided in sample kit. To allow room for expansion during freezing (if necessary), aqueous sample containers should not be overfilled. Aqueous sample containers should be filled only to the appropriate gradation marked on the container, or to the shoulder of the container if no gradations are provided.*

[2] *Nominal amount of sample required for each discrete test. Solid and biosolid sample amounts reflect dry weight.*

[3] *Used for pre-screening analyses.*

[4] *Container listed here will be used for tissue homogenate; samples may be received at the laboratory as whole fish or filets wrapped in aluminum foil or food grade polyethylene wrap. Ideally fish should be frozen upon collection and shipped to the laboratory as soon as possible.*

Note: Project-specific requirements dictate which storage condition applies. The storage condition to be used for each project must be formally documented in written form (QAPP or otherwise) before samples are received. Without any prior indication from the client, the lab will store all aqueous and solid/biosolid samples at 0-6°C until extraction, with a 28-day holding time (collection to prep) for aqueous matrices and a 90-day holding time (collection to prep) for solid/biosolid matrices.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Thermal preservation is checked and recorded on receipt in accordance with laboratory SOP (ENV-SOP-WEST-0003, Sample Receipt and Login), or however named.

After receipt, samples are stored as listed above until sample preparation. Prepared sample extracts of all matrices are stored at 0-6°C until sample analysis.

After analysis, samples are retained as stated in the Pace® standard terms and conditions, unless otherwise specified in the analytical services contract. Samples are then disposed of in accordance with Federal, State, and Local regulations.

7.0 EQUIPMENT & SUPPLIES

Use of equivalent instrumentation, support equipment, and supplies from alternative vendors is acceptable so long as they meet the specifications as stated in the reference method.

Due to the possibility of adsorption of analytes onto glass, plastic containers are used for all standard, sample, and extraction preparations. Any time a new lot of SPE cartridges, solvents, cryovials, or autosampler vials are used, it must be demonstrated that a MB is reasonably free of contamination and that the criteria in Section 11.1.1 are met.

7.1 Instrumentation

- High-performance liquid chromatograph (HPLC) equipped with tandem quadrupole mass spectrometer – Sciex 5500+ or equivalent
- Agilent Zorbax RRHD Eclipse Plus C18, 2.1 x 50 mm (1.8 µm) analytical column (Agilent Part # 959757-902), or equivalent
- Guard cartridge/column – Agilent Zorbax Eclipse Plus C18, 2.1 x 5 mm, 1.8 um (Agilent Part# 821725-901), or equivalent
- Trap/delay column – InfinityLab PFC Delay Column, 4.6 x 30 mm (Agilent Part# 5062-8100), or equivalent

7.2 Support Equipment

- Oven – Capable of maintaining a temperature of 105 ± 5 ºC
- Analytical balance – Capable of weighing 0.0001 g
- Top loading balance – Capable of weighing 0.01 g
- Calibrated mechanical variable volume pipettes with disposable HDPE or polypropylene tips (10 µL to 5 mL) – used for preparation of calibration standards and spiked samples
- Point of Use water preparation system – Thermo Scientific Barnstead E-Pure; model 7119 – Used for QC samples to verify the systems are PFAS free
- Ultrasonic mixer – Fisherbrand; Model CPX3800 – 5.7L, 40 kHZ, 120V, 2.9 Amp with timer
- Analog or digital vortex mixer, single or multi-tube (Fisher Scientific 02-215-452, or equivalent)
- Variable speed mixing table (VWR Model 3500 Orbital Shaker, or equivalent)

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

- Centrifuge (Beckman Allegra 6, Hettich Rotanta 460, or equivalent), capable of reaching at least 3000 rpm (~2000 RCF)
- Vacuum Pump – Sufficient capacity to maintain a vacuum of approximately 10 to 15 inches of mercury for extraction cartridges. GAST model # DOA-P704-AA, Waters Cat# 725000417, 115V, 60Hz, 4.2A
- Vacuum manifold for SPE Cartridges – Waters Cat# WAT200609: SPE Vacuum manifold, or equivalentCat
- Vacuum tubing – 1/4” ID, 5/8” OD, 3/16” wall; Fisher Scientific part# 14-176-6B or equivalent
- PE Transfer tubing – 1/8” X .062 x 500ft, Freelin Wade part# 1C-109-10 or equivalent.

7.3 Supplies

- Solid Phase Extraction (SPE) cartridges – Phenomenex part# CS0-9216, 250 mg WAX/20mL, or equivalent
- Carbon Cleanup cartridges – Phenomenex part# 8B-S528-CAJ, 50 mg GCB, or equivalent
- SPE reservoirs – 60 mL, Phenomenex part# AH0-7189, or equivalent
- SPE adapter caps – Supelco part# 57267 (Adapter cap for 12, 20 & 60 mL SPE tubes)
- Disposable liners for Vacuum Manifold – Waters part# 20685 or equivalent
- Silanized glass wool (Pyrex 3950 or equivalent)
- Reference matrix: Aqueous – reagent water
- Reference matrix: Solid – Ottawa sand
- Reference matrix: Tissue – fish fillets, chicken breast or similar animal tissue. First preference will be frozen cod fillets.
- Bottles – HDPE or PP, with linerless HDPE or polypropylene caps. Various sizes. QEC item # 6212-Q016/BC-150-PACE (500 mL), 6212-Q008BC-P (250 mL), 6213-U004BC-P (125 mL), 6214-003PPGBC-P (90 mL)
- Screw top vials, Polypropylene 0.7-mL with polypropylene caps – used in sample analysis and pre-screening (Waters Cat # 186005219 and 186004169 or equivalent)
- 15- and 50-mL conical polypropylene tubes with polypropylene screw caps for preparing and storing extract solutions and for collection of eluents (Fisher Scientific 05-527-90 and 14-432-22, or equivalent)
- 500-mL conical polypropylene centrifuge bottles for sample centrifugation (Fisher Scientific 07-200-621 or equivalent)
- Extract/Standard storage containers – 15-mL, 8-mL, or 4-mL narrow-mouth HDPE container - Thermo Scientific item# 2002-9050, 2002-9025, 2002-9125; 2.0-mL screw-top polypropylene cryogenic vials – Grainger item# 6EMV1/ Wheaton item# W985872;1.5-mL snap-cap polypropylene microcentrifuge tubes - Fisher item# 05-408-129; or equivalent
- pH Paper, range 0-14 - (VWR Cat# BD3539.606 or equivalent), 0.5-unit readability

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

- Disposable glass and plastic pipets

8.0 REAGENTS & STANDARDS

Refer to laboratory SOP (ENV-SOP-MANS-0112, Reagent, Solvent, and Standard Control), or however named, for information regarding standard and reagent tracking and traceability. All reagents and stock standards are commercially prepared, when available. Expiration and storage requirements are defined per manufacturer.

8.1 Reagents

Use of equivalent reagents from alternative vendors is acceptable so long as the substitution meets the performance specifications required by the reference method.

- Acetic acid – ACS grade or equivalent, store at room temperature; VWR cat# BDH3098-3.8LP or equivalent
- Acetonitrile – UV grade or equivalent, verified before use, store at room temperature; Honeywell Cat# 018-4 or equivalent (for extraction)
- Ammonium acetate – ACS or equivalent, store at 2-8° C, replace 2 years after opening date; VWR BDH9204-500G or equivalent.
- 1M aqueous ammonium acetate (Waters Cat# 186006693-1) used for mobile phase additive; store as indicated by manufacturer.
- Ammonium hydroxide – certified ACS+ grade or equivalent, 30% in water, store at room temperature; Fisher A470-500 or equivalent
- Formic acid – greater than 96% purity or equivalent, store at room temperature; Acros 147930010 or equivalent
- Methanol – HPLC grade or better, 99.9% purity, store at room temperature; Honeywell CAT# 230-4 or equivalent
- Mobile Phase A – 2 mM ammonium acetate in 95:5 water/acetonitrile. Aliquot 0.4 mL of aqueous 5M ammonium acetate in 949.6 mL of water and 50 mL of acetonitrile. Alternatively, dissolve 0.154 g of neat ammonium acetate into 950 mL of water and 50 mL of acetonitrile. Store at room temperature; shelf life is 2 months.
- Mobile Phase B – Acetonitrile, Ultra HPLC grade or equivalent; OmniSolv AX0142-1 or equivalent
- Potassium hydroxide – certified ACS or equivalent, store at room temperature, replace after 2 years; Fisher P250-500 or equivalent.
- Reagent water – Laboratory reagent water, test by lot/batch number for residual PFAS content.

8.2 Standards

Use of equivalent standards from alternative vendors is acceptable so long as they are traceable to a national standard, when commercially available. Follow manufacturer's recommended storage conditions and expiration dates.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

8.2.1 Primary PFAS Standard

- EPA Method 1633 Native PFAS Standard mix from Wellington Laboratories (item# EPA-1633STK) – used to prepare the calibration standards and to spike the reference QC samples prepared/analyzed with every batch of samples. Also used to prepare an intermediate standard for calibration standard preparation and low-level QC sample spiking, as described below.

8.2.2 Secondary PFAS Standard

- Method 1633-PFCs-Calibration Standard mix from Absolute Standards (item# 65735) – used to prepare the ICV standard as described below.

8.2.3 Extracted Internal Standard (EIS)

- Mass-labelled PFAS Extraction Standard mix from Wellington Laboratories (item# MPFAC-HIF-ES) – used to prepare analytical standards and spike each sample prior to extraction.

8.2.4 Non-extracted Internal Standard (NIS)

- Mass-labelled PFAS Injection Standard mix from Wellington Laboratories (item# MPFAC-HIF-IS) – used to prepare analytical standards and spike sample extracts prior to instrumental analysis.

8.2.5 Bile Salt (TDCA) Standard

- Neat Taurodeoxycholic acid from Cayman Chemical (item# 15935), or equivalent – used to prepare analytical standards for bile salt interference check.

8.3 Formulations

Prepare standard solutions from materials of known purity and composition or purchase as solutions or mixtures with certification to their purity, concentration, and authenticity. Observe the safety precautions in Section 5.

Purchase of commercial standard solutions or mixtures is highly recommended for this method; however, when these are not available, preparation of stock solutions from neat materials may be necessary. If the chemical purity is 98% or greater, the weight may be used without correction to calculate the concentration of the standard.

When not being used, store standard solutions in the dark at 4 °C, unless the vendor recommends otherwise, in tightly sealed screw-capped vials. Place a mark on the vial at the level of the solution so that solvent loss by evaporation can be detected. Replace the solution if solvent loss has occurred.

Note: 18O-mass labeled perfluoroalkyl sulfonates may undergo isotopic exchange with water under certain conditions, which lowers the isotopic purity of the standards over time.

The laboratory must maintain records of the certificates for all standards for traceability purposes. Copies of the certificates should be provided as part of the data packages in order to check that proper calculations were performed.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

8.3.1 Analytical and Preparation Reagents

Analytical and Preparation reagents are stored in plastic or glass containers under ambient conditions. Expiries are listed with each reagent.

- Instrument Blank Mix (IBLK Mix) – Methanol with 4% water, 1% ammonium hydroxide and 0.625% acetic acid – add ammonium hydroxide (3.3 mL, 30%), reagent water (1.67 mL) and acetic acid (0.625 mL) to methanol (94.4 mL); store at room temperature, replace after 1 month. This solution is used to prepare the instrument blank (Sections 8.3.3.3 and 9.2.5) and sample extract dilutions.
- Mobile Phase A – 2 mM ammonium acetate in 95:5 water: acetonitrile. Aliquot 2.0 mL of aqueous 1M ammonium acetate in 948 mL of water and 50 mL of acetonitrile. Store at room temperature; replace after 2 months or less.
- Mobile Phase B – Acetonitrile, HPLC grade or equivalent; Omnisolv AX0142-1 or equivalent
- Acetic acid (0.1%) - dissolve acetic acid (1 mL) in reagent water (1 L); store at room temperature, replace after 3 months.
- Aqueous ammonium hydroxide (3%) – add ammonium hydroxide (10 mL, 30%) to reagent water (90 mL), store at room temperature, replace after 3 months.
- Methanolic ammonium hydroxide (0.3%) – add ammonium hydroxide (1 mL, 30%) to methanol (99 mL), store at room temperature, replace after 1 month.
- Methanolic ammonium hydroxide (1%) – add ammonium hydroxide (3.3 mL, 30%) to methanol (97 mL), store at room temperature, replace after 1 month.
- Methanolic ammonium hydroxide (2%) – add ammonium hydroxide (6.6 mL, 30%) to methanol (93.4 mL), store at room temperature, replace after 1 month.
- Formic acid (aqueous, 0.1 M) – dissolve formic acid (4.6 g / 3.77 mL) in reagent water (1 L), store at room temperature, replace after 2 years.
- Formic acid (aqueous, 0.3 M) – dissolve formic acid (13.8 g / 11.31 mL) in reagent water (1 L), store at room temperature, replace after 2 years.
- Formic acid (aqueous, 5% v/v) – mix 5 mL formic acid with 95 mL reagent water, store at room temperature, replace after 2 years.
- Formic acid (aqueous, 50% v/v) – mix 50 mL formic acid with 50 mL reagent water, store at room temperature, replace after 2 years.
- Formic acid (methanolic 1:1, 0.1 M formic acid/methanol) – mix equal volumes of methanol and 0.1 M formic acid, store at room temperature, replace after 2 years.
- Methanolic potassium hydroxide (0.05 M KOH) – add 3.3 g of potassium hydroxide to 1 L of methanol, store at room temperature, replace after 3 months.

8.3.2 Intermediate Standards

Intermediate standards are stored in plastic containers as listed below. Expiries are listed with each formulation.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

- TDCA Stock Solution: Dissolve 10 mg of neat TDCA into 5 mL of MeOH; final concentration equals 2000 µg/mL. Store frozen (<0°C) when not in use; replace after 1 year, or sooner if degradation is observed.
- STK-10X Solution: Dilute 200 µL of EPA-1633STK with 1.8 mL of MeOH for a final volume of 2 mL; final concentrations vary by analyte – 25, 50, 100, 125, 250, or 625 ng/mL. Store at 0-6°C when not in use; replace every time a new lot of 1633STK is used, or after 1 month.

8.3.3 Working Solutions

Working solutions are stored in plastic containers under refrigerated conditions at 0-6°C and expire 1 month from the date of preparation.

8.3.3.1 Calibration Standards

A series of calibration solutions containing the target analytes and the EIS and NIS is used to establish the initial calibration of the analytical instrument. The concentration of the method analytes in the solutions varies to encompass the working range of the instrument, while the concentrations of the EIS and NIS (and TDCA) remain constant. The calibration solutions are prepared using the standards and intermediate standards described above. The final solvent composition will match the solvent mix of sample extracts, which contain methanol with 4% water, 1% ammonium hydroxide and 0.625% acetic acid. Calibration standard solutions do not undergo solid phase extraction/cleanup. Prepare the calibration standard solutions according to the table below. Following all formulations listed in this SOP will require 3 ampoules of the 1633STK mix to prepare a full calibration set; other final volumes may be prepared. If the lab follows all formulations in this SOP as written, the remaining volumes of 1633STK and STK-10X solutions after preparing the calibration should be enough to spike approximately 40 sets of aqueous batch QC. The remainder of MPFAC-HIF-ES and MPFAC-HIF-IS mixes should provide enough volume to spike approximately 40-45 samples.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Component[1]	L1	L2 (LOQ)	L3	L4	L5 (CCV)	L6	L7	L8	L9
STK-10X	20	16	40						
EPA-1633STK				20	100	100	200	400	500
MPFAC-HIF-ES	25	10	10	10	25	10	10	10	10
MPFAC-HIF-IS	25	10	10	10	25	10	10	10	10
TDCA Stock	25				25				10
IBLK Mix	4905	1964	1940	1960	4825	1880	1780	1580	1470
Final Volume	5000	2000	2000	2000	5000	2000	2000	2000	2000

[1]*All values listed are µL*

8.3.3.2 Initial Calibration Verification Standard (ICV)

Prepare the ICV standard using the Absolute Standards 1633 PFC Mix, following the table below; expected concentration for all compounds in the ICV will be 10 ng/mL. The ICV is prepared from a separate, second source (or separate manufacturer lot) than that used for the calibration solutions. If a second source or lot is unavailable, a separate preparation using the same stocks is acceptable.

Component	Volume used (µL)
1633 PFC Mix	20
MPFAC-HIF-ES	20
MPFAC-HIF-IS	20
IBLK Mix	3940
ICV Final Volume	4000

8.3.3.3 Instrument Blank

A solvent blank is analyzed at the beginning of each analytical sequence, to demonstrate clean instrumental background, and after samples containing high levels of target compounds (e.g., calibration, CCV) to monitor carryover from the previous injection. The instrument blank consists of clean reagent fortified with the EIS and NIS for quantitation purposes. Prepare the IBLK using the IBLK mix (Section 8.3.1) and an appropriate volume of EIS and NIS; alternatively, prep the IBLK from 1887 µL of 1% Methanolic ammonium hydroxide, 80 µL of reagent water, 12.5 µL of acetic acid, and 10 µL each of EIS and NIS.

9.0 PROCEDURE

9.1 Equipment Preparation

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

9.1.1 Instrument Setup

9.1.1.1 Routine Instrument Operating Conditions

Example LC Gradient

Step	Total Time (min)	Flow Rate (µL/min)	A: 5% Acetonitrile w/ 10mM Ammonium Acetate (%)	B: Acetonitrile (%)
1	0.00	400	80	20
2	6.00	400	0	100
3	6.50	400	0	100
4	6.51	400	80	20
5	8.50	400	80	20

Example MS Parameters

MS Parameter	Setting or Value
Sample Loop	100 µL
Injection Volume	2 µL
Column Oven Temperature	40° C
MRM Scan Window	60 sec
Curtain Gas (CUR)	30.0
Collision Gas (CAD)	9
Ion Spray Voltage (IS)	-4500 V
Source Temperature (TEM)	450° C
Ion Source Gas 1 (GS1)	30.0
Ion Source Gas 2 (GS2)	50.0

9.1.1.2 Mass Calibration

The mass spectrometer must undergo mass calibration to ensure accurate assignments by the instrument. This mass calibration must be performed at least annually to maintain instrument sensitivity and stability. Mass calibration must be repeated on an as-needed basis (e.g., QC failures, ion masses fall outside of the instrument required mass window, major instrument maintenance, or if the instrument is moved). Mass calibration must be performed using the calibration compounds and procedures prescribed by the manufacturer. The procedures used for mass calibration and mass calibration verification must evaluate an ion range that encompasses the ion range (Q1 and Q2 m/z) of the analytes of interest of this method.

9.1.1.3 Mass Calibration Verification

A mass calibration verification must be performed following mass calibration, prior to standard and sample analyses. Mass verification checks must also be performed after any subsequent mass calibrations. The laboratory must follow the instructions for the individual instrument software to confirm the mass calibration, mass resolution and peak relative response. If the manufacturer's

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

instructions include options for evaluation of mass resolution, the tightest resolution requirements (typically called unit resolution) must be met.

9.1.1.4 Retention Time (RT) calibration

Once RT windows have been confirmed for each target analyte, EIS, and NIS compound, then once per ICAL and at the beginning of the analytical sequence, the position of all target analyte, EIS, and NIS peaks shall be set using the midpoint standard of the ICAL curve when ICAL is performed. When an ICAL is not performed, the initial CCV retention times or the midpoint standard of the ICAL curve can be used to establish the RT window position.

The RTs for the target analytes, EIS, and NIS compounds must fall within 0.4 minutes of the predicted retention times from the midpoint standard of the ICAL or initial daily CCV, whichever was used to establish the RT window position for the analytical batch. All branched isomer peaks identified in either the calibration standard or the qualitative (technical grade) standard also must fall within 0.4 minutes of the predicted retention times from the midpoint standard of the ICAL or initial daily CCV. For all target analytes with exact corresponding isotopically labeled analogs, target analytes must elute within 0.1 minutes of the associated EIS compound.

When establishing the chromatographic conditions, it is important to consider the potential interference of bile salts (i.e. TDCA) during analyses of samples. Analytical conditions must be set to allow a separation of at least 1 minute between TDCA and the retention time window of PFOS. The method requires this evaluation when establishing the chromatographic conditions, regardless of the sample matrices to be analyzed.

9.1.2 Support Equipment

Refer to laboratory SOP (ENV-SOP-WEST-0036 Balance Calibration Verification, ENV-SOP-WEST-0123 Pipette and Bottle Top Verification), or however named, for additional information on calibration requirements for support equipment that may be used in this procedure.

9.2 Calibration

Refer to corporate POL ENV-POL-CORQ-0005, *Acceptable Calibration Practices for Instrument Testing*, for general laboratory calibration policies and procedures.

9.2.1 Calibration Frequency

Prior to the analysis of samples, and after a successful mass calibration check, each LC-MS/MS system must be calibrated at a minimum of 6 standard concentrations (Section 8.3.3.1 and Appendix A, Table 5). This method procedure calibrates and quantifies 40 PFAS target analytes, using the isotopically labeled compounds added to the sample prior to extraction, by one of two approaches (see Appendix A, Table 4 for quantitation associations):

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

- Isotope Dilution quantification (ID), whereby the response of the target compound is compared to the response of its isotopically labeled analog; twenty-four target compounds are quantified in this way.
- Extracted Internal Standard quantification (EIS), whereby the response of the target compound is compared to the response of the isotopically labeled analog of another compound with chemical and retention time similarities; sixteen target compounds are quantified in this way.

Each LC-MS/MS system must be calibrated whenever the laboratory takes corrective action that might change or affect the initial calibration criteria, or if either the CCV or ISC acceptance criteria have not been met.

Each time a modification is made to this method, the laboratory is required to repeat the procedure in Sections 11.3.1 and 11.3.2. If calibration will be affected by the change, the instrument must be recalibrated.

9.2.2 Calibration Levels

Calibration standards are stored in plastic containers under refrigerated conditions (0-6°C).

Concentrations for calibration solutions are presented in Appendix A, Table 5. A minimum of six contiguous calibration standards are required for a valid analysis when using a linear calibration model, with at least five of the six calibration standards being within the quantitation range (e.g., from the LOQ to the highest calibration standard). If a second-order calibration model is used, then a minimum of seven calibration standards are required, with at least six of the seven calibration standards within the quantitation range. The lowest level calibration standard must be at a concentration less than or equal to the Limit of Quantitation (LOQ) and must meet a signal-to-noise ratio of 3:1 for the quantitation and confirmation ions that exist and must meet ion ratio requirements described in Section 10.1.1.3. If the analyte has no confirmation ion, then a 10:1 signal to noise ratio is required. All initial calibration requirements listed in Section 9.2.4 and 9.2.5 must be met.

Note: Additional calibration standards, at levels lower than the lowest calibration standard listed in the method, may be added to accommodate a lower limit of quantitation if the instrument sensitivity allows. Calibration standards at the high end of the calibration may be eliminated if the linearity of the instrument is exceeded or at the low end if those calibration standards do not meet the S/N ratio criterion of 3:1 (for quantitation and confirmation ions that exist; 10:1 for analytes with no confirmation ion), so long as the required number of calibration points is met. All analytes with commercially available stable isotope analogues must be quantified using isotope dilution.

9.2.3 Calibration Sequence

Calibration standards must be analyzed in sequence from lowest to highest concentration to minimize the chance that carryover from a higher concentration standard will boost the area of a lower concentration standard. A typical sequence for days when calibration is required is shown below.

Description	Comment
ICAL L1	

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Description	Comment
ICAL L2	Also used as ISC (Section 9.2.4.4)
ICAL L3	
ICAL L4	
ICAL L5	Also used as bracketing/closing CCV (Section 9.2.4.5)
ICAL L6	
ICAL L7	
ICAL L8	
ICAL L9	
IBLK	Any detections must be <MDL
ICV	%R must be 70 – 130%
CCV (ISC)	%R must be 70-130%; begins and ends Analytical Sequence

9.2.4 Calibration Evaluation

If the criteria for initial calibration are not met, inspect the system for problems and take corrective actions to achieve the criteria. This may require the preparation and analysis of fresh calibration standards. All initial calibration criteria must be met before any samples or required blanks are analyzed.

9.2.4.1 Curve Fit

One of the following two approaches must be used to evaluate the linearity of the instrument calibration. Weighting (typically 1/x or 1/x2) is allowed for linear and non-linear regressions.

- Option 1: Calculate the relative standard deviation (RSD) of the Relative Response (RR) or Response Factor (RF) values of the initial calibration standards for each native compound and isotopically labeled compound. See Section 10.2.1 for calculation of RR and RF. The RSD must be ≤ 20% to establish instrument linearity.

- Option 2: Calculate the relative standard error (RSE) for each native compound and EIS compound for all the initial calibration standards that were analyzed. The RSE for all method analytes must be ≤ 20% to establish instrument linearity.

If these criteria cannot be met, corrective action should be taken to restrict the range of calibration, reanalyze and/or reprepare the ICAL standards, or perform instrument maintenance and/or re-optimization.

If more than the minimum number of standards are analyzed and levels are excluded from the calibration, only the lowest or highest standards may be excluded, except as noted here. The removal of calibration levels from the interior of the curve is allowed only when there is sound technical reason for doing so and when the level is removed for all analytes; for example, when it can be proven that the wrong standard was analyzed for the calibration level or there is obvious evidence that the instrument malfunctioned during injection of the standard. The removal of any calibration level from the interior of the curve must be approved by the department supervisor/manager. Management approval and

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

the rationale for the level removal must be documented and kept with the technical record.

9.2.4.2 Relative Error (% RE)

Although not required by the method, it may be useful to compare the actual responses for each standard to the calibration model; percent error of >30% between the calculated and expected concentrations of an analyte in any standard may be cause for concern.

9.2.4.3 Initial Calibration Verification (ICV)

As part of the IDOC and once after each ICAL, analyze an ICV sample prepared from a second source (different from the source of the ICAL standards). If a second vendor is not available, then a different lot of the standard from the same vendor should be used. The ICV should be prepared and analyzed just like a CCV. Acceptance criteria for the ICV are identical to the CCVs: the calculated concentration for each analyte must be within ± 30% of the expected value. If measured analyte concentrations are not of acceptable accuracy, correct the problem and rerun the ICV. If the problem persists, repeat the ICAL. Samples are not to be analyzed until the ICAL has been verified by acceptable ICV accuracy.

9.2.4.4 Instrument Sensitivity Check (ISC)

The lowest calibration standard within the quantitation range must be analyzed at the beginning of the analytical sequence. The signal-to-noise ratio of the ISC must be ≥ 3:1 for the quantification ions and the confirmation ions, or ≥ 10:1 if the analyte only has a quantification ion. Recovery of the native and EIS compounds for the ISC must be within 70-130%. If the requirements cannot be met, the problem should be corrected before analyses can proceed.

The lowest calibration standard within the quantitation range must be analyzed at the beginning of the analytical sequence. The signal-to-noise ratio of the ISC must be ≥ 3:1 for the quantification ions and the confirmation ions, or ≥ 10:1 if the analyte only has a quantification ion. Recovery of the native and EIS compounds for the ISC must be within 70-130%. If the requirements cannot be met, the problem should be corrected before analyses can proceed.

9.2.4.5 Continuing Calibration Verification (CCV)

After a passing MS resolution and a successful initial calibration is achieved and prior to the analysis of any samples, the calibration is verified by injecting an aliquot of the appropriate concentration ICAL standard, analyzed with the same conditions used during the ICAL. CCV is performed at the beginning of each analytical sequence, after every ten samples, and at the end of the analytical sequence. In this context, a “sample” is defined as a field sample: MBs, CCVs, LCSs, MSs, FDs, TBs and MSDs are not counted as samples. All CCV analyses are performed using a mid-level ICAL standard, except for the daily Instrument Sensitivity Check, as noted above.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Calculate concentration for each native and EIS compound in the CCV; the recovery of native and EIS compounds for the CCVs must be within 70 – 130%. If the CCV criteria are not met, take corrective action (possibly including recalibration) and reanalyze any extracts that were analyzed between the last passing CCV and the one that failed. Alternately, the analyst may immediately analyze two CCVs for confirmation. If both confirmation CCV analyses meet the recovery criteria, analysis may proceed; however, the analyst must rerun any samples that were analyzed after the failing CCV and before the 2 passing CCVs. If either of the 2 confirmation CCV analyses fails to meet the acceptance criteria take corrective action and recalibrate the LC-MS/MS.

If an individual target compound recovery in a CCV is above the upper control limit and all associated samples are ND for that compound, the data for those samples may be reported. In such cases, a narrative statement must be included in the report indicating the specific compound result that was biased high in the CCV, and that samples were ND for that compound and thus reportable.

9.2.5 Initial Calibration Blank (ICB) / Continuing Calibration Blank (CCB)

One instrument blank (IBLK) is analyzed immediately following the highest ICAL standard analyzed (ICB), each analysis day prior to sample analysis, and following each bracketing CCV in a sequence (CCB), to check for carryover and instrument contamination. The concentration of each analyte must be ≤ the MDL-equivalent concentration in each IBLK/ICB/CCB. If the IBLK does not pass this requirement after the highest ICAL standard, the acquisition method should be adjusted to reduce the amount of carryover observed. Alternately, the calibration should be performed using a lower concentration for the highest standard until the acceptance criteria is met.

If unacceptable contamination is persistent in blanks, analyze additional instrument blanks until the response of the analyte is no longer detectable, or perform additional troubleshooting steps to identify and minimize other potential sources of PFAS contamination.

9.3 Sample Preparation

This section describes the sample preparation procedures for aqueous samples (Section 9.3.3), solid samples (soil, sediment or biosolid; Section 9.3.6), and tissue samples (Section 9.3.9). For solid samples, percent solids are determined using the procedures in Section 9.3.2. This section also describes the solid phase extraction (SPE) and extract cleanup protocols for all matrices.

Note: The laboratory may choose to pre-screen some samples prior to performing the analysis, following the protocol described in Appendix D. For aqueous samples, use the smaller secondary container to perform the pre-screening. If high levels of PFAS are present in the sample, a lower volume is required for analysis.

Do not use any fluoropolymer articles or task wipes in these extraction procedures. Use only HDPE or polypropylene wash bottles and centrifuge tubes. Reagents and solvents for cleaning may be kept in glass containers.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

9.3.1 Homogenization & Subsampling

Refer to laboratory SWI ENV-SWI-WEST-0128, Subsampling of Soil / Solid Samples, or however named, for information regarding the handling, homogenization, and splitting of samples to ensure that a representative aliquot is used for preparation.

The laboratory may subsample the aqueous samples as described in Appendix E; however, subsampling must meet project-specific requirements. The laboratory must notify the client that subsampling has occurred. Subsampling is acceptable for samples which require greater than a 10X dilution for over-range detections (or are known/expected to be highly contaminated), and for samples which fail the acceptance criteria for EIS compounds (see Appendix B, Tables 10-12). Other sample matrix characteristics which may require subsampling are described in Appendix G. When subsampling is required to manage high concentrations, no less than 250 µL of aqueous or leachate samples may be subsampled - if greater dilution is required, serial dilution must be employed. When subsampling is required to manage challenging matrices, no less than 1 mL of samples may be subsampled. For solid and tissue samples, no less than 10% of the target sample mass should be used for reduced-mass extractions, to help ensure the extracted mass is representative of the bulk sample. This means no less than 0.5 g for solids and no less than 0.2 g for tissues may be used for sample preparation.

Tissue sample homogenization will be performed in the Pace Green Bay facility, following SOP ENV-SOP-GBAY-0129 v05 *Sample Homogenization Compositing and Sub-Sampling*.

9.3.2 Determination of Percent Solids

Aqueous samples received with visually observable solids will be handled following the decision tree presented in Appendix G. No TSS pre-test will be performed on aqueous samples prior to preparation.

Percent solids analysis must be performed on all solid samples (excluding tissues) prior to preparation and analysis. All solid samples will be logged in for both 1633 and percent solids analysis. The percent solids analysis will follow the Method SM2540G protocol.

9.3.3 Aqueous Sample Processing

Per the parent method, this protocol is applicable to aqueous samples containing up to 100 mg/L solids per sample, and the procedure requires the preparation of the entire sample where possible. Smaller sample volumes may be analyzed for samples containing solids greater than specified for this method, or when unavoidable due to high levels of PFAS. The typical sample size is 500 mL; however, sample size may vary, depending on project requirements, applicable regulations, and sample characteristics. The sample is to be analyzed in its entirety and should not be filtered.

Leachate samples are analyzed using a 100 mL sample volume. Therefore, they must not be included in the same sample preparation batch as aqueous samples analyzed using 500 mL sample volumes. Otherwise, leachate samples are handled identically to all other aqueous samples.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

1) Visually inspect each sample and note any matrix characteristics which may pose challenges during SPE and require additional processing; see Appendix G for more information.

2) Weigh each sample bottle (with the lid) to the nearest 0.1 g. The volume of the aqueous sample analyzed is determined by weighing the full sample bottle and then the empty sample bottle after extraction is complete.

3) Prepare a method blank and two LCSs using PFAS-free water in HDPE bottles. Select a volume of water that is typical of the samples in the batch (i.e., 500 mL; 100 mL for leachate samples). Spike one LCS sample with native standard solution at 2x the LOQ (64 µL of STK-10X mix). This aliquot (LLLCS) will serve to verify the LOQ. Spike the other LCS sample at a concentration near the mid-level calibration point (40 µL of EPA-1633STK). This aliquot will serve as the traditional LCS.

Note: If matrix spikes are required for a specific project, spike the field sample bottles designated for use as MS/MSD samples in the same manner as the LCS.

4) Spike 20 µL of EIS solution (Section 8.2.3) directly into the sample in the original bottle (or subsampled bottle) as well as to the bottles prepared for the QC samples. Mix by capping and inverting the sample containers.

5) Check that the pH is 6.5 ± 0.5. If necessary, adjust pH with 50% formic acid or ammonium hydroxide (or with 5% formic acid and 3% aqueous ammonium hydroxide). The sample is now ready for solid phase extraction (SPE) and cleanup.

9.3.4 Solid Phase Extraction of Aqueous Samples

Note: Carbon cleanup is required. Carbon cleanup may remove analytes if the sample has a very low organic carbon content (this is unusual for non-drinking water environmental samples). This will be apparent if the isotope dilution standard recoveries are significantly higher on the reanalysis.

1) Pack clean silanized glass wool to half the height of a WAX SPE cartridge barrel; repeat for the total number of samples in the batch.

2) For each sample and QC aliquot, set up the vacuum manifold with one WAX SPE cartridge plus a reservoir adaptor and reservoir for each cartridge; label each reservoir with the associated sample ID. If using plastic transfer lines instead of reservoirs, ensure the connecting caps are snug in each cartridge and the transfer lines are placed within the appropriate sample; label each cartridge tube with the associated sample ID.

3) Pre-condition the cartridges by washing them with 15 mL of 1% methanolic ammonium hydroxide followed by 5 mL of 0.3M formic acid. Perform each rinse separately. Do not allow the WAX SPE to go dry. Discard the wash solvents.

4) Pour the sample into the reservoir (do not use a pipette), taking care to avoid splashing while loading; or, if using transfer lines, begin opening the stopcocks on the vacuum manifold. Adjust the vacuum/stopcocks to pass each sample through

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

the cartridge at approximately 5-10 mL/min; discard the eluate. Retain the empty sample bottle for later rinsing (Section 9.3.5).

Note: In the event the SPE cartridge begins to clog during aqueous sample loading, abandon the loading step and attempt to rinse and dry the clogged cartridge, following the protocol below. The cartridge is then ready for elution. If the clogging prevents the rinse from passing through the cartridge, it will not be possible to collect an extract for the associated sample. See Appendix G for more information.

5) Rinse the walls of the reservoir with 5 mL reagent water twice, followed by 5 mL of 1:1 0.1M formic acid/methanol and pass those rinses through the cartridge using vacuum. If using sample transfer lines for loading, add the 3 rinses to the bottle and load through the transfer lines to the cartridge, one reagent at a time. Dry the cartridge by pulling air through for approximately 5 minutes. Discard the rinse solution.

6) After the WAX cartridges are sufficiently dry, rinse the GCB cartridges with 5 mL of 1% methanolic ammonium hydroxide; discard the rinsate. Do not allow the GCB to go completely dry.

7) Connect the outlet of the WAX cartridges to the inlet of the GCB cartridges to stack them on the manifold and allow for cleanup of the extract as part of elution. Ensure that the WAX cartridges are returned to their original locations on the manifold to avoid cross contamination. Continue to the elution steps in the next section.

9.3.5 Elution of Aqueous Sample Extracts

1) Place clean collection tubes inside the manifold, ensuring that the extract delivery tips do not touch the walls of the tubes. Resume vacuum and ensure a proper seal is achieved. DO NOT add NIS to these collection tubes.

2) Add 5 mL of 1% methanolic ammonium hydroxide to each empty sample bottle. Cap the bottle and rotate to ensure all internal surfaces of each bottle are rinsed; avoid vigorous shaking when rinsing the 500 mL aqueous sample bottles with only 5 mL of methanol – any evaporation/vaporization will contribute to loss of extract here. After rinsing the inside of the sample bottle, pour the rinse from the bottle or use a plastic transfer pipette to transfer the rinse to the SPE reservoir, using it to wash the walls of the reservoir. If using sample transfer lines, simply transfer this rinse from each sample container to its associated cartridge using vacuum. Allow the elution solvent to soak the SPE sorbent for 2 minutes before using vacuum to pull the elution solvent through the cartridge and into the collection tubes in a slow, dropwise manner.

3) Air dry the empty sample bottle after the rinse is transferred. Weigh the empty bottle with the cap on and subtract that from the weight of the bottle with sample, determined in Section 9.3.3, step 2.

4) Add 25 µL of concentrated acetic acid and 20 µL of NIS mix to each sample extract in its collection tube and vortex to mix. Transfer a portion of each extract into an autosampler vial for LC-MS/MS analysis. Cap the collection tubes containing the remaining extracts and store at 0 - 6 °C.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

9.3.6 Solid Sample (excluding tissues) Processing

Any solid sample received containing <50% solids (>50% moisture; >10 g target mass for 5 g dry weight) should be re-logged and prepared as a biosolid, using a target dry weight of 0.5 g. Any solid or biosolid sample received containing <5% solids (>95% moisture; >10 g target mass for 0.5 g dry weight) should be re-logged and prepared as a leachate sample, using no more than 100 mL of sample for extraction.

1) Mix the sample in its original jar. If it is impractical to mix the sample within its container, transfer the sample to a larger container. Mix the sample thoroughly, stirring from the bottom to the top and in a circular motion along the sides of the jar, breaking particles up by pressing against the side of the container. The homogenized sample should be even in color and have no separate layers. Store the homogenized material in its original container or in multiple smaller containers.

2) Determine the percent solids as per Section 9.3.2.

Note: The target sample weight for sediment or soil is 5 g dry weight. The target sample weight for biosolids is 0.5 g dry weight. Small amounts of reagent-free water used for method blanks (10% of sample weight or less) can be added to unusually dry samples. This is an option, not a requirement.

3) Check the LIMS system for the percent solids data associated with the samples to be prepared. Using the percent solids data and the calculation below, weigh out an aliquot of each solid sample, not dried, into a 50 mL polypropylene centrifuge tube. Sample mass should be within ±0.2 g of target mass for soil and sediment samples, and within ±0.02 g of target mass for biosolids samples. Sample aliquot should provide 5 g dry weight (Wi_{Dry} below) for soil and sediment or 0.5 g dry weight for biosolids. Because biosolid samples are analyzed with a 0.5 g sample mass, they must not be included in the same sample preparation batch as solid samples analyzed with 5 g sample masses. Any solid sample received containing <50% solids (>50% moisture; >10 g target mass for 5 g dry weight) should be re-logged and prepared as a biosolid, using a target dry weight of 0.5 g. Any solid or biosolid sample received containing <5% solids (>95% moisture; >10 g target mass for 0.5 g dry weight) should be re-logged and prepared as a leachate sample, using no more than 100 mL of sample for extraction.

$$Solid\ Sample\ Target\ Mass\ (g) = \frac{Wi_{Dry}\ (g)}{\%\ solids\ (decimal)}$$

4) Prepare batch QC samples using 5 g of reference solid wetted with 2.5 g of reagent water for the method blank and two LCSs (use 0.5 g of reference solid with 0.25 g of reagent water for biosolid extraction batches). The addition of reagent water to the sand provides a matrix closer in composition to real-world samples. Spike one LCS sample with native standard solution at 2x the LOQ (80 µL of STK-10X mix). This aliquot (LLLCS) will serve to verify the LOQ. Spike the other LCS sample at a concentration near the mid-level calibration point (40 µL of EPA-1633STK). This aliquot will serve as the traditional LCS.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Note: If matrix spikes are required for a specific project, spike the field sample bottles designated for use as MS/MSD samples in the same manner as the LCS.

5) Spike 20 µL of EIS solution (Section 8.2.3) directly into each centrifuge tube containing the aliquoted field and QC samples. Vortex or shake the sample to disperse the standard and allow to equilibrate for approximately 30 minutes.

6) Add 15 mL of 0.3% methanolic ammonium hydroxide to each centrifuge tube. Vortex to disperse, then shake for 30 minutes on a variable speed mixing table. Centrifuge at 3000 rpm (~2000 RCF) for 10 minutes and transfer the supernatant to a clean, labeled 50 mL polypropylene centrifuge tube.

7) Add 15 mL of 0.3% methanolic ammonium hydroxide to the remaining solid sample in each centrifuge tube. Vortex to disperse, then shake for 30 minutes on a variable speed mixing table. Centrifuge at 3000 rpm (~2000 RCF) for 10 minutes and decant the supernatant from the second extraction into the centrifuge tube with the supernatant from the first extraction.

8) Dilute to approximately 40 mL with reagent water. A separate centrifuge tube marked at the 40 mL level may be kept for a visual reference to get the approximate volume. Samples containing excess water may yield extracts that are greater than 40 mL in volume; therefore, do not add water to these.

9) Check that the pH is 6.5 ± 0.5. If necessary, adjust pH with 50% formic acid or ammonium hydroxide (or with 5% formic acid and 3% aqueous ammonium hydroxide). The extract is now ready for solid phase extraction (SPE) and cleanup.

9.3.7 Solid Phase Extraction of Solid Samples

1) Pack clean silanized glass wool to half the height of a WAX SPE cartridge barrel; repeat for the total number of samples in the batch.

2) For each sample and QC aliquot, set up the vacuum manifold with one WAX SPE cartridge plus a reservoir adaptor and reservoir for each cartridge; label each reservoir with the associated sample ID. If using plastic transfer lines instead of reservoirs, ensure the connecting caps are snug in each cartridge and the transfer lines are placed within the appropriate sample; label each cartridge tube with the associated sample ID.

3) Pre-condition the cartridges by washing them with 15 mL of 1% methanolic ammonium hydroxide followed by 5 mL of 0.3M formic acid. Perform each rinse separately. Do not allow the WAX SPE to go dry. Discard the wash solvents.

4) Pour the sample into the reservoir (do not use a pipette), taking care to avoid splashing while loading; or, if using transfer lines, begin opening the stopcocks on the vacuum manifold. Adjust the vacuum/stopcocks to pass each sample through the cartridge at approximately 5-10 mL/min; discard the eluate. Retain the empty sample bottle for later rinsing (Section 9.3.8).

5) Rinse the walls of the reservoir with 5 mL reagent water twice, followed by 5 mL of 1:1 0.1M formic acid/methanol and pass those rinses through the cartridge using

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

vacuum. If using sample transfer lines for loading, add the 3 rinses to the bottle and load through the transfer lines to the cartridge, one reagent at a time. Dry the cartridge by pulling air through for approximately 5 minutes. Discard the rinse solution.

6) After the WAX cartridges are sufficiently dry, rinse the GCB cartridges with 5 mL of 1% methanolic ammonium hydroxide; discard the rinsate. Do not allow the GCB to go completely dry.

7) Connect the outlet of the WAX cartridges to the inlet of the GCB cartridges to stack them on the manifold and allow for cleanup of the extract as part of elution. Ensure that the WAX cartridges are returned to their original locations on the manifold to avoid cross contamination. Continue to the elution steps in the next section.

9.3.8 Elution of Solid Sample Extracts

1) Place a clean collection tube in the manifold rack for each sample and QC aliquot, ensuring the extract delivery needles are not touching the walls of the tubes. Resume vacuum and ensure a proper seal is achieved. DO NOT add NIS to these collection tubes.

2) Rinse the inside of each sample's centrifuge tube using 5 mL of 1% methanolic ammonium hydroxide. Then pour the rinse from each bottle (or use a plastic transfer pipette) to transfer the rinse to the associated SPE reservoir, washing the walls of the reservoir. If using sample transfer lines, simply transfer this rinse from each sample container to its associated cartridge using vacuum. Allow the elution solvent to soak the SPE sorbent for 2 minutes, then use vacuum to pull the elution solvent through the cartridge and into the collection tubes in a slow, dropwise manner.

3) Add 25 µL of concentrated acetic acid and 20 µL of NIS mix to each sample extract in its collection tube and vortex to mix. Transfer a portion of each extract into an autosampler vial for LC-MS/MS analysis. Cap the collection tubes containing the remaining extracts and store at 0 - 6 °C.

9.3.9 Tissue Sample Processing

Prior to processing tissue samples, the laboratory must determine the exact tissue to be analyzed. Common requests for analysis of fish tissue include whole fish with the skin on, whole fish with the skin removed, edible fish fillets (filleted in the field or by the laboratory), specific organs, and other portions. Once the appropriate tissue has been determined, the samples must be prepared and homogenized.

Pace utilizes the Green Bay location for tissue homogenization, following ENV-SOP-GBAY-0129 (Sample Homogenization, Compositing, and Subsampling; specifically, Section 9.4).

1) For each sample, weigh a 2 g aliquot of homogenized tissue into a 50 mL polypropylene centrifuge tube. Reseal the container with the remaining homogenized portion of the sample and return it to frozen storage in case it needs to be used for reanalysis. The default sample weight for tissue is 2 g wet weight; however, a 1 g sample may be used. Higher sample weights are not recommended for this method.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

2) Prepare the batch QC samples using 2 g of reference tissue matrix for the method blank and two LCSs. Spike one LCS sample with native standard solutions at 2x the LOQ (80 µL of STK-10X mix). This aliquot (LLLCS) will serve to verify the LOQ. Spike the other LCS sample at a concentration near the mid-level calibration point (40 µL of EPA1633-STK). This aliquot will serve as the traditional LCS.

Note: If matrix spikes are required for a specific project, spike the field sample bottles designated for use as MS/MSD samples in the same manner as the LCS.

3) Spike 20 µL of EIS solution (Section 8.2.3) directly into each field and QC sample. Vortex and allow to equilibrate for approximately 30 minutes.

4) Add 15 mL of 0.05M KOH in methanol to each sample. Vortex to disperse the tissue then place tubes on a variable speed mixing table to shake for 1 hour. Centrifuge at 3000 rpm (~2000 RCF) for 10 minutes and collect the supernatant in a 125mL sample bottle.

5) Add 10 mL of acetonitrile to remaining tissue in the centrifuge tube, vortex to mix and disperse the tissue. Sonicate for 30 minutes. Centrifuge at 3000 rpm (~2000 RCF) for 10 minutes and collect the supernatant, adding it to the 125mL bottle containing the initial extract.

6) Dilute to approximately 75 mL with reagent water. A separate bottle marked at the 75 mL level may be used to get the approximate volume.

7) Check that the pH is 6.5 ± 0.5. If necessary, adjust pH with 50% formic acid or ammonium hydroxide (or with 5% formic acid and 3% aqueous ammonium hydroxide). The extract is now ready for solid phase extraction (SPE) and cleanup.

9.3.10 Solid Phase Extraction of Tissue Samples

1) Pack clean silanized glass wool to half the height of a WAX SPE cartridge barrel; repeat for the total number of samples in the batch.

2) For each sample and QC aliquot, set up the vacuum manifold with one WAX SPE cartridge plus a reservoir adaptor and reservoir for each cartridge; label each reservoir with the associated sample ID. If using plastic transfer lines instead of reservoirs, ensure the connecting caps are snug in each cartridge and the transfer lines are placed within the appropriate sample; label each cartridge tube with the associated sample ID.

3) Pre-condition the cartridges by washing them with 15 mL of 1% methanolic ammonium hydroxide followed by 5 mL of 0.3M formic acid. Perform each rinse separately. Do not allow the WAX SPE to go dry. Discard the wash solvents.

4) Pour the sample into the reservoir (do not use a pipette), taking care to avoid splashing while loading; or, if using transfer lines, begin opening the stopcocks on the vacuum manifold. Adjust the vacuum/stopcocks to pass each sample through the cartridge at approximately 5-10 mL/min; discard the eluate. Retain the empty sample bottle for later rinsing (Section 9.3.8).

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

5) Rinse the walls of the reservoir with 5 mL reagent water twice, followed by 5 mL of 1:1 0.1M formic acid/methanol and pass those rinses through the cartridge using vacuum. If using sample transfer lines for loading, add the 3 rinses to the bottle and load through the transfer lines to the cartridge, one reagent at a time. Dry the cartridge by pulling air through for approximately 5 minutes. Discard the rinse solution.

6) After the WAX cartridges are sufficiently dry, rinse the GCB cartridges with 5 mL of 1% methanolic ammonium hydroxide; discard the rinsate. Do not allow the GCB to go completely dry.

7) Connect the outlet of the WAX cartridges to the inlet of the GCB cartridges to stack them on the manifold and allow for cleanup of the extract as part of elution. Ensure that the WAX cartridges are returned to their original locations on the manifold to avoid cross contamination. Continue to the elution steps in the next section.

9.3.11 Elution of Tissue Sample Extracts

1) Place a clean collection tube in the manifold rack for each sample and QC aliquot, ensuring the extract delivery needles are not touching the walls of the tubes. Resume vacuum and ensure a proper seal is achieved. DO NOT add NIS to these collection tubes.

2) Rinse the inside of each sample's centrifuge tube using 5 mL of 1% methanolic ammonium hydroxide. Then pour the rinse from each bottle (or use a plastic transfer pipette) to transfer the rinse to the associated SPE reservoir, washing the walls of the reservoir. If using sample transfer lines, simply transfer this rinse from each sample container to its associated cartridge using vacuum. Allow the elution solvent to soak the SPE sorbent for 2 minutes, then use vacuum to pull the elution solvent through the cartridge and into the collection tubes in a slow, dropwise manner.

3) Add 25 µL of concentrated acetic acid and 20 µL of NIS mix to each sample extract in its collection tube and vortex to mix. Transfer a portion of each extract into an autosampler vial for LC-MS/MS analysis. Cap the collection tubes containing the remaining extracts and store at 0 - 6 °C.

9.4 Analysis

9.4.1 Sequence Preparation

Analysis of sample extracts for PFAS by LC-MS/MS is performed running manufacturer's data acquisition software. The mass spectrometer is run with unit mass resolution in the multiple reaction monitoring (MRM) mode.

1) Perform mass calibration and mass calibration verification, establish the operating conditions, and perform an initial calibration prior to analyzing samples. Only after all performance criteria are met may blanks, MDLs, IDOC/LCS, and samples be analyzed.

2) Each day of analysis, the column must be thoroughly flushed with 100% Acetonitrile for at least 30 minutes to clear any accumulated impurities and interferences from the sample pathway and equilibrate the system. It is also good practice to open the purge valve(s) on the pumps for the first ~1 minute of flush time and/or use the "purge"

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

function available as part of the pump functionality. Additionally, it is good practice to purge the autosampler injector flow path daily prior to analysis by using the "purge" function, if available. The column should then be equilibrated to the analysis starting conditions by flushing for approximately 15 mins with 50:50 Mobile Phase A: Mobile Phase B and finally approximately 15 mins with 80:20 Mobile Phase A: Mobile Phase B (acquisition starting conditions). Ensure that system pressure is stable.

3) Following any initial priming injections on days when a calibration is not needed, an ISC and an instrument blank will be analyzed to demonstrate system suitability and the absence of system contamination prior to sample analysis.

4) After acceptable ISC and IBLK results are confirmed, load and submit extracted samples for analysis, typically starting with batch QC with field samples following. A CCV and CCB must be analyzed after every 10 (or fewer) field samples.

9.4.2 Routine Analytical Sequence

After a successful initial calibration has been completed, samples may be analyzed; an example analytical sequence is provided below. The volume injected for samples and QCs must be identical to the volume used for calibration. Standards and sample extracts must be brought to room temperature and vortexed prior to aliquoting into an instrument vial to ensure homogeneity of the extract.

- ISC
- CCV
- Instrument Blank
- Method Blank
- LLLCS
- LCS
- Samples (10 or fewer)
- CCV
- CCB
- Samples (10 or fewer)
- CCV

If the results are acceptable, the closing CCV analysis may be used as the opening solution for the next analytical sequence.

If the response exceeds the calibration range for any sample, extracts are diluted as per Section 9.4.3 to bring all target responses within the calibration range.

Note: If the analytes that exceed the calibration range in the original analysis are known to not be of concern for the specific project (e.g., are not listed in a discharge permit), then the laboratory may consult with the client regarding the possibility of reporting that sample from the undiluted analysis.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

9.4.3 Sample Dilutions

If the measured concentration for any compound exceeds the calibration range of the system, dilute an aliquot of the sample extract with the IBLK mix solution by a factor no greater than 10x, refortify the NIS compounds to initial concentration, and analyze the diluted extract. If the responses for each applicable EIS in the diluted extract meet the S/N and retention time requirements in Section 10.1.1, and the EIS recoveries from the analysis of the diluted extract, corrected for the dilution, are within the limits presented in Table 10, 11 or 12 (according to sample matrix), then the compounds associated with those EISs may be quantified. The EIS recoveries, compound concentrations, detection limits, and LOQs are adjusted to account for the dilution.

If the EIS responses in the diluted extract do not meet the S/N and retention time requirements listed in Section 10.1.1, then the compound cannot be measured reliably in the diluted extract. In such cases, subsample a smaller aliquot of any affected aqueous sample and dilute it to 500 mL with reagent water and re-extract the sample. For solid sample matrices, prepare a smaller aliquot of soil, biosolid, sediment, or tissue and re-extract the sample. The reduced sample volume (or mass) chosen for the re-extraction should reflect the dilution applied to the original extract (i.e., if the original aqueous sample extract was analyzed at a 10X dilution, 50 mL should be subsampled for the re-extraction). See Section 9.3.1 for more guidance. The reported compound concentrations, detection limits, and LOQs are adjusted to account for the reduced sample volume (or mass) that is extracted.

If the recovery of any isotopically labeled compound is outside of the acceptance limits (Appendix B) in the original, undiluted analysis, a diluted aqueous sample or smaller aliquot (for solids and tissue) should be prepared and analyzed.

10.0 DATA ANALYSIS & CALCULATIONS

10.1 Data Analysis

10.1.1 Qualitative Identification

A native, EIS, or NIS compound is positively identified in a standard, blank, sample, or QC sample when all criteria in Sections 10.1.1.1 through 10.1.1.3 are met.

10.1.1.1 Signal-to-Noise Ratio (S/N)

Peak responses of the quantitation and confirmation ions must be at least three times the background noise level (S/N 3:1). The quantitation ion must have a S/N ≥ 10:1 if there is no confirmation ion. If the S/N ratio is not met in a standard or QC sample due to high background noise, the laboratory must correct the issue (e.g., perform instrument troubleshooting). If the S/N ratio is not met in a blank or sample, then the analyte is to be considered a non-detect.

10.1.1.2 RT Criteria

Target analyte, EIS analyte, and NIS analyte RTs must fall within 0.4 minutes of the predicted retention times from the midpoint standard of the ICAL or initial daily CCV, whichever was used to establish the RT window position for the

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

analytical batch. The retention time window used must be of sufficient width to detect earlier-eluting branched isomers. For all method analytes with exact corresponding isotopically labeled analogs, method analytes must elute within 0.1 minutes of the associated EIS.

10.1.1.3 Ion Ratio Criteria

For any reported compound detection, the ratio of the total (branched and linear isomer) quantification ion response to the total (branched and linear isomer) confirmation ion response – referred to as the Ion Ratio – must fall within ± 50% of the ratio observed in the mid-point ICAL standard. The ion ratio requirement does not apply for PFBA, PFPeA, NMeFOSE, NEtFOSE, PFMPA, and PFMBA because suitable secondary transitions are unavailable (not detectable or inadequate S/N).

10.1.2 Manual Integration

Manual integration is sometimes necessary to correct inaccurate automated integrations but must never be used to meet QC criteria or to substitute for proper instrument maintenance and/or method set-up. To assure that all manual integrations are justified and proper all manual integrations must be performed, documented, reviewed, and approved in accordance with corporate SOP ENV-SOP-CORQ-0006, *Manual Integration*. Refer to this SOP for guidance on manual integration techniques and required procedures.

10.1.2.1 Branched Isomer Integration

The response of all isomers in the quantitative standards should be used to define integration parameters and ion ratios. In samples, the total integrated response should include the branched isomer peaks that have been identified in the quantitative standard, if present. For compounds with identified branched and linear isomer peaks, the reported concentration is the sum of all isomers. If standards (either quantitative or qualitative) containing a mix of isomers are not available for purchase for a particular compound, only the linear isomer can be identified and quantitated in samples.

10.1.2.2 Qualification

If the field sample result does not meet all criteria stated in Section 10.1.1, and all sample preparation avenues (e.g., extract cleanup, sample dilution, etc.) have been exhausted, the result may only be reported with a data qualifier alerting the data user that the result could not be confirmed because it did not meet the method-required criteria and therefore should be considered an estimated value. If the criteria listed above are not met for the standards, the laboratory must stop analysis of samples and correct the issue.

10.2 Calculations

Refer to laboratory SOP (ENV-SOP-WEST-0124, Common Laboratory Calculations), or however named, for equations used to perform common calculations.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

10.2.1 ICAL Relative Response (RR) and Response Factor (RF)

The response ratio (RR) for each native compound calibrated by isotope dilution is calculated according to the equation below, separately for each of the calibration standards, using the areas of the quantification ions shown in Table 4. RR is used for the 24 compounds measured by true isotope dilution quantification.

$$RR = \frac{Area_t M_{EIS}}{Area_{EIS} M_t}$$

Where:

$Area_t$ = Measured area of the quantitation ion for the target analyte.

$Area_{EIS}$ = Measured area of the quantitation ion for the corresponding labeled PFAS used as the EIS in the calibration standards.

M_{EIS} = Concentration of the isotopically labeled PFAS uses as the EIS in the calibration standards (ng/L)

M_t = Concentration of the target analyte in the calibration standard (ng/L)

Similarly, the response factor (RF) for each native compound calibrated by extracted internal standard is calculated according to the equation below. RF is used for the 16 compounds measured by extracted internal standard quantification.

$$RF = \frac{Area_t M_{EIS}}{Area_{EIS} M_t}$$

Where:

$Area_t$ = Measured area of the quantitation ion for the target analyte.

$Area_{EIS}$ = Measured area of the quantitation ion for the corresponding labeled PFAS used as the EIS in the calibration standards.

M_{EIS} = Concentration of the isotopically labeled PFAS uses as the EIS in the calibration standards (ng/L)

M_t = Concentration of the target analyte in the calibration standard (ng/L)

A response factor (RF_S) is calculated for each EIS compound in the calibration standard using the equation below. RF_S is used for the 24 isotopically labeled compounds measured by non-extracted internal standard quantification.

$$RF_S = \frac{Area_{EIS} M_{NIS}}{Area_{NIS} M_{EIS}}$$

Where:

$Area_{EIS}$ = Measured area of the quantitation ion for the EIS compound added to the sample before extraction.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

$Area_{NIS}$ = Measured area of the quantitation ion for the NIS compound in the calibration standard.

M_{NIS} = Concentration of the NIS compound in the calibration standard (ng/L).

M_{EIS} = Concentration of the EIS compound in the calibration standard (ng/L).

10.2.2 Target Analyte Concentration

Concentrations of the target analytes are determined with respect to the extracted internal standard (EIS) which is added to the sample prior to extraction (see Table 4). Other equations may be used if the laboratory demonstrates that those equations produce the same numerical result as produced by the equation below.

$$\boldsymbol{Concentration\ (ng/Lor ng/g) = \frac{Area_N M_{EIS}}{Area_{EIS}(\overline{RR}\ or\ \overline{RF})}\ x\ DF\ x \frac{Vf}{Vi}}$$

Where:

$Area_N$ = The measured area of the quantitation ion for the native (unlabeled) PFAS.

$Area_{EIS}$ = The measured area of the quantitation ion for the EIS.

M_{EIS} = The expected concentration of the EIS in the extract (ng/L)

$\boldsymbol{\overline{RR}}$ = Average response ratio used to quantify target compounds by the isotope dilution method.

$\boldsymbol{\overline{RF}}$ = Average response ratio used to quantify target compounds by the extracted internal standard method.

DF = Dilution Factor. If no extract dilution was performed, then DF=1.

Vf = Final extract volume (L)

Vi = Initial sample volume (L) or weight (g)

10.2.3 EIS Concentration

The EIS compounds are quantitated with respect to an NIS, as shown in Table 4, using the response ratios or response factors from the most recent initial calibration. Other equations may be used if the laboratory demonstrates that those equations produce the same numerical result as produced by the equation below.

$$Concentration\ (ng/L\ or\ ng/g) = \frac{Area_{EIS} M_{NIS}}{Area_{NIS}\overline{RF_S}}\ x\ DF\ x \frac{Vf}{Vi}$$

Where:

$Area_{EIS}$ = The measured area of the quantitation ion for the EIS.

$Area_{NIS}$ = The measured area of the quantitation ion for the associated NIS.

M_{NIS} = The expected concentration of the NIS in the extract (ng/L)

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

$\overline{RF_S}$ = Average response factor used to quantify the EIS compound by the non-extracted internal standard method.

DF = Dilution Factor. If no extract dilution was performed, then DF=1.

Vf = Final extract volume (L)

Vi = Initial sample volume (L) or weight (g)

10.2.4 Relative Error (%RE)

$$\%\ Relative\ Error = \left(\frac{x'i - xi}{xi}\right) x\ 100$$

Where:

xi = True value of the calibration standard

x'i = Measured concentration of the calibration standard

10.2.5 Percent Relative Standard Deviation

$$\%\ Relative\ Standard\ Deviation = \left(\frac{S}{\bar{\bar{x}}}\right) x\ 100$$

Where:

S = Standard Deviation

X = Mean

10.2.6 Standard Deviation

$$S = \left(\frac{\sum (x_i - \bar{x})^2}{(n-1)}\right)$$

Where:

S = standard deviation

n = size of the population

x_i = each value of the population

$\bar{x}$ = population mean

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

10.2.7 Mean

$$\bar{x} = \frac{\left(\sum_{i=1}^{n} x_i\right)}{n}$$

Where:

$\bar{x}$ = population mean

x_i = each value of the population

n = number of values in the population

10.3 Reporting

All results for aqueous samples will be reported in ng/L. All results for solid samples will be reported in ng/g, on a dry-weight basis, and the percent solids for each sample will be reported separately. All results for tissue samples will be reported in ng/g, on a wet-weight basis. All QC data will be reported with the sample results. See Appendix A for specific reporting limits in all matrices.

Unless specified otherwise by a regulatory authority or in a discharge permit, results for analytes that meet the identification criteria are reported down to the concentration of the LOQ established by the laboratory.

Results for any analyte found in a sample or extract that has been diluted will be reported at the least dilute level for which the measured concentration is within the calibration range (e.g., above the LOQ for the analyte and below the highest calibration standard) and in which isotopically labeled compound recoveries are within their respective QC acceptance criteria. This may require reporting results for some analytes from different analyses.

Recoveries of all associated EIS compounds will be reported for all field samples and QC Quality Control & Method Performance

10.4 Quality Control

Prepare and analyze the following QC samples with each batch of samples. Refer to Appendix B for acceptance criteria and required corrective action(s).

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

QC Check	Acronym	Frequency
Method Blank	MB	1 per batch of 20 or fewer samples.
Laboratory Control Sample	LCS	1 per batch of 20 or fewer samples.
Low Level Laboratory Control Sample	LLLCS	1 per batch of 20 or fewer samples.
Matrix Spike	MS	1 pair per batch of 20 or fewer samples (if required/requested)
MS Duplicate	MSD	
Sample Duplicate	DUP	1 per AFFF or F3 sample.
Extracted Internal Standard	EIS	All CAL standards, batch QC and field samples.
Non-extracted Internal Standard	NIS	All CAL standards, batch QC and field samples.

The minimum quality control requirements of this method consist of an initial demonstration of laboratory capability, analysis of samples spiked with isotopically labeled compounds to evaluate and document data quality, and analysis of standards and blanks as tests of continued performance. Laboratory performance is compared to established performance criteria to determine if the results of analyses meet the performance characteristics of the method.

If the method is to be applied to a sample matrix other than water (e.g., soils, biosolids, tissue), the appropriate alternative reference matrix is substituted for the reagent water matrix in all performance tests.

The laboratory must make an initial demonstration of the ability to generate acceptable precision and recovery with this method. This demonstration is described in Section 11.3.2.

Analyses of method blanks (MBs) are required on an on-going basis to demonstrate the extent of background contamination in any reagents or equipment used to prepare and analyze field samples. The procedures and criteria for analyses of MBs are described in Section 11.1.1.

The laboratory must spike all samples with isotopically labeled compounds to monitor method performance. These evaluations are described in Sections 11.1.4 and 11.1.5. When results of these spikes indicate atypical method performance for samples, the samples are diluted to evaluate whether the performance issue is caused by the sample matrix. Procedures for dilution are given in Section 9.4.3.

The laboratory must, on an ongoing basis, demonstrate that the analytical system is in control through calibration verification (CCV) and the analysis of blanks and ongoing precision and recovery standards spiked at low (LLLCS) and mid-level concentrations (LCS). These procedures are given in Sections 9.2.4.5, 11.1.1 and 11.1.2.

10.4.1 Method Blank (MB)

A method blank is analyzed with each extraction batch to demonstrate freedom from contamination. The matrix for the method blank must be similar to the sample matrix for the batch (e.g., reagent water blank, solids matrix blank, or tissue blank [Section 7.3]).

Analyze the extract of the method blank aliquot before the analysis of the LCSs.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

If any PFAS is found in the MB 1) at a concentration greater than the LOQ for the analyte, 2) at a concentration greater than one-third the regulatory compliance limit, or 3) at a concentration greater than one-tenth the concentration in a sample in the extraction batch, whichever is greatest, analysis of samples must be halted, and the problem corrected. Other project-specific requirements may apply; therefore, the laboratory may adopt more stringent acceptance limits for the method blank at their discretion. If the contamination is traceable to the extraction batch, samples affected by the blank must be re-extracted and analyzed along with a new MB and LCS/LLLCS, provided enough sample volume is available and the samples are still within holding time. Reanalysis or re-extraction is not required if the samples are not impacted. Samples are not impacted when the MB detection is not present in the sample, or the sample concentration is ≥10x the concentration of the detection in the MB.

If the new blank also exhibits contamination and additional volume of the associated sample(s) is not available for re-extraction and analysis, the laboratory must document and report the failures (e.g., as qualifiers on results), unless the failures are not required to be reported as determined by the regulatory/control authority.

10.4.2 Laboratory Control Sample (LCS) / Low-Level LCS (LLLCS)

Analyze the extract of the LCS and LLLCS to ensure the analytical process is under control.

Compute the percent recovery of the native compounds by the appropriate quantification method depending on the compound. Compute the percent recovery of each isotopically labeled compound by the non-extracted internal standard quantitation method.

For the target analytes and EIS compounds, compare the recovery to the LCS and LLLCS limits given in Tables 7 through 10 (or 12). LCS, LLLCS, and EIS results must meet the acceptance criteria in these tables. If all compounds meet the acceptance criteria, system performance is acceptable, and analysis of blanks and aqueous samples may proceed. If, however, any individual concentration falls outside of the given range, the extraction/concentration processes are not being performed properly for that compound. In this event correct the problem, re-extract all affected samples, including any QC samples, and repeat the analysis. Samples are unaffected if the LCS or LLLCS recovery is above the acceptance criteria and the sample is ND for the failing compound.

10.4.3 Matrix Spike (MS)

Matrix spikes generally are not required for methods that employ isotope dilution quantification because deleterious effects of the matrix should be evident in the recoveries of the EIS compounds spiked into every sample. The analysis of matrix spike samples may help diagnose the potential impact of matrix interferences for specific target analytes or sample matrices. See Appendix E for MS/MSD, MS/DUP sample selection guidance.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

10.4.4 Extracted Internal Standard (EIS)

To assess method performance on the sample matrix, the laboratory must spike all samples with the EIS solution. Analyze each sample according to the procedures in this SOP. Compute the percent recovery of the EIS compound concentration using the NIS quantitation method and the equation in Section 10.2.3.

The recovery of each EIS compound in an aqueous sample must be within the limits in Table 10, which are the required QC acceptance limits for aqueous samples, including landfill leachates. The recovery of each EIS compound in soil, sediment, or biosolid samples must be within the limits in Table 11. The recovery of each EIS compound in tissue samples must be within the limits in Table 12. The limits presented in Tables 10, 11, and 12 are the required QC acceptance limits for these matrices derived from the multi-laboratory validation study. If the recovery of any EIS falls outside of these limits, method performance is unacceptable for that EIS in that sample. Additional cleanup procedures or limited dilution of the sample extract may be employed to attempt to bring the EIS recovery within the acceptance normal range.

If the recovery cannot be brought within the acceptance limits after extract dilution or additional cleanup procedures have been employed, then the laboratory must take a smaller aliquot of any affected aqueous sample, dilute it to 500 mL with reagent water and prepare and analyze the diluted sample, or must prepare and analyze a smaller aliquot of soil, sediment, biosolid, or tissue sample, per Section 9.4.3.

10.4.5 Non-extracted Internal Standard (NIS)

To assess method performance, the laboratory must spike all sample extracts with the NIS solution. Analyze each sample extract according to the procedures in this SOP. Percent recovery of the NIS compound is calculated by comparing the measured response in each analysis to the average response of the same compound measured in the ICAL.

Calculate the ratio of the NIS peak areas from the QC and field samples relative to the mean area of the corresponding NIS in the most recent initial calibration to check for possible bad injections of NIS solution or loss of instrument sensitivity.

The NIS areas in the field samples and QC samples must be within 50 to 200% of the mean area of the corresponding NIS in the most recent initial calibration (i.e., within a factor of 2). If the areas are low for all the field samples and QC samples in the batch, it suggests a loss of instrument sensitivity, while low areas in only some field or QC samples suggests a possible bad injection.

10.5 Instrument QC

Perform the following checks to verify instrument performance. Refer to Appendix B for acceptance criteria and required corrective action.

Instrument Check	Acronym	Frequency
Mass Calibration		Annually and on as-needed basis
Mass Calibration Verification		After mass calibration

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Instrument Check	Acronym	Frequency
Initial Calibration	ICAL	Prior to analysis, and on as-needed basis
Initial Calibration Verification	ICV	Following each ICAL
Instrument Blank	IBLK/ICB	Daily prior to analysis and after high standards
Instrument Sensitivity Check	ISC	Daily prior to analysis
Continuing Calibration Verification	CCV	At the beginning (ISC) and every 10 samples
Continuing Calibration Blank	CCB	After each bracketing CCV
RT Window	RTW	During ICAL and at the beginning of each analytical sequence

10.6 Method Performance

10.6.1 Method Validation

Refer to corporate SOP ENV-SOP-CORQ-0011, *Method Validation and Instrument Verification*, for general requirements and procedures for method validation.

Establish Detection Limit (DL) and limits of quantitation (LOQ) at initial method set up and verify the DL and LOQ on an on-going basis thereafter. Refer to corporate policy and/or SOP for DL and LOQ requirements and procedures.

10.6.2 Demonstration of Capability (DOC)

Refer to laboratory SOP ENV-SOP-WEST-0122 Demonstration of Capability, or however named, for information regarding the laboratory's procedures for initial and ongoing Demonstration of Capability.

Prior to unsupervised (independent) work on any client sample, analysts that prepare or analyze samples must have successful initial demonstration of capability (IDOC) and must successfully demonstrate on-going proficiency on an annual basis (see below for details). Successful means the initial or on-going DOC met criteria, documentation of the DOC is complete, and the DOC record is in the employee’s training file.

Each DOC requires the extraction and analysis of four aliquots of the reference matrix type to be tested, prepared in the same way as the mid-level LCS. At least one method blank, matching the matrix being analyzed, must be prepared with the DOC batch. If more than one MB was prepared and analyzed with the DOC batch, all blank results must be reported. All sample processing steps that are to be used for processing samples, including preparation and extraction, must be included in this test.

Using the results of the four analyses, compute the average percent recovery (%REC) and the relative standard deviation (RSD) of the concentration of each target compound. There are no mean or RSD criteria for EIS compounds in the DOC; %REC of each DOC sample should meet the criteria in Appendix B, Tables 10, 11, or 12, depending on the matrix.

For each target compound, compare RSD and %REC to the corresponding limits for initial precision and recovery in Appendix B, Tables 7, 8, or 9, depending on the matrix.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

If RSD and %REC for all compounds meet the acceptance criteria, system performance is acceptable, and analysis of blanks and samples may begin. If, however, any individual RSD exceeds the precision limit or any individual %REC falls outside the range for recovery, system performance is unacceptable for that compound. Correct the problem and repeat the test.

11.0 Data Review & Corrective Action

11.1 Data Review

The data review process of Pace® Analytical Services includes a series of checks performed at different stages of the process by different people to ensure that SOPs were followed, the analytical record is complete and properly documented, QC criteria were met, proper corrective actions were taken for QC failure and other nonconformance(s), and test results are reported with proper qualification, when necessary.

The review and checks that are performed by the employee performing the task is called primary review.

All data and test results are also peer reviewed. This process, known as secondary review, is performed to verify SOPs were followed, that calibration, instrument performance, and QC criteria were met and/or proper corrective actions were taken, qualitative ID and quantitative measurement is accurate, all manual integrations are justified, documented, and approved in accordance with the Pace® Analytical Services SOP for manual integration, calculations are correct, the analytical record is complete and traceable, and that results are properly qualified.

Lastly, a third-level review, called a completeness check, is performed by reporting or project management staff to verify the test report is complete.

Refer to laboratory SWI ENV-SWI-WEST-0087 SVOA Data Review Work Instructions for specific instructions and requirements for each step of the data review process.

11.2 Corrective Action

Corrective action is required when QC or sample results are not within acceptance criteria.

Refer to Appendix B for a complete summary of QC, acceptance criteria, and recommended corrective actions for QC associated with this test method.

If corrective action is not taken or was not successful, the decision/outcome must be documented in the analytical record. The primary analyst has primary responsibility for taking corrective action when QA/QC criteria are not met. Secondary data reviewers must verify that appropriate action was taken and/or that results reported with QC failure are properly qualified.

Corrective action is also required when carryover is suspected and when results are over range. Samples analyzed after a high concentration sample must be checked for carryover and reanalyzed if carryover is suspected. Carryover is usually indicated by low concentration detects of the analyte in successive samples analyzed after the high concentration sample.

Sample results at concentrations above the upper limit of quantitation must be diluted and reanalyzed. The result in the diluted samples should be within the working concentration range

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

of the instrument calibration. If dilution is not performed, any result reported above the upper range is considered a qualitative measurement and must be qualified as an estimated value.

12.0 POLLUTION PREVENTION & WASTE MANAGEMENT

Refer to laboratory guide ENV-GUI-WEST-0020 Hazardous Waste Management and Disposal, or however named, for waste handling and management practices pertaining to the waste streams created at this facility.

Pace® proactively seeks ways to minimize waste generated during work processes. Some examples of pollution prevention include but are not limited to reduced solvent extraction, solvent capture, use of reusable cycletainers for solvent management, and real-time purchasing.

The EPA requires that laboratory waste management practices comply with all applicable federal and state laws and regulations. Excess reagents, samples, and method process wastes are characterized and disposed of in an acceptable manner in accordance with the Pace® Chemical Hygiene Plan / Safety Manual. Refer to this manual for these procedures.

13.0 MODIFICATIONS

The procedures in this SOP have been modified from the reference test method as follows:

Modification	Section of Reference Method Modified	Justification for Modification	Validation of Modification
Updated EIS quantitation matching for select compounds (PFMPA, 7:3FTCA, ADONA, 9Cl-PF3ONS, 11Cl-PF3OUdS)	Section 20, Table 10	Improved performance, more appropriate correlation	MDL, IDOC, PT
Updated product ion used for measurement of 13C4-PFOA from m/z 172 to m/z 372	Section 20, Table 10	Match ion transition used for EIS 13C8-PFOA and native PFOA	MDL, IDOC, PT
Increased SPE sorbent bed to 250mg, tube size to 20mL	Section 6.7.1	Wider cartridge improves sample loading, reduces chances of clogs	MDL, IDOC, PT
Increased allowable sample loading rate to 5-10 mL/min	Section 12.1.4	Reduced Sample processing time	MDL, IDOC, PT
Omit TSS for aqueous samples	Section 11.1 (11.1.1.5), 11.2.4	Reduced sample processing time	MDL, IDOC, PT
Solid matrix extraction: reduced liquid-solid shake/decant steps to 2; omitted concentration step	Section 11.3 (11.3.4, 11.3.6, 11.3.9)	Improved performance & reduced sample processing time	MDL, IDOC, PT
GCB cartridges: eliminated dGCB + syringe filtration	Section 11.3.7, 11.4.7, 12.1, 12.2.3, 12.2.4, 12.3.3, 12.4.3	Improved performance, reduced sample processing time, & ease of use	MDL, IDOC, PT

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Modification	Section of Reference Method Modified	Justification for Modification	Validation of Modification
Tissue matrix extraction: reduced liquid-solid shake/decant steps to 2; reduced shake time; omitted concentration step	Section 11.4.4, 11.4.6, 11.4.8	Improved performance & reduced sample processing time	MDL, IDOC, PT
Clearly defined the characteristics used to distinguish Aqueous vs. Biosolid vs. Solid matrices	n/a	Increased clarity in process decision making, improved first-run performance	MDL, IDOC, PT

When applicable, comparability and/or equivalency studies necessary to validate the modification as required per corporate SOP ENV-SOP-CORQ-0011, *Method Validation and Instrument Verification*, are retained by local quality personnel for historical reference.

14.0 RESPONSIBILITIES

- PAS employees that perform any part this procedure in their work activities must have a signed Read and Acknowledgement Statement (R&A) in their training file for the version(s) of the SOP that were in effect during the time the employee performed the activity.
- PAS supervisors and managers, however named, are responsible for training employees on the procedures in this SOP, implementing the SOP in the work area, and monitoring on-going adherence to the SOP in the work area(s) they oversee.
- PAS employees are responsible for following the procedures in this SOP. Unauthorized deviations or departures from this SOP are not allowed except with documented approval from the local QM and only when those deviations do not violate the Pace® Code of Ethics or Professional Conduct (COR-POL-0004) or associated policy and procedure(s). Hand-edits or manual changes to the SOP are not permitted. If a change is desired or necessary, Pace® employees must follow the procedures for document revision specified in corporate SOPs ENV-SOP-CORQ-0015, *Document Management* and ENV-SOP-CORQ-0016, *SOP for Creation of SOP and SWI.*

15.0 ATTACHMENTS

- Appendix A: Routine Analyte Limits (DL, LOQ), Analytical Parameters, and Calibration
- Appendix B: QC Summary & Corrective Action; Table: Method Acceptance Criteria
- Appendix C: State/Program Specific Requirements
- Appendix D: Sample Pre-screening Instructions
- Appendix E: Aqueous Sample Subsampling Instructions
- Appendix F: MS/MSD, MS/DUP Selection Protocols
- Appendix G: Aqueous Sample Management Decision Guide
- Appendix H: Aqueous Sample Centrifugation Protocol

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

- Appendix I: Separation and Analysis of Liquid-Solid Biphasic Matrices
- Appendix J: TCLP/SPLP by 1633
- Appendix K: Wipe Analysis by 1633
- Appendix L: Articles of Commerce Analysis via Cryomill Processing
- Appendix M: Procedure for Total Oxidizable Precursors (TOP)

16.0 REFERENCES

- ENV-POL-CORQ-0005, *Acceptable Calibration Practices*, current version.
- ENV-SOP-CORQ-0006, *Manual Integration*, current version.
- ENV-SOP-CORQ-0011, *Method Validation and Instrument Verification*, current version.
- ENV-SOP-CORQ-0015, *Document Management*, current version.
- ENV-SOP-CORQ-0016, *Standard Operating Procedures and Standard Work Instructions,* current version.
- COR-POL-0004, *Code of Ethics and Professional Conduct*, current version.
- COR-MAN-001, *Pace® Safety Manua*l, current version.
- ENV-MAN-WEST-0001, *Quality Manual*, current version.
- TNI Standard, “Volume 1 Management and Technical Requirements for Laboratories Performing Environmental Analysis”, current version.
- “Working with Carcinogens,” Department of Health, Education, & Welfare, Public Health Service, Centers for Disease Control, NIOSH, Publication 77-206, August 1977, NTIS PB-277256.
- “OSHA Safety and Health Standards, General Industry,” OSHA 2206, 29 CFR 1910.
- “Safety in Academic Chemistry Laboratories,” ACS Committee on Chemical Safety, 1979.
- “Standard Methods for the Examination of Water and Wastewater,” 18th edition and later revisions, American Public Health Association, 1015 15th St, NW, Washington, DC 20005, 1-35: Section 1090 (Safety), 1992.
- “Standard Practice for Sampling Water,” ASTM Annual Book of Standards, ASTM, 1916 Race Street, Philadelphia, PA 19103-1187, 1980.
- “Handbook of Analytical Quality Control in Water and Wastewater Laboratories,” USEPA EMSL, Cincinnati, OH 45268, EPA 600/4-79-019, April 1979.
- “Less is Better: Laboratory Chemical Management for Waste Reduction,” American Chemical Society, 1993. Available from the American Chemical Society's Department of Government Relations and Science Policy, 1155 16th Street NW, Washington, DC 20036.
- “Environmental Management Guide for Small Laboratories,” USEPA, Small Business Division, Washington DC, EPA 233-B-00-001, May 2000.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

- "The Waste Management Manual for Laboratory Personnel," American Chemical Society, 1990. Available from the American Chemical Society's Department of Government Relations and Science Policy, 1155 16th Street NW, Washington, DC 20036.
- SERDP. Single-Laboratory Validation Study of PFAS by Isotope Dilution LC-MS/MS. ER19-1409. January 26, 2022.
- Woudneh, Million B., Bharat Chandramouli, Coreen Hamilton, Richard Grace, 2019, "Effects of Sample Storage on the Quantitative Determination of 29 PFAS: Observation of Analyte Interconversions during Storage", Environmental Science and Technology 53(21): 12576-12585.
- EPA. Method 1633, Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS. January 2024.
- Standard Method for the Examination of Water and Wastewater, 23rd Edition, 2017 – Total, Fixed, and Volatile Solids in Solid and Semisolid Samples, Method 2540.

17.0 REVISION HISTORY

Revisions Made from Prior Version

Section	Description of Change
	N/A: new document

Document Succession: This version replaces the following document(s):

Document Number	Version	Document Title	Effective Date:
N/A	N/A	N/A	N/A

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix A: Routine Analyte Limits (DL, LOQ), Analytical Parameters, and Calibration

DL and LOQ are always adjusted to account for actual amounts used and for dilution. Values listed are as of effective date of this SOP. DL and LOQ are subject to change. Contact quality personnel for current information. See Table 4 below for more information regarding analyte detection and quantitation.

Table 1: Standard Analyte List – Aqueous and Landfill Leachate Matrices

Analyte Abbreviation	CAS #	Aqueous (ng/L)		Leachate (ng/L)	
		DL	LOQ	DL	LOQ
PFBA	375-73-5	0.527	6.4	2.64	32
PFPeA	2706-91-4	0.359	3.2	1.79	16
PFHxA	355-46-4	0.245	1.6	1.22	8
PFHpA	375-92-8	0.238	1.6	1.19	8
PFOA	1763-23-1	0.263	1.6	1.31	8
PFNA	68259-12-1	0.266	1.6	1.33	8
PFDA	335-77-3	0.210	1.6	1.05	8
PFUnA	79780-39-5	0.178	1.6	0.892	8
PFDoA	375-73-5	0.214	1.6	1.07	8
PFTrDA	2706-91-4	0.187	1.6	0.934	8
PFTeDA	355-46-4	0.160	1.6	0.801	8
PFBS	375-73-5	0.402	1.6	2.01	8
PFPeS	2706-91-4	0.206	1.6	1.03	8
PFHxS	355-46-4	0.133	1.6	0.665	8
PFHpS	375-92-8	0.201	1.6	1.00	8
PFOS	1763-23-1	0.264	1.6	1.32	8
PFNS	68259-12-1	0.203	1.6	1.02	8
PFDS	335-77-3	0.140	1.6	0.699	8
PFDoS	79780-39-5	0.242	1.6	1.21	8
4:2 FTS	757124-72-4	0.910	6.4	4.55	32
6:2 FTS	27619-97-2	4.82	6.4	24.1	32
8:2 FTS	39108-34-4	1.22	6.4	6.11	32
PFOSA	754-91-6	0.097	1.6	.484	8
NMeFOSA	31506-32-8	0.226	1.6	1.13	8
NEtFOSA	4151-50-2	0.351	1.6	1.76	8

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Analyte Abbreviation	CAS #	Aqueous (ng/L)		Leachate (ng/L)	
		DL	LOQ	DL	LOQ
NMeFOSAA	2355-31-9	0.483	1.6	2.41	8
NEtFOSAA	2991-50-6	0.478	1.6	2.39	8
NMeFOSE	24448-09-7	1.30	16	6.52	80
NEtFOSE	1691-99-2	1.10	16	5.50	80
HFPO-DA	13252-13-6	1.60	6.4	8.02	32
ADONA	919005-14-4	0.376	6.4	1.88	32
PFMPA	377-73-1	0.244	3.2	1.22	16
PFMBA	863090-89-5	0.360	3.2	1.80	16
NFDHA	151772-58-6	0.541	3.2	2.71	16
9Cl-PF3ONS	756426-58-1	0.442	6.4	2.21	32
11Cl-PF3OUdS	763051-92-9	0.447	6.4	2.23	32
PFEESA	113507-82-7	0.330	3.2	1.65	16
3:3 FTCA	356-02-5	0.535	8	2.68	40
5:3 FTCA	914637-49-3	4.26	40	21.3	200
7:3 FTCA	812-70-4	3.18	40	15.9	200

Table 2: Standard Analyte List – Solid and Biosolid Matrices

Analyte Abbreviation	CAS #	Solid (ng/g)		Biosolid (ng/g)	
		DL	LOQ	DL	LOQ
PFBA	375-73-5	0.028	0.8	0.28	8
PFPeA	2706-91-4	0.038	0.4	0.38	4
PFHxA	355-46-4	0.016	0.2	0.16	2
PFHpA	375-92-8	0.012	0.2	0.12	2
PFOA	1763-23-1	0.026	0.2	0.26	2
PFNA	68259-12-1	0.012	0.2	0.12	2
PFDA	335-77-3	0.035	0.2	0.35	2
PFUnA	79780-39-5	0.013	0.2	0.13	2
PFDoA	375-73-5	0.021	0.2	0.21	2
PFTrDA	2706-91-4	0.016	0.2	0.16	2
PFTeDA	355-46-4	0.024	0.2	0.24	2
PFBS	375-73-5	0.020	0.2	0.20	2

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Analyte Abbreviation	CAS #	Solid (ng/g)		Biosolid (ng/g)	
		DL	LOQ	DL	LOQ
PFPeS	2706-91-4	0.027	0.2	0.27	2
PFHxS	355-46-4	0.020	0.2	0.20	2
PFHpS	375-92-8	0.045	0.2	0.45	2
PFOS	1763-23-1	0.031	0.2	0.31	2
PFNS	68259-12-1	0.029	0.2	0.29	2
PFDS	335-77-3	0.015	0.2	0.15	2
PFDoS	79780-39-5	0.022	0.2	0.22	2
4:2 FTS	757124-72-4	0.078	0.8	0.78	8
6:2 FTS	27619-97-2	0.148	0.8	1.48	8
8:2 FTS	39108-34-4	0.259	0.8	2.59	8
PFOSA	754-91-6	0.011	0.2	0.11	2
NMeFOSA	31506-32-8	0.026	0.2	0.26	2
NEtFOSA	4151-50-2	0.022	0.2	0.22	2
NMeFOSAA	2355-31-9	0.086	0.2	0.86	2
NEtFOSAA	2991-50-6	0.044	0.2	0.44	2
NMeFOSE	24448-09-7	0.121	2.0	1.21	20
NEtFOSE	1691-99-2	0.081	2.0	0.81	20
HFPO-DA	13252-13-6	0.039	0.8	0.39	8
ADONA	919005-14-4	0.030	0.8	0.30	8
PFMPA	377-73-1	0.017	0.4	0.17	4
PFMBA	863090-89-5	0.024	0.4	0.24	4
NFDHA	151772-58-6	0.083	0.4	0.83	4
9Cl-PF3ONS	756426-58-1	0.029	0.8	0.29	8
11Cl-PF3OUdS	763051-92-9	0.040	0.8	0.40	8
PFEESA	113507-82-7	0.046	0.4	0.46	4
3:3 FTCA	356-02-5	0.092	1.0	0.92	10
5:3 FTCA	914637-49-3	0.236	5.0	2.36	50
7:3 FTCA	812-70-4	0.365	5.0	3.65	50

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Table 3: Standard Analyte List – Tissue Matrices

Analyte Abbreviation	CAS #	DL (ng/g)	LOQ (ng/g)
PFBA	375-73-5	0.215	2.0
PFPeA	2706-91-4	0.088	1.0
PFHxA	355-46-4	0.044	0.5
PFHpA	375-92-8	0.062	0.5
PFOA	1763-23-1	0.070	0.5
PFNA	68259-12-1	0.099	0.5
PFDA	335-77-3	0.102	0.5
PFUnA	79780-39-5	0.093	0.5
PFDoA	375-73-5	0.052	0.5
PFTrDA	2706-91-4	0.067	0.5
PFTeDA	355-46-4	0.039	0.5
PFBS	375-73-5	0.044	0.5
PFPeS	2706-91-4	0.029	0.5
PFHxS	355-46-4	0.075	0.5
PFHpS	375-92-8	0.093	0.5
PFOS	1763-23-1	0.084	0.5
PFNS	68259-12-1	0.065	0.5
PFDS	335-77-3	0.056	0.5
PFDoS	79780-39-5	0.062	0.5
4:2 FTS	757124-72-4	0.222	2.0
6:2 FTS	27619-97-2	0.934	2.0
8:2 FTS	39108-34-4	0.249	2.0
PFOSA	754-91-6	0.051	0.5
NMeFOSA	31506-32-8	0.139	0.5
NEtFOSA	4151-50-2	0.115	0.5
NMeFOSAA	2355-31-9	0.089	0.5
NEtFOSAA	2991-50-6	0.106	0.5
NMeFOSE	24448-09-7	0.598	5.0
NEtFOSE	1691-99-2	0.410	5.0
HFPO-DA	13252-13-6	0.072	2.0

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Analyte Abbreviation	CAS #	DL (ng/g)	LOQ (ng/g)
ADONA	919005-14-4	0.139	2.0
PFMPA	377-73-1	0.078	1.0
PFMBA	863090-89-5	0.086	1.0
NFDHA	151772-58-6	0.113	1.0
9Cl-PF3ONS	756426-58-1	0.179	2.0
11Cl-PF3OUdS	763051-92-9	0.228	2.0
PFEESA	113507-82-7	0.069	1.0
3:3 FTCA	356-02-5	0.145	2.5
5:3 FTCA	914637-49-3	1.54	12.5
7:3 FTCA	812-70-4	1.26	12.5

Table 4: Identification and Quantification Information for Target Analytes, Extracted Internal Standards and Non-extracted Internal Standards.

Analyte Name	CAS #	Analyte Abbreviation	Parent Ion Mass	Quantification Ion Mass	Confirmation Ion Mass	Quantification Reference Compound
Perfluorobutanoic acid	375-73-5	PFBA	213	169	NA	13C4-PFBA
Perfluoropentanoic acid	2706-91-4	PFPeA	263	219	69	13C5-PFPeA
Perfluorohexanoic acid	355-46-4	PFHxA	313	269	119	13C5-PFHxA
Perfluoroheptanoic acid	375-92-8	PFHpA	363	319	169	13C4-PFHpA
Perfluorooctanoic acid	1763-23-1	PFOA	413	369	169	13C8-PFOA
Perfluorononanoic acid	68259-12-1	PFNA	463	419	219	13C9-PFNA
Perfluorodecanoic acid	335-77-3	PFDA	513	469	219	13C6-PFDA
Perfluoroundecanoic acid	79780-39-5	PFUnA	563	519	269	13C7-PFUnA
Perfluorododecanoic acid	375-73-5	PFDoA	613	569	319	13C2-PFDoA
Perfluorotridecanoic acid	2706-91-4	PFTrDA	663	619	169	13C2-PFDoA
Perfluorotetradecanoic acid	355-46-4	PFTeDA	713	669	169	13C2-PFTeDA
Perfluorobutanesulfonic acid	375-73-5	PFBS	299	80	99	13C3-PFBS
Perfluoropentansulfonic acid	2706-91-4	PFPeS	349	80	99	13C3-PFHxS
Perfluorohexanesulfonic acid	355-46-4	PFHxS	399	80	99	13C3-PFHxS

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Analyte Name	CAS #	Analyte Abbreviation	Parent Ion Mass	Quantification Ion Mass	Confirmation Ion Mass	Quantification Reference Compound
Perfluoroheptanesulfonic acid	375-92-8	PFHpS	449	80	99	13C8-PFOS
Perfluorooctanesulfonic acid	1763-23-1	PFOS	499	80	99	13C8-PFOS
Perfluorononanesulfonic acid	68259-12-1	PFNS	549	80	99	13C8-PFOS
Perfluorodecanesulfonic acid	335-77-3	PFDS	599	80	99	13C8-PFOS
Perfluorododecanesulfonic acid	79780-39-5	PFDoS	699	80	99	13C8-PFOS
1H,1H, 2H, 2H-Perfluorohexane sulfonic acid	757124-72-4	4:2 FTS	327	307	81	13C2-4:2FTS
1H,1H, 2H, 2H-Perfluorooctane sulfonic acid	27619-97-2	6:2 FTS	427	407	81	13C2-6:2FTS
1H,1H, 2H, 2H-Perfluorodecane sulfonic acid	39108-34-4	8:2 FTS	527	507	81	13C2-8:2FTS
Perfluorooctanesulfonamide	754-91-6	PFOSA	498	78	478	13C8-PFOSA
N-methyl perfluorooctanesulfonamide	31506-32-8	NMeFOSA	512	219	169	D3-NMeFOSA
N-ethyl perfluorooctanesulfonamide	4151-50-2	NEtFOSA	526	219	169	D5-NEtFOSA
N-methyl perfluorooctanesulfonamidoacetic acid	2355-31-9	NMeFOSAA	570	419	483	D3-NMeFOSAA
N-ethyl perfluorooctanesulfonamidoacetic acid	2991-50-6	NEtFOSAA	584	419	526	D5-NEtFOSAA
N-methyl perfluorooctanesulfonamidoethanol	24448-09-7	NMeFOSE	616	59	NA	D7-NMeFOSE
N-ethyl perfluorooctanesulfonamidoethanol	1691-99-2	NEtFOSE	630	59	NA	D9-NEtFOSE
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	HFPO-DA	285	169	185	13C3-HFPODA
4,8-Dioxa-3H-perfluorononanoic acid	919005-14-4	ADONA	377	251	85	13C4-PFHpA
Perfluoro-3-methoxypropanoic acid	377-73-1	PFMPA	229	85	NA	13C4-PFBA
Perfluoro-4-methoxybutanoic acid	863090-89-5	PFMBA	279	85	NA	13C5-PFPeA
Nonafluoro-3,6-dioxaheptanoic acid	151772-58-6	NFDHA	295	201	85	13C5-PFHxA

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Analyte Name	CAS #	Analyte Abbreviation	Parent Ion Mass	Quantification Ion Mass	Confirmation Ion Mass	Quantification Reference Compound
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	756426-58-1	9Cl-PF3ONS	531	351	533→353	13C8-PFOS
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	763051-92-9	11Cl-PF3OUdS	631	451	633→453	13C8-PFOS
Perfluoro(2-ethoxyethane)sulfonic acid	113507-82-7	PFEESA	315	135	83	13C5-PFHxA
3-Perfluoropropyl propanoic acid (FPrPA)	356-02-5	3:3FTCA	241	177	117	13C5-PFPeA
2H,2H,3H,3H-Perfluorooctanoic acid (FPePA)	914637-49-3	5:3FTCA	341	237	217	13C5-PFHxA
3-Perfluoroheptyl propanoic acid (FHpPA)	812-70-4	7:3FTCA	441	337	317	13C9-PFNA
Extracted Internal Standard Compounds (EIS)						
Perfluoro-n-[13C4] butanoic acid	NA	13C4-PFBA	217	172	NA	13C3-PFBA
Perfluoro-n-[13C5] pentanoic acid	NA	13C5-PFPeA	268	223	NA	13C2-PFHxA
Perfluoro-n-[1,2,3,4,6-13C5] hexanoic acid	NA	13C5-PFHxA	318	273	NA	13C2-PFHxA
Perfluoro-n-[1,2,3,4-13C4] heptanoic acid	NA	13C4-PFHpA	367	322	NA	13C2-PFHxA
Perfluoro-n-[13C8] octanoic acid	NA	13C8-PFOA	421	376	NA	13C4-PFOA
Perfluoro-n-[13C9] nonanoic acid	NA	13C9-PFNA	472	427	NA	13C5-PFNA
Perfluoro-n-[1,2,3,4,5,6-13C6] decanoic acid	NA	13C6-PFDA	519	474	NA	13C2-PFDA
Perfluoro-n-[1,2,3,4,5,6,7-13C7] undecanoic acid	NA	13C7-PFUnA	570	525	NA	13C2-PFDA
Perfluoro-n-[1,2-13C2] dodecanoic acid	NA	13C2-PFDoA	615	570	NA	13C2-PFDA
Perfluoro-n-[1,2-13C2] tetradecanoic acid	NA	13C2-PFTeDA	715	670	NA	13C2-PFDA
Perfluoro-1-[2,3,4-13C3] butanesulfonic acid	NA	13C3-PFBS	302	80	NA	18O2-PFHxS
Perfluoro-1-[1,2,3-13C3] hexanesulfonic acid	NA	13C3-PFHxS	402	80	NA	18O2-PFHxS

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Analyte Name	CAS #	Analyte Abbreviation	Parent Ion Mass	Quantification Ion Mass	Confirmation Ion Mass	Quantification Reference Compound
Perfluoro-1-[13C8] octanesulfonic acid	NA	13C8-PFOS	507	80	NA	13C4-PFOS
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2] hexanesulfonic acid	NA	13C2-4:2FTS	329	81	NA	18O2-PFHxS
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2] octanesulfonic acid	NA	13C2-6:2FTS	429	81	NA	18O2-PFHxS
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2] decanesulfonic acid	NA	13C2-8:2FTS	529	81	NA	18O2-PFHxS
Perfluoro-1-[13C8] octanesulfonamide	NA	13C8-PFOSA	506	78	NA	13C4-PFOS
N-methyl-D3-perfluoro-1-octanesulfonamide	NA	D3-NMeFOSA	515	219	NA	13C4-PFOS
N-ethyl-D5-perfluoro-1-octanesulfonamide	NA	D5-NEtFOSA	531	219	NA	13C4-PFOS
N-methyl-D3-perfluoro-1-octanesulfonamidoacetic acid	NA	D3-NMeFOSAA	573	419	NA	13C4-PFOS
N-ethyl-D5-perfluoro-1-octanesulfonamidoacetic acid	NA	D5-NEtFOSAA	589	419	NA	13C4-PFOS
N-methyl-D7-perfluorooctanesulfonamidoethanol	NA	D7-NMeFOSE	623	59	NA	13C4-PFOS
N-ethyl-D9-perfluorooctanesulfonamidoethanol	NA	D9-NEtFOSE	639	59	NA	13C4-PFOS
Tetrafluoro-2-heptafluoropropoxy-13C3-propanoic acid	NA	13C3-HFPO-DA	287	169	NA	13C2-PFHxA
Non-extracted Internal Standard Compounds (NIS)						
Perfluoro-n-[2,3,4-13C3] butanoic acid	NA	13C3-PFBA	216	172	NA	NA
Perfluoro-n-[1,2-13C2]hexanoic acid	NA	13C2-PFHxA	315	270	NA	NA
Perfluoro-n-[1,2,3,4-13C4]octanoic acid	NA	13C4-PFOA	417	172	NA	NA
Perfluoro-n-[1,2,3,4,5-13C5] nonanoic acid	NA	13C5-PFNA	468	423	NA	NA

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Analyte Name	CAS #	Analyte Abbreviation	Parent Ion Mass	Quantification Ion Mass	Confirmation Ion Mass	Quantification Reference Compound
Perfluoro-n-[1,2-13C2]decanoic acid	NA	13C2-PFDA	515	470	NA	NA
Perfluoro-1-hexane[18O2]sulfonic acid	NA	18O2-PFHxS	403	84	NA	NA
Perfluoro-n-[1,2,3,4-13C4] octanesulfonic acid	NA	13C4-PFOS	503	80	NA	NA

Table 5: Calibration Standard Concentrations (ng/mL)

Compound	L1	L2 (ISC)	L3	L4	L5 (CCV)	L6	L7	L8	L9
Perfluoroalkyl carboxylic acids									
PFBA	0.4	0.8	2	10	20	50	100	200	250
PFPeA	0.2	0.4	1	5	10	25	50	100	125
PFHxA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
PFHpA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
PFOA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
PFNA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
PFDA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
PFUnA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
PFDoA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
PFTrDA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
PFTeDA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
Perfluoroalkyl sulfonic acids									
PFBS	0.089	0.178	0.444	2.22	4.44	11.1	22.2	44.4	55.5
PFPeS	0.094	0.188	0.470	2.35	4.70	11.8	23.5	47.0	58.8
PFHxS	0.091	0.182	0.456	2.28	4.56	11.4	22.8	45.6	57.0
PFHpS	0.095	0.190	0.476	2.38	4.76	11.9	23.8	47.6	59.5
PFOS	0.093	0.186	0.464	2.32	4.64	11.6	23.2	46.4	58.0
PFNS	0.096	0.192	0.480	2.40	4.80	12.0	24.0	48.0	60.0
PFDS	0.096	0.193	0.482	2.41	4.82	12.1	24.1	48.2	60.3
PFDoS	0.097	0.194	0.484	2.42	4.84	12.1	24.2	48.4	60.5
Fluorotelomer sulfonic acids									
4:2FTS	0.375	0.750	1.87	9.37	18.7	46.9	93.7	187	234
6:2FTS	0.380	0.761	1.90	9.51	19.0	47.6	95.1	190	238
8:2FTS	0.384	0.768	1.92	9.6	19.2	48	96	192	240
Perfluorooctane sulfonamides									

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Compound	L1	L2 (ISC)	L3	L4	L5 (CCV)	L6	L7	L8	L9
PFOSA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
NMeFOSA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
NEtFOSA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
Perfluorooctane sulfonamidoacetic acids									
NMeFOSAA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
NEtFOSAA	0.1	0.2	0.5	2.5	5	12.5	25	50	62.5
Perfluorooctane sulfonamide ethanols									
NMeFOSE	1	2	5	25	50	125	250	500	625
NEtFOSE	1	2	5	25	50	125	250	500	625
Per- and polyfluoroether carboxylic acids									
HFPO-DA	0.4	0.8	2	10	20	50	100	200	250
ADONA	0.378	0.756	1.89	9.45	18.9	47.25	94.5	189	236.25
PFMPA	0.2	0.4	1	5	10	25	50	100	125
PFMBA	0.2	0.4	1	5	10	25	50	100	125
NFDHA	0.2	0.4	1	5	10	25	50	100	125
Ether sulfonic acids									
9Cl-PF3ONS	0.373	0.746	1.87	9.33	18.7	46.7	93.3	187	233
11Cl-PF3OUdS	0.377	0.754	1.89	9.43	18.9	47.2	94.3	189	236
PFEESA	0.178	0.357	0.892	4.46	8.92	22.3	44.6	89.2	112
Fluorotelomer Carboxylic Acids									
3:3FTCA	0.5	1	2.5	12.5	25	62.5	125	250	312.5
5:3FTCA	2.5	5	12.5	62.5	125	312.5	625	1250	1560
7:3FTCA	2.5	5	12.5	62.5	125	312.5	625	1250	1560
Extracted Internal Standards (EIS)									
13C4-PFBA	10	10	10	10	10	10	10	10	10
13C5-PFPeA	5	5	5	5	5	5	5	5	5
13C5-PFHxA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C4-PFHpA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C8-PFOA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C9-PFNA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C6-PFDA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C7-PFUnA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C2-PFDoA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C2-PFTeDA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C3-PFBS	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33
13C3-PFHxS	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37
13C8-PFOS	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
13C2-4:2FTS	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Compound	L1	L2 (ISC)	L3	L4	L5 (CCV)	L6	L7	L8	L9
13C2-6:2FTS	4.76	4.76	4.76	4.76	4.76	4.76	4.76	4.76	4.76
13C2-8:2FTS	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
13C8-PFOSA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
D3-NMeFOSA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
D5-NEtFOSA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
D3-NMeFOSAA	5	5	5	5	5	5	5	5	5
D5-NEtFOSAA	5	5	5	5	5	5	5	5	5
D7-NMeFOSE	25	25	25	25	25	25	25	25	25
D9-NEtFOSE	25	25	25	25	25	25	25	25	25
13C3-HFPODA	10	10	10	10	10	10	10	10	10
Non-Extracted Internal Standards (NIS)									
13C3-PFBA	5	5	5	5	5	5	5	5	5
13C2-PFHxA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C4-PFOA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C5-PFNA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C2-PFDA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
18O2-PFHxS	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37
13C4-PFOS	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix B: QC Summary & Corrective Action Table; Method Acceptance Criteria

Table 6: QC Summary & Corrective Action

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
Demonstration of Capability (DOC)	Initially, prior to analyzing field samples and annually thereafter.	See Method Acceptance Criteria for each matrix in the Tables below.	Identify and correct source of problem, repeat.	None. Do not proceed with analysis.
Mass Calibration	Annually and on as-needed basis.	Must meet manufacturer's acceptance criteria.	Identify and correct source of problem, repeat.	None. Do not proceed with analysis.
Mass Calibration Verification	After each Mass Calibration performed.	Must meet manufacturer's acceptance criteria.	Identify and correct source of problem, repeat Mass Calibration.	None. Do not proceed with analysis.
Initial Calibration (ICAL)	At instrument set up, after CCV failure and/or major maintenance.	Must meet one of the curve fit options presented in Section 9.2.4.	Identify and correct source of problem, repeat.	None. Do not proceed with analysis.
Initial Calibration Verification (ICV)	After Each ICAL.	All analytes must be within ± 30% of their true values. (%R)	Identify and correct source of problem, re-analyze. If repeat failure, repeat ICAL. Analysis may proceed if it can be demonstrated that the ICV exceedance has no impact on analytical measurements. For example, the ICV %R is high, CCV is within criteria, and the analyte is not detected in sample(s).	Qualify analytes with ICV out of criteria when results are unaffected; otherwise, correct the problem and repeat ICV.
Initial Calibration Blank (ICB)	After highest concentration ICAL standard.	Must meet criteria specified in Section 9.2.5: all detections ≤MDL concentration.	Identify and correct source of contamination or performance issue. Alternately, calibrate using a lower concentration standard for the highest point.	No samples shall be analyzed until ICB has met acceptance criteria.
RT Window Position	Once per ICAL and at the beginning of the analytical window.	Position is set using the mid-point of the ICAL on the day ICAL is performed; otherwise, opening CCV is used. RT Window is ± 60 secs from RT position.	NA	NA
Instrument Sensitivity Check (ISC)	Daily before sample analysis.	All native and isotopically labelled compounds within ± 30% recovery.	Identify and correct source of problem and reanalyze ISC. If problem persists, repeat ICAL.	No samples shall be analyzed until ISC has met acceptance

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
				criteria. See Section 9.2.4.5 for exceptions.
Bile Salts Check	With each ICAL and daily with each CCV	Bile Salt peak detected >1 min outside RT window for PFOS.	Identify and correct source of problem, then reevaluate Bile Salts separation from PFOS.	No samples shall be analyzed until Bile Salts Check has met acceptance criteria.
Continuing Calibration Verification (CCV)	Daily before sample analysis, after every 10 samples, and at end of analytical sequence.	All native and isotopically labelled compounds within ±30% recovery.	See Section 9.2.4.5 for required corrective actions based on circumstance.	Qualify analytes with CCV out of criteria.
Instrument Blank (IBLK) / Continuing Calibration Blank (CCB)	Daily prior to analysis and after high standards, including CCV.	Must meet criteria specified in Section 9.2.5: all detections ≤MDL concentration.	Identify and correct source of contamination or performance issue. Reanalyze IBLK.	No samples shall be analyzed until IBLK has met acceptance criteria.
Extracted Internal Standards (EIS)	Every field sample, standard and QC sample.	See Method Acceptance Criteria for each matrix in the Tables below.	If batch QC is acceptable, reanalyze to confirm. If confirmed, re-extract and reanalyze samples. If reprep is within acceptance, report reprep data. If failure is confirmed by reprep, qualify as matrix impacted.	Qualify outages and explain in case narrative.
Non-extracted Internal Standards (NIS)	Every field sample, standard and QC sample.	NIS areas in all samples must be within 50 – 200% of the average area of the corresponding NIS in the ICAL.	Troubleshoot instrument performance. Reanalyze samples.	Qualify outages and explain in case narrative.
Method Blank (MB)	1 per batch of 20 or fewer samples.	Must meet criteria specified in Section 10.4.1: all detections ≤MDL concentration.	If IBLK is acceptable, reanalyze MB to confirm. If confirmed, re-extract and reanalyze associated impacted samples (if sufficient sample remains). If insufficient sample remains for reprep, narrate and report data associated with unacceptable MB. See Section 10.4.1 for more details.	Qualify outages and explain in case narrative.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
LCS/LLLCS	1 pair per batch of 20 or fewer samples.	See Method Acceptance Criteria for each matrix in the Tables below; must meet criteria specified in Section 10.4.2.	If most recent ISC/CCV is acceptable, reanalyze LCS to confirm. If low-failure results are confirmed, re-extract and reanalyze associated samples (if sufficient sample remains). If insufficient sample remains for reprep, narrate and report data associated with low-failure LCS. If high-failure results are confirmed and sample(s) is ND for failing compound, narrate and report sample data.	Qualify outages and explain in case narrative.
MS/MSD	1 pair per batch of 20 or fewer samples. (If requested)	RSD ≤30% between MS/MSD	If possible, reprep to confirm.	Qualify outages and explain in case narrative.
Laboratory Duplicate	1 per AFFF sample; 1 per prep batch for all other matrices (if requested).	RSD ≤30% between parent/DUP	If possible, reprep to confirm.	Qualify outages and explain in case narrative.

Table 7: DOC/LCS/LLLCS Acceptance Limits for Aqueous & Landfill Leachate Matrices

Target Analyte	DOC Mean Recovery (%)	DOC RSD (%)	LCS/LLLCS Recovery (%)
PFBA	70-135	21	70-140
PFPeA	70-135	23	65-135
PFHxA	70-135	24	70-145
PFHpA	70-135	28	70-150
PFOA	65-155	27	70-150
PFNA	70-140	28	70-150
PFDA	65-140	26	70-140
PFUnA	70-135	29	70-145
PFDoA	70-130	21	70-140
PFTrDA	60-145	29	65-140
PFTeDA	70-145	27	60-140
PFBS	70-140	23	60-145
PFPeS	70-135	25	65-140
PFHxS	70-135	27	65-145
PFHpS	70-140	30	70-150
PFOS	70-140	29	55-150
PFNS	70-135	29	65-145
PFDS	70-135	30	60-145

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Target Analyte	DOC Mean Recovery (%)	DOC RSD (%)	LCS/LLLCS Recovery (%)
PFDoS	45-135	35	50-145
4:2FTS	70-135	27	70-145
6:2FTS	70-135	32	65-155
8:2FTS	70-140	33	60-150
PFOSA	70-135	22	70-145
NMeFOSA	70-135	30	60-150
NEtFOSA	70-130	26	65-145
NMeFOSAA	65-140	32	50-140
NEtFOSAA	70-135	28	70-145
NMeFOSE	70-135	29	70-145
NEtFOSE	70-130	21	70-135
HFPO-DA	70-135	23	70-140
ADONA	70-135	23	65-145
PFMPA	60-140	23	55-140
PFMBA	65-145	27	60-150
NFDHA	65-140	37	50-150
9Cl-PF3ONS	70-145	30	70-155
11Cl-PF3OUdS	50-150	35	55-160
PFEESA	70-135	25	70-140
3:3FTCA	70-130	23	65-130
5:3FTCA	70-130	24	70-135
7:3FTCA	55-130	34	50-145

Table 8: DOC/LCS/LLLCS Acceptance Limits for Solid & Biosolid Matrices

Target Analyte	DOC Mean Recovery (%)	DOC RSD (%)	LCS/LLLCS Recovery (%)
PFBA	70-140	17	70-140
PFPeA	70-140	26	60-150
PFHxA	70-135	23	65-140
PFHpA	70-140	21	65-145
PFOA	70-140	23	70-150
PFNA	65-145	24	70-155
PFDA	70-145	26	70-155
PFUnA	70-145	26	70-155
PFDoA	70-145	25	70-150
PFTrDA	55-160	26	65-150
PFTeDA	70-145	24	65-150
PFBS	60-145	25	65-145
PFPeS	65-140	29	55-160
PFHxS	65-145	28	60-150
PFHpS	70-140	27	65-155
PFOS	70-135	27	65-160
PFNS	70-140	27	55-140

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Target Analyte	DOC Mean Recovery (%)	DOC RSD (%)	LCS/LLLCS Recovery (%)
PFDS	50-150	31	40-155
PFDoS	40-140	40	25-160
4:2FTS	70-135	27	60-150
6:2FTS	60-160	50	55-200
8:2FTS	70-140	27	70-150
PFOSA	70-140	19	70-140
NMeFOSA	65-145	26	70-155
NEtFOSA	70-135	19	70-140
NMeFOSAA	65-145	31	65-155
NEtFOSAA	60-150	31	65-165
NMeFOSE	70-140	19	70-140
NEtFOSE	70-135	17	70-135
HFPO-DA	70-140	25	70-145
ADONA	70-155	26	70-160
PFMPA	70-140	25	30-140
PFMBA	55-145	33	60-150
NFDHA	45-145	27	60-155
9Cl-PF3ONS	65-135	23	70-150
11Cl-PF3OUdS	50-135	31	45-160
PFEESA	70-140	20	70-140
3:3FTCA	45-155	32	45-130
5:3FTCA	70-135	28	60-130
7:3FTCA	70-145	39	60-150

Table 9: DOC/LCS/LLLCS Acceptance Limits for Tissue Matrix

Target Analyte	DOC Mean Recovery (%)	DOC RSD (%)	LCS/LLLCS Recovery (%)
PFBA	70-135	20	60-140
PFPeA	70-130	20	60-145
PFHxA	70-140	20	60-160
PFHpA	70-140	20	60-145
PFOA	70-130	25	60-150
PFNA	70-140	20	60-145
PFDA	70-135	20	60-150
PFUnA	70-135	20	60-155
PFDoA	70-135	20	60-140
PFTrDA	55-160	20	60-150
PFTeDA	70-140	25	60-140
PFBS	70-145	20	60-150
PFPeS	70-150	20	60-145
PFHxS	70-140	25	60-155
PFHpS	70-145	20	60-140
PFOS	70-135	30	60-160

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Target Analyte	DOC Mean Recovery (%)	DOC RSD (%)	LCS/LLLCS Recovery (%)
PFNS	60-130	20	45-140
PFDS	55-135	20	50-140
PFDoS	25-145	45	25-140
4:2FTS	65-140	30	55-150
6:2FTS	70-140	25	60-150
8:2FTS	70-150	25	60-170
PFOSA	70-140	20	60-150
NMeFOSA	70-140	30	60-160
NEtFOSA	70-140	40	60-150
NMeFOSAA	70-140	20	60-145
NEtFOSAA	70-140	25	60-145
NMeFOSE	60-150	20	40-180
NEtFOSE	70-145	40	60-205
HFPO-DA	70-140	25	60-145
ADONA	70-145	20	55-165
PFMPA	70-145	40	25-145
PFMBA	70-140	20	60-150
NFDHA	70-155	30	60-180
9Cl-PF3ONS	70-140	20	60-170
11Cl-PF3OUdS	65-140	20	50-170
PFEESA	70-145	25	50-150
3:3FTCA	55-130	25	30-140
5:3FTCA	70-145	20	60-160
7:3FTCA	70-155	20	60-200

Table 10: Acceptance Limits for EIS and NIS Compounds in Aqueous & Landfill Leachate Matrices

Labeled Compound	Aqueous Recovery (%)	Landfill Leachate Recovery (%)
13C4-PFBA	5-130	5-130
13C5-PFPeA	40-130	40-130
13C5-PFHxA	40-130	40-130
13C4-PFHpA	40-130	40-130
13C8-PFOA	40-130	40-130
13C9-PFNA	40-130	40-130
13C6-PFDA	40-130	40-130
13C7-PFUnA	30-130	40-130
13C2-PFDoA	10-130	35-130
13C2-PFTeDA	10-130	25-130
13C3-PFBS	40-135	40-130
13C3-PFHxS	40-130	40-130
13C8-PFOS	40-130	40-130

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Labeled Compound	Aqueous Recovery (%)	Landfill Leachate Recovery (%)
13C2-4:2FTS	40-200	40-220
13C2-6:2FTS	40-200	40-170
13C2-8:2FTS	40-300	40-145
13C8-PFOSA	40-130	40-130
D3-NMeFOSA	10-130	40-130
D5-NEtFOSA	10-130	35-130
D3-NMeFOSAA	40-170	35-130
D5-NEtFOSAA	25-135	30-130
D7-NMeFOSE	10-130	20-130
D9-NEtFOSE	10-130	20-130
13C3-HFPODA	40-130	40-130
13C3-PFBA	50-200	50-200
13C2-PFHxA	50-200	50-200
13C4-PFOA	50-200	50-200
13C5-PFNA	50-200	50-200
13C2-PFDA	50-200	50-200
18O2-PFHxS	50-200	50-200
13C4-PFOS	50-200	50-200

Table 11: Acceptance Limits for EIS and NIS Compounds in Solid & Biosolid Matrices

Labeled Compound	Solids Recovery (%)	Biosolids Recovery (%)
13C4-PFBA	8-130	5-130
13C5-PFPeA	35-130	35-130
13C5-PFHxA	40-130	40-130
13C4-PFHpA	40-130	40-130
13C8-PFOA	40-130	40-130
13C9-PFNA	40-130	40-145
13C6-PFDA	40-130	40-130
13C7-PFUnA	40-130	40-130
13C2-PFDoA	40-130	40-130
13C2-PFTeDA	20-130	10-160
13C3-PFBS	40-135	40-150
13C3-PFHxS	40-130	40-140
13C8-PFOS	40-130	40-130
13C2-4:2FTS	40-165	40-300
13C2-6:2FTS	40-215	40-300
13C2-8:2FTS	40-275	40-300

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Labeled Compound	Solids Recovery (%)	Biosolids Recovery (%)
13C8-PFOSA	40-130	20-140
D3-NMeFOSA	10-130	20-130
D5-NEtFOSA	10-130	20-130
D3-NMeFOSAA	40-135	30-150
D5-NEtFOSAA	40-150	20-140
D7-NMeFOSE	20-130	25-130
D9-NEtFOSE	15-130	20-130
13C3-HFPODA	40-130	40-130
13C3-PFBA	50-200	50-200
13C2-PFHxA	50-200	50-200
13C4-PFOA	50-200	50-200
13C5-PFNA	50-200	50-200
13C2-PFDA	50-200	50-200
18O2-PFHxS	50-200	50-200
13C4-PFOS	50-200	50-200

Table 12: Acceptance Limits for EIS and NIS Compounds in Tissue Matrices

Labeled Compound	Tissue Recovery (%)
13C4-PFBA	5-130
13C5-PFPeA	10-185
13C5-PFHxA	25-170
13C4-PFHpA	25-150
13C8-PFOA	25-150
13C9-PFNA	35-185
13C6-PFDA	30-150
13C7-PFUnA	30-180
13C2-PFDoA	35-180
13C2-PFTeDA	20-160
13C3-PFBS	25-190
13C3-PFHxS	35-175
13C8-PFOS	40-160
13C2-4:2FTS	30-300
13C2-6:2FTS	35-300
13C2-8:2FTS	40-365
13C8-PFOSA	25-180
D3-NMeFOSA	5-130
D5-NEtFOSA	5-130

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Labeled Compound	Tissue Recovery (%)
D3-NMeFOSAA	30-250
D5-NEtFOSAA	30-235
D7-NMeFOSE	5-160
D9-NEtFOSE	5-130
13C3-HFPODA	20-185
13C3-PFBA	50-200
13C2-PFHxA	50-200
13C4-PFOA	50-200
13C5-PFNA	50-200
13C2-PFDA	50-200
18O2-PFHxS	50-200
13C4-PFOS	50-200

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix C: State/Program Specific Requirements

This appendix provides program specific requirements that supersede or supplement the main body of the SOP. When analyzing samples under DoD compliance, these requirements are applicable.

QC Item	SOP Section	Requirement
Instrument Blank	9.2.5	No analytes detected > ½ LOQ.
Method Blank	11.1.1	No analytes detected > ½ LOQ.
AFFF Sample Duplicate	Appendix E	All AFFF samples shall be prepared and analyzed in duplicate in the same manner as aqueous samples (e.g., solid phase extraction, extracted internal standards, carbon cleanup, etc.).
Laboratory Duplicate	Appendices B & F	One per preparatory batch. RPD of all analytes should be ≤ 30% between sample and DUP. RPD criterion does not apply if both results are below the LOQ.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix D: Sample Pre-screening Instructions

Samples that are known or suspected to contain high levels of analytes may be pre-screened using the following procedure. These are example procedures using smaller sample aliquots spiked with EIS and NIS and no clean up procedures. Other pre-screening procedures may be used.

Aqueous Samples

1) Weight out 10 (±0.1) g of sample into a 50-mL centrifuge tube.
2) Add 50 µL of EIS to the sample and vortex to mix.
3) Filter 1 mL of the sample through 0.2-µm membrane filter into a microvial. Sample is ready for instrumental analysis.

Solid and Tissue Samples

1) Weigh 1.0 (±0.1) g sample into 50-mL polypropylene centrifuge tubes.
2) Add 20 mL of 0.3% methanolic ammonium hydroxide to the sample. Vortex and mix on a shaker table (or equivalent) for 10 min. Allow to settle and/or centrifuge to produce a clear extract.
3) Filter using a filter vial:
    a. Add 20 µL of EIS to a clean filter vial (chamber).
    b. Add 400 µL of clear extract from step 2 (e.g., by adding extract until it reaches the fill line), carefully vortex to mix.
    c. Use filter/plunger part and filter.
4) Transfer 30 µL of filtrate to a ~300 µL polypropylene microvial and dilute to 300 µL with 0.3% methanolic ammonium hydroxide. Add NIS (1.5 µL) to the resulting solution.
5) The extract is now a 10x dilution.
6) Sample is ready for instrumental screening analysis.
7) Calculate results using the equivalent sample weight computed as follows:

$$Equivalent\ Weight = Sample\ weight\ (g) x \frac{0.4\ mL}{20\ mL}$$

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix E: Aqueous Sample Subsampling Instructions

Note: Because some target analytes may be stratified within the sample (e.g., AFFF-contaminated media, surfactants), or adhere to the walls of the sample container, subsampling may only be done on a project-specific basis. Subsampling has been shown to increase uncertainty in PFAS analysis, especially on foaming samples.

If a reduced sample size is required, transfer a weighed subsample using the following subsampling procedure to a 60-mL HDPE bottle and dilute to approximately 60 mL using reagent water. This container is now considered the "sample bottle."

1) Gently invert sample 3-4 times being careful to avoid foam formation and subsample immediately (do not let stand).
2) If foam forms and more than 5 mL is required – pour sample, avoiding any foam.
3) If foaming forms and a volume less than 5 mL is required – pipette from ½ cm below the foam.
4) If no foam forms – pour or pipette based on volume required.

Required Protocol for AFFF and FFF (F3) Concentrates

Samples composed of AFFF or F3 will be subsampled consistently, with approximately **0.02 g of AFFF/F3 material** aliquoted for each discrete sample preparation/analysis; each AFFF or F3 concentrate sample analyzed under DoD direction **must be prepared in duplicate**. After creating and documenting the subsample aliquot, add approximately 60 mL of reagent water, cap the vessel, and shake vigorously by hand for 20-30 seconds. After adding the reagent water and agitating, allow **at least 3 hours** for the subsample aliquot to fully dissolve in the water. If dissolution is incomplete after 3 hours, agitate again and wait another 3 hours; consider applying continuous agitation (orbital shaker) if full dissolution of the aliquot into water requires extended time. Following the extended dissolution time, prepared AFFF/F3 samples should be prepared and analyzed following the routine protocols for aqueous sample processing. Aqueous reporting limits (MDL/LOD/LOQ) will be used, with values adjusted to account for the actual sample aliquot, assuming 1 g/mL; this constitutes a 25,000X nominal adjustment factor for AFFF/F3 reporting limits, relative to nominal aqueous reporting limits.

Pace **STRONGLY DISCOURAGES** clients from sending AFFF concentrate material for analysis; this protocol is designed for "as-prepared" AFFF materials (i.e. pre-diluted to application concentration) and newer generation 'Fluorine Free Foam' (F3) concentrates. If F3 material (concentrate or as-prepared) or as-prepared AFFF material is received, follow the normal routines described in the first paragraph above. If an AFFF concentrate material (usually of a thick gel-like consistency) is received for analysis, the lab shall prepare a 3% (w/w) aqueous solution from the received sample (in the smallest volume feasible) prior to subsampling and diluting 0.02 g for extraction. Handling of AFFF concentrate should ideally be done in an isolated area outside of the PFAS processing area to prevent gross lab contamination. Following the two dilution steps, the nominal adjustment factor for AFFF concentrate material is 833,333X (8.33×10^5) relative to nominal aqueous reporting limits.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix F: MS/MSD, MS/DUP SAMPLE SELECTION PROTOCOL

Project-specific requirements may include that matrix spikes (MS), matrix spike duplicates (MSD), and/or laboratory duplicates (DUP) be prepared and analyzed with project samples. The client/field team should identify those samples which are designated for these additional QC procedures and provide additional sample material for them. In the event that samples are received for such a project without additional containers for MS/MSD/DUP, prep analysts will select samples to be used for this purpose following a hierarchy of preference, as defined below.

Note: Any kind of blank (Field Blank, Trip Blank, Equipment Blank, Rinsate Blank, etc.) will not be used for MS/MSD/DUP analysis.

1) First preference is to use client-designated samples as MS/MSD samples. This designation should show up on the prep worklist, in the comments. It is possible that SR will miss adding this comment to the sample, but this designation will be present in the COC from the client, on the right side of the COC under “Comments/Remarks/Cooler ID.” When a client designates a sample to be used for MS/MSD analysis, they will typically provide us with more than 2 bottles (often 4, sometimes as many as 6).

2) Lacking a client-designated MS/MSD sample, the next preference is to use any sample received with more than 2 bottles provided. If an analyst selects a set of samples for prep in which none of the samples are client-designated for MS/MSD, the analyst should check for any samples in the set that were received with 3 or more bottles. If there is a sample with 3 or more bottles, pull 3 of them and use one for the parent sample and spike the other two for analysis as MS/MSD samples.

3) Lacking any samples received with 3 or more bottles, the prep analyst must use two different parent samples to create an MS/DUP pair. Find two samples out of the set of samples selected for prep which were received with 2 bottles and pull both bottles for each sample. Pick one sample (pair of bottles) to be used for parent/MS prep and the other sample (pair of bottles) to be used for parent/DUP. The sample selected for parent/MS will have one bottle spiked with targets and one prepped as normal, with no added spiking. The bottle which is spiked should be identified in the LIMS as MS. The sample selected for parent/DUP will have both bottles prepared following normal procedures but one of the two should be identified in the LIMS as DUP.

4) If all samples in a particular prep batch were all received in just one bottle, analysis of an MS/MSD or MS/DUP pair will not be possible. This should be an uncommon occurrence, as prep analysts will attempt to adjust batching to ensure that every prep batch contains an MS/MSD or MS/DUP for projects which require the additional QC.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix G: Aqueous Sample Management Decision Guide

NOTE: No TSS pre-test will be performed on aqueous samples received for 1633 analysis.

Per Method 1633, Section 11.1.1.5, “laboratories may utilize other documented strategies for minimizing the disruptions due to SPE clogging and slow extractions.” Follow the guide below to evaluate aqueous sample matrices for solid material and determine the appropriate preparation approach; a matching decision tree is included at the end of this appendix.

If potential interferences other than settled solids are observed, take action to mitigate the impacts on data quality. Examples of other sample characteristics that could lead the lab to take precautionary measures with a field sample (i.e., prepare from reduced volume) include: presence of standing foam in the sample after shaking, thick/viscous matrix, collected from a known highly contaminated site/project, client notes indicating potential high concentrations, and knowledge of potential hazards to safety, equipment performance, or process integrity due to sample composition. Consider any visible indications of particulate matter including settled solids collected on the bottom of the container, cloudiness and/or dark color of the sample, suspended solids within the sample, increased viscosity, etc. If uncertain, seek a second opinion from another analyst, supervisor, or operations director; these matrix characteristics may require reduced-volume extraction. The lab will attempt to use the largest volume possible (i.e., the smallest reduction possible) when performing a reduced-volume extraction to manage challenging matrix characteristics, and no less than 1 mL of sample will be used in this case.

1) Allow samples to sit for at least 15 minutes to allow solids in the matrix to settle to the bottom of the container.

2) Visually inspect each sample for settled solids collected in the bottom of the container and follow the appropriate protocol based on observation:

    a. If no solids are observed in the bottom of the container, proceed to step 3.

    b. If solids are observed in the bottom of the container with an approximate depth <1/2 cm (<5 mm), proceed to step 5.

    c. If solids are observed in the bottom of the container with an approximate depth >1/2 cm (>5 mm), proceed to step 7.

    d. If solids observed in the container make up approximately 5% or more of the total sample volume, proceed to step 9.

No Settled Solids Observed:

3) Do not take any additional action to prepare for extraction and follow routine protocols.

4) If the SPE cartridge begins to clog during sample loading (see Identifying Cartridge Clogging section below), abandon loading of the remaining sample volume and proceed to the cartridge rinsing and drying described in step 10 of Section 9.3.4.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

a. Document the inability to load the entire sample volume due to cartridge clogging. If the resulting EIS recoveries are below the method acceptance ranges, this documentation provides the rationale for re-extraction from reduced volume.

b. The sample bottle rinse described in step 12 of Section 9.3.5 must be omitted; simply add the 5 mL of 1% methanolic ammonium hydroxide directly to the reservoir/cartridge.

c. If the cartridge clog prevents the cartridge rinses or elution solvent from passing through the cartridge, document that an extract could not be collected for that sample. Submit the sample for re-extraction from reduced volume. Notify the group leader and prep team of this necessity and, based on the total volume loaded in the first extraction attempt, provide a suggested reduction factor (i.e., reduce volume 5X, 10X, 20X, etc.).

Settled Solids Depth <1/2 cm Observed:

5) Do not take any additional action to prepare for extraction and follow routine protocols; however, be aware that there is a higher probability that the SPE cartridge will clog, and care must be taken in sample loading to attempt to pass the entire sample through the sorbent.

6) If the SPE cartridge begins to clog during sample loading (see Identifying Cartridge Clogging section below), abandon loading of the remaining sample volume and proceed to the cartridge rinsing and drying described in step 10 of Section 9.3.4.

a. The sample bottle rinse described in step 12 of Section 9.3.5 must be omitted; simply add the 5 mL of 1% methanolic ammonium hydroxide directly to the reservoir/cartridge.

b. Document the inability to load the entire sample volume due to cartridge clogging. If the resulting EIS recoveries are below the method acceptance ranges, this documentation provides the rationale for re-extraction following centrifugation; however,

c. If the cartridge clog prevents the cartridge rinses or elution solvent from passing through the cartridge, document that an extract could not be collected for that sample. Submit the sample for re-extraction with sample centrifugation (See Aqueous Sample Centrifugation Protocol in Appendix H). Notify the group leader and prep team of this necessity.

i. If, in the judgment of an experienced analyst, the nature of the solids present in the sample is of a nature that would preclude successful centrifugation and decantation, the decision should be confirmed with the group supervisor and/or another experienced analyst; once confirmed, the sample is submitted for re-extraction from reduced volume. Notify the group of this necessity and, based on the total volume loaded in the first extraction attempt, provide a suggested reduction factor (i.e., reduce volume 5X, 10X, 20X, etc.).

ii. If the centrifuged sample clogs the cartridge in the second extraction, see step 6 above; if there is sufficient sample remaining for another re-extraction, submit the sample for re-extraction from reduced volume as described in (i) above. If there is not sufficient sample remaining for another re-extraction, narrate any quality exceedances and report data for all runs.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Settled Solids Depth >1/2 cm Observed:

7) The sample will need to be centrifuged before performing SPE. Instead of following the routine sample extraction procedures, refer to Appendix H for the Aqueous Sample Centrifugation Protocol.

8) Document the decision to centrifuge the sample prior to SPE.

    a. If resulting EIS recoveries are below the method acceptance ranges, this documentation provides evidence that the results are impacted by matrix interference.

        i. Report the data with a narrative statement explaining that the results are matrix-impacted.

        ii. Alternately, submit the sample for re-extraction from reduced volume to attempt to provide data with compliant EIS recoveries.

    b. If the decanted sample clogs the SPE and prevents successful collection of the extract, document that detail and submit the sample for re-extraction from reduced volume. Notify the group of this necessity and, based on the total volume loaded in the first extraction attempt, provide a suggested reduction factor (i.e., reduce volume 5X, 10X, 20X, etc.) for the re-extraction.

Settled Solids Observed to be ≥ 5% of Total Volume:

9) Shake the sample to thoroughly homogenize it, then immediately subsample 1 mL into a pre-labeled 50mL centrifuge tube and add reagent water to approximately 40 mL. At 5% solids, a sample contains 50,000 mg/L, so 1 mL contains 50 mg of solid material.

10) Spike the diluted subsample with EIS as normal and proceed with extraction.

11) If the SPE cartridge begins to clog during sample loading (see Identifying Cartridge Clogging section below), abandon loading of the remaining sample volume and proceed to the cartridge rinsing and drying described in step 10 of Section 9.3.4.

    a. Document the inability to load the entire sample volume due to cartridge clogging.

    b. The sample bottle rinse described in step 12 of Section 9.3.5 must be omitted; simply add the 5 mL of 1% methanolic ammonium hydroxide directly to the reservoir/cartridge.

    c. If the cartridge clog prevents the cartridge rinses or elution solvent from passing through the cartridge, document that an extract could not be collected for that sample.

12) If the cartridge clogs during extraction and causes failing results, the lab will contact the client and notify them that sample extraction failed due to the nature of the matrix, and that they must decide between two options for reprocessing the sample:

    a. Apply biosolid matrix protocols, following Sections 9.3.6 through 9.3.8 of this SOP. Use 0.5 g of sample for extraction; do not submit for % solids analysis and report results as ng/g, on a wet weight basis.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

b. Attempt to separate and analyze the aqueous and solid phases separately. If the client selects this option, follow the protocol detailed in Appendix I.

Identifying Cartridge Clogging

During the loading phase of the SPE process, some samples may cause their cartridges to clog, preventing the entire sample from being loaded through, and sometimes preventing an extract from being collected. If you have a sample that slows down considerably during the loading process, you may need to abandon loading the remainder of the sample. The goal is to stop the process before the cartridge seizes up completely, so that a sample extract can still be collected from the cartridge.

When Clogs Start

Some of the first visual indications of a cartridge becoming clogged include: discoloration of the cartridge frit and/or sorbent bed, reduced drip rate of the sample through the cartridge, and coloration or sedimentation on the bottom of the reservoir.

When a cartridge starts to clog, it is important to stop the process before the cartridge seizes up completely. Take the actions listed below; an evaluation must be made to decide whether each cartridge can reasonably be used further without seizing up completely.

- Do not continue to add any more sample volume to the reservoir of the clogging cartridge.
- If there is substantial volume remaining in the reservoir (i.e., > 10 mL) and the cartridge is in apparent imminent danger of seizing completely, close the manifold port to stop sample loading. Carefully remove the cartridge-adaptor-reservoir assembly for the sample in question and pour whatever sample volume remains in the reservoir back into the original sample bottle. This volume will be included in the evaluation of extracted sample volume (initial volume).
- If the reservoir on the clogging cartridge empties before the other samples have finished loading, close the manifold port to prevent the cartridge from drying.
- If sample volume remains in any of the slowed cartridges after the loading of the other samples is finished, close all the manifold ports and focus pressure on the slowed cartridge in an attempt to load the volume remaining in the reservoir. (Do this one at a time for multiple clogs.) If the cartridge appears to be in imminent danger of seizing up completely, do not attempt to load the volume remaining in the reservoir; follow the steps in the second bullet of this section.

Abandoning Sample Loading

If the decision is made to abandon sample loading, take the following actions. Some of these are partial duplicates of the actions listed in the section above.

- If any sample remains in the reservoir, carefully remove the cartridge-adaptor-reservoir assembly for the sample in question and pour whatever sample volume remains in the reservoir back into the

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

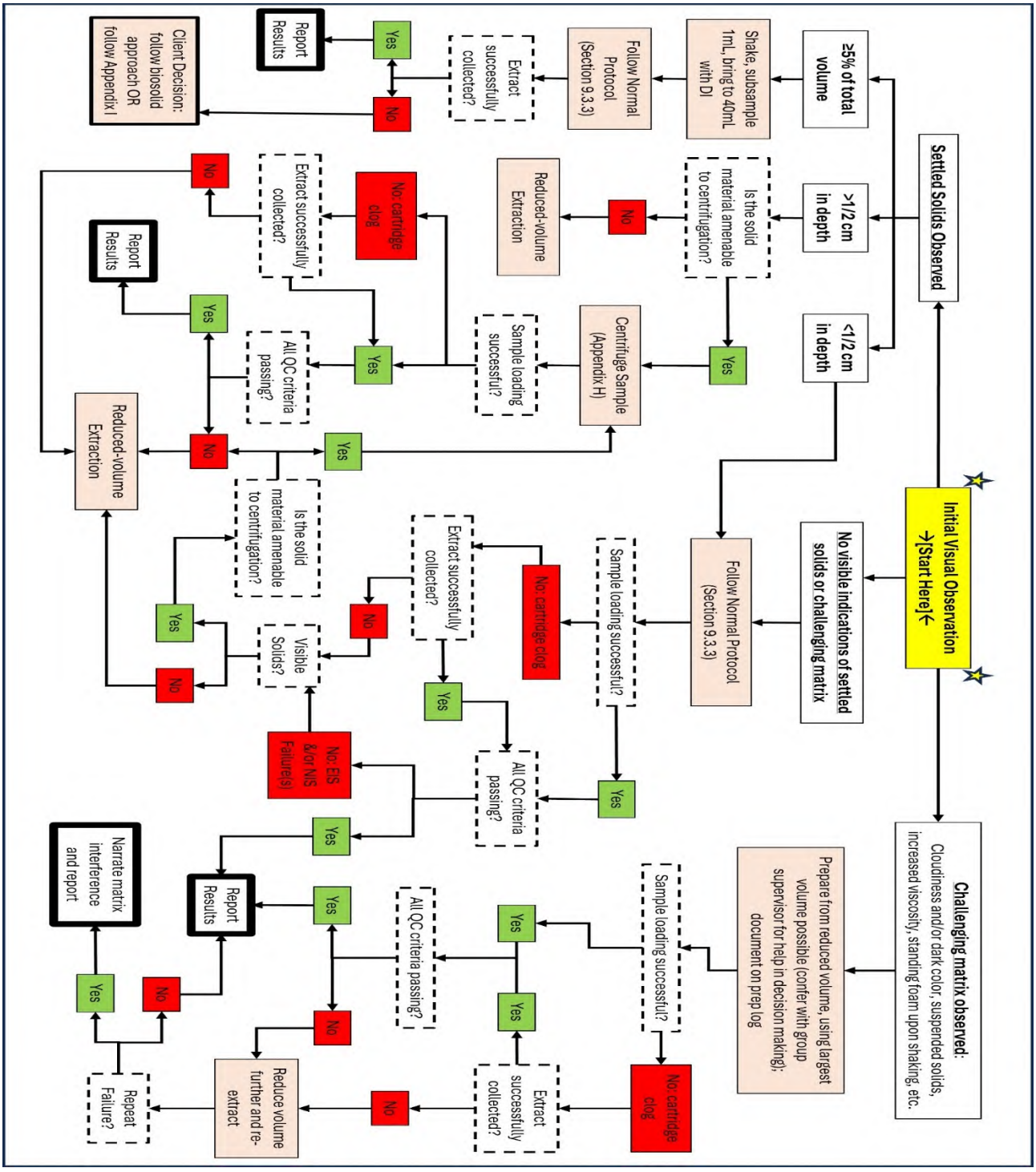
original sample bottle. This volume will be included in the evaluation of extracted sample volume (initial volume).

- Use the cartridge from the abandoned sample and finish the SPE process to collect what extract is available.
- The sample bottle rinse described in step 12 of Section 9.3.5 must be omitted; simply add the 5 mL of 1% methanolic ammonium hydroxide directly to the reservoir/cartridge.
- Weigh the sample in its original bottle to establish the “empty bottle” weight (aka post-extraction weight).

Fully Clogged Cartridges

Samples will have to be re-extracted when cartridges clog so fully that the extraction process cannot be taken to completion to collect a sample extract. Based on the total volume loaded in the failed extraction attempt, provide a suggested reduction factor for the re-extraction (i.e., reduce volume 5X, 10X, 20X, etc.) The sample should be shaken up before subsampling for the reduced volume re-extraction. However, for samples containing solids that are very fine and easily suspended, the analyst may consider allowing the sample to settle before subsampling an aliquot for reduced volume re-extraction; this may help prevent cartridge clogging in the re-extraction process.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.



The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix H: Aqueous Sample Centrifugation Protocol

Method 1633 states “laboratories may utilize other documented strategies for minimizing the disruptions due to SPE clogging and slow extractions,” and “a trained analyst should be able to distinguish samples with very low TSS and focus…on only those samples that might present a risk of clogging.” Therefore, whether an individual sample will require centrifugation for proper preparation will be determined and documented by the preparation analyst, following the guidance in Appendix G. Additionally, the method states “If centrifugation is used to prevent samples with high TSS from clogging the SPE, the EIS compounds must be spiked into the original sample container prior to centrifugation.” This protocol complies with that dictate.

1) Follow Appendix G to evaluate the sample for the presence of solids. Inspect the sample and consider the necessity of centrifuging.
2) If the sample is determined to require centrifugation/decantation, contemporaneously make a note on the prep batch log indicating this fact.
3) Spike samples requiring centrifugation in the same manner and with the same standard volume as samples which will not be centrifuged.
4) Label a 500mL conical centrifuge bottle with the sample ID for each sample that will be centrifuged. Set them in an appropriate rack with the caps removed.
5) Vigorously shake the spiked sample and then quickly pour it into the appropriately labeled centrifuge bottle. Try to ensure that the original sample bottle is devoid of any solid material after the transfer. Be careful to avoid spilling sample during the transfer process. Tightly cap each centrifuge bottle after transfers are complete.
6) Transfer capped centrifuge bottles to the centrifuge rotor, ensuring that the carousel is symmetrically balanced. Close the top and centrifuge at 3000 RPM (~2000 RCF) for 6 minutes.
7) Remove centrifuge bottles and decant the centrifuged liquid from the condensed solids by transferring it back into the original sample bottle. Try to avoid transferring any of the condensed solids from the centrifuge bottle back to the original sample bottle, while maximizing the amount of liquid collected in the sample bottle.
8) Weigh the full, decanted original sample bottle and document in the prep batch log.
9) Extract the decanted sample as normal alongside un-centrifuged samples, through the cartridge rinsing and drying (step 10 of Section 9.3.4).
10) When the SPE cartridges have been dried, rinse the original sample bottle following the protocol in step 12 of Section 9.3.5. Additionally, add 5mL of 1% methanolic ammonium hydroxide (1%-MeOH) to each centrifuge bottle to rinse the inside of them as well as the solids they contain. If the condensed solids become re-suspended while rinsing the bottles, centrifugation may be required. Using a transfer pipet or mechanical pipet, transfer the 1%-MeOH rinse from the centrifuge bottle into the reservoir/SPE cartridge and elute with the original sample bottle rinse into a 15mL conical centrifuge tube.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

11) Add 5 mL of additional 1%-MeOH directly to the SPE reservoir of all batch QC samples (MB/LCS/LLLCS) and elute with the normal bottle rinse. This is to match the volume used for elution of centrifuged field samples in the prep batch.

12) After elution, all sample extracts (client and QC) with additional elution volume shall be concentrated to ~3.5 mL and brought to a final volume of ~4 mL with 1%-MeOH. Concentrate each extract at approximately 55 ºC with N2 flow of approximately 1.2 L/min. Use a reference elution tube to reconstitute to the appropriate volume, like the protocol in step 8 of Section 9.3.6 of this SOP. This extract concentration and reconstitution must be done BEFORE adding acetic acid and NIS to the extracts, as directed in step 14 of Section 9.3.5.

13) Weigh the empty bottle with the cap on and subtract that from the weight of the bottle with sample, determined in step 8 of this appendix, to determine initial sample volume.

14) Add 25 µL of concentrated acetic acid and 20 µL of NIS mix to each sample extract in its collection tube and vortex to mix. Transfer a portion of each extract into an autosampler vial for LC-MS/MS analysis. Cap the collection tubes containing the remaining extracts and store at 0 - 6 °C.

15) Generate a narrative statement noting which samples in the prep batch included centrifugation in the extraction process. Include any additional observations and/or deficiencies that were noted during the centrifugation or extraction process, particularly if any issues were encountered during the sample loading step of the SPE process.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix I: Separation & Analysis of Liquid-Solid Biphasic Matrices

Method 1633 states “laboratories may utilize other documented strategies for minimizing the disruptions due to SPE clogging and slow extractions, including centrifuging the sample before adding the EIS and treating the supernatant aqueous phase and the solid phase as separate samples.” This will be done only according to client direction or project requirement; see Appendix G for more information regarding management of solids in aqueous samples.

1) If the client has requested to have the sample separated into aqueous and solid phases for analysis, the sample must be logged into the LIMS system separately for both matrices. The resulting solid phase will be reported on a wet weight basis and will not be analyzed for percent solids (aka percent moisture).

NOTE: The LOQ for the resulting solid analysis will depend on the amount of solid material available after decanting – the lab will use ~5 g of material if available, but any reduction in available solids will result in an increase in the reported LOQ.

2) Label a 500mL conical centrifuge bottle with the sample ID for each sample that will be centrifuged. Set them in an appropriate rack with the caps removed.

3) Vigorously shake the sample and then quickly pour it into the appropriately labeled centrifuge bottle. Try to ensure that the original sample bottle is devoid of any solid material after the transfer. Be careful to avoid spilling sample during the transfer process. Tightly cap each centrifuge bottle after transfers are complete.

4) Transfer capped centrifuge bottles to the centrifuge rotor, ensuring that the carousel is symmetrically balanced. Close the top and centrifuge at 3000 RPM (~2000 RCF) for 6 minutes.

5) Remove centrifuge bottles and decant the centrifuged liquid from the condensed solids by transferring it back into the original sample bottle. Try to avoid transferring any of the condensed solids from the centrifuge bottle back to the original sample bottle, while maximizing the amount of liquid collected in the sample bottle.

6) Weigh the full, decanted original sample bottle and document in the prep batch log.

7) Extract the decanted aqueous sample as normal alongside un-centrifuged samples, starting with EIS addition.

8) Label a 50 mL centrifuge tube with the sample ID for each solid phase sample generated from phase separation. Using a wooden tongue depressor or a pre-cleaned metal scoopula, transfer the solid material from the decanted 500 mL centrifuge bottle to the labeled 50 mL tube, targeting 5 g of total sample mass. Record the sample mass transferred to the 50 mL tube – this will be the extracted sample mass used for calculations and reporting. In many cases, re-extraction will not be possible due to limited solid material.

9) Spike the collected solid material with EIS and extract as normal alongside solid samples which were not generated from phase separation.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix J: TCLP/SPLP by 1633

Clients may submit samples (solid or aqueous) for PFAS following TCLP or SPLP procedures. For solid samples, the TCLP and SPLP procedures are used to simulate the leaching of environmental contaminants over extended periods of time from a solid material into the environment. A subsample of the client's sample is weighed out and combined with a leaching solution and mechanically tumbled for a set period. Each leachate prep method (TCLP: Method 1311 or SPLP: Method 1312) employs a unique leaching solution dictated by the parent methods. After the sample has been tumbled/leached by the Organic prep department, the leachate is filtered by the Organic Prep department and delivered to the PFAS sample holding area. The PFAS department is notified by email when the leachate solutions are ready for PFAS prep. The filtered leachate solutions are prepared by the PFAS prep analysts using the 1633 aqueous prep method, at a 1:5 dilution (100 mL of leachate solution).

1) Samples requested for PFAS by SPLP/TCLP analysis will be batched and leached by the normal SPLP/TCLP procedures used by the Westborough Alpha Organic Prep department. Organic Prep will be the initial responsible party for samples analyzed for PFAS by SPLP/TCLP.

2) When the leaching process is complete, Organic Prep will collect approximately 500mL (at minimum 100mL) of the leachate solutions in clean HDPE containers provided by the Emerging Contaminants department.

3) After collecting the leachate solution, an Organic Prep analyst will filter approximately 500 mL (at minimum 100mL) of each leachate solution using a Flipmate apparatus, using normal protocols for Flipmate filtration.

4) After filtering the leachates, the Organic Prep analyst will deliver the filtrates to the Sample management department for transport to the Emerging Contaminants Department (EC) at the Alpha Mansfield Facility. Leachates will be transferred to the EC department's designated sample storage refrigerator.

5) Samples to be analyzed for PFAS following TCLP/SPLP will appear on a separate PFAS prep worklist, the title of which will contain "SPLP" or "TCLP." From these worklists, PFAS analysts will select the samples to be extracted.

6) Pour ~100 mL of filtrate solution into a pre-labeled HDPE PFAS sample bottle, using the gradations marked on the bottle as a guide. Record the actual amount of filtrate by weighing the sample bottle. LOQs for samples prepared in this way will be ~5X higher than normal Aqueous matrix LOQs.

7) Following the instructions in step 7, use the leachate blank solution (typically has sample ID L0000000-01) to prepare three bottles for use as batch QC. Volume for the leachate blank, LLLCS, and LCS will be recorded as 100 mL.

8) Label and fill a clean 125 mL HDPE bottle with ~125 mL of pre-tested reagent water for use as a typical 1633 MB sample. Volume for the 1633 MB sample will be recorded as 100 mL.

9) After preparing the diluted filtrate, filtrate batch QC, and 1633 MB bottles, follow the normal extraction steps for aqueous matrices. Each sample will be spiked with EIS as normal. The filtrate

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

LLLCS and LCS will be spiked with target analytes according to the routine aqueous protocol for LLLCS and LCS target spiking.

10) Leachate batch QC (MB/LLLCS/MS/MSD) are documented in LIMS as leachate blank (MB), and LLLCS (LCS).

11) Following the SPE process, the instrumental analyst will analyze the extracts by the 1633 method, as normal.

12) After processing, reviewing, generating reports for the data, and importing the data into LIMS, the TCLP/SPLP tumble date must be input into the analytical results from the leachate logs.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix K: Surface Wipe PFAS Analysis by 1633

Clients may submit wipe samples for PFAS analysis by 1633; wipes can be used as a proxy measurement of surface contamination in production facilities, labs, etc. The lab provides sampling kits for users which consist of a 50 mL centrifuge tube paired with a packaged ghost wipe for each surface to be sampled (ghost wipes: Environmental Express Part# SC5000). The wipe is used to swab a defined area of the surface or item of interest and is placed in the accompanying centrifuge tube, which is then capped, labeled, and shipped back to the lab for preparation and analysis.

Used wipe samples are prepared directly in the container in which they are received, following the protocols for solid matrices described in Sections 9.3.6 through 9.3.8; analysis follows normal 1633 routines. No correction will be made for percent solids, and results are reported as ng/wipe.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix L: Articles of Commerce Analysis via Cryomill Processing

Clients may submit samples of various consumer product materials and 'articles of commerce' for analysis of PFAS contained in the products. To effectively mobilize any PFAS that may be present within the structure of the material, samples must be milled to a fine powder using a cryogenic mill (or Cryomill).

This appendix provides strategies for processing samples obtained from an article of commerce. Common techniques are covered for mechanical size reduction of articles and their sub-units or portions thereof prior to the determination of PFAS in the article or article components via extraction and quantitative analysis. Polymer powders, nanomaterials, fibers, pastes, fluorinated ionomers etc. may not require size reduction if they are known to be sufficiently homogenous and more than 95% of the material passes a 250 µm sieve. Examples of common articles requiring milling prior to extraction and analysis are compacted cakes, melt extruded pellets and molded articles, elastomers and agglomerates, coated wire, textiles, paper, leather, food, and LDPE and polypropylene.

The user shall elect to apply one or more of the approaches, or compendium of approaches, to create homogenous samples suitable for extraction and analysis. Selection of the appropriate technique(s) depends on the article. Alternative methods of mechanical sample preparation can be used, provided that the required particle size (avg. particle size approx. 100 µm) of the sample is achieved without contaminating or compromising the sample.

Sample Processing Equipment and Materials

The following sample processing equipment and materials are required, subject to the type of material being prepared. Conditions for cryogenic fine milling are provided for the Retsch CryoMill, however, alternative cryomilling equipment like the SPEX ® Freezer/Mill may be used for most products.

1) Scissors, heavy plate shears or RetschTM ZM 200 Grinding Mill (Centrifugal Mill) with 6 or 12 tooth stainless steel (SS) rotor and 1 mm stainless steel bottom sieve.
2) Retsch CryoMill (Ball Mill), with SS grinding cartridge and 25 mm grinding ball (50 mL grinding cartridge, 5 g fill), or equivalent cryogenic mill capable of grinding to approximately 100 µm particles.
3) Cleaning brushes (different sizes) and polishing cloths, or cotton balls/swabs
4) Liquid nitrogen (LN2)
5) High purity methanol and ASTM Type I water for cleaning mill parts
6) Ventilated hood, to minimize exposure to fine particles/dusts/aerosols and chemical vapors
7) Ventilated drying oven capable of > 200°C
8) Precision sieves and accessories, nickel mesh, 50 µm and 150 µm sizes

Manual Cutting

If possible, manual cutting with pre-cleaned shears or scissors is suitable for rough cutting and preparation of samples for further reduction by grinding, etc. Recommended maximum sample size is 10

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

x 10 mm but will depend on the specification of the equipment used in the subsequent preparation processes.

Fine Grinding by Cryomill

Fine grinding via cryomill is suitable for further mechanical breakdown of samples, grinding material to pieces ~100 µm in diameter. Be careful not to allow the LN2 to come into direct contact with the sample to prevent spattering and sample loss. Thorough cleaning of the mill components between samples is crucial to avoid cross-contamination; see steps 7-11 below for details.

Cryomilling will be performed using a Retsch CryoMill (ball mill) with automatic LN2 feed, as described below:

Sample Type[1]	Cycles	Preset	Frequency (Hz)	PCT (minutes)	MT (minutes)	ICT (minutes)
Elastomers (FKM, FFKM, FEPM, and agglomerates)	1	1	30	Auto	2	NA
Compacted Cake	5	NA	30	Auto	2	2
Melt Extruded Pellets and Molded Articles	7	2	30	Auto	4	2
Coated Wire	3	3	30	Auto	2	2
Textiles, Paper, Leather	3	4	25	10	2.5	0
Food (meat, cheese)	1	5	25	8	2	NA
LDPE and PP	2	6	25	10	2	2

[1] *In most applications, a feed mass of 5 g is used.*
PCT: Precooling time (automatic set)
MT: Milling time
ICT: In-between cooling time

1) In the case of FFKM compounds and articles, care must be taken to avoid excessive energy input as it may lead to cryo-mechanical degradation of the polymer and the creation of mechanoradicals, which can inflate the amount of target substance detected. Filling levels will impact the energy applied in the grinding process and can inflate test results as well.

2) In the case of cured FFKM elastomeric articles, pulverizing the product in a 2-roll mill as commonly used for compounding of elastomers can be an alternate sample preparation method to avoid or reduce the risk of mechanical degradation. Alternative methods for FFKM compounds and articles that do not require cryo-grinding are being investigated.

3) Cryogenically mill the sample powder and sweep out the milled material to collect all the powder. The collected plastic-based sample material should be precision sieved to obtain a sufficiently homogeneous portion of known particle size range of 50 µm to 150 µm, by first sieving material

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

through the 150 µm sieve, then the 50 µm sieve (keep contents captured on 50 µm sieve). Size range is 100 + 50 µm (i.e. ~ 100 µm).

4) The collected FKM-, FFKM- and FEPM-based samples are visually inspected for homogenous size, verification via light-scattering is beneficial. Sieving of the samples is not recommended due to materials' elastomeric nature and the potential for particles to re-agglomerate into larger segments over time.

NOTE: Freshly cryomilled samples should either be extracted ASAP (same day) OR placed under frozen conditions (-10° C) ASAP and held under frozen conditions until ready to extract.

5) Make sure to follow the User Manual for installing and removing the grinding jar. This includes the two lock rings on the left side of the mechanism.

    a. Make sure outer LOCK RINGS are loosened.

    b. Screw in the grinding jar (from the right side of the mechanism). Tighten with black plastic tightening aid.

    c. TIGHTEN TWO LOCK RINGS: Outside ring tightened first (hand-tighten only); inner ring tightened second (snug), using the tool.

    d. Perform grinding cycle.

    e. LOOSEN THOSE TWO LOCK RINGS: Inside ring loosened first, outer ring loosened second. To loosen either ring, the tool will be needed because of icing.

    f. Unscrew grinding jar.

    g. When cryomill is not in use, make sure to replace the cooling jacket seal.

6) For extraction of cryomilled materials, follow the solid matrix extraction protocol listed in Sections 9.3.6-9.3.8, using 2 g as the target sample mass instead of 5 g. Sample results will be reported as ng/g, with no moisture correction.

Cleaning Procedure for Mill Components

Thorough cleaning of the mill components between samples is crucial to avoid cross-contamination. The following cleaning procedure is recommended.

7) Remove residual polymer thoroughly with DI water and brush.

8) If necessary, wipe away last polymer residue with clean polish cloth or cotton ball/swab.

9) Rinse all parts with methanol, use an ultrasonic bath as needed.

10) Rinse all parts with DI Water, use an ultrasonic bath as needed.

11) Repeat steps 7-10 as needed.

Analysis and Holding Time

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Matrix	Routine Container	Minimum Sample Amount	Preservation	Holding Time
Fluoropolymers, molded articles, coated wire, pellets, or other Articles of Commerce[1]	Any container or packaging that does not contain PFAS. Target container is a 125 mL PFAS container; however, clients will often send in Ziploc bags or other packaging.	5 g (target weight for clients to send is 20 g).	Can be shipped at any temperature (being an Article of Commerce). Once received in the lab: <6°C (prior to cryomill) Once cryomilled: Frozen Extract storage: <6°C	Sample receipt (or dated collected)[2] to cryomill: 1 year From cryomilling to extraction: 14 days Once extracted: 30 days

[1] Almost any "solid" material is applicable to this approach, as long as it can be manually coarse cut to approximately 5-10 mm in size (half a pea). If the matrix is soft (e.g., gummy bear), a larger feed size can be used.

[2] Often clients do not include "date collected." If none provided, "date collected" becomes "date received."

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix M: Procedure for Total Oxidizable Precursors (TOP)

The following modifications to the referenced SOP are as follows:

Section 7: Water Bath – Capable of monitoring recording to .1 C maintaining 85 C.

Section 8.1: Sodium Hydroxide (NaOH, CAS#: 1310-73-2) – High purity, demonstrated to be free of analytes and interferences.

Potassium Persulfate ($K_2S_2O_8$, CAS#: 7727-21-1) - High purity, demonstrated to be free of analytes and interferences.

Hydrochloric Acid (HCl, CAS#: 7647-01-0) - High purity, demonstrated to be free of analytes and interferences.

Additional table to be added to Section 8

Table 1

Isotope Labeled Standard	Conc. Top Surr Stock (ng/mL)	Vol. of Top Surr Stock (µl)	Final Vol. of Top Surr PDS (mL)	Final Conc. of Top Surr PDS (ng/mL)
$^{13}C_2$-PFOA	50,000	40	4.0	500
$^{13}C_2D_4$-4:2FTS	50,000	80	4.0	1000

For Aqueous samples, prior to Section 10 of SOP 45852, add to each 125 ml sample with Potassium Persulfate until 60 mM (about 2 grams). Add Sodium Hydroxide until the sample is 125 mM (about .625 grams).

Sample should have a pH >12.

Fortify each sample with 20 µl of TOP pre-assay surrogate containing 1 negative control surrogates and 1 positive control surrogates from table 1.

Place sample in a water bath at 85 C for 6 hours.

Remove sample from water bath and adjust pH 6-8 with Hydrochloric Acid.

Following pre-treatment, follow the aqueous extraction protocol from section 10 of SOP 45852 unaltered.

Section 11, An additional calculation is added for the final reporting of the TOP assay results.

TOP Assay = Result of Post TOP assay extraction – Result of analysis from Pre-Top Assay extraction.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Pace ANALYTICAL SERVICES	**ENV-SOP-ELON-0060 v02_1,4-Dioxane EPA 8270E Sim**
	Effective Date: 08/27/2024

Management Approval:
Catherine Rouleau Approved on 8/23/2024 9:19:20 AM
Francis Derose Approved on 8/26/2024 11:16:21 AM
Tod Kopyscinski Approved on 8/26/2024 9:31:55 AM
Katherine Allen Approved on 8/27/2024 9:28:11 AM

©2019-2024, Pace® Analytical Services, LLC

1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the laboratory procedure used for the determination of low-level 1,4-Dioxane in ground water, surface water, and soils by GC/MS based on method EPA 8270E SIM.

1.1 Target Analyte List and Limits of Quantitation (LOQ)

The target analytes that can be determined by this SOP and the associated LOQ is provided below:

RL/LOQ for aqueous samples = 0.2 µg/L

RL/LOQ for soil/solid samples = 0.05 mg/kg

2.0 SUMMARY OF METHOD

For water samples, approximately one liter of sample is extracted with methylene chloride at a neutral pH using a separatory funnel (In accordance with SW-846 Method 3510C). For soil samples, 20 g of sample is weighed and extracted with a methylene chloride/acetone mixture in accordance with SW-846 method 3546. The methylene chloride extract is dried and concentrated to a volume of 1.0 mL and analyzed by GC/MS SIM using GC/MS equipped with an LVI/PTV (Large volume injection/programmable temperature vaporization inlet). Qualitative identification of the parameters in the extract is performed using the retention time and the relative abundance of three characteristic masses (m/z). Quantitation is accomplished by using the response of a major ion relative to an internal standard and a response factor generated from a minimum five-point calibration curve.

3.0 INTERFERENCES

Method interferences may be caused by contaminants in solvents, reagents, glassware, and other sample processing hardware that lead to discrete artifacts and or cause elevated baselines in the total ion current profiles.

Interferences by phthalate esters can pose a problem, usually the result of contamination during extraction. Avoiding the use of plastics in the laboratory can best minimize these interferences.

Matrix interferences may be caused by contaminants that are co-extracted from the sample.

It should be noted that there are some chromatographic consequences observed due to the acetone used in the extraction process. This is characterized by a shift in retention time for 1,4-Dioxane and the 1,4-Dioxane-d8 surrogate, as well as the presence of a large peak in all chromatograms.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

4.0 DEFINITIONS

Refer to the Laboratory Quality Manual for a glossary of common lab terms and definitions.

5.0 HEALTH AND SAFETY

Contact your supervisor or local safety coordinator with questions or concerns regarding safety protocol or safe handling procedures for this procedure

The following sections provide general health and safety information about chemicals and materials that may be present in the laboratory.

- The toxicity or carcinogenicity of each chemical material used in the laboratory has not been fully established. Each chemical should be regarded as a potential health hazard and exposure to these compounds should be as low as reasonably achievable.
- The laboratory maintains documentation of hazard assessments and OSHA regulations regarding the safe handling of the chemicals specified in each method. Safety data sheets for all hazardous chemicals are available to all personnel. Employees must abide by the health, safety and environmental (EHS) policies and procedures specified in this SOP and in the Pace® Chemical Hygiene / Safety Manual (COR-MAN-0001)
- Personal protective equipment (PPE) such as safety glasses, gloves, and a laboratory coat must be worn in designated areas and while handling samples and chemical materials to protect against physical contact with samples that contain potentially hazardous chemicals and exposure to chemical materials used in the procedure.
- Concentrated corrosives present additional hazards and are damaging to skin and mucus membranes. For procedures that require use of acids, use acids in a fume hood whenever possible with PPE designed for handing these materials. If eye or skin contact occurs, flush with large volumes of water. When working with acids, always add acid to water to prevent violent reactions. For procedures that that emit large volumes of solvents (evaporation/concentration processes), these activities must be performed in a fume hood or apparatus that reduces exposure.

6.0 .SAMPLE COLLECTION, PRESERVATION, HOLDING TIME & STORAGE

The laboratory provides containers for the collection of samples upon client request. Refer to laboratory SOP ENV-SOP-ELON-0017_Bottle Prep for procedures related to preparation of bottle kits for the test method(s) associated with this SOP.

The laboratory does not perform sample collection or field measurements for this test method. Samples should be collected in accordance with a sampling plan and sampling procedures appropriate to achieve the regulatory, scientific, and data quality objectives for the project.

Container Type, Minimum Sample Amount, Preservation, and Holding Time Requirements:

Matrix	Container Size & Type	Required Sample Amount[1]	Preservation	Holding Time
Water	1-Liter Amber with Teflon lined cap	1-Liter	Thermal: ≤6°C Chemical: If residual chlorine suspected, 80mg Sodium thiosulfate per 1-Liter.	Collection to Ext: 7 Days Ext to Analysis: 40 Days

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Soil	8 oz amber glass jar	8 oz	Thermal: ≤6°C	Collection to Ext: 14 Days Ext to Analysis: 40 Days

[1] *Amount of sample required for each discrete test.*

Thermal preservation is checked and recorded on receipt in accordance with laboratory SOP Login. Chemical preservation is checked and recorded at time of receipt or prior to sample preparation.

After receipt, samples are stored at ≤6°C until sample preparation. Prepared samples (extracts, digestates, distillates, other) are stored at ≤6°C until sample analysis.

After analysis, samples are retained as stated in the Pace® standard terms and conditions, unless otherwise specified in the analytical services contract. Samples are then disposed of in accordance with Federal, State, and Local regulations.

7.0 EQUIPMENT & SUPPLIES

7.1 Equipment

- HP7890GC/MS
- Enviroquant data system (HP ChemStation)

7.2 Supplies

- Capillary column: Restek Rtx-PCB; 60m, 0.25mm ID, 0.25 µm, cat # 13226
- Gas Tight syringes
- Vials: 2mL snap cap and crimp top, and 4mL screw cap vials

8.0 REAGENTS & STANDARDS

8.1 Reagents

- Reagent Water: interferent free
- Methylene Chloride: Pesticide quality or equivalent
- Methanol, Acetone: Pesticide quality or equivalent
- Nitrogen: Ultra high purity
- Helium: Ultra high purity

8.2 Standards

Note: All Standards must be stored in amber vials, for protection from light.

Note: All working standards have an expiration date of 6 months from when prepared or manufacturer's documented expiration date, whichever comes first.

Note: After opening Stock Standards, transfer the stock standard into vials with PTFE lined caps. Store protected from light at -10°C or less. Stock standard solutions should be checked frequently for signs

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

of degradation or evaporation and expire 1 year from open date unless manufacturer's documented expiration date comes first.

Note: All standards are purchase as certified solutions

- Surrogate Stock: 1,4-dioxane-d8 Standard, 2000 µg/mL in p&t methanol, 1.0 mL ampule; Restek cat# 30614
- **Surrogate Prep:**

Compound	Vendor	Volume	Final Volume (mL)	Final Concentration (µg/mL)
1,4-Dioxane-d8	Restek	500 µL	10 mL	100

  - Add 5.0 mL of Acetone to 10 mL volumetric flask.
  - Add 500 µL of 1,4-Dioxane-d8 at 2000 µg/mL
  - Bring up to final volume with Acetone.

- Spike Stock: 1,4-dioxane, 1000 µg/mL in MeCl2, Absolute #79216
- **Matrix Spike Prep**:

Compound	Vendor	Conc. (µg/mL)	Volume (mL)	Final Volume (mL)	Final Conc. (µg/mL)
1,4-Dioxane Spike Stock	Absolute	1,000	1.0	10.0 mL in acetone	100

  - Add 5.0 mL Acetone to 10 mL Volumetric flask
  - Add 1.0 mL 1,4-Dioxane spike stock @ 1000 µg/mL
  - Bring to volume with Acetone

- Internal Standard Stock: 1,4-dichlorobenzene-d4 @ 1000 µg/mL in Methanol, Absolute Standards Cat# 70118.
- **Internal Standard Prep**:

Compound	Vendor	Init. Conc. (µg/mL)	Volume or weight (mL or g)	Final Volume (mL)	Final Conc. (µg/mL)
1,4-dichlorobenzene-d4 I.S.	Absolute Standard	1,000	1.2mL	3.0 mL in MeCl2	400

Cal Std Level	Amount of 1,4-Dioxane-d8 Stock (mL)	Amount of I.S. 1,4-Dioxane-d8 mL)	Final Volume (mL)	Final Conc. I.S. (µg/mL)	Final Conc. 1,4-Dioxane-d8 (µg/mL)
1	0.01	0.125	5.0	1.0	0.2
2	0.05	0.125	5.0	1.0	1.0

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

3	0.125	0.125	5.0	1.0	2.5
4	0.25	0.125	5.0	1.0	5.0
5	0.025**	0.125	5.0	1.0	10
6	0.0625**	0.125	5.0	1.0	25
7	0.125**	0.125	5.0	1.0	50
8	0.25**	0.125	5.0	1.0	100

**Use 1,4-dioxane-d8@2000 µg/mL, not the intermediate stock @ 100 µg/mL

An internal standard is made from 1,4-dichlorobenzene-d4 and is added to all samples and QC. Add 5.0 µL of internal standard at 400 µg/mL to 200 µL of room temperature sample extract.

- Tuning standard: Semi-volatiles GC/MS Tuning Standard, 1000 µg/mL each in methylene chloride; Restek cat# 31615.
- **DFTPP Tuning Solution Prep:**

Compound	Initial Conc. (µg/mL)	Amount (mL)	Final Volume (mL)	Final Conc. (µg/mL)
Tuning Standard	1000	0.125	5.0 mL in $MeCl_2$	25.0

Prior to running an initial calibration, DFTPP Tuning solution must be injected and evaluated. It is up to the analyst's discretion to run a tune at times other than prior to an ICAL, however it is recommended to evaluate the overall performance of the system.

The DFTPP Tuning Solution consists of four compounds: DFTPP (Decafluorotriphenylphosphine), Benzidine, Pentachlorophenol, and DDT, and is purchased from Agilent.

- Calibration Stock – 1,4-Dioxane, 2000 µg/mL in MeCl2, Restek #31853

  Stock standards are purchased as certified solutions from Restek. They are used to prepare calibration standards, which are used to create the calibration curve.

- **Working Standard Stock Prep**:

Compound	Initial Conc. (µg/mL)	Amount (mL)	Final Volume (mL)	Final Conc. (µg/mL)
1,4-Dioxane	2000	0.25	5.0	100
1,4-Dioxane-d8	2000	0.25	5.0	100

Bring up to Final Volume of 5mL with Methylene Chloride.

Final Concentration = 100 µg/mL

- **Calibration Curve Prep** for 1,4-Dioxane with 1,4-Dioxane-d8 as internal standard:

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Cal Std Level	Amount of 1,4-Dioxane Stock (mL)	Amount of I.S. 1,4-Dioxane-d8 mL)	Final Volume (mL)	Final Conc. I.S. (µg/mL)	Final Conc. 1,4-Dioxane (µg/mL)
1	0.01	0.025	5.0	10	0.2
2	0.05	0.025	5.0	10	1.0
3	0.125	0.025	5.0	10	2.5
4	0.25	0.025	5.0	10	5.0
5	0.025**	0.025	5.0	10	10
6	0.0625**	0.025	5.0	10	25
7	0.125**	0.025	5.0	10	50
8	0.25**	0.025	5.0	10	100

**Use 1,4-Dioxane@2000 µg/mL, not intermediate stock @ 100 µg/mL

9.0 PROCEDURE

9.1 Extraction

- Water samples – Extract by method EPA 3510C. Refer to ENV-SOP-ELON-0005_3510C Water Extraction.
- Soil samples – Microwave extraction by method EPA 3546. Refer to ENV-SOP-ELON-0001_Microwave Extraction SW846 3546.

9.2 Analysis

9.2.1 Instrument Set Up

AGILENT TECHNOLOGIES – 7890 GC/MS

Column: RESTEK Rtx-PCB; 60m, 0.25mm ID, 0.25µm

Column flow: constant; 0.9 mL/min

Injection Temperature: 250°C

Transfer Line Temperature: 290°C

Injection Volume: 1.0 µL Splitless

Temperature Program:

35°C for 3 min.
Ramp @ 25°C/min to 200°C for 0 min.
Ramp @ 50°C/min to 300°C for 3.4 min.
Total run time: 15 min.

Purge Flow: 20 mL/min @ 2.0 min.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

9.2.2 DFTPP tuning

Prior to running an initial calibration, DFTPP Tuning solution must be injected and evaluated. It is recommended that DFTPP solutions are prepared at 50 ng/µL or less in methylene chloride. Alternate concentrations may be used so long as the total amount injected is 50 ng or less. It is up to the analyst's discretion to run a tune at times other than prior to an ICAL, however it is recommended to evaluate the overall performance of the system.

The DFTPP Tuning Solution consists of four compounds: DFTPP (Decafluorotriphenylphosphine), Benzidine, Pentachlorophenol, and DDT, and is purchased from Agilent.

The mass spectrum of DFTPP must meet the performance criteria established by the method (listed below). If it does not, analyst must retune the mass spectrometer and repeat the test until all criteria are achieved. Benzidine must also be evaluated for excessive tailing, and the tailing must be < 2. If this criterion is not met, instrument maintenance should be performed to correct.

The mass spectrum of DFTPP that is evaluated against the acceptance criteria is obtained in the following manner: Three scans (the peak apex and the scans immediately preceding and following the apex) are averaged, and a single scan no more than 20 scans prior to the DFTPP peak is subtracted. No part of the DFTPP peak itself may be background-subtracted.

MASS	M/Z ABUNDANCE CRITERIA
68	<2% of m/z 69
69	Present
70	<2% of m/z 69
197	<2% of m/z 198
198	Base peak or present
199	5-9% of m/z 198
365	>1% of base peak
441	<150% of m/z 443
442	Base peak or present
443	15-24% of m/z 442

9.2.3 Daily Maintenance

Maintenance may need to be performed to bring instrument back within calibration criteria or to satisfy mass ion abundance criteria. Daily maintenance includes replacement of the following: Injection liner, wool, inlet base seal and clipping head of guard column.

9.2.4 Initial Calibration

Initial calibration is performed before any samples are analyzed. A new initial calibration must be performed whenever the following corrective action or maintenance procedures are performed: Changing the electron multiplier or ion source chamber, column replacement, or if the calibration check standard criteria cannot be met.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

The initial calibration requires a minimum of five different concentrations of all target analytes and surrogates. The calibration standards routinely used in this method are listed in Section 8.2.

The low concentration initial calibration standard must be less than or equal to the reporting limit (RL). Target analytes detected in a sample at concentrations below the concentration of the lowest

initial calibration standard should not be reported as quantitative results. If reported, they must be qualified as estimates or "J" flags.

Initial Calibration requirements for samples run by Method 8270E protocols:

The % RSD for all target analytes over the working calibration range must be less than or equal to 20% for the average RRF or "r" > 0.99 to be used for subsequent quantitations. If any of the target compounds exceed the 20% RSD limit or when the compound is calibrated by linear regression where the correlation coefficient < 0.99 alternative (SEE EPA METHOD 8000D), cannot be achieved, the system is considered too reactive, and the calibration must be repeated.

In some cases, the detector response may not be linear because of the broad range of the standards. Data points for individual target analytes at either extreme end of the calibration range may be discarded and the %RSD recalculated. Discarding an individual point in the middle of the calibration range is not permitted. If the low concentration standard is discarded, the reporting limits must be adjusted so that the lowest standard used for the calibration is less than or equal to the reporting limit.

Note: No points may be dropped from the initial calibration curve for any surrogate compound.

If any initial calibration standard is determined to be unusable (e.g., bad injection), the standard in question may be rerun within eight (8) hours of the last initial calibration standard analyzed and before any samples are run. The rerun standard may be incorporated into the initial calibration in its entirety, replacing the original standard. If the initial calibration still does not meet acceptance criteria, even with the replacement standard, then the entire initial calibration should be performed again.

All changes made to the calibration curve are documented with the reason given for the change.

When the instrument data system is updated to reflect the new initial calibration, the analyst verifies that it has been properly set up to calculate each target analyte according to the actual model used to establish the initial calibration (i.e., average RRF or Linear Regression) and to reflect any abbreviated ranges established for individual analytes.

The initial calibration is verified by analyzing a secondary source (ICV)- (Same solution as the LCS source). The criteria are 70-130% recovery.

9.2.5 Continuing Calibration Verification (CCV)

The calibration relationship established during the Initial Calibration is verified at the beginning of analytical sequence.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

The analysis sequence is documented on an analysis run log maintained by the analyst.

At the start of each 12-hour analysis sequence, before any samples are analyzed, a mid-point calibration standard is analyzed to check the calibration curve.

Continuing Calibration requirements for samples run by Method 8270E protocols:

The percent difference or percent drift must be less than or equal to 20% for all target compounds

If the percent difference criteria are not met for any target analyte, then the analytical system should be evaluated for problems and corrective action taken as appropriate (change septa, check compressed gas cylinders, syringes, column fittings, etc., clean MS source, change the injector port or check filament, clean the inlet.)

If corrective action that may affect instrument response is taken, then the calibration check standard must be rerun before samples are analyzed. If the corrective actions do not resolve the problem(s) with the calibration check standard, then a new initial calibration must be performed.

Note: Additional Method 8270E Quality Assurance Requirements – Quantitation Check

When calculating the calibration curve using linear regression, a minimum quantitation check, on the viability of the lowest calibration point should be performed by re-fitting the response from the low concentration standard back into the curve (SEE METHOD 8000D). The recalculated concentration of the low calibration point should be within + 30% of the standards' true concentration. Analytes which do not meet the minimum quantitation calibration re-fitting criteria should be considered "out of control" and corrective action such as redefining the lower limit of quantitation and/or reporting those "out of control" target analytes as estimated.

Internal Standard (IS) retention times must be evaluated in the calibration check standard. The IS retention times should be within + 30 seconds of the retention times from the midpoint standard of the initial calibration. If the retention times shift more than 30 seconds, the system is inspected for malfunctions and corrections made as required. When corrections are made, a new calibration check standard is to be run.

I.S. areas must be evaluated in the calibration check standard. If the IS areas change by more than a factor of two (50-200%) from the areas in the midpoint standard of the most recently analyzed initial calibration, proceed as follows:

a. If I.S. is failing high, run the CCAL a 2nd time; (re-prep CCV) if results confirm, then the system needs to be inspected for malfunctions and corrections made as required. A new ICAL would need to be run.

b. If I.S. is failing low, adjust the tune and begin a new window with CCAL and blank; if maintenance and tune do not correct the failure, make corrective actions and re-calibrate.

If corrective action requires that the column be replaced, or that the electron multiplier or ion source be replaced, then performing a new initial calibration is automatically required.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

If two calibration check standards are run in succession, one immediately following the other, and neither is deemed to have a bad injection, then the one closest in injection time to the associated sample analysis, or both standards, must be evaluated for and pass method performance criteria for sample analyses to continue.

10.0 DATA ANALYSIS & CALCULATIONS

10.1 Qualitative Identification

Identify a sample component by comparison of its mass spectrum (after background subtraction) to a reference spectrum in the user-created database. The GC retention time of the sample component should be within three standard deviations of the mean retention time of the compound in the calibration mixture.

In general, all ions that are present above 10% relative abundance in the mass spectrum of the standard should be present in the mass spectrum of the sample component and should agree within absolute 20%. For example, if an ion has a

relative abundance of 30% in the standard spectrum, its abundance in the sample spectrum should be in the range of 10-50%. Some ions, particularly the molecular ion, are of special importance, and should be evaluated even if they are below 10% relative abundance.

Identification requires expert judgment when sample components are not resolved chromatographically and produce mass spectra containing ions contributed by more than one analyte. When GC peaks obviously represent more than one sample component. (i.e. broadened peak with shoulder(s) or valley between two or more maxima), appropriate analyte spectra and background spectra can be selected by examining plots of characteristic ions for tentatively identified components. When analytes co elute (i.e., only one GC peak is apparent), the identification criteria can be met but each analyte spectrum will contain extraneous ions contributed by the co eluting compound.

Because target organic compounds are relatively small molecules and produce comparatively simple mass spectra, this is not a significant problem for most method analytes.

Structural isomers that produce very similar mass spectra can be explicitly identified only if they have sufficiently different GC retention times. Acceptable resolution is achieved if the height of the valley between two peaks is less than 25% of the average height of the two peaks. Otherwise, structural isomers are identified as isomeric pairs.

All raw data must be properly identified with initials of the proper analyst and date analyzed.

10.1.1 Manual Integration

Manual integration is sometimes necessary to correct inaccurate automated integrations but must never be used to meet QC criteria or to substitute for proper instrument maintenance and/or method set-up. To assure that all manual integrations are justified and proper all manual integrations must be performed, documented, reviewed, and approved in accordance with corporate SOP ENV-SOP-CORQ-0006, *Manual Integration*

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

and Local SOP ENV-SOP-ELON-0058_Manual Integrations. Refer to these SOPs for guidance on manual integration techniques and required procedures.

When performing manual integration of any peak in a calibration standard, client sample, or quality control sample, the integration must be performed in conformance with the procedures outlined in the SOPs for Manual integration procedures.

In Summary:

The most appropriate instrument parameters should be used during method development to allow for automatic integration by the data system in most cases.

All data must be integrated consistently for all standards, samples, and QC samples.

In those instances, when the automated software does not integrate a peak correctly, manual integration may be used to correct the improper integration performed by the data system. Manual integration should always be performed to create the analyst's best estimate of the actual peak area discerned from the chromatogram.

All manual integrations must be documented by printing, initialing, and dating the before and after reports with manual integrations as well as by recording the reasons for the manual integrations.

To prevent overwriting manual integrations, the analyst should not re-quantitate calibration standard files.

A minimum signal to noise ratio of 3:1 (based on peak height) must be achieved for any peak used in a calibration standard, client sample, or quality control sample.

When preparing to establish a new initial calibration, to prevent carry-over of numbers from previous calibrations, the analyst should "Clear all response factors "(which is a function in the software) from old calibration curves prior to running the new curve.

10.2 SIM – Selective Ion Monitoring Mode

A GC/MS system is operated in the SIM mode to increase sensitivity. In the SIM mode, the mass spectrometer repeatedly scans a smaller number of pre-selected masses rather than the typical mass range (35 to 500 amu) utilized in the full scan mode. In the GC/MS SIM acquisition mode, the masses to be monitored are selected based on the mass spectra of compounds to be analyzed.

GC/MS SIM improves detection limits without compromising positive identification of analytes. Sample preparation, chromatographic conditions, analyte identification, analyte quantification are the same whether the GC/MS system is operated in the full scan or SIM Mode.

SIM Parameters:

SIM Group	Ions (m/z) / Dwell in Group
#1	43.0, 46.0, 64.0, 88.0, 96.0, 58.0
	115.0, 150.0, 152.0
#2	56.0, 82.0, 83.0, 111.0, 54.0

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

10.3 Calculations

10.3.1 Calculation #1

$$\frac{\text{Final Extract Volume}}{\text{Sample Volume Extracted (L)}} \text{ X Dilution Factor X Instrument Value (µg/mL) = µg/L}$$

10.3.2 Calculation #2

All calculations are based on the internal standard technique.

$$Cx = \frac{AxCis}{AisRRF}$$

Cx = Compound concentration = instrument value
Ax = Area of the characteristic ion for the compound to be measured, counts
Ais = Area of the characteristic ion for the specific internal standard, counts
Cis = Concentration of the internal standard spiking mixture, ppm
RRF = Relative Response Factor is the average Response factor for the compound from the initial calibration

- **Relative Retention Times (RRT)** Calculate the RRTs for each target compound over the initial calibration range using the following equation:

$$RRT = \frac{RTc}{RTis}$$

Where: RTc = Retention time of the target compound, seconds

Rtis = Retention time of the internal standard, seconds

- **Mean of the Relative Retention Times (RRT)** Calculate the mean of the relative retention times (RRT) for each target compound over the initial calibration range using the following equation:

$$\overline{RRT} = \sum_{i=1}^{n} \frac{RRT}{n}$$

Where:

$\overline{RRT}$ = Mean Relative Retention time for the target compound for each initial calibration standard

RRT = Relative Retention time for the target compound at each calibration level.

- **Mean Retention Times (RT)** Calculate the mean of the retention times (RT) for each internal standard over the initial calibration range using the following equation:

$$\overline{RT} = \sum_{i=1}^{n} \frac{RTi}{n}$$

Where:

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

$\overline{RT}$ = Mean retention time, seconds

RT = Retention time for the internal standard for each initial calibration standard, seconds

11.0 QUALITY CONTROL & METHOD PERFORMANCE

11.1 Quality Control

Prepare the following QC samples with each batch of samples. Refer to Appendix A for acceptance criteria and required corrective action(s).

QC Check	Acronym	Frequency
Method Blank	MB	1 per batch of 20 or fewer samples. If batch exceeds 20 samples, every 20 samples.
Laboratory Control Sample	LCS	1 per batch of 20 or fewer samples. If batch exceeds 20 samples, every 20 samples.
LCS Duplicate	LCSD	1 per batch of 20 or fewer samples. If batch exceeds 20 samples, every 20 samples.
Matrix Spike/Matrix Spike Duplicate	MS/MSD	1 per batch of 20 or fewer samples. If batch exceeds 20 samples, every 20 samples.
Surrogate	SSTD	Added to every QC and client sample
Internal Standards	ISTD	Added to every QC and client sample

11.2 Instrument QC

Perform the following checks to verify instrument performance. Refer to Appendix A for acceptance criteria and required corrective action.

Instrument Check	Acronym	Frequency
Tune (MS Only)		Analyzed prior to ICAL and analyst discretion
Initial Calibration Verification	ICV	Immediately after ICAL
Continuing Calibration Verification	CCV	At the start of each 12-hour window

11.3 Method Performance

11.3.1 Method Validation

Refer to corporate SOP ENV-SOP-CORQ-0011 for general requirements and procedures for method validation.

Establish detection limits (DL) and limits of quantitation (LOQ) at initial method set up and verify the DL and LOQ on an on-going basis thereafter. Refer to corporate policy and/or SOP for DL and LOQ requirements and procedures.

Method Detection Limit Studies (MDLs)

Initial MDLs are conducted when new methodology is being implemented. After an initial MDL is performed, on-going verifications are performed quarterly. Procedure is performed in accordance with 40CFR Part 136 Appendix B Rev2. Refer to ENV-MAN-ELON-0001 Quality Manual and ENV-SOP-ELON-0132 LOQ_LOD_MDL Determination.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

12.0 DATA REVIEW & CORRECTIVE ACTION

12.1 Data Review

The data review process of Pace® Analytical Services includes a series of checks performed at different stages of the process by different people to ensure that SOPs were followed, the analytical record is complete, and properly documented, QC criteria were met, proper corrective actions were taken for QC failure and other nonconformance(s), and test results are reported with proper qualification, when necessary.

The review and checks that are performed by the employee performing the task is called primary review.

All data and test results are also peer reviewed.

This process, known as secondary review is performed to verify SOPs were followed, that calibration, instrument performance, and QC criteria were met and/or proper corrective actions were taken, qualitative ID and quantitative measurement is accurate, all manual integrations are justified and documented, and approved in accordance with the Pace® Analytical Services SOP for manual integration, calculations are correct, the analytical record is complete and traceable, and that results are properly qualified.

Lastly, a third-level review, called a completeness check, is performed by reporting or project management staff to verify the test report is complete.

Refer to laboratory SOP ENV-SOP-ELON-0035_Data Review for specific instructions and requirements for each step of the data review process.

12.2 Corrective Action

Corrective action is required when QC or sample results are not within acceptance criteria.

Refer to Appendix A for a complete summary of QC, acceptance criteria, and recommended corrective actions for QC associated with this test method.

If corrective action is not taken or was not successful, the decision/outcome must be documented in the analytical record. The primary analyst has primary responsibility for taking corrective action when QA/QC criteria are not met. Secondary data reviewers must verify that appropriate action was taken and/or that results reported with QC failure are properly qualified.

Corrective action is also required when carryover is suspected and when results are over range.

Samples analyzed after a high concentration sample must be checked for carryover and reanalyzed if carryover is suspected. Carryover is usually indicated by low concentration detects of the analyte in successive samples analyzed after the high concentration sample.

Sample results at concentrations above the upper limit of quantitation must be diluted and reanalyzed. The result in the diluted samples should be within the upper half of the calibration range. Results less than the mid-range of the calibration indicate the sample was over diluted and analysis should be repeated with a lower level of dilution. If dilution is not performed, any result reported above the upper range is considered a qualitative measurement and must be qualified as an estimated value.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

13.0 POLLUTION PREVENTION & WASTE MANAGEMENT

Pace® proactively seeks ways to minimize waste generated during work processes. Some examples of pollution prevention include but are not limited to reduced solvent extraction, solvent capture, use of reusable cycletainers for solvent management, and real-time purchasing.

The EPA requires that laboratory waste management practices comply with all applicable federal and state laws and regulations. Excess reagents, samples, and method process wastes are characterized and disposed of in an acceptable manner in accordance with the Pace® Chemical Hygiene Plan / Safety Manual. Refer to this manual for these procedures.

14.0 MODIFICATIONS

The procedures in this SOP have not been modified from the reference test method(s) cited.

When applicable, comparability and/or equivalency studies necessary to validate the modification as required per corporate SOP ENV-SOP-CORQ-0011 are retained by local quality personnel for historical reference.

15.0RESPONSIBILITIES

- All employees of Pace® Analytical Services that perform any part this procedure in their work activities must have a signed Read and Acknowledgement Statement (R&A) in their training file for the version(s) of the SOP that were in effect during the time the employee performed the activity.
- Local quality personnel are responsible for tracking the currency of the R&A on this SOP for employees at the locations they are assigned to and for notifying the General Manager (GM), however named, when R&A are overdue or outstanding. The GM and the employee's direct supervisor are responsible for ensuring the employee completes the R&A assignments as required.
- The supervisors and managers of Pace® Analytical Services, however named, are responsible for training employees on the procedures in this SOP, implementing the SOP in the work area, and monitoring on-going adherence to the SOP the work area(s) they oversee.
- All employees of Pace® Analytical Services are responsible for following the procedures in this SOP. Unauthorized deviations or departures from this SOP are not allowed except with documented approval from the local Quality Manager and only when those deviations do not violate the Pace® Code of Ethics or Professional Conduct (COR-POL-0004) or associated policy and procedure(s). Hand-edits or manual change to the SOP are not permitted. If a change is desired or necessary, Pace® employees must follow the procedures for document revision specified in corporate SOPs ENV-SOP-CORQ-0015 *Document Managemen*t and ENV-SOP-CORQ-0016 *SOP for Creation of SOP and SWI*.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

- Local quality personnel are responsible for monitoring conformity to this SOP during routine internal audits of work areas that utilize this SOP and for communicating gaps and deviations found during monitoring to the work area supervisor, who is responsible for correction of the situation.

16.0 ATTACHMENTS

- Appendix A: QC Summary & Corrective Action Table

17.0 REFERENCES

- ENV-SOP-CORQ-0006, *Manual Integration*, current version.
- ENV-SOP-CORQ-0011, *Method Validation*, current version.
- ENV-SOP-CORQ-0015, *Document Management*, current version.
- ENV-SOP-CORQ-0016, *SOP for SOP and SWI,* current version.
- ENV-TMP-CORQ-0007, *Quality Manual Template*, current version.
- COR-POL-0004, *Code of Ethics and Professional Conduct*, current version.
- COR-MAN-001, *Pace® Safety Manua*l, current version.
- ENV-MAN-ELON-0001, *Quality Assurance Manual*, current version.
- SW-846 Method 8270E, Test Methods for Evaluating Solid Waste, "Semi-volatile Organic Compounds by Gas Chromatography/Mass Spectrometry", June 2018, Revision 6.
- Connecticut DEP, RCP, Quality Assurance and Quality Control Requirements, Semi-Volatile Organic Compounds by method 8270E, SW-846, Version 6, June 2018.
- Massachusetts DEP, "Quality Control Requirements and Performance Standards for the Analysis of Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) in Support of Response Actions under the Massachusetts Contingency Plan (MCP)", Revision 2, November 05, 2021.
- Connecticut DEP, RCP, Quality Assurance and Quality Control Requirements, Semi-Volatile Organic Compounds by method 8270, SW-846, Version 3, May 2024.
- USEPA – "Determinative Chromatographic Separations", SW846, 5th edition, March 2018, Method 8000D.
- Instrument Manuals, HP GCMS 5975.

18.0 REVISION HISTORY

Revisions Made from Prior Version

Section	Description of Change
3.0	Added Interference of Acetone.
6.0	Changed <4℃ to ≤6℃.
8.2	Changed Tune standard from Agilent to Restek.
11.3.1	Added MDL info and references.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

17.0	Added MCP and RCP references.

Document Succession: This version replaces the following documents:

Document Number & Version	Document Title	Effective Date:
ENV-SOP-ELON-0060	1,4-Dioxane 8270E Sim	7/27/2024

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix A: QC Summary and Corrective Action Table

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
ICAL	At instrument set up, after CCV failure	Must meet one of curve fit options presented in Section 9.2.4. For any curve fit other than Average RF (RSD), curve must also pass RSE test at the low and midpoint calibration standard.	Identify and correct source of problem, repeat	None. Do not proceed with analysis
ICV	After Each ICAL	All analytes must be within ± 30% of the true value. (%R)	Identify source of problem, re-analyze. If repeat failure, repeat ICAL. Analysis may proceed if it can be demonstrated that the ICV exceedance has no impact on analytical measurements. For example, the ICV %R is high, CCV is within criteria, and the analyte is not detected in sample(s).	Qualify analytes with ICV out of criteria.
CCV	Daily, at the start of each 12-hour sequence	All analytes within ± 20 % of the true value (%R)	See Section 9.2.5 for required corrective actions based on circumstance.	Qualify analytes with CCV out of of criteria.
Internal Standards	Every field sample, standard and QC sample	15-130%	Troubleshoot instrument performance. Reanalyze samples.	Qualify outages and explain in case narrative.
Surrogate	Every field sample, standard and QC sample	15-130%		
Method Blank	Every 20 samples or less	<RL		
LCS/LCSD	Every 20 samples or less	40-140%		
MS/MSD	Every 20 samples or less	30-140%		
Tune Standard	Prior to ICAL and analyst descretion	Meet criteria in section 9.2.2		

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Pace ANALYTICAL SERVICES	**ENV-SOP-ELON-0043 v04_IC EPA 300.0**
	Effective Date: 08/27/2024

Management Approval:
Irmarilis Santos Approved on 8/14/2024 7:20:11 AM
Francis Derose Approved on 8/26/2024 11:18:34 AM
Tod Kopyscinski Approved on 8/14/2024 3:34:58 PM
Katherine Allen Approved on 8/27/2024 9:22:08 AM

© 2019-2024, Pace® Analytical Services, LLC

1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the laboratory procedure used for the determination of Inorganic anions by Ion Chromatography (IC) and bases these documented procedures on those listed in method EPA 300.0. The matrices applicable to this method are as follows: Drinking water, surface water, mixed domestic and industrial wastewaters, groundwater, and reagent waters.

1.1 Target Analyte List and Limits of Quantitation (LOQ)

The target analytes that can be determined by this SOP and the associated LOQ is provided in Table 1, Appendix A.

2.0 SUMMARY OF METHOD

A 25µL volume of sample is introduced into an ion chromatograph (IC). The anions are measured using an Ion Chromatography System, comprised of a pump, sample injection valve, guard column, analytical column, suppressor device, conductivity detector, pressure transducer, and autosampler. This method is recommended for use by analysts experienced in the use of ion chromatography and in the interpretation of the resulting ion chromatograms.

3.0 INTERFERENCES

Method interference may be caused by contaminants in the reagent water, reagents, glassware, and other sample processing apparatus that lead to discrete artifacts or elevated baselines in an ion chromatogram. These interferences can lead to false positive results for the target analyte as well as reduced detection limits as a consequence of elevated baseline noise.

Interference can be caused by substances with retention times that are similar to and overlapping those of the analyte of interest. Large amounts of an analyte can interfere with the peak resolution of a closely eluting analyte. Sample dilution and/or fortification can be used to solve many interference problems associated with overlapping retention times. However, sample dilution will affect the RL values proportionally.

Any anion that is not retained by the column or only slightly retained will elute in the area of fluoride and interfere. Known coelution is caused by small organic anions. At concentrations of fluoride above 1.5mg/L, this interference may not be significant.

The quantitation of unretained peaks should be avoided, such as low molecular weight organic acids (formate, acetate, propionate etc.) which are conductive and coelute with or near fluoride and would bias the fluoride quantitation in some drinking waters and most wastewaters.

All reagent solutions (eluents, external water for ASRS suppressor, etc.) used by the

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

instrument and samples must be filtered through no larger than a 0.2µm nominal pore size membrane to remove particles and prevent damage to the instrument, columns, and flow systems ONLY IF NEEDED, WHERE SAMPLES HAVE PARTICLES LARGER THAN 0.2µm. This applies not only to field samples but also to the LCS, LCS DUP, and MS. The LCS samples function as controls and must be filtered to confirm no bias is attributable to the filtration. Filter the samples through a membrane with no larger than a 0.2µm nominal pore size. Syringe mounted, cartridge type, filters work well. Filters specifically designed for IC applications should be used.

Close attention should be given to the potential for carry over peaks from one analysis interfering with the proper detection of anions in a second, subsequent analysis. It is the responsibility of the user to confirm that no late eluting peaks have carried over into a subsequent analysis thereby compromising the integrity of the analytical results.

4.0 DEFINITIONS

Refer to the Laboratory Quality Manual for a glossary of common lab terms and definitions.

5.0 HEALTH AND SAFETY

Contact your supervisor or local safety coordinator with questions or concerns regarding safety protocol or safe handling procedures for this procedure

The following sections provide general health and safety information about chemicals and materials that may be present in the laboratory.

- The toxicity or carcinogenicity of each chemical material used in the laboratory has not been fully established. Each chemical should be regarded as a potential health hazard and exposure to these compounds should be as low as reasonably achievable.
- The laboratory maintains documentation of hazard assessments and OSHA regulations regarding the safe handling of the chemicals specified in each method. Safety data sheets for all hazardous chemicals are available to all personnel. Employees must abide by the health, safety and environmental (EHS) policies and procedures specified in this SOP and in the Pace® Chemical Hygiene / Safety Manual (COR-MAN-0001)
- Personal protective equipment (PPE) such as safety glasses, gloves, and a laboratory coat must be worn in designated areas and while handling samples and chemical materials to protect against physical contact with samples that contain potentially hazardous chemicals and exposure to chemical materials used in the procedure.
- Concentrated corrosives present additional hazards and are damaging to skin and mucus membranes. For procedures that require use of acids, use acids in a fume hood whenever possible with PPE designed for handing these materials. If eye or skin contact occurs, flush with large volumes of water. When working with acids, always add acid to water to prevent violent reactions. For procedures that that emit large volumes of solvents (evaporation/concentration processes), these activities must be performed in a fume hood or apparatus that reduces exposure.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

6.0 SAMPLE COLLECTION, PRESERVATION, HOLDING TIME & STORAGE

The laboratory provides containers for the collection of samples upon client request. Refer to laboratory SOP ENV-SOP-ELON-0017 *Bottle Prep* for procedures related to preparation of bottle kits for the test method(s) associated with this SOP.

The laboratory does not perform sample collection or field measurements for this test method. Samples should be collected in accordance with a sampling plan and sampling procedures appropriate to achieve the regulatory, scientific, and data quality objectives for the project.

Container Type, Minimum Sample Amount, Preservation, and Holding Time Requirements:

Matrix	Anion	Container Size & Type	Required Sample Amount[1]	Preservation	Holding Time
Water	Nitrate-N	Plastic or glass bottles	1.5mL	Thermal: ≤6°C	48 Hours
Water	Nitrate-N Chlorinated potable water samples only	Plastic or glass bottles	1.5mL	Thermal: ≤6°C	14 Days
Water	Nitrite-N	Plastic or glass bottles	1.5mL	Thermal: ≤6°C	48 Hours
Water	Fluoride	Plastic or glass bottles	1.5mL	Thermal: ≤6°C	28 Days
Water	Bromide	Plastic or glass bottles	1.5mL	Thermal: ≤6°C	28 Days
Water	Ortho Phosphate	Plastic or glass bottles	1.5mL	Thermal: ≤6°C	48 Hours
Water	Chloride	Plastic or glass bottles	1.5mL	Thermal: ≤6°C	28 Days
Water	Sulfate	Plastic or glass bottles	1.5mL	Thermal: ≤6°C	28 Days

[1] *Amount of sample required for each discrete test.*

Thermal preservation is checked and recorded on receipt in accordance with laboratory SOP ENV-SOP-ELON-0100 *Sample Log-in Procedures*. Chemical preservation is checked and recorded at time of receipt or prior to sample preparation.

After receipt, samples are stored at ≤6°C until sample preparation. Prepared samples (extracts, digestates, distillates, other) are stored at ≤6°C until sample analysis.

After analysis, samples are retained as stated in the Pace® standard terms and conditions, unless otherwise specified in the analytical services contract. Samples are then disposed of in accordance with Federal, State, and Local regulations.

7.0 EQUIPMENT & SUPPLIES

7.1 Equipment

- Ion Chromatograph -- Analytical system complete with ion chromatograph and all required accessories including analytical columns and detectors. Dionex Integrion HPIC.
- IC Software - Dionex Chromeleon, Chromatography Management System, v. 7.2.8
- Suppressor - Suppresses conductivity, ADRS® 600 (4 mm) RFIC, Dynamically Regenerated Suppressor (Dionex P/N 088666).
- Balance - analytical, capable of accurately weighing to the nearest 0.0001 g.
- Eppendorf Pipettes – Various sizes

7.2 Supplies

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

- Glassware - Class A volumetric flasks and pipettes.
- Eppendorf Pipette tips –Various sizes
- Anion guard column - IonPac AS18 Guard 4 x 30 mm (Dionex P/N 076035).
- Anion analytical column- IonPac AG18 Analytical 4 x 150 mm (Dionex P/N 076034).
- Dionex MFC 500 Column, P/N 079017. – Metals free
- 1.5 mL IC Vials with polypropylene caps and septa: Environmental Express or Thermo
- Particulate filters
    - 0.45 um IC Acrodisc syringe filters, 25 mm, specifically designed for IC applications (Restek – P/N 26145, Pall-Gelman IC Acrodisc, Supor (PES) membrane, PN 4585T, or equivalent).
- Luer-Lok Disposable Syringes - BD Syringe (or equivalent), 10 mL

8.0 REAGENTS & STANDARDS

8.1 Reagents

- Reagent water - Use MilliQ DI System-Type I.
- Eluent Generator Cartridge - EluGen Cartridge (EGC 500 KOH), Dionex P/N 075778

8.2 Standards

8.2.1 Primary Anion Stock Standard Solution:

1000µg/mL individual analytes from ABSOLUTE STANDARDS:

Anion	F	Cl	NO2	Br	SO4	NO3	PO4
PN	54102	54101	54104	54107	54106	54103	54105

Stored at 2-6°C. Note: this standard is used for CCV and Cal standards only

8.2.2 Anion Calibration Standards: Document prep in LIMS.

Calibration is performed volumetrically by serial dilution starting with the 5.0ug/mL concentration.

Note: Method EPA 300.0 states at least 3 calibration points and a blank are needed, however we analyze a 7-point calibration curve. See below. All dilutions are to be made in volumetric flasks using volumetric pipettes.

Note: All dilute working calibration standards are prepared fresh daily.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Calibration Standards

F	Cl	NO2	Br	SO4	NO3	PO4	Serial Dilute Volume	Fill to	Final Concentration
0	0	0	0	0	0	0	0	0	0 µg/mL
-	-	-	-	-	-	-	4mL from 0.25 µg/L	10mL	0.1 µg/mL
-	-	-	-	-	-	-	5mL from 0.5 µg/L	10mL	0.25 µg/mL
-	-	-	-	-	-	-	5mL from 1.0 µg/L	10mL	0.5 µg/mL
-	-	-	-	-	-	-	4mL from 2.5 µg/L	10mL	1.0 µg/mL
-	-	-	-	-	-	-	5mL from 5.0 µg/L	10mL	2.5 µg/mL
0.125mL	0.125mL	0.125mL	0.125mL	0.125mL	0.125mL	0.125mL	-	25mL	5.0 µg/mL
	1.25mL			1.25mL			-	25mL	50.0 µg/mL

8.2.3 CCV Preparation:

Expires 1 month after prepared. Store in fridge at ≤6°C. Document prep in LIMS.

Take 0.1mL of 1000µg/mL from ABSOLUTE STANDARDS Individual Ions: F, NO2, Br, NO¬3, PO4 and 1.0mL of 1000µg/mL from ABSOLUTE STANDARDS Individual Ions: Cl and SO4. Dilute to 100mLs with DI water. (1 and 10 µg/mL concentration)

8.2.4 Second Source Anion Stock Standard Solution:

Anion Mix (purchased from ABSOLUTE STANDARDS, p/n: 59142) at 10µg/mL for Fluoride, Nitrite, Bromide, Nitrate and Phosphate and 100µg/mL for Chloride and Sulfate.

Note: Ensure Second Source is a different lot than the Primary Calibration Standard.

8.2.5 ICV Preparation:

Prepared fresh daily. Document prep in LIMS. Prepare using DI water.

Take 1mL of second source anion std (p/n: 59142) and bring up to 10mL with DI water for a 1:10 dilution. This yields a concentration of 1 µg/mL for Fluoride, Nitrite, Bromide, Nitrate, and Phosphate and 10µg/mL for Sulfate and Chloride.

8.2.6 LCS and LCSD Preparation:

Prepared fresh daily. Document prep in LIMS. Prepare using DI water.

Take 1mL of second source anion std (p/n: 59142) and bring up to 10mL with DI water for a 1:10 dilution. This yields a concentration of 1 µg/mL for Fluoride, Nitrite, Bromide, Nitrate, and Phosphate and 10µg/mL for Sulfate and Chloride.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

8.2.7 Matrix Spike Preparation:

Document prep in LIMS on bench-sheet. Prepare MS using selected sample from bench-sheet. Spike with anion mix of known concentrations; prep a volume of 10mL and treat exactly as a sample.

Take 1mL of second source anion std (p/n: 59142) and bring up to 10mL with sample. This yields a concentration of 1µg/mL for Fluoride, Nitrite, Bromide, Nitrate, and Phosphate and 10µg/mL for Sulfate and Chloride.

9.0 PROCEDURE

9.1 Instrument Set-Up

9.1.1 Establish Ion Chromatographic Operating Procedures

Ion Chromatograph: Dionex Integrion
HP IC#1 – S/N 17110066 **HP IC #2** – S/N 19140120
Dionex AS-AP autosampler – S/N 19041884
Sample Loop: 25µL

Eluent: Multi-Step Gradient

Time (min)	Concentration
0	10 mM
6	15 mM
12	50 mM
13	50 mM
13	10 mM
20	10 mM

Eluent Flow: 1.00 mL/min
Cell Temperature: 35°C
Column Temperature: 30°C
Suppressor Current without Phosphate: 124 mA
Columns: Dionex AG18-Fast, 4 mm, AS18-Fast, 4 mm
Typical System Backpressure: ~2500 - 4000 psi
Detector - Suppressed conductivity, ADRS600 (4 mm), Electrolytically-regenerated suppressor (Dionex P/N 088666) and the AERS_4mm Suppressor is used.
Background Conductivity: ~.2 µS

9.1.2 AS-AP Automated Sampler Set-up

Vial Type: 1.5mL
Injection Type: Loop – 25µL (P/N 042857)
Injection Mode: Full Loop
Bleed: off
Injections per vial: 1
Operation: Local

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

9.2 Calibration

Demonstration and documentation of acceptable initial calibration is required prior to the IDC and before any samples are analyzed, and CCVs are required intermittently throughout analysis, to meet required QC performance criteria for method 300.0.

All Calibration curves must have a correlation coefficient of ≥0.995 and all points must back calculate ±10%. The low-level standard must be at the RL, or the curve must be re-run. The calibration must be analyzed at least semi-annually. See section 9.2.1.

Note: Method EPA 300.0 states at least 3 calibration points and a blank are needed, however we analyze a 7-point calibration curve along with a blank.

9.2.1 Linear Calibration Range (LCR)

Estimate the Linear Calibration Range (LCR), the LCR should cover the expected concentration range of the field samples. The LCR must be determined initially and verified every 6 months or whenever a significant change in instrument response is observed or expected. The initial demonstration of linearity must use sufficient standards to ensure that the resulting curve is linear. The verification of linearity must use a minimum of a blank and three standards. If any verification data exceeds the initial values by ±10%, linearity must be re-established. If any portion of the range is shown to be nonlinear, sufficient standards must be used to clearly define the nonlinear portion.

9.2.2 Initial Calibration Verification (ICV)

After establishing or re-establishing calibration curves, the accuracy of this calibration must be verified through the analysis of an ICV (secondary source, independent of the calibration curve). The ICV should be prepared at known concentrations. If the concentrations do not fall within ±10% of the stated true values, then the ICV must be run again. If the ICV still does not fall within stated true values re-prep the ICV and if it fails again an investigation is needed to find the cause of failure before continuing.

9.2.3 Continuing Calibration Verification (CCV)

For all determinations the laboratory must analyze the CCV (at a mid-range check standard) and a calibration blank at the beginning of every run, after every 10th sample, and at the end of the sample run. Analysis of the CCV immediately following instrument equilibration, must verify that the instrument is within ±10% of calibration. Subsequent analyses of the CCV must verify the calibration is still within ±10 %. If the calibration cannot be verified within the specified limits, reanalyze the CCV. If the second analysis of the CCV confirms calibration to be outside the limits, sample analysis must be discontinued, the cause determined and/or in the case of drift, the instrument recalibrated. All samples following the last acceptable CCV must be reanalyzed. The analysis data of the calibration blank and the CCV must be kept on file with the sample analyses data.

9.3 Analysis

9.3.1 Sample Prep:

A 1.5mL sample volume that is needed per sample (Note: if a sample dup is being done, (2) 1.5mL aliquots are needed).

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Samples or reagents that contain particles larger than 0.2µm should be filtered, by using a 0.2µm PES syringe filter to prevent damage to the valves and columns. Samples may also require additional filtration through a 0.45µm PES syringe filter and 0.45µm glass-fiber syringe filter.

NOTE: purge the syringe filter with about 1-2mL of sample - this is a discard volume.

9.3.2 Sample Analysis:

Set up the system and analyze per Appendix C of this SOP, Dionex ICS-2000, and Chromeleon manuals.

Example of sequence set-up below:

DI instrument equilibration blank
DI instrument equilibration blank
ICV (Only after Initial Calibration)
ICB (Only after initial Calibration)
CCV
CCB
Method Blank
LCS
LCS DUP
Sample
Sample DUP
MS
CCV
CCB

Note: The calibration curve is copied and pasted in the beginning of each sequence, so it is available in data packages.

Note: Reference table in Appendix B for method specifications, frequency, and acceptance criteria

10.0 DATA ANALYSIS & CALCULATIONS

10.1 Qualitative Identification

Calibration is based upon injected standards. Analyte concentrations for unknown samples are calculated from the respective regression equations.

Identify anions in the sample chromatogram by comparing the retention time of a suspect peaks within the retention time window to the actual retention time of a known analyte peak in a calibration standard.

The width of the retention time window used to make identifications should be based upon measurements of actual retention time variations of standards over the course of multiple days.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Three times the standard deviation of a retention time can be used to calculate a suggested window size for each anion. However, the experience of the analyst should weigh heavily in the interpretation of chromatograms.

Report only those values that fall between the reporting limit (lowest point of the calibration curve) and the highest calibration standards. Samples exceeding the highest calibration standard must be diluted and reanalyzed. Sample concentrations less than the reporting limit are reported as "ND" or if requested to be reported to the MDL will be qualified with a “J” flag.

If the resulting chromatogram fails to produce adequate resolution, or if identification of specific anions is questionable, fortify the sample with an appropriate amount of standard and reanalyze.

NOTE: Retention time is inversely proportional to concentration. Nitrate and sulfate exhibit the greatest amount of change, although all anions are affected to some degree. In some cases, this peak migration may produce poor resolution or identification.

Report results in mg/L.

Report NO2- as N

NO3- as N

Ortho-Phospate- as P

Report date and time of analysis in the LIMS system. Date and time are automatically recorded in the IC software.

10.1.1 Manual Integration

Manual integration is sometimes necessary to correct inaccurate automated integrations but must never be used to meet QC criteria or to substitute for proper instrument maintenance and/or method set-up. To assure that all manual integrations are justified and proper all manual integrations must be performed, documented, reviewed, and approved in accordance with corporate SOP ENV-SOP-CORQ-0006, *Manual Integration.* Refer to this SOP for guidance on manual integration techniques and required procedures.

10.2 Calculations

10.2.1 Relative Percent Difference (RPD)

RPD = (A – B)/C

Where:

A = sample result or duplicate result (whichever is larger)
B = sample result or duplicate result (whichever is smaller)
C = average of sample and duplicate results

10.2.2 Percent Recovery

%R = [(A – B)/C] x 100

Where:

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

A = matrix spike result
B = sample result
C = true value of spike

11.0 QUALITY CONTROL & METHOD PERFORMANCE

11.1 Quality Control

Prepare the following QC samples with each batch of samples. Refer to Appendix B for acceptance criteria and required corrective action(s).

QC Check	Acronym	Frequency
Method Blank	MB	1 per batch of 20 or fewer samples. If batch exceeds 20 samples, every 20 samples.
Laboratory Control Sample	LCS	1 per batch of 20 or fewer samples. If batch exceeds 20 samples, every 20 samples.
LCS Duplicate	LCSD	1 per batch of 20 or fewer samples. If batch exceeds 20 samples, every 20 samples.
Matrix Spike	MS	1 per batch of 10 or less samples.
Matrix Spike Duplicate	MSD	Client Request.
Sample Duplicate	SD	1 per batch of 10 or less samples.

11.1.1 Method Blank (MB)

Include MB with every analysis batch (up to 20 samples); Acceptance criteria <RL.

Note: If the MB = > RL re-analyze or recalibrate.

If the MB = > RL when samples are either ND or >10x the RL then use a narrative.

For NC samples the method blank must not exceed 50% of the reporting limit or as specified by the reference method.

11.1.2 Laboratory Control Sample (LCS) and LCSD

LCS & LCS DUP reflect achieved accuracy under ideal conditions for a methodology and analysis procedure.

Analyze an LCS and LCS DUP for each batch (up to 20 samples).

Control limits = 90-110%R

RPD= 20%

NOTE: The LCS and LCS DUP must pass acceptance criteria before any further analysis can take place. If either fails re-analyze or re-prep. If fails high and sample is ND, then narrate. If fails high or low with sample hits, then re-analyze or recalibrate.

11.1.3 Sample Duplicates

A separate 10mL aliquot of the sample.

Analyze on a 10% basis (1 per batch of 10 samples or less or 2 if the batch size is 11-20).

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

RPD = 20%; if fails criteria then narrate

11.1.4 Matrix Spikes (MS)

Must be fortified at no less than 4x the RL.

Analyze on a > 10% basis (one per batch of 10 or less samples or 2 if the batch size is 11-20) to assess accuracy by use of a calculated % recovery. Be sure to include a MS in all PT batches. An MSD is performed only upon client request.

Control Limits = 80-120%

If the recovery of any analyte falls outside the designated MS recovery range and the laboratory performance for that analyte is shown to be in control in the LCS and LCS DUP, the recovery problem encountered with the MS is judged to be either matrix or solution related, not system related.

11.2 Instrument QC

Perform the following checks to verify instrument performance. Refer to Appendix B for acceptance criteria and required corrective action.

Instrument Check	Acronym	Frequency
Initial Calibration Verification	ICV	Immediately following calibration
Initial Calibration Blank	ICB	Immediately following calibration
Continuing Calibration Verification	CCV	Analyzed at the beginning, after every 10 samples and at the end.
Continuing Calibration Blank	CCB	Analyzed at the beginning, after every 10 samples and at the end.

11.2.1 Calibration Blanks (CB/ICB/CCB)

Analyzed as part of the calibration curve to determine any bias associated with reagents.

It is also included with every analysis batch (up to 20 samples). Analyze prior to analyzing field samples: acceptance criteria <RL. For NC samples the blank must not exceed 50% of the reporting limit or as otherwise specified by the reference method.

11.3 Method Performance

11.3.1 Method Validation

Refer to corporate SOP ENV-SOP-CORQ-0011 for general requirements and procedures for method validation.

Establish detection limits (DL) and limits of quantitation (LOQ) at initial method set up and verify the DL and LOQ on an on-going basis thereafter. Refer to corporate policy and/or SOP for DL and LOQ requirements and procedures.

11.3.2 Method Detection Limit (MDL)

Initial MDLs are conducted when new methodology is being implemented. After an initial MDL is performed, on-going verifications are performed quarterly. Procedure is

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

performed in accordance with 40CFR Part 136 Appendix B Rev2. Refer to ENV-MAN-ELON-0001 *Quality Assurance Manual* and ENV-SOP-ELON-0132_*LOQ_LOD_MDL Determination*.

12.0 DATA REVIEW & CORRECTIVE ACTION

12.1 Data Review

The data review process of Pace® Analytical Services includes a series of checks performed at different stages of the process by different people to ensure that SOPs were followed, the analytical record is complete, and properly documented, QC criteria were met, proper corrective actions were taken for QC failure and other nonconformance(s), and test results are reported with proper qualification, when necessary.

The review and checks that are performed by the employee performing the task is called primary review.

All data and test results are also peer reviewed.

This process, known as secondary review is performed to verify SOPs were followed, that calibration, instrument performance, and QC criteria were met and/or proper corrective actions were taken, qualitative ID and quantitative measurement is accurate, all manual integrations are justified and documented, and approved in accordance with the Pace® Analytical Services SOP for manual integration, calculations are correct, the analytical record is complete and traceable, and that results are properly qualified.

Lastly, a third-level review, called a completeness check, is performed by reporting or project management staff to verify the test report is complete.

Refer to laboratory ENV-SOP-ELON-0035 *Data Revie*w for specific instructions and requirements for each step of the data review process.

12.2 Corrective Action

Corrective action is required when QC or sample results are not within acceptance criteria.

Refer to Appendix B for a complete summary of QC, acceptance criteria, and recommended corrective actions for QC associated with this test method.

If corrective action is not taken or was not successful, the decision/outcome must be documented in the analytical record. The primary analyst has primary responsibility for taking corrective action when QA/QC criteria are not met. Secondary data reviewers must verify that appropriate action was taken and/or that results reported with QC failure are properly qualified.

Corrective action is also required when carryover is suspected and when results are over range.

Samples analyzed after a high concentration sample must be checked for carryover and reanalyzed if carryover is suspected. Carryover is usually indicated by low concentration detects of the analyte in successive samples analyzed after the high concentration sample.

Sample results at concentrations above the upper limit of quantitation must be diluted and reanalyzed. The result in the diluted samples should be within the upper half of the calibration

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

range. Results less than the mid-range of the calibration indicate the sample was over diluted and analysis should be repeated with a lower level of dilution. If dilution is not performed, any result reported above the upper range is considered a qualitative measurement and must be qualified as an estimated value.

13.0 POLLUTION PREVENTION & WASTE MANAGEMENT

Pace® proactively seeks ways to minimize waste generated during work processes. Some examples of pollution prevention include but are not limited to reduced solvent extraction, solvent capture, use of reusable cycletainers for solvent management, and real-time purchasing.

The EPA requires that laboratory waste management practices comply with all applicable federal and state laws and regulations. Excess reagents, samples, and method process wastes are characterized and disposed of in an acceptable manner in accordance with the Pace® Chemical Hygiene Plan / Safety Manual. Refer to this manual for these procedures.

14.0 MODIFICATIONS

The procedures in this SOP have not been modified from the reference test method(s) cited.

15.0 RESPONSIBILITIES

- All employees of Pace® Analytical Services that perform any part this procedure in their work activities must have a signed Read and Acknowledgement Statement (R&A) in their training file for the version(s) of the SOP that were in effect during the time the employee performed the activity.
- Local quality personnel are responsible for tracking the currency of the R&A on this SOP for employees at the locations they are assigned to and for notifying the General Manager (GM), however named, when R&A are overdue or outstanding. The GM and the employee's direct supervisor are responsible for ensuring the employee completes the R&A assignments as required.
- The supervisors and managers of Pace® Analytical Services, however named, are responsible for training employees on the procedures in this SOP, implementing the SOP in the work area, and monitoring on-going adherence to the SOP the work area(s) they oversee.
- All employees of Pace® Analytical Services are responsible for following the procedures in this SOP. Unauthorized deviations or departures from this SOP are not allowed except with documented approval from the local Quality Manager and only when those deviations do not violate the Pace® Code of Ethics or Professional Conduct (COR-POL-0004) or associated policy and procedure(s). Hand-edits or manual change to the SOP are not permitted. If a change is desired or necessary, Pace® employees must follow the procedures for document revision specified in corporate SOPs ENV-SOP-CORQ-0015 *Document Managemen*t and ENV-SOP-CORQ-0016 *SOP for Creation of SOP and SWI*.
- Local quality personnel are responsible for monitoring conformity to this SOP during routine internal audits of work areas that utilize this SOP and for communicating gaps and deviations found during monitoring to the work area supervisor, who is responsible for correction of the situation.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

16.0 ATTACHMENTS

- Appendix A: Routine Analyte List and LOQ
- Appendix B: QC Summary & Corrective Action Table
- Appendix C: IC System Maintenance and Set-Up Guidance
- Appendix D: Prime IC Guidance Document

17.0 REFERENCES

- ENV-SOP-CORQ-0006, *Manual Integration*, current version.
- ENV-SOP-CORQ-0011, *Method Validation*, current version.
- ENV-SOP-CORQ-0015, *Document Management*, current version.
- ENV-SOP-CORQ-0016, *SOP for SOP and SWI,* current version.
- COR-POL-0004, *Code of Ethics and Professional Conduct*, current version.
- COR-MAN-001, *Pace® Safety Manua*l, current version.
- ENV-MAN-ELON-0001, *Quality Manual*, current version.
- USEPA “Methods for Determination of Inorganic Substances in Environmental Samples”, EPA 300.0 C ("Determination of Inorganic Anions by Ion Chromatography"), Rev. 2.1, August 1993.
- Instrument Manual, Thermo Scientific Dionex Integrion HPIC system operator’s manual, Rev. 4, August 2016.
- Operator’s Manual, Thermo Scientific Dionex AS-AP Autosampler Operators Manual, Rev. 7, September 2012.

18.0 REVISION HISTORY

Revisions Made from Prior Version:

Section	Description of Change
All	Fixed various typos and formatting issues throughout.
4.0	Removed definitions, all are found in Quality Manual
6.0	Changed 4℃ to ≤6℃.
7.2	Added 1.5ml vials and removed filters not used anymore.
8.2.2	Added more detail on ICAL standard prep.
9.1.1	Added AERS_4mm Suppressor.
9.3.2	Added note to copy and paste the ICAL into each sequence.
11.1, 11.1.4, & Appendix B	Added MSD performed only upon client request.
Appendix D	Changes to procedure.

Document Succession: This version replaces the following documents:

Document Number & Version	Document Title	Effective Date:

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix A: Target Analyte List and LOQ

Table 1: Standard Analyte List and LOQ

Analyte	CAS #	LOQ[1] Water (mg/L)
Nitrate-N	14797-55-8	0.1
Nitrite-N	14797-65-0	0.1
Fluoride	16984-48-8	0.1
Bromide	24959-67-9	0.5
Ortho Phosphate-P	9066-91-5	0.5
Chloride	16887-00-6	1.0
Sulfate	14808-79-8	1.0

[1] *Values as of effective date of this SOP. LOQ are subject to change, contact quality personnel for most current information.*

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix B: QC Summary and Corrective Action Table

QC Item	Frequency	Acceptance Criteria	Corrective Action	Qualification
ICAL	At instrument set up, after CCV failure – new ICAL every 6 months	Must meet the criteria presented in Section 9.2. R≥0.995 Back calculate cal points in curve At least 3 to be 90-110%	Identify and correct source of problem, repeat	None. Do not proceed with analysis
ICV	After Each ICAL	All analytes must be within ± 10% of the true value. (%R)	Identify source of problem, re-analyze. If repeat failure, repeat ICAL. Analysis may proceed if it can be demonstrated that the ICV exceedance has no impact on analytical measurements. For example, the ICV %R is high, CCV is within criteria, and the analyte is not detected in sample(s).	Qualify analytes with ICV out of criteria.
CCV	Daily, before sample analysis, after every 10, and at end of analytical window.	All analytes must be within ± 10 % of the true value. (%R)	See Section 9.2.3 for required corrective actions based on circumstance.	Qualify analytes with CCV out of of criteria.
Method Blank	1 per batch of 20 or less samples.	<RL NC samples = < ½ RL	See Section 11.3.5 for required corrective actions based on circumstance.	If samples are ND – Qualify
LCS/LCSD	1 per batch of 20 or less samples.	90-110% RPD = 20%	See Section 11.3.7 for required corrective actions based on circumstance.	Qualify analytes with LCS out of criteria.
MS	1 per batch of 10 or less samples. MSD performed only upon client request.	80-120%	See section 11.3.9 for more info. If fortified sample fails, the recovery criteria, but the CB, ICV, LCS, and CCVs are in control, the problem is a result of the matrix and not the IC system.	Qualify analytes with MS out of criteria.
Sample Duplicate	1 per batch of 10 or less samples	RPD = 20%	See section 11.3.8 for required corrective actions based on circumstance.	Qualify analytes with Sample Dup out of criteria

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix C: IC System Maintenance and Set-Up Guidance

Instrument Start-up:

- Fill Eluent reservoir with fresh DI water daily. Stop pump if it's idle before filling the Eluent Reservoir to prevent air from getting into the pump.
- Before turning on pump flow:
- Prime the pump heads by initiating a purge on the instrument panel. Turn valve ¼ turn and ensure no spike in the pressure. If valve is opened too much the system will get air introduced into lines.
- Once the priming has finished, close the purge valve.
- Turn on pump flow 1st to 1.0mL/min. Increase slowly in increments of 0.2mL/min.
    - Note: The system will automatically cease pump flow if the pressure remains below 200psi for more than 1 minute when not in Priming Mode. Keep an eye on the pressure to ensure the pressure gets to the appropriate level
- Turn on Eluent Generator
- Then turn on CR-TC & Suppressor last
- Verify that all instrument run conditions are correct for the Anion EPA 300.0 Method.
- Track and approve consumables. Make note of remaining life cycles of parts.
- Let the Integrion equilibrate properly (~1 hour, pending if it was in smart standby or not) and monitor the baseline, system pressure, and conductivity signal.
- Set-up run sequence in Chromeleon software and add to queue or start.

Instrument Method Set-up:

- Overview: Run Time = 20.000
- Pump:
    - Type = Isocratic
    - Column Flow Start = 1.000mL/min
    - Pressure Limits = Lower Limit: 200.0; Upper Limit: 5000.00
    - Solvents Name = %A
- Eluent Generator:
    - Cartridge Type = EGC 500 KOH *The serial number and expiration date will be grayed but automatically recognized once cartridge is connected.
    - Concentration Mode = Multi-Step Gradient
    - To set-up gradient click on Eluent Generator Concentration Gradient tab and ensure the table below is entered correctly.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

No	Time	Concentration (mM)	Curve
1	0.000	Run	
2	0.000	10.00	
3	6.000	15.00	
4	12.000	50.00	
5	13.000	50.00	
6	13.000	10.00	
7	20.000	10.00	
8	New Row		
9	20.000	Stop Run	

- CR-TC = On
- Sampler:
    - Injection Mode
        - Push Full
        - Loop Overfill: 5.000
        - Cycle Time: 0
    - General Settings:
        - Buffer Wash Factor: 2.000
        - Wash Volume: 250.0
        - Wash Speed: 19.2
        - Draw Speed: 9.4
        - Draw Delay: 2.0
        - Dispense Speed: 9.4
        - Dispense Delay: 2.0
        - Waste Speed: 19.2
        - Wash Dispense Speed: 20.0
        - Sample Height: 2.000
        - Injection Wash Property: Both
        - Dilution Mix Properties:
            - Draw Speed: 30.0
            - Dispense Speed: 60.0
            - Iterations: 3

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

- Options (CD: CDet):
  - Channels: Make sure to check off CD and CD_Total
  - Data Collection Rate: 5.0 Hz
  - Autozero: Yes
  - Rise Time: 0.5
  - Cell Temperature: On
    - Temp Comp: 1.7
    - Cell Temp: 35.0
- Suppressor Options:
  - Suppressor Type: ADRS_4mm at 1 mL/min Isocratic
  - Eluent Concentration: Hydroxide = 50.0
  - Current: Set at 124 mA
- Options (Integrion_Pump_ECD): Temperature Options
  - Column: Use
    - On; Temperature at 30.0
  - Compartment: Use
    - On; Temperature at 15.0
- System: Run time set at 20.000; Pump_1_Pressure checked off
- Startup: Ensure that all boxes are checked

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Appendix D: Prime IC Guidance

- First, check the pressure. If pressure is in the 3000s, IC is already running and does not need to be primed.
- Open Chromeleon (normally it is already open)
- On the bottom left, click “Instruments”
- Click the “Pump_ECD” tab
- In the “Pump_ECD” box, click “OFF”
- Once the pressure is under 100 PSI, you may open the top door on the physical IC.
- Inside, you will see a valve, turn the valve 1/4th of a turn, to open it.
- On the computer in the “Pump_ECD” section, press “PRIME”
- The instrument will prime for 5 minutes, make sure to check the line for any bubbles. After 5 minutes, if the line has bubbles, simply press “PRIME” again.
- After the instrument is primed and there are no bubbles in the line, close the valve and close the door.
- In the “Pump_ECD” section, press “ON**”**
- Set the pressure to 0.200
- Next, press the “ON” button in the three sections above the “Pump_ECD”. These sections are “EluentGenerator”, “CR_TC” and “Suppressor”
- Ensure that all lights are now green.
- Next the pressure needs to be brought up. In the “Pump_ECD” section, you will see “Flow”, the flow should be at 0.100[mL/min]. But it needs to be brought up to 1.000[mL/min]. Slowly bring the flow up. Click into the gray box and change the pressure to 0.300, 0.500, 0.700, 0.900 and finally 1.000 (hit enter after each change). This should be done in increments of 0.2mL/min one after another where pressure keeps rising, not settling at one point.
- Leave IC alone for 1 hour.

The distribution of printed or electronic copies of this document outside of the PAS electronic document management system (eDMS) is not controlled or tracked. PAS employees must ensure any copy used for daily work, if not accessed directly from PAS eDMS, is the current version of the document.

Determination of Volatile Organic Compounds in Air Using Specially-Prepared Canisters and Analyzed by GC/MS

References: **Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air - Second Edition.** U.S. Environmental Protection Agency. EPA/625/R-96/010b. Office of Research and Development National Risk Management Research Laboratory. Center for Environmental Research Information. Cincinnati, Ohio. January 1999.

Method TO-15: Determination of Volatile Organic Compounds (VOCs) In Air Collected In Specially-Prepared Canisters and Analyzed By Gas Chromatography Mass Spectrometry (GC/MS). U.S. Environmental Protection Agency. EPA/625/R-96/010b. Office of Research and Development National Risk Management Research Laboratory. Center for Environmental Research Information. Cincinnati, Ohio. January 1999.

1. Scope and Application

Matrices: Ambient Air, Soil Gas, Soil Vapor

Definitions: Refer to Section 16 and Alpha Analytical Quality Systems Manual

This SOP describes the procedure for the analysis of volatile organic compounds (VOCS) in ambient air. The whole air samples are collected in fused-silica lined (FSL) stainless steel canisters, or Tedlar® bags. The VOCs are subsequently separated by gas chromatography (GC) and measured by mass selective detector (MSD).

The organic compounds that are amenable to this method are listed in Table 9. Other compounds may also be amenable provided they meet the QA/QC requirements of the method.

The data report packages present the documentation of any method modification related to the samples tested. Depending upon the nature of the modification and the extent of intended use, the laboratory may be required to demonstrate that the modifications will produce equivalent results for the matrix. Approval of all method modifications is by one or more of the following laboratory personnel before performing the modification: Area Supervisor, Department Supervisor, Laboratory Director, or Quality Assurance Officer.

This method is restricted to use by or under the supervision of analysts experienced in the operation of the GC/MS and in the interpretation of GC/MS data. Each analyst must demonstrate the ability to generate acceptable results with this method by performing an initial demonstration of capability.

This SOP contains addendums for various state-specific requirements. The criteria in these addenda (Addendum C-F) must be adhered to for projects conducted under the state programs.

2. Summary of Method

Samples are collected in precleaned, evacuated FSL canisters or Tedlar® bags.

Samples are pre-concentrated using the Entech 7200 or 7200A Cryogenic Concentrator. A specified volume of sample is pulled using a vacuum pump through a mass flow controller. The sample is cryogenically concentrated to a volume of less than one mL on a Tenax® trap.

Following pre-concentration, the sample is refocused on the GC transfer line. This step further reduces the sample volume to less than one microliter for injection.

The sample is then injected into the GC, which is used to separate the compounds of interest. All compounds are detected using an MSD.

2.1 Method Modifications from Reference

Initial Calibration modifications: If a target analyte cannot meet the %RSD criteria for relative response factor calibration, then linear regression may be used. A minimum of five calibration points must be incorporated and a correlation coefficient of 0.995 or greater must be achieved. The calibration plot must be printed and approval by a supervisor must be obtained prior to calibration acceptance. If any compound is calibrated using linear regression then after the ICV and prior to any sample analysis, a low point standard must be analyzed to confirm there is no bias resulting from the linear regression calibration used. Recovery of the low point standard must be 60-140% using the linear regression curve.

Continuing calibration and laboratory controlled spike (LCS) modifications: The recoveries of all analytes must be within 70% to 130% of the true value. If more than 10% of the compounds fail these criteria, or if one compound has a recovery less than 50% or greater than 150% the LCS must be re-analyzed. If failure occurs a second time, the instrument must be re-calibrated. Recoveries greater than 150% may be acceptable, provided analytes are not detected in the samples.

Initial Calibration Verification modification: Two analytes are allowed to be greater than 30% RSD, but less than 40%.

Sample Duplicate modifications: Up to 10% of the target analyte detections may exceed acceptance criteria. If more variation occurs, the sample analysis must be repeated. If an analyte detected in one of the analysis at >5x the reporting limit, and not detected in the duplicate analysis, the analysis must be repeated. If an analyte is detected in one analysis at <5x the reporting limit and not detected in the duplicate analysis, the RPD is not calculable (NC) and the analysis does not have to be repeated. If an analyte is not detected in both the original and duplicate analysis, the RPD is NC.

Section 8.4.1.2 of the TO-15 method requires all canisters to be leak checked for a period of 24 hr via pressurization of the canister. The laboratory conducts the leak check by measuring the vacuum of the canister after a minimum of a 24 hr. period has elapsed, not by pressurizing the canister as per the method.

The % RSD for any analyte must be < 30%, as outlined in Section 10.2.2.7 of this SOP.

Humidified nitrogen is used in place of zero air due to the frequency of detection of VOCs in zero air, particularly at SIM detection limits.

There is no NIST-traceable second source standard currently available for the analytes listed in Table 1, Table 3B, and Table A-7.

3. Reporting Limits

Table 9 lists target analytes and Reported Detection Limit information.

4. Interferences

4.1 Contamination may occur in the sampling system if canisters are not properly cleaned before use. Additionally, all other sampling equipment (e.g., pump and flow controllers)

must be thoroughly cleaned to ensure that the filling apparatus will not contaminate samples.

4.2 System carryover can be a potential problem, particularly for the heavier molecular weight hydrocarbons. Carryover can occur after the analysis of standards or high-level samples. Measures that must be taken to remove this contamination can include the analysis of multiple blanks, lab air, and the purging of the autosampler with nitrogen.

4.3 High moisture content, methane levels and/or carbon dioxide levels may interfere with the chromatography and trapping of target analytes. Dilutions may be performed on these samples; however, the reporting limits will then be elevated.

5. Health and Safety

The toxicity or carcinogenicity of each reagent and standard used in this method is not fully established; however, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. A reference file of material safety data sheets is available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available in the Chemical Hygiene Plan.

All personnel handling environmental samples known to contain or to have been in contact with municipal waste must follow safety practices for handling known disease causative agents.

All employees performing laboratory procedures must have read and understood the Alpha Analytical Chemical Hygiene Plan. All laboratory procedures must be performed in accordance with the provisions and policies of the manual. All accidents, injuries, spills, or unsafe conditions must be reported immediately to the laboratory manager, and such occurrences must be thoroughly documented.

The analyst must wear a lab coat, gloves, and safety glasses while preparing solutions or handling samples.

Preparation of liquid standards must be performed under a properly functioning fume hood. Preparation and venting of gaseous standards must also be performed under a properly functioning fume hood.

6. Sample Collection, Preservation, Shipping and Handling

6.1 Sample Collection

6.1.1 FSL canister samples can be collected as grab samples or as time-integrated samples. Time-integrated samples can be collected for a maximum of 12 hours using 2.7-liter canisters, or a maximum of 24 hours to 7 days using 6-liter canisters. One liter canisters are typically used for soil vapor sampling with a sampling flowrate of 100-200 ml/min.

6.1.1.1 Grab samples are collected by opening the canister valve and allowing the canister to fill to ambient pressure. This process takes approximately one minute.

6.1.1.2 Time-integrated samples require the use of a properly calibrated flow controller. The flow controller, if provided by Alpha, is calibrated prior to

sample collection and is documented in the Alpha ACS LIMs (Refer to Alpha SOP # 2190 for Canister and Flow Controller Preparation).

6.1.2 Tedlar® bag samples typically can be collected as grab or composite samples and may require a pumping system or evacuated box.

6.1.3 Upon receipt at the laboratory, all samples are assigned unique laboratory identification numbers, checked for possible discrepancies, etc. (See SOP # 1559.)

6.2 Sample Preservation

Canisters-None. Tedlar® bags-should be protected from light.

6.3 Sample Shipping

All samples must be accompanied by a chain of custody form, which documents the date, and time of sample collection.

6.4 Sample Handling

The pressure of all FSL canister samples is measured upon receipt at the laboratory and documented in the ACS LIMs (See Alpha SOP #2190). A pressure gauge is attached to the canister inlet, the canister valve is briefly opened and the pressure is recorded. The gauge apparatus used to measure ambient air samples must be separate from that used to measure soil vapor or other matrices known to have elevated levels of VOCs to avoid cross-contamination.

Samples with pressures greater than -15 inches Hg are considered acceptable for analysis.

Samples with less than -15 inches Hg should be pressurized to > -15 inches Hg in order for the concentrator system to accurately draw the correct volume, resulting in a dilution of the sample. For ambient air samples, the client must be notified prior to sample analysis since this dilution may cause reporting limits to be elevated above project action levels.

Any samples that undergo pressurization prior to analysis are documented in the instrument software. Refer to Section 10.3.3.6 for the calculation of dilution factors due to pressurization of samples.

Refer to SOP # 1559 for Sample Management information.

FSL canister and Tedlar® bag samples are stored in the Volatiles Laboratory until analysis has been completed. Tedlar® bag samples are stored in opaque containers.

The recommended holding time for the analysis of FSL canister samples for TO-15 is 30 days from date of collection. The recommended holding time for the analysis of Tedlar® bag samples for TO-15 is 48-72 hours from date of collection. Tedlar® bag samples requiring TO-15 analysis may be transferred into canisters upon receipt at the laboratory in order to extend the holding time of the sample to 30 days.

Samples designated by client to be held for subsequent analyses or are “on hold” are to be kept in a designated area in the laboratory. “Hold” samples are discarded upon client authorization or after holding time expiration date.

7. Equipment and Supplies

7.1 Microliter syringes: 10, 25,and 500 µL

7.2 Gas tight syringes: 1 mL, 5 mL, 25 mL, 50 mL, and 100 mL

7.3 FSL canisters: 1.0, 2.7, 6.0 and 15 Liter

7.4 Tedlar® bags: Various sizes. Alpha supplies 5-Liter sizes. All bags must have polypropylene fittings which are recommended for the analysis of Sulfides and Mercaptans (see App. A).

7.5 Stop watch

7.6 Sample Concentrator

7.6.1 The concentrator system consists of two separate pieces of equipment: (1) Entech Model 7016D VOC Autosampler, and (2) Entech Model 7200 or 7200A Cryogenic Concentrator using liquid nitrogen.

7.6.2 A vacuum pump (Vaccubrand Model ME2 or similar) delivers the sample from the autosampler to the cryogenic concentrator FSL-lined steel tubing.

7.7 Gas Chromatograph System

7.7.1 Gas chromatograph - Shimadzu 2010, 2030

7.7.2 Chromatographic column: Restek RTX-1; 60 meters, 0.25 mm or 0.32 mm ID, 1 micron film thickness

7.7.3 Transfer line from column to GC injection port: Hydroguard ™ 0.32 mm capillary tubing connected to column with Restek Vu-Union connector.

7.8 Mass Spectrometer System

7.8.1 Mass spectrometer - Shimadzu 2010, 2020

7.8.2 The mass spectrometer must be capable of scanning from 29 to 270 amu every 3 seconds or less, utilizing 70 volts (nominal) electron energy in the electron impact ionization mode and producing a mass spectrum that meets all the criteria in Table 5 when 50 ng of 4- bromofluorobenzene is injected. For SIM (selective ion monitoring) analysis, the system must be capable of simultaneous SIM/full scan acquisition.

7.8.3 Data System - Shimadzu GC/MS Solutions software for data acquisition and Agilent Enviroquant version E.02.00 for data processing.

7.9 Dilution Systems

7.9.1 Entech 4600A Dynamic Dilution System- for performing sample dilutions in canisters and Entech 4700 Precision Diluter preparing calibration standards in canisters. .

7.10 Primary flow measurement device: BIOS Cell Defender 510 or equivalent

8. Reagents and Standards

8.1 DI Water or Carbon-filtered tap water

8.2 High purity purge and trap grade methanol (Fisher part # A453-1 or equivalent) for MS source cleaning

8.3 Ultra high purity (UHP) helium for the GC/MS system

8.4 Ultra high purity (UHP) nitrogen for standard preparation

8.5 NIST certified TO-15 gas standards, purchased from Linde (formerly Spectra Gases). Standards are stored at room temperature and expire per vendor's expiration date, unless re-certified. Recertified standards are received with an updated certificate of analysis which includes a new expiration date.

8.6 Neat chemicals: Listed in Table 1, Table A-1, and Table 3B, ≥ 98% purity.

8.7 Liquid nitrogen: For the concentrator system and/or GC cooling

8.8 Primary Standards

8.8.1 Primary standard mixtures of TO-15 analytes are purchased certified gaseous standards already prepared as well as gaseous standards prepared in the laboratory by injecting neat chemicals into Tedlar® bags (See Table 1).

8.8.2 Table 1 indicates volumes of neat chemicals that are injected into 20 L of zero air or UHP nitrogen to obtain primary standard concentrations for all analytes.

8.8.3 Purchased primary standards are assigned a CSS # (commercially supplied standard) upon receipt for tracking purposes. Preparation of primary standards must be entered into the primary standard preparation logbook (Form No.: 117-11).

8.8.4 Standards are valid per the manufacturer's expiration date as noted.

8.9 Secondary Standards

8.9.1 Prepare secondary standards in canisters using the Entech 4700 Precision Diluter at a minimum of two concentration levels. Table 3A and 3B outlines the preparation steps for each secondary standard.

8.9.2 Prior to preparation of the standards, verify that an appropriate vacuum exists in the canister (>0.5 psia). Figure 3 demonstrates the standard preparation system. Primary standards prepared in Tedlar bags are injected into a canister (typically

15 L) using an injection tee with a septum or transferred from purchased and / or prepared cylinders via the precision diluter.

8.9.3 Attach the transfer lines from the primary standards to the dynamic diluter.

8.9.4 Prior to the injection of the gaseous standards, allow the dynamic diluter to equilibrate for a approximately 25 minutes by allowing each standard channel to flush for a minimum of 5 min. Be sure the vent line is attached to the outlet.

8.9.5 After equilibrating the system, attach the canister to the outlet of the diluter. Flush line with nitrogen for 20 sec prior to attaching canister. Load in the appropriate configuration and standard preparation method (TO15 ICAL, DIAZ, or TO15 LCS) into the precision dilution software for the corresponding target concentration (TO15 ICAL 100 ppbV, TO15 ICAL 10 ppbV).

Equation 1: Flow rate calculation:

$$T_f = V_{std} / F_{std}$$

Where:

T_f = standard transfer time, minutes
V_{std} = standard volume, mL
F_{std} = standard flowrate, mL/min

8.9.6 Inject the appropriate amount of Tedlar bag primary standard and/or the low vapor pressure compounds listed in Table 3B into the injection port tee. This injection must be done while the canister is below atmospheric pressure.

8.9.7 When all the primary standards have been added to the canister, the canister will be pressurized to the programmed final pressure using the precision diluter.

NOTE: Standard canisters prepared for analysis using the autosampler must have a maximum pressure of 30 psia to ensure proper and consistent sampling by the instrument.

8.9.8 Label the canister accordingly and record the standard preparation in the secondary standard (SS) preparation logbook (Form No.: 12925).

8.9.9 The ICV/LCS standard is prepared in the same manner, using primary standards of differing lot #s, at a concentration of 10 ppbV

Secondary standards are valid for 6 months.

8.10 Internal Standard and BFB Tuning Standard/Surrogate Standard

An internal standard (Bromochloromethane, 1,4-Difluorobenzene, and Chlorobenzene-D5) and tuning/surrogate standard containing Toluene-D8, 1,2-Dichloroethane-D4, and Bromofluorobenzene (BFB) are prepared as two separate gas standards at 25 ppbV (2

year expiration date). The internal standards and BFB / surrogates are loaded onto the sample trap prior to the calibration standard(s), sample, or QC sample(s) via a mass flow controller. The concentration of the internal standard and BFB / surrogates added is based upon the nominal concentration of sample that is analyzed. If the nominal volume of sample is 250 mL, then 100 mL of the 25 ppbV internal standard mix will yield a true value of 10 ppbV for the internal standards and BFB. Using equation 7, the ug/m^3 equivalent of BFB injected 179 ug/m^3 or 179 ng/L (MW of BFB = 175). Thus, the total ng injected is:

Total ng = 179 ng/L x 0.100 L = 17.9 ng

8.11 Instrument Calibration Standards

Calibration standards are prepared by injecting different volumes of the secondary standards into the concentrator/GC/MS system. The low standard will be used to establish the reporting limit for sample analyses. These are described in more detail in Section 10.

9. Quality Control

The laboratory must maintain records to document the quality of data that is generated. Ongoing data quality checks are compared with established performance criteria to determine if the results of analyses meet the performance characteristics of the method. Quality control limits may also be found in the Laboratory Information Management System(LIMs)

At a minimum, for each day of analysis, a Continuing Calibration standard, Laboratory Method Blank, Laboratory Control Spike and Laboratory Duplicate must be analyzed. Laboratory Control Spike Duplicate (LCSD) will be analyzed only upon client request.

9.1 Laboratory Method Blank(s)

A FSL canister pressurized to 30 psia with humidified nitrogen is utilized as the Laboratory Method Blank. This method blank must be free of target analyte contamination at or above the reporting limit. If it is not, the system must be evaluated for possible sources of contamination. Once the source is determined and eliminated, the Blank must be reanalyzed.

A Laboratory Method Blank must be run after samples suspected of being highly contaminated to determine if sample carryover has occurred. If samples have been analyzed using an autosampler, data must be evaluated for potential carryover and re-analyses conducted, as appropriate.

9.2 Laboratory Control Sample (LCS) / Laboratory Control Spike Duplicate (LCSD)

NOTE: A Laboratory Control Spike Duplicate is only performed when specified by the project requirements and/or upon Client request.

Laboratory Control Spike - A Laboratory Control Spike (LCS) is prepared by spiking an evacuated FSL canister with a different primary standard solution than that used for the calibration or a purchased gaseous standard with the components of interest may be used. If the recovery is not within acceptance criteria, the LCS may be analyzed a second time. If the LCS failure continues, the instrument must be recalibrated. Refer to Section 12 for appropriate corrective actions to be taken. QC limits are subject to change for any particular analyte, if deemed necessary after review of QC control limits.

9.3 Initial Calibration Verification (ICV)

A mid-range calibration standard must be analyzed after the initial calibration and prior to sample analysis, and must be a different source than that used for the initial calibration. See section 10.4.1 for additional criteria. Otherwise, sample analysis may proceed.

9.4 Continuing Calibration Verification (CCV)

A mid-range calibration standard must be analyzed prior to sample analysis. This standard is of a different source than that used for the LCS/LCSD pair, typically the same source as the initial calibration standards. See section 10.4. or additional criteria. If repeated failure of the CCV occurs, the instrument must be recalibrated. Otherwise, sample analysis may proceed. The LCS may also be utilized as the continuing calibration unless otherwise defined in an addendum.

9.5 Matrix Spike

Not applicable.

9.6 Laboratory Duplicate

Laboratory Duplicate is a replicate analysis of a sample. The RPD of duplicate analyses must not exceed 25. Up to 10% of the target analyte detections may exceed acceptance criteria. The criteria does not need to be applied to concentrations less than 5X the reporting limit. If more variation occurs, the sample analysis must be repeated. If an analyte is detected in one analysis at >5x the reporting limit and not detected in the duplicate analysis, the analysis must be repeated. If an analyte is detected in one analysis at <5x the reporting limit and not detected in the duplicate analysis, the RPD is not calculable (NC) and the analysis does not have to be repeated. If an analyte is not detected in both the original and duplicate analyses, the RPD is NC. Equation 9 is used to calculate the RPD.
The sample chosen for duplicate analysis should not be a trip blank, field blank, or equipment blank. The sample chosen for duplicate analysis must be rotated among clients and/or sites. If possible, field duplicates should not be chosen for duplicate analysis, nor should outside air samples if indoor air samples are also included in the analytical batch. Refer to Appendices D - F for agency –specific criteria on laboratory duplicate criteria.

.

Equation 9: RPD Calculation

$$\mathbf{RPD = ABS(C_s - C_d) / [(C_s + C_d)/2]*100}$$

where:

RPD = relative percent difference
C_s = concentration in original sample analysis
C_d = concentration in duplicate sample analysis

9.7 Method-specific Quality Control Samples

9.7.1 BFB Tune - A successful BFB spectrum must meet the criteria in Table 5 prior to sample analysis. If a successful BFB spectrum is not obtained, the MS must be retuned and the BFB spectrum re-evaluated prior to analyzing samples.

9.7.2 Internal Standards - The internal standard area counts of each sample, blank, and Laboratory Control Sample are evaluated against the corresponding

continuing calibration standard. The internal standard area counts must be within 60-140% of the continuing calibration standard area counts. If the retention times of the internal standards must be within +/- 0.33 min. If the internal standards fall outside this range, the sample, blank, or Laboratory Control Sample must be reanalyzed. In addition, area counts for internal standards for continuing calibration must be within 60-140% recovery of initial calibration. Refer to Sect. 12 for contingencies on samples exhibiting internal standard recovery failures.

9.7.3 TIC Internal Standards - Internal standards used for the quantitation of TICs must be evaluated by comparing the total ion area counts of the internal standards in the samples to the total ion area counts of the internal standards in the blanks. The internal standard area counts must be within 50-200% of the blank area counts. If the internal standards fall outside this range, a different internal standard or an estimated internal standard total ion area must be used to quantitate the TIC. This estimate can be done by using the total ion area from a blank or a clean sample within the analytical batch.

9.8 Method Sequence

- BFB Tune Check
- Calibration Standards (initial) or Continuing Calibration
- Laboratory Control Sample (may be used as the ICV or CCV)
- Laboratory Control Sample Duplicate (if needed)
- Laboratory Method Blank
- Samples
- Laboratory Duplicate

Injections may be made until 24 hours after the injection used to check the BFB tune.

All analytical sequences must be recorded in the instrument software and documented in the instrument logbook (Form 117-09).

10. Procedure

10.1 Equipment Set-up

10.1.1 Canister Cleaning and Certification

Refer to Alpha SOP #2190 for canister and flow controller preparation.

10.1.2 Sample Preparation and Concentration

Ensure the integrity of the canister sample as described in Section 6.4. General description of procedure: A 3-stage concentration technique called Cold-Trap Dehydration is used to analyze VOC's in air. The air sample is first concentrated to about a 0.5cc volume by drawing an aliquot of sample simultaneously through a cold trap (no packing material) and then through a Tenax trap. The cold trap is then heated to 10 ^{o}C and is held there while slowly passing helium through it to transfer these compounds to the Tenax trap, leaving most of the moisture in the cold trap. Sweeping the VOC's from the first to the second trap with only 20cc of helium results in a transfer of less than 0.5 µL of water (40 mL @ 100% RH @ 10 ^{o}C) which can be easily handled by benchtop mass spectrometers. The 20 cc transfer volume also serves to flush the CO_2 through the Tenax trap. After transfer to the second trap, the VOC's are back-flushed while heating to be further focused on an open-tubular focusing trap (cryofocuser) for rapid injection onto the analytical column. Internal standard is added directly to the first stage cryogenic trap prior to the sample by a mass flow controller (MFC). MFC controlled introduction is advantageous over loop injection as it remains consistent with the mechanism used to measure the sample volume.

Connect the canisters or Tedlar® bag(s) to the Entech 7016D Autosampler. For FSL canisters: Align the tubing from one of the 16 positions to the canister inlet position. Push the inlet line into the orifice of the canister and hold in place while tightening the fitting finger tight. Turn the stainless steel nut ¼ turn more with a wrench. The canister valves must be closed at this point. For Tedlar® bags: Connect the valve of the Tedlar® bag with the autosampler line using an adapter fitting.

For canister samples, leak check all inlet connections using the leak check procedure included with the Entech software. The software will indicate if there is a change in vacuum over a period of 30 sec. The vacuum must not increase more than 2 psia. Analysis cannot begin until the leak check has passed for each canister being tested and/or the source of the leak has been determined..

Open the canister or bag valves.

Set up the sequence of the Entech system to withdraw 250 mL from each sample. If high concentrations are expected, lower volumes can be used (minimum of 25 mL).. Samples suspected to contain elevated concentrations (i.e. soil vapor, sub-slab, landfill gas) should be pre-screened prior to analysis to obtain more precise dilution information. If screening results indicate elevated concentrations of non-target analytes, the sample should be diluted such that the peak height of the non-target analyte is approximately 10X greater than the peak height of the first internal standard. Recommended concentrator operating parameters are provided in Table 6.

10.2 Initial Calibration

10.2.1 GC Conditions (Shimadzu 2010, 2030)

Oven program: 25° C, hold for 5.0 minutes, then:

Ramp 1: 100° C at 8.0^{o} C / min.; hold for 0.0 min

Ramp 2: 220° C at 25° C / min.; hold for 4.0 min

Gas Flows

Helium carrier gas flow program: 2.0 mL/min for entire run (23.18 min)

Sample Injection

Injection mode:	split
Injection port temperature:	250^0 C
Inlet pressure:	27.3 psi
Total flow:	39.3 mL/min
Split ratio:	17.3
Split flow:	34.6 mL/min
Gas saver flow:	OFF

10.2.2 MS Conditions

Temperature of MSD transfer line: 250^0 C

Temperature of MS Quad: 150^0 C

Temperature of MS Source: 230^0 C

Solvent Delay: 3.0 minutes

Scanning Parameters: 29-270 amu until 10 min, scan rate = 5.52 scans/sec; then 35-270 amu, scan rate = 3.1 scans/sec. Threshold = 150. Sampling rate = 2. EM offset-variable to achieve response of 200K area counts (+/- 25K) for the internal standard bromochloromethane.

10.2.3 Daily GC/MS Performance Check

10.2.3.1 The first analysis of the day is typically a tune evaluation. The GC/MS system is checked to confirm that acceptable performance criteria for bromofluorobenzene (BFB), which is in surrogate mixture, are achieved. These criteria must be met prior to analyzing further standards, blanks and samples.

10.2.3.2 A maximum injection of 50 ng must successfully meet the BFB spectrum criteria in Table 5.

10.2.3.3 If the spectrum of BFB does not meet the above stated criteria, the analysis must be repeated. If the spectrum of BFB still does not meet these criteria, the GC/MS instrument must be re-tuned.

10.2.3.4 The Daily GC/MS Performance Check must be analyzed every 24 hours or less.

10.2.4 Initial Calibration

10.2.4.1 Analyze a minimum of five different levels by analyzing various volumes of the secondary standards prepared in Table 3 (Table A-3 for sulfide/mercaptan analysis). The lowest standard will be at or below the

reporting limit. If the response is not linear at the lowest level for the higher molecular weight compounds, this point must not be included in the calibration curve for these compounds. As a result, the analysis of more than five levels may be required in order to ensure a minimum of five calibration points for each analyte.

Table 4 lists the calibration standard levels and the volumes of the secondary standards needed to achieve these levels.

10.2.4.2 The true value of each of these calibration points is determined by applying a dilution factor that is based on the volume of sample extracted from the canister for each calibration point. Assuming that a volume of 250 mL will be the maximum volume extracted from the samples; this will be the "1X" volume. A dilution factor can be calculated using Equation 2.

Equation 2: Calculation of Instrument Dilution Factor

$$\mathbf{DF = V_{1X} / V_{actual}}$$

where:

DF = dilution factor
V_{1X} = maximum volume sampled, mL
V_{actual} = actual volume sampled for samples and standards

10.2.4.3 Analyze each calibration standard according to the procedures specified in Section 10. The true value of each calibration point is determined by dividing the concentration of the canister by the dilution factor determined using Equation 2.

10.2.4.4 Tabulate the area response of the characteristic ions against the amount for each analyte and internal standard and calculate relative response factors (RRF) for each compound using Equation 3. Perform this calculation for each calibration standard.

Equation 3: Relative Response Factor for Individual Target Analytes

$$\mathbf{RRF = [(A_{EC}) * (C_i)] / [(A_{EI}) * (C_c)]}$$

where:

RRF = relative response factor
A_{EC} = area count of the extracted ion for the analyte of interest
C_i= amount of internal standard (ppbV)
A_{EI} = area count of the extracted ion for the associated internal standard
C_c = amount of analyte of interest (ppbV)

Table 7 lists all TO-15 analytes, internal standards and the associated quantitation ion.

Table 8 lists the internal standards and the associated TO-15 analytes.

10.2.4.5 Calculate the average response factor for each of the target analytes by the following equation (AVG_x = SUM(RFs) / total # of RFs).

10.2.4.6 Calculate the percent relative standard deviation (%RSD) of the response factors over the secondary range of the curve for each of the target analytes using Equation 4.

Equation 4: Percent Relative Standard Deviation

$$\%RSD = [(SD_n - 1) / (AVG_x)] * 100]$$

where:

%RSD = percent relative standard deviation
SD_n -1 = standard deviation (n-1 degrees of freedom)
AVG_x = average response factor from the initial calibration curve

This task can also be accomplished using the quantitation software provided by the instrument manufacturer.

10.2.4.7 If the %RSD is <30 for each analyte, linearity can be assumed for the associated target analyte and sample analysis may proceed. If the curve fit is using average response factor, RSD (analogous to RSE) is the measure of relative error, and no additional calculation is required.

If the %RSD is >30 for any analyte, the integrations must be evaluated and the calculations verified. If a %RSD <30 cannot be achieved, it is acceptable for two (2) of the analytes to be above 30%, but below 40% RSD (applies to analytes flagged with a “C” on the Enviroquant initial calibration summary table).

Alpha may use the following modified acceptance criteria only for projects that have documentation and approval within the QAPP by the quality assurance project planners, and also for analytes not listed in EPA Method TO-15:

10.2.4.8 If the %RSD is >30 for any analyte, the integrations must be evaluated and the calculations verified. If a %RSD <30 cannot be achieved, it is acceptable for 10% of the total analytes to be above 30%, but below 50% RSD. Before acceptance of such a Calibration Curve, it must be confirmed with the approval of the Section Supervisor and/or the Project Manager that these analytes are typically and historically "trouble" analytes or "poor performers" (typically compounds listed in Table 3B), and that all Client and Project Data Quality Objectives (DQOs) will still be met when analyzing samples using this calibration. Refer to Appendices D - F for agency –specific criteria regarding initial calibration acceptance criteria.

Calibration points may be removed from the calibration curve to meet the 30% RSD criteria, so long as five consecutive points remain in the calibration curve, and the following procedure is followed:

- Remove high level calibration points
- Remove low-level calibration points; reporting limits will need to be elevated, however.

10.2.4.9 If calibration points in the mid-level range need to be removed due to a sequence error or instrument malfunction, the entire calibration level must be removed from the calibration curve. If the %RSD >30, a calibration curve is generated using the EnviroQuant quantitation software.

Correlation Coefficient calculation is performed by the Enviroquant software as follows;

$$r = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[\, n\Sigma x^2 - (\Sigma x)^2 \,][\, n\Sigma y^2 - (\Sigma y)^2 \,]}}$$

Where:

r = Correlation Coefficient

n = number of standards measured

x = true concentration of the standard

y = observed concentration of the standard

The correlation coefficient (linear) for the calibration curve must be greater than 0.995. If these criteria cannot be met, prepare a new set of calibration standards and recalibrate the instrument. NOTE: Quadratic calibration in any form is not acceptable.

Authorization from the department supervisor is required prior to using linear regression calibration. Linear regression is only allowed if certain criteria listed below are met:

- The minimum number of points for a linear regression curve is five points.
- The curve must be plotted and printed and turned in with the raw data.
- A calibration standard must be analyzed at the low point of the curve. Recovery of the low point standard must be 60-140% using the linear regression curve.

  The recovery of the compound for the continuing calibration / LCS must be within 70-130%.

10.2.4.10 The reference spectra for all target analytes are reviewed for both assignments and purity for all instruments. In addition, this process of reviewing all spectra continues whenever a new calibration is completed.

Reference spectra should be updated with each initial calibration performed with the midpoint standard of the calibration.

10.2.4.11 Internal Standard Criteria for Initial Calibration Levels and ICV.

The mean response for each internal standard compound is calculated over the initial calibration range. The area response at each calibration level must be within 60-140% of the midpoint area response over the initial calibration range for each internal standard. If recovery is outside the range, re-analyze calibration level. This criteria must be met prior to sample analysis.

All of these criteria must be met prior to sample analysis.

10.3 Equipment Operation and Sample Processing

10.3.1 GC/MS ANALYSIS

10.3.1.1 The Entech 7200 or 7200A Concentrator is programmed to the specific analytical conditions listed in Table 6 (Entech method Alpha_TO15.CTD) and the GC/MS parameters are set to those listed in Sections 10.3.1 and 10.3.2. (Enviroquant method TO15-SFS.M (SIM and full scan) or TO15_FS_35C.M (full scan only, for sulfide & mercaptan analysis in App. A)).

10.3.1.2 The BFB spectrum is evaluated by analyzing a Laboratory Method Blank and adding 100 mL of the BFB/surrogate mix.

10.3.1.3 A continuing calibration and/or a laboratory control spike is analyzed. See sect. 9.2 for acceptable criteria, and refer to Appendices D - F for agency – specific criteria on continuing calibration and laboratory control spike criteria.

10.3.1.4 A Laboratory Method Blank is analyzed. The Laboratory Method Blank consists of the analysis of 250 mL from a canister of humidified nitrogen. The method blank must be free of target analyte contamination at or above the reporting limit.

10.3.1.5 A 250-mL aliquot of sample is preconcentrated on the Entech 7200 or 7200A concentrator and injected onto the GC column. For soil vapor samples, or other samples that may contain elevated levels, the aliquot amount must be determined using the results from a pre-screening analysis. Sample concentrations are determined using the following equation:

$$ppbV = [(A_{EC}) * (C_i)] / [(A_{EI}) * (RRF)]$$

10.3.1.6 Instrument Dilutions and Sub-Atmospheric Sample dilutions

10.3.1.6.1 For dilutions, smaller sample volumes (<250 mL) are analyzed. The smallest volume that can be analyzed with accuracy using the Entech concentrator is 10 mL. The dilution factor is accounted for by entering the volume analyzed in the sample calculation discussed in Section 10.2.2.2 (Equation 2).

10.3.1.6.2 Samples that arrive at the laboratory with pressures below -15 inches Hg should be pressurized with nitrogen to greater than -15 inches Hg, as discussed in Section 6.4. This pressurization results in a dilution factor. The dilution factor is calculated using Equation 6, and the canister dilution spreadsheet (Form No.: 117-05). Attach a green tag to the canister with the pressurization information (initial pressure and final pressure) recorded on the tag.

Equation 6: Dilution Factor for Pressurization of Subatmospheric Samples: Three Steps

Step 1: Calculate the volume in the canister prior to pressurization (Assume a 2.7-liter canister is used).

$$\mathbf{V_{ci} = 2.7 * P_I / 14.696}$$

Step 2: Calculate the volume in the canister after pressurization.

$$\mathbf{V_{cf} = 2.7 * P_F / 14.696}$$

Step 3: Calculate the dilution factor.

$$\mathbf{DF = V_{cf} / V_{ci}}$$

where:

V_{ci}= volume of air in canister prior to pressurization, L

P_I = pressure reading of canister prior to pressurization (psia)

V_{cf} = volume of air in canister after pressurization, L

P_F = pressure reading of canister after pressurization (psia)

DF = dilution factor

14.696 = atmospheric pressure (psia)

10.3.1.6.3 If samples require larger dilutions than pressurization and instrument dilutions, a syringe dilution into an additional canister or Tedlar bag (typically used only for App. A analytes) with a known volume of nitrogen is required.

10.3.1.6.4 Fit a VCO® adapter with a septa to the pressurized sample canister. With a gastight syringe remove appropriate sample size for dilution. Allow sample to flow through syringe for 1 – 2 seconds to flush syringe prior to volumizing. Inject the sample aliquot into a Tedlar bag. If using an evacuated canister, connect the canister to an injection port tee (see Figure 3) attached to the dynamic diluter. Inject the aliquot of sample while a steady stream of Nitrogen is flowing into the dilution canister. Pressurize this canister to 30 psia. Attach a green tag to the canister with dilution information recorded on the tag. Use the dilution calculation worksheet (Form No.: 117-05) to calculate resulting dilutions.

10.3.2 Qualitative Identifications

10.3.2.1 An analyst competent in the interpretation of mass spectra must identify the target analytes by comparison of the sample mass spectrum to the mass spectrum of the standard. Two criteria must be satisfied to verify the identification: (1) elution of the component in the sample at the same GC relative retention time (RRT) as the component in the standard, and (2) agreement of the sample component and standard component mass spectra.

10.3.2.2 For establishing correspondence of the GC RRT, the RRT of the component in the sample must compare within ± 0.06 RRT units of the RRT of the component in the standard. If co-elution of interfering components prohibits accurate assignment of the sample component RRT from the total ion chromatogram, the RRT must be assigned using extracted ion current profiles for the ion unique to the component of interest.

10.3.2.3 For comparison of the standard and sample component mass spectra, mass spectra of standards obtained on the GC/MS under the same instrument conditions are required. Reference spectra should be updated for each initial calibration performed, using the mid-level standard. Once obtained, these standard spectra may be used for identification and reference purposes.

10.3.2.4 The requirements for qualitative verification by comparison of mass spectra are as follows:

- All ions present in the standard mass spectra at a relative intensity greater than 10% (most abundant ion in the spectrum equals 100%) must be present in the sample spectrum.
- The relative intensities of ions specified must agree within ± 20% between the standard and sample spectra.
- Ions greater than 10% in the sample spectrum must be considered and accounted for by the analyst making the comparison.

Table 7 lists the primary and secondary ions for all analytes.

10.3.2.5 Manual integrations: for peaks that are observed to be not integrated correctly by the quantitation software, manual integrations must be performed. Please refer to the manual integration SOP for further instruction on how to properly perform and document manual integrations (Alpha SOP # 1731).

10.3.2.6 **Tentatively identified compounds (TICs)-**A library search may be performed for non-target sample components for the purpose of tentative identification, as requested by the client. Mass spectra are compared to the National Institute of Standards and Technology Mass Spectral Library (2002 version), and a qualitative match is determined by the analyst. Computer generated library search routines must not use normalization routines that would misrepresent the library or unknown spectra when

compared to each other. Refer to Appendices D - F for agency –specific criteria on TIC reporting.

10.3.2.7 Guidelines for making tentative identification:

- Relative intensities of major ions in the reference spectrum (ions greater than 20% of the most abundant ion) must be present in the sample spectrum.
- The relative intensities of the major ions must agree within ± 30%.
- Molecular ions present in the reference spectrum must be present in the sample spectrum.
- Ions present in the sample spectrum but not in the reference spectrum must be reviewed for possible background contamination or presence of coeluting compounds.
- If, in the technical judgment of the mass spectral interpretation specialist, no valid tentative identification can be made, the compound will be reported as "Unknown". The mass spectral interpretation specialist should give additional classification of the unknown compound, if possible (i.e., unknown aromatic, unknown hydrocarbon, unknown acid, unknown chlorinated compound)..

10.4 Continuing Calibration

10.4.1 Calibration Verification

10.4.1.1 The initial calibration must be verified through the analysis of an Initial Calibration Verification (ICV) sample. (The ICV may also be used to satisfy LCS requirements.) This analysis must be performed every time an initial calibration is performed.

10.4.1.2 The ICV must be prepared using a purchased gaseous standard (from a different lot # or separate vendor) with the components of interest in an evacuated FSL canister. Follow the standard preparation procedure for the calibration standards outlined in Section 8.0. The standard must be prepared at or below the midpoint of the calibration curve.

See section 10.4.2.6 for acceptable criteria and Section 12 for corrective actions.

10.4.2 Continuing Calibration

10.4.2.1 A continuing calibration check must be performed daily prior to sample analysis. The continuing calibration standard must be one of the initial calibration levels.

10.4.2.2 Analyze a calibration standard that is at the midpoint of the calibration curve.

10.4.2.3 The LCS standard may be utilized as the continuing calibration check, provided that all target analytes of interest are present in the LCS standard.. Refer to Appendices D - F for agency –specific criteria on LCS criteria.

10.4.2.4 Evaluate continuing calibration for internal standard recoveries. Recoveries must be between 60-140%. If not, the CCV will be re-analyzed.

10.4.2.5 Calculate the percent difference (%D) of the continuing calibration response factor from the initial calibration average response factor using Equation 5.

Equation 5: Percent Difference

$$\% D = [(C_{found})-(C_{true}) / (C_{true})] * 100$$

where:

%D = percent difference

C_{found} = amount of the analyte detected in the standard (ppbV)
C_{true} = true amount of the analyte in the standard (ppbV)

This task can also be accomplished using the quantitation software provided by the instrument manufacturer.

10.4.2.6 Acceptance Criteria

The acceptance criteria is less than 30% RSD for any analyte, with an allowance of two analytes to be greater than 30%, but less than 40%.

Alpha may use the following modified acceptance criteria only for projects that have documentation and approval within the QAPP by the quality assurance project planners, and also for analytes not listed in EPA Method TO-15:

If the %RSD is <30 for each analyte, linearity can be assumed for the associated target analyte and sample analysis may proceed.

10.4.2.7 If the %RSD is >30 for any analyte, the integrations must be evaluated and the calculations verified. If a %RSD <30 cannot be achieved, it is acceptable for 10% of the total analytes to be above 30%, but below 50% RSD. Before acceptance of such a Calibration Curve, it must be confirmed with the approval of the Section Supervisor and/or the Project Manager that these analytes are typically and historically "trouble" analytes or "poor performers" (typically compounds listed in Table 3B), and that all Client and Project Data Quality Objectives (DQOs) will still be met when analyzing samples using this calibration. . Refer to Appendices D - F for agency –specific criteria on initial calibration acceptance criteria.

10.4.2.8 Refer to Sect. 12 for additional procedures regarding continuing calibration acceptance criteria and corrective actions if criteria are not met.

10.5 Preventive Maintenance

Ion source cleaning – typically prior to initial calibration.

Electron Multiplier (EM)-changed when the voltage setting required to achieve adequate response approaches 1900. (Agilent MS only).

Rough pump oil changed annually.

Transfer lines, concentrator traps, and the GC guard column should be changed semi-annually, or when system repeatedly fails initial calibration.

11. Data Evaluation, Calculations and Reporting

11.1 Calculations

11.1.1 Individual Target Analytes: The average response factor from the initial calibration is used to calculate the amount of analyte detected in the sample analyses. Standards are prepared on a ppbV basis, so if no dilution is performed, values can be reported from the quantitation report without any calculations. Dilution factors are calculated using Equation 2. Equation 7 shows the conversion of ppbV to µg/m^3 .

Equation 7: Conversion of ppbV to µg/m^3

µg/m^3 = (ppbV) * MW / 24.45

where:

24.45 = molar gas constant (g/g-mole)
MW = molecular weight of the compound of interest (Table 1 and 2 lists the molecular weights of the target analytes)

11.1.2 TICS: An estimated amount for the TIC is calculated using the total area of the TIC, the total area of the internal standard assigned by the quantitation software, and a response factor of 1.000 (Equation 8). If the internal standard assigned by the quantitation software exhibits significant interference from other analytes, the next closest eluting internal standard will be utilized. Refer to Appendices D – F for agency-specific criteria on reporting TICS.

Equation 8: Calculation of TIC Results in ppbV

ppbV = [(A_T) * (C_{IS})] / [(A_{IS-T}) * (1.000)]

where:

A_T = total ion area of the TIC to be measured

C_{IS} = amount of the internal standard

A_{IS-T} = total ion area of the closest eluting internal standard

The integration of target analytes and internal standards must be performed from valley to valley.

11.1.3 Percent Recovery

$$\% \text{ Recovery} = \frac{C_x}{C_t} \text{ X } 100$$

where:
C_x = measured concentration of compound
C_t = true concentration of compound

11.2 Data Package

11.2.1 Canister Cleaning Information

A copy of the data for the batch certification analysis associated with the FSL canisters must be on file. The raw data must include a sample chromatogram, quantitation report, and spectra of all positive results.

11.2.2 BFB Tune Checks

Tune checks must be included for all days of analysis, including initial calibration. Raw data must include the chromatogram, mass spectra, and summary of relative abundances of the BFB ions.

11.2.3 Calibration Data

- Initial calibration summary (including average response factors, %RSDs, and copies of calibration curves, if appropriate) for target analytes and all calibration chromatograms must be on file.
- Continuing calibration summaries (including %Ds) for individual analytes.
- Chromatograms and quantitation reports associated with all standards used, in the initial and continuing calibrations.

11.2.4 QA/QC

- Internal standard responses and % recoveries vs. the continuing calibration.
- Quantitation report and chromatogram for laboratory control spike (and laboratory control spike duplicate, if requested).
- Quantitation reports, chromatograms, and spectra of positive results for all blanks.
- Copy of the instrument runlog.

11.2.5 Sample Data

- Quantitation reports, chromatograms, spectra of positive results, negative proofs, and pre- and post-manual integrations for all LCSs, samples, and duplicates.
- A copy of the canister dilution worksheet, Form No.: 117-05 (if any canister pressurizations or canister dilutions are performed).

12. Contingencies for Handling Out-of-Control Data or Unacceptable Data

The laboratory must maintain records to document the quality of data that is generated. Ongoing data quality checks are compared with established performance criteria to determine if the results of analyses meet the performance characteristics of the method. When results indicate atypical method performance, a calibration verification standard is used to confirm the measurements were performed in an in-control mode of operation.

Holding time exceedence and/or container damage is noted on the Sample Delivery Group form.

Perform routine preventative maintenance following manufacturer's specification. Record all maintenance in the instrument logbook.

Review of standards, blanks and standard response for acceptable performance occurs for each batch of samples. Record any trends or unusual performance on a nonconformance action form. The method blank must be free of target analyte contamination at or above the reporting limit. If it is not, the system must be evaluated for possible sources of contamination. Once the source is determined and eliminated, the method blank must be reanalyzed.

If the ICV, CCV, LCS or LCSD recovery of any parameter falls outside the designated acceptance range, the laboratory performance for that parameter is judged to be out of control, and the problem must be immediately identified and corrected. The analytical result for that parameter in the unspiked samples is suspect and is only reported for regulatory compliance purposes with the appropriate Narratives. Immediate corrective action includes reanalyzing all affected samples (provided sufficient volume of sample remains) by using any retained sample before the expiration of the holding time. If sufficient volume is not available, Alpha will narrate accordingly. Analytes that fail ICV, CCV and LCS criteria due to elevated recoveries may be reported, provided there are no detections in the associated samples.

Samples exhibiting internal standard recovery failures must be re-analyzed at the same dilution level if instrument malfunction is suspected to be the cause, or at a lesser dilution if sample matrix or concentration levels of target and/or non-target analytes are suspected of being the cause. If recovery failures are observed upon re-analysis, narrate bias accordingly (negative if high recovery, positive if low recovery).

When applicable criteria is not met (ICV, CCV, LCS, IS), Alpha will narrate bias which will be included in the opening narrative of the report.

13. Method Performance

13.1 Method Detection Limit Study (MDL) / Limit of Detection Study (LOD) / Limit of Quantitation (LOQ)

The laboratory follows the procedure to determine the MDL, LOD, and/or LOQ as outlined in Alpha SOP # 1732. These studies performed by the laboratory are maintained on file for review.

13.2 Demonstration of Capability Studies

Refer to Alpha SOP # 1739 for further information regarding IDC/DOC Generation.

13.2.1 Initial (IDC)

The analyst must make an initial, one-time, demonstration of the ability to generate acceptable accuracy and precision with this method, prior to the processing of any samples.

13.2.2 Continuing (DOC)

The analyst must make a continuing, annual, demonstration of the ability to generate acceptable accuracy and precision with this method.

14. Pollution Prevention and Waste Management

Refer to Alpha's Chemical Hygiene Plan and Waste Management and Disposal SOP for further pollution prevention and waste management information.

15. Referenced Documents

Chemical Hygiene Plan

SOP # 1732 MDL/LOD/LOQ Generation

SOP # 1739 IDC/DOC Generation

SOP # 1797 Hazardous Waste & Sample Disposal

SOP # 1731 Manual Integration

Form 117-05: Canister Dilution Worksheet Template

Form 117-09: Instrument Run Log

Form 117-11: Primary Standard Preparation Log

Form 12925: Secondary Standard Preparation Log

16. Attachments

Table 1	TO-15 Tedlar® Bag Stock Standard Preparation for LCS
Table 2A	TO-14 Primary Mix #1 & TO-15 Mix #2 Stock Standard Cylinder
Table 2B	TO-15 Custom Mix #3 Stock Standard Cylinder
Table 2C	TO-15 Custom Mix #4 Stock Standard Cylinder
Table 2D	TO-15 Custom Mix #5 Stock Standard Cylinder
Table 3A	Summary of Working Standard Preparation
Table 3B	Preparation of Calibration Standards for Low Vapor Pressure Compounds
Table 4	Calibration Standard Levels
Table 5	BFB Key Ions and Abundance Criteria
Table 6	Entech 7200 or 7200A /7016D Operating Parameters
Table 7	Quantitation and Secondary Ions for TO-15 Analytes and Internal Standards
Table 8	Internal Standards and the Associated Target Analytes
Table 9A	TO-15 Target Analytes and Reporting Limits-Standard List
Table 9B	TO-15 Target Analytes and Reporting Limits-Additional Analytes

Appendix A	Cold Trap Dehydration technique (CTD) for Analysis of Sulifides and Mercaptans
Appendix B	Data Acquisition Parameters and Analysis Modifications for Conducting SIM Analysis
Appendix C	Modifications to Data Review and Case Narrative to Comply with MADEP MCP-TO-15 Method
Appendix E	Modifications to Data Review and Case Narrative to Comply with 2014 NJDEP Technical Guidance for EPA Method TO-15
Appendix F	Modifications to Data Review and Case Narrative to Comply with Ohio EPA Voluntary Action Program (VAP) Requirements for EPA Method TO-15

DEFINITIONS

Absolute canister pressure - Pg + Pa, where Pg = gauge pressure in the canister (psig) and Pa = barometric pressure.

Absolute pressure - Pressure measured with reference to absolute zero pressure (as opposed to atmospheric pressure), usually expressed as kPA, mm Hg, or psia (pounds per square inch absolute).

Cryogen - The refrigerant used to obtain very low temperatures in the cryogenic trap of the analytical system. A typical cryogen is liquid nitrogen (bp = -196^{0}C).

Gauge pressure - Pressure measured above atmospheric pressure (as opposed to absolute pressure). Zero gauge is equal to ambient atmospheric (barometric) pressure. Units = psig (pounds per square inch gauge).

ppmV – parts per million on a volume basis.

ppbV – parts per billion on a volume basis

psia – pounds per square inch absolute

Relative retention time (RRT)– retention time (RT) ratio of the target analyte and the internal standard used to quantitate (RT target / RT internal standard).

Table 1

TO-15 Tedlar® Bag Stock Standard Preparation- LCS/ICV Standard

ICV / LCS Standard				
COMPOUND (liquids)	**MOL WGT**	**Density ug/uL**	**uL injected***	**FINAL ppmV**
Acetone	58.1	791	12.0	200
Isopropyl alcohol	60.1	785	4.8	76.7

All neat chemicals are injected into a Tedlar® bag containing 20 Liters of zero air or UHP nitrogen.

See Table A-1 & Table A-4 for sulfide/mercaptan stock standard preparation

Table 2A

TO-15 Purchased Primary Standard Mix

TO-14 Primary Standard Mix #1

COMPOUND	MOL WGT	Conc. ppmV	COMPOUND	MOL WGT	Conc. ppmV
dichlorodifluoromethane	120.92	1.0	cis-1,3-dichloropropene	110.97	1.0
chloromethane	50.49	1.0	trans-1,3-dichloropropene	110.97	1.0
Freon-114	170.92	1.0	1,1,2-trichloroethane	133.41	1.0
vinyl chloride	62.5	1.0	toluene	92.14	1.0
bromomethane	94.94	1.0	1,2-dibromoethane	187.87	1.0
chloroethane	64.52	1.0	tetrachloroethene	165.83	1.0
trichlorofluoromethane	137.37	1.0	chlorobenzene	112.56	1.0
1,1-dichloroethene	96.94	1.0	ethylbenzene	106.17	1.0
methylene chloride	84.93	1.0	m-xylene	106.17	1.0
Freon-113	187.38	1.0	p-xylene	106.17	1.0
trans-1,2-dichloroethene	98.96	1.0	styrene	104.15	1.0
1,1-dichloroethane	98.96	1.0	1,1,2,2-tetrachloroethane	167.85	1.0
cis-1,2-dichloroethene	96.94	1.0	o-xylene	106.17	1.0
chloroform	119.38	1.0	1,3,5-trimethylbenzene	120.2	1.0
1,2-dichloroethane	98.96	1.0	1,2,4-trimethylbenzene	120.2	1.0
1,1,1-trichloroethane	133.41	1.0	1,3-dichlorobenzene	147.0	1.0
benzene	78.11	1.0	1,4-dichlorobenzene	147.0	1.0
carbon tetrachloride	153.82	1.0	1,2-dichlorobenzene	147.0	1.0
1,2-dichloropropane	113	1.0	1,2,4-trichlorobenzene	181.45	1.0
trichloroethene	131.38	1.0	hexachlorobutadiene	260.76	1.0

TO-15 Primary Standard Mix #2

COMPOUND	MOL WGT	Conc. ppmV
Propylene	42.08	1.0
1,3-butadiene	54.09	1.0
Vinyl bromide	106.96	1.0
Acetone	58.08	1.0
Isopropyl alcohol	60.1	1.0
Carbon disulfide	76.14	1.0
3-chloropropene	76.53	1.0
Trans-1,2-dichloroethene	96.94	1.0
Methyl-tert butyl ether	88.15	1.0
Vinyl acetate	86.09	1.0
2-butanone (MEK)	72.11	1.0
Hexane	86.18	1.0
Ethyl acetate	88.11	1.0
Tetrahydrofuran	72.11	1.0
Cyclohexane	84.16	1.0
Bromodichloromethane	163.83	1.0
1,4-dioxane	88.11	1.0
2,2,4-trimethylpentane	114.23	1.0
Heptane	100.21	1.0
4-methyl-2-pentanone (MIBK)	100.16	1.0
2-hexanone	100.16	1.0
Dibromochloromethane	208.29	1.0
Bromoform	252.75	1.0
Benzyl chloride	126.59	1.0
4-ethyl toluene	120.2	1.0

Table 2B

TO-15 Purchased Custom Mix #3

TO-15 Custom Standard Mix					
COMPOUND	**MOL WGT**	**Conc. ppmV**	**COMPOUND**	**MOL WGT**	**Conc. ppmV**
Propane	44.10	1.0	n-Octane	114.23	1.0
Chlorodifluoromethane	86.47	1.0	1,1,1,2-Tetrachloroethane	167.85	1.0
Methanol	32.04	5.0	1,2,3-Trichloropropane	147.43	1.0
n-Butane	58.12	1.0	Nonane	128.26	1.0
Dichlorofluoromethane	102.92	1.0	Isopropylbenzene	120.19	1.0
Ethanol	46.07	5.0	Bromobenzene	157.01	1.0
Acetonitrile	41.05	1.0	2-Chlorotoluene	126.58	1.0
Acrolein	56.10	1.0	n-Propylbenzene	120.19	1.0
n-Pentane	72.20	1.0	4-Chlorotoluene	126.58	1.0
Acrylonitrile	53.10	1.0	tert-Butylbenzene	134.20	1.0
Ethyl Ether	74.12	1.0	n-Decane	142.28	1.0
tert-Butyl Alcohol	74.12	1.0	sec-Butylbenzene	134.20	1.0
2,2-Dichloropropane	112.99	1.0	p-Isopropyltoluene	134.22	1.0
Di-Isopropyl Ether	102.17	1.0	n-Butylbenzene	134.20	1.0
Tert-Butyl Ethyl Ether	102.20	1.0	1,2-Dibromo-3-chloropropane	236.33	1.0
1,1-Dichloropropene	110.97	1.0	n-Undecane	156.31	1.0
Tert Amyl Methyl Ether	102.17	1.0	Naphthalene	128.17	1.0
Dibromomethane	173.83	1.0	n-Dodecane	170.33	1.0
1,3-Dichloropropane	112.99	1.0	1,2,3-Trichlorobenzene	181.45	1.0
n-Butyl Acetate	116.16	1.0			

All mixes currently purchased fromPraxair (formerly Linde and Spectra Gases)

Table 2C

TO-15 / PIANO Custom Mix #4

COMPOUND (liquids)	Boiling Pt, deg C	Molecular Weight	Density ug/uL	uL injected*	FINAL ppmV
1,1-difluoroethane (gas)	-24.7	66.05	NA	10 mL	5.0
1-ethyl-1-methylcyclopentane	121.55	112.21	785.4	11.9	1.0
Indan	177	118.18	965.0	10.2	1.0
Indene	182	116.16	996.0	9.7	1.0
1,2,3-trimethylbenzene	176	120.19	890.0	11.2	1.0
Acetaldehyde	20.2	44.05	785	23.3	5.0
Acetone	56.1	58.08	784.5	24.6	4.0
isopropyl alcohol	82.6	60.1	786	9.5	1.5
methyl methacrylate	101	100.1	940	8.8	1.0

Table 2D

TO-15 / PIANO Custom Mix #5

COMPOUND (liquids)	Boiling Pt, deg C	Molecular Weight	Density ug/uL	uL injected*	FINAL ppmV
Thiophene	83	84.14	1060	6.6	1.0
2-Ethylthiophene	133	112.19	990	9.4	1.0
2-methyllthiophene	114	98.17	1016	8.0	1.0
3-Methylthiophene	113	98.17	1017	8.0	1.0

* both mixes #4 and #5 prepared in 29.5 L high pressure cylinders, pressurized to 995 psia with UHP nitrogen. Total volume of standard is 1997 L. Two year expiration date.

Table 3A

Summary of Secondary Standards Preparation

Primary Standard	Primary Standard Conc. ppmV	Volume of Primary Standard Injected into canister	Primary Standard Transfer Method	Final Volume canister (L)	Final Concentration ppbV **
Secondary standards prepared using precision dilution system (Entech 4700)					
TO-15 Mixes #1 - #5	1.0	3000 mL	Pressure differential	30	100
TO-15 Mixes #1 - #5	1.0	300 mL	Pressure differential	51	10 ***
Secondary standards prepared via serial dilution					
100 ppbV ICAL mix	1.0	300 mL	Syringe Injection	30	1.0
100 ppbV ICAL mix	0.1 *	30 mL	Syringe Injection	30	0.1

All standards prepared using humidified nitrogen.

* This calibration standard is used for TO-15 SIM analysis only (see Appendix B).

** The following analytes have concentrations that are greater than the listed concentration

Methanol, acetylaldehyde, and ethanol – 5 times greater

m&p-xylene- 2 times greater

Isopropyl alcohol-2.5 times greater

*** 10 ppbV standards that are prepared at a pressure of 50 psia are split out into additional empty 15L canisters to reduce the pressure in the standard and allow for additional canisters to be prepared for continuing calibration usage.

Table 3B

Preparation of Calibration Standards for Low Vapor Pressure Compounds

COMPOUND (solids)	Vapor Pressure* (P), atm	Molecular Weight	Volume (V) extracted, mL	Gas Constant (R) (L atm/gm mol K)	T, °K	n**	Final Volume, L	mg	ug/m³	ppbV
1-methylnaphthalene	7.11E-05	142.20	7.1	0.082057	298.1	2.44E-08	51	0.00347	115.7	10
1-methylnaphthalene	7.11E-05	142.00	42	0.082057	298.1	1.22E-07	30	0.0173255	577.5	100
2-methylnaphthalene	8.96E-05	142.00	5.8	0.082057	298.1	2.491E-08	51	0.0035373	117.9	10.2
2-methylnaphthalene	8.96E-05	142.00	34	0.082057	298.1	1.246E-07	30	0.0176867	589.6	101.6
benzothiophene	7.70E-05	134.20	6.5	0.082057	291.5	2.446E-08	51	0.0032824	109.4	10.0
benzothiophene	7.70E-05	134.20	38	0.082057	291.5	1.223E-07	30	0.016412	547.1	100

Approximately 5.0 g of solid material was allowed to stand in a 250 mL jar w/ septa cap for 30 min prior to removal of vapor phase aliquot. The aliquot was then spiked directly into secondary standard.

All vapor pressure values from Lange's Handbook of Chemistry & Physics

Table 4

Calibration Standard Levels

Calibration Level	Amount (ppbV)	Volume / Secondary Standard
1	0.20	50 mL of 1.0 ppbV sec. standard
2	0.50	125 mL of 1.0 ppbV sec. standard
3	1.0	250 mL of 1.0 ppbV sec. standard
4	5.0	125 mL of 10 ppbV sec. standard
5	10	250 mL of 10 ppbV sec. standard
6	20	50 mL of 100 ppbV sec. standard
7	50	125 mL of 100 ppbV sec. standard
8	100	250 mL of 100 ppbV sec. standard

Table 5

BFB Key Ions and Abundance Criteria

Mass	Ion Abundance Criteria
50	8.0-40.0 percent of the base peak
75	30.0-66.0 percent of the base peak
95	Base peak, 100 percent relative abundance
96	5.0-9.0 percent of the base peak
173	Less than 2.0% of mass 174
174	50.0 to 120.0% of mass 95
175	4.0-9.0 percent of mass 174
176	Greater than 93.0 percent but less than 101.0 percent of mass 174
177	5.0-9.0 percent of mass 176

Table 6

ENTECH 7016D/ 7200 or 7200A Operating Parameters

Module 1 (Cold Trap)	
Parameter	**Setting**
Trapping Temperature	-40° C
Internal standard / surrogate volume	100 mL
Internal standard / surrogate flow rate	100 mL / min
Nominal Sample volume (may vary depending on sample concentrations)	250 mL
Sample flow rate, mL / min	100 mL / min
Preheat Temperature	10° C
Desorb Temperature	10° C
Bake Temperature	220° C
Bake Time	10 min
Module 1 to Module 2 transfer volume / rate	20 cc @ 5.0 cc/min
Module 2 (Tenax trap)	
Parameter	**Setting**
Trapping Temperature	-65° C to -75° C
Desorb Temperature	220° C
Bake Temperature	220° C
Module 2 to Module 3 desorb time	3.5 min
Module 3 (Cryofocusser)	
Parameter	**Setting**
Cryofocusing Temperature	-130° C to -190° C
Desorb Temperature	Approx. 90° C
Module 3 to GC desorb time	3.0-3.5 min
Bake temperature / event	Approx. 90° C / event 3
Delay time	13-17 min

Table 7
Quantitation and Secondary Ions for TO-15 Analytes and Internal Standards

Compound	Quant. Ion	Sec. Ion(s)
bromochloromethane	49	130
chlorodifluoromethane	51	67
propylene	41	39, 42
propane	29	43,39
dichlorodifluoromethane	85	87
chloromethane	50	52
Freon-114	85	87, 135
methanol	31	32,29
vinyl chloride	62	64,
1,3-butadiene	54	39
butane	43	41,58
bromomethane	94	96
chloroethane	64	66
dichlorofluoromethane	67	69, 47
ethanol	31	45
acetonitrile	41	40
vinyl bromide	106	108
acrolein	56	55,29
acetone	43	58
trichlorofluoromethane	101	103
isopropyl alcohol	45	59
acrylonitrile	53	52,51
pentane	43	57,72
ethyl ether	31	59,45
1,1-dichloroethene	61	96, 63
Tertiary butyl Alcohol	59	41, 43
methylene chloride	49	84
3-chloropropene	41	39, 76
carbon disulfide	76	44
Freon 113	101	85, 151
trans-1,2-dichloroethene	61	96, 98
1,1-dichloroethane	63	65
MTBE	73	57, 43
vinyl acetate	43	86
2-butanone	43	72
cis-1,2-dichloroethene	61	96, 98
chloroform	83	85, 47
1,2-dichloroethane	62	49, 63, 64
acetaldehyde	29	43, 44

Compound	Quant. Ion	Sec. Ion(s)
1,4-difluorobenzene	114	63
n-hexane	57	43, 86
diisopropyl ether	87	45, 59
ethyl acetate	61	43, 70
2,2-dichloropropane	77	41, 97
tetrahydrofuran	42	71, 72
tert-butyl ethyl ether	59	87, 57
1,2-dichloroethane-D4	65	67, 102
1,1,1-trichloroethane	97	61, 119
1,1-dichloropropene	75	39,110
benzene	78	52
carbon tetrachloride	117	119, 82
cyclohexane	56	84, 41
tert-amyl methyl ether	73	43, 87
dibromomethane	93	95, 174
1,2-dichloropropane	63	39, 62
bromodichloromethane	83	85, 129
trichloroethene	130	132, 97
1,4-dioxane	88	58
2,2,4-trimethylpentane	57	41, 99
n-heptane	43	57, 100
cis-1,3-dichloropropene	75	39, 77
4-methyl-2-pentanone	43	58, 100
methyl methacrylate	41	69, 100
trans-1,3-dichloropropene	75	39, 77
1,1,2-trichloroethane	97	61, 83
Thiophene	84	45, 58
chlorobenzene-D5	54	82, 117
toluene	91	92
toluene-D8	98	100
1,3-dichloropropane	76	41,49
2-hexanone	43	58, 100
dibromochloromethane	129	127, 131
1,2-dibromoethane	107	109
butyl acetate	73	43, 56
octane	85	43, 57, 114
tetrachloroethene	166	94, 131
1,1,1,2-tetrachloroethane	131	95, 133
chlorobenzene	112	77, 114
ethylbenzene	91	106
m+p-xylene	91	106

Compound	Quant. Ion	Sec. Ion(s)
bromoform	173	171, 175
styrene	104	103, 78
1,1,2,2-tetrachloroethane	83	85
o-xylene	91	106
1,2,3-trichloropropane	75	39, 110
nonane	43	57, 128
bromofluorobenzene	95	75, 174
isopropylbenzene	105	120
bromobenzene	77	156
2-chlorotoluene	126	91
n-propylbenzene	120	91
4-chlorotoluene	91	126
4-ethyl toluene	105	91, 120
1,3,5-trimethylbenzene	105	91, 120
tert-butlybenzene	119	134
1,2,4-trimethylbenzene	105	91, 120
decane	57	43, 142
benzyl chloride	91	126
1,3-dichlorobenzene	146	75, 111
1,4-dichlorobenzene	146	75, 111
sec-butylbenzene	105	134
p-isopropyltoluene	119	134
1,2-dichlorobenzene	146	75, 111
n-butylbenzene	91	134
1,2-dibromo-3-chloropropane	75	39, 157
undecane	57	43, 71, 156
dodecane	57	43
1,2,4-trichlorobenzene	180	109, 145
naphthalene	128	102
1,2,3-trichlorobenzene	180	109, 145
hexachlorobutadiene	225	118, 260
2-methylthiophene	97	45, 98
3-methylthiophene	97	45, 98
2-ethylthiophene	97	45, 112
1,2,3-trimethylbenzene	105	120
indan	117	91, 118
indene	115	89, 116
1,2,4,5-tetramethylbenzene	119	91, 134
benzothiophene	134	63, 89
2-methylnaphthalene	142	115, 141
1-methylnaphthalene	142	115, 141

Table 8

Internal Standards and the Associated Target Analytes

bromochloromethane		1,4-difluorobenzene	chlorobenzene-D5	
chlorodifluoromethane	trans-1,2-dichloroethene	hexane	toluene	decane
propylene	1,1-dichloroethane	diisopropyl ether	toluene-D8	benzyl chloride
propane	MTBE	tert-butyl ethyl ether	1,3-dichloropropane	1,3-dichlorobenzene
dichlorodifluoromethane	vinyl acetate	1,2-dichloroethane-D4	2-hexanone	1,4-dichlorobenzene
chloromethane	2-butanone	1,1,1-trichloroethane	dibromochloromethane	sec-butylbenzene
Freon-114	cis-1,2-dichloroethene	1,1-dichloropropene	1,2-dibromoethane	p-isopropyltoluene
methanol	chloroform	benzene	butyl acetate	1,2-dichlorobenzene
vinyl chloride	1,2-dichloroethane	carbon tetrachloride	Octane	n-butylbenzene
1,3-butadiene	trans-1,2-dichloroethene	cyclohexane	tetrachloroethene	1,2-dibromo-3-chloropropane
butane	1,1-dichloroethane	tert-amyl methyl ether	1,1,1,2-tetrachloroethane	undecane
bromomethane	acetaldehyde	dibromomethane	Chlorobenzene	dodecane
chloroethane	ethyl acetate	1,2-dichloropropane	Ethylbenzene	1,2,4-trichlorobenzene
dichlorofluoromethane	2,2-dichloropropane	bromodichloromethane	m+p-xylene	naphthalene
ethanol	tetrahydrofuran	trichloroethene	Bromoform	1,2,3-trichlorobenzene
acetonitrile		1,4-dioxane	Styrene	hexachlorobutadiene
vinyl bromide		2,2,4-trimethylpentane	1,1,2,2-tetrachloroethane	2-methylthiophene
acrolein		heptane	o-xylene	3-methylthiophene
acetone		cis-1,3-dichloropropene	1,2,3-trichloropropane	2-ethylthiophene
trichlorofluoromethane		4-methyl-2-pentanone	Nonane	1,2,3-trimethylbenzene
isopropyl alcohol		methyl methacrylate	bromofluorobenzene	indan
acrylonitrile		trans-1,3-dichloropropene	isopropylbenzene	indene
pentane		1,1,2-trichloroethane	bromobenzene	1,2,4,5-tetramethylbenzene
ethyl ether		thiophene	2-chlorotoluene	benzothiophene
1,1-dichloroethene			n-propylbenzene	2-methylnaphthalene
Tertiary butyl Alcohol			4-chlorotoluene	1-methylnaphthalene
methylene chloride			4-ethyl toluene	
3-chloropropene			1,3,5-trimethylbenzene	
carbon disulfide			tert-butlybenzene	
Freon 113			1,2,4-trimethylbenzene	

Table 9A

TO-15 Target Analytes and Reporting Limits
Standard List

COMPOUND	CAS #	Standard Reporting Limit, ppbV	Standard Reporting Limit, ug/m^3
1,1,1-trichloroethane	71-55-6	0.2	1.09
1,1,2,2-tetrachloroethane	79-34-5	0.2	1.37
1,1,2-trichloroethane	79-00-5	0.2	1.09
1,1-dichloroethane	75-34-3	0.2	0.81
1,1-dichloroethene	75-35-5	0.2	0.79
1,2,4-trichlorobenzene	120-82-1	0.2	1.48
1,2,4-trimethylbenzene	95-63-6	0.2	0.98
1,2-dibromoethane	106-93-4	0.2	1.54
1,2-dichlorobenzene	95-50-1	0.2	1.2
1,2-dichloroethane	107-06-2	0.2	0.81
1,2-dichloropropane	78-87-5	0.2	0.92
1,3,5-trimethylbenzene	108-67-8	0.2	0.98
1,3-butadiene	106-99-0	0.2	0.44
1,3-dichlorobenzene	541-73-1	0.2	1.2
1,4-dichlorobenzene	106-46-7	0.2	1.2
1,4-dioxane	123-91-1	0.2	0.72
2,2,4-trimethylpentane	540-84-1	0.2	0.93
2-butanone	78-93-3	0.5	1.48
2-hexanone	591-78-6	0.2	0.82
3-chloropropene	107-05-1	0.2	0.63
4-Ethyltoluene	622-96-8	0.2	0.98
Acetone	67-64-1	1.0	2.38
benzene	71-43-2	0.2	0.64
Benzyl Chloride	100-44-7	0.2	1.03
bromodichloromethane	75-27-4	0.2	1.34
bromoform	75-25-2	0.2	2.07
bromomethane	74-83-9	0.2	0.78
carbon disulfide	75-15-0	0.2	0.62
carbon tetrachloride	56-23-5	0.2	1.26
chlorobenzene	108-90-7	0.2	0.92
chloroethane	75-00-3	0.2	0.53
chloroform	67-66-3	0.2	0.98

COMPOUND	CAS #	Standard Reporting Limit, ppbV	Standard Reporting Limit, ug/m^3
chloromethane	74-87-3	0.2	0.41
cis-1,2-dichloroethene	156-59-2	0.2	0.79
cis-1,3-dichloropropene	10061-01-5	0.2	0.91
cyclohexane	110-82-7	0.2	0.69
dibromochloromethane	124-48-1	0.2	1.7
dichlorodifluoromethane	75-71-8	0.2	0.99
ethanol	64-17-5	2.5	4.71
ethyl acetate	141-78-6	0.5	1.8
ethylbenzene	100-41-4	0.2	0.87
Freon-113	76-13-1	0.2	1.53
Freon-114	76-14-2	0.2	1.4
hexachlorobutadiene	87-68-3	0.2	2.13
hexane	110-54-3	0.2	0.7
isopropyl alcohol	67-63-0	0.5	1.23
methylene chloride	75-09-2	0.5	1.74
MIBK	108-10-1	0.5	2.1
MTBE	1634-04-4	0.2	0.72
m+p-xylene	108-38-3 106-42-3	0.4	1.74
n-heptane	142-82-5	0.2	0.82
o-xylene	95-47-6	0.2	0.87
propylene	115-7-1	0.5	0.85
styrene	100-42-5	0.2	0.85
tetrachloroethene	127-18-4	0.2	1.36
tetrahydrofuran	109-99-9	0.5	1.48
toluene	108-88-3	0.2	0.75
trans-1,2-dichloroethene	156-60-5	0.2	0.79
trans-1,3-dichloropropene	10061-02-6	0.2	0.91
trichloroethene	79-01-6	0.2	1.07
trichlorofluoromethane	75-69-4	0.2	1.12
vinyl acetate	108-05-4	0.5	1.75
vinyl bromide	593-60-2	0.2	0.87
vinyl chloride	75-01-4	0.2	0.51

Table 9B

TO-15 Target Analytes and Reporting Limits
Additional Analytes

COMPOUND	CAS #	Standard Reporting Limit, ppbV	Standard Reporting Limit, ug/m^3
AP-42 Analytes			
acrolein	107-02-8	0.50	1.15
acrylonitrile	107-13-1	0.50	1.08
butane	106-97-8	0.20	0.48
Chlorodifluoromethane	75-45-6	0.20	0.71
Dichlorofluoromethane	75-71-8	0.20	0.84
n-Pentane	109-66-0	0.20	0.59
Propane	74-98-6	0.50	0.90
MADEP MCP 8260 Analytes			
1,1,1,2-tetrachloroethene	630-20-6	0.20	1.37
1,1-dichloropropene	563-58-6	0.20	0.91
1,2,3-trichlorobenzene	87-61-6	0.20	1.48
1,2,3-Trichloropropane	96-18-4	0.20	1.20
1,3-dichloropropane	142-28-9	0.20	0.92
2,2-dichloropropane	594-20-7	0.20	0.92
2-chlorotoluene	95-49-8	0.20	1.03
4-chlorotoluene	106-43-4	0.20	1.03
bromobenzene	108-86-1	0.20	1.28
1,2-dibromo-3-chloropropane	96-12-8	0.20	1.93
dibromomethane	74-95-3	0.20	1.42
diisopropyl ether	108-20-3	0.20	0.84
isopropylbenzene	98-82-8	0.20	0.98
isopropyltoluene	99-87-6	0.20	1.10
naphthalene	91-20-3	0.20	1.05
n-butylbenzene	104-51-8	0.20	1.10
n-propylbenzene	103-65-1	0.20	0.98
sec-butylbenzene	135-98-8	0.20	1.10
tert-amyl methyl ether	994-05-8	0.20	0.84
tert-Butyl ethyl ether	637-92-3	0.20	0.84
tert-butylbenzene	98-06-6	0.20	1.10

COMPOUND	CAS #	Standard Reporting Limit, ppbV	Standard Reporting Limit, ug/m^3
NYDEC Petroleum Indicator Compounds			
nonane	111-84-2	0.20	1.05
octane	111-65-9	0.20	0.93
undecane	1120-21-4	0.20	1.28
decane	124-18-5	0.20	1.16
dodecane	112-40-3	0.20	1.39
indene	95-13-6	0.20	0.95
Indan	496-11-7	0.20	0.97
thiophene	110-02-1	0.20	0.69
2-methylthiophene	554-13-3	0.20	0.80
3-methylthiophene	616-44-4	0.20	0.80
2-ethyl thiophene	872-55-9	0.20	0.92
benzothiophene	934-80-5	0.50	2.74
1,2,3-trimethylbenzene	526-73-8	0.20	0.98
1,2,4,5-tetramethylbenzene	95-93-2	0.20	1.10
2-methylnaphthalene	91-57-6	1.0	5.8
1-methylnaphthalene	90-12-0	1.0	5.8
Project Specific Analytes			
acetaldehyde	75-07-0	2.5	4.51
Acetonitrile	75-05-8	0.20	0.34
butyl acetate	123-86-4	0.50	2.38
ethyl ether	60-29-7	0.20	0.61
methanol	67-56-1	5.0	6.55
tert-butyl alcohol	75-65-0	0.50	1.51
Methyl methacrylate	80-62-6	0.50	2.05
All reporting limits are subject to change.			

Appendix A

Cold Trap Dehydration technique (CTD) for Analysis of Sulfides and Mercaptans by EPA TO-15

Target analytes:

Compound	CAS#	Reporting Limit, ppbV
Hydrogen sulfide	7783-06-4	2.0
Carbonyl sulfide	463-58-1	2.0
Methyl mercaptan	74-93-1	2.0
Ethyl mercaptan	75-08-1	0.5
Dimethyl sulfide	75-18-3	0.5
carbon disulfide	75-15-0	0.5
Isopropyl Mercaptan	75-33-2	0.5
tert-Butyl Mercaptan	75-66-1	0.5
n-Propyl Mercaptan	107-03-9	0.5
Ethyl Methyl Sulfide	624-89-5	0.5

Compound	CAS#	Reporting Limit, ppbV
Thiophene	110-02-1	0.5
Isobutyl Mercaptan	513-44-0	0.5
diethyl sulfide	352-93-2	0.5
Butyl Mercaptan	109-75-5	2.0
dimethyl disulfide	624-92-0	0.5
3-Methylthiophene	616-44-4	0.5
Tetrahydrothiophene	110-01-0	0.5
2-Ethylthiophene	872-55-9	0.5
2,5-Dimethylthiophene	638-02-8	0.5
Diethyl Disulfide	110-81-6	0.5
All reporting limits are subject to change.		

The cold trap dehydration method requires a blank trap (i.e. no trapping material) be installed in module 1 of the Entech 7200 or 7200A concentrator. This trap is cooled and a 250 mL aliquot of sample is allowed to pass through this trap and then directly onto the Tenax trap in module 2, which is also cooled (see Table A-5 for setpoints). The sample is then transferred to module 3 (cryofocusser) via ballistic heating. All requirements stated in this SOP must be applied to any TO15-Sulfide/Mercaptan analysis conducted in the laboratory.

SOP modifications:

Standard preparation and calibration procedures for these analytes are listed in Table A-1 through A-5. Quantitation parameters are listed in Table A-8. Table A-7 lists modified GC conditions.

Section 9.2.5 and 9.5.3.1: Use the Entech method alpha_H2S&SULF.CTD in place of the alpha_TO15.MPT method.

A second source laboratory check standard (LCS) is not readily available for these analytes. An LCS standard is prepared at a different concentration than the initial calibration standards using the same stock standard.

Table A-1

Sulfide/Mercaptan Primary Standard Mix #1

COMPOUND	CAS#	Molecular Weight	Concentration, ppmV
hydrogen sulfide	7783-06-4	34.08	5.0
Carbonyl sulfide	463-58-1	60.08	5.0
Methyl mercaptan	74-93-1	48.11	5.0
ethyl mercaptan	75-08-1	62.14	1.0
dimethyl sulfide	75-18-3	62.14	1.0
carbon disulfide	75-15-0	76.1	1.0
Isopropyl Mercaptan	75-33-2	76.2	1.0
tert-Butyl Mercaptan	75-66-1	90.19	1.0
n-Propyl Mercaptan	107-03-9	76.16	1.0
Ethyl Methyl Sulfide	624-89-5	76.16	1.0
Thiophene	110-02-1	84.1	1.0
Isobutyl Mercaptan	513-44-0	90.19	1.0
diethyl sulfide	352-93-2	90.2	1.0
Butyl Mercaptan	109-79-5	90.19	4.0
3-Methylthiophene	616-44-4	98.17	1.0
Tetrahydrothiophene	110-01-0	88.17	1.0
2-Ethylthiophene	872-55-9	112.19	1.0
2,5-Dimethylthiophene	638-02-8	112.19	1.0

Table A-2

Sulfide/Mercaptan Primary Standard Mix #2

COMPOUND	CAS#	Molecular Weight	Concentration, ppmV
dimethyl disulfide	624-92-0	94.2	1.0

Table A-3

Sulfide/Mercaptan Primary Standard Mix #3

COMPOUND	CAS#	Molecular Weight	Concentration, ppmV
Diethyl Disulfide	110-81-6	122.25	1.0

Table A-4

Summary of Secondary Standards Preparation for Sulfides and Mercaptan Analysis

Primary Standard	Primary Standard Conc. ppmV	Volume of Primary Standard Injected into Tedlar® Bag	Primary Standard Transfer Data	Final Volume Tedlar® Bag (L)	Final Concentration ppbV
Secondary standards prepared using gas-tight syringes					
Tedlar® bag primary standard-Low	1- 5ppmV	20 mL	Syringe Injection	4.0	5.0 / 20.0 / 20
Tedlar® bag primary standard-High	1- 5ppmV	400 mL	Syringe Injection	4.0	100 / 400 / 500
Tedlar® bag primary standard-LCS	1- 5ppmV	40 mL	Syringe Injection	4.0	10 / 40 / 50

Table A-5

Calibration Standard Levels

Calibration Level	Amount (ppbV)	Volume / Secondary Standard
1	0.50	25 mL of 5.0 ppbV sec. standard
2	1.0	50 mL of 5.0 ppbV sec. standard
3	5.0	250 mL of 5.0 ppbV sec. standard
4	10	25 mL of 100 ppbV sec. standard
5	20	50 mL of 100 ppbV sec. standard
6	50	125 mL of 100 ppbV sec. standard
7	80	200 mL of 100 ppbV sec. standard
8	100	250 mL of 100 ppbV sec. standard

Table A-6

ENTECH & 7016D/7200 or 7200A Operating Parameters for CTD Method

Module 1 (Blank Trap)	
Parameter	**Setting**
Trapping Temperature	-20° C
Internal standard volume	100 mL
Internal standard flow rate	60 mL / min
Sample volume (may vary depending on sample concentrations)	250 mL
Sample flow rate	100 mL / min
Preheat Temperature	10° C
Desorb Temperature	10° C
Bake Temperature	220° C
Bake Time	10 min.
Module 2 (Tenax trap)	
Parameter	**Setting**
Trapping Temperature	-70° C
Desorb Temperature	180° C
Bake Temperature	220° C
Module 2 to Module 3 desorb time	3.5 min
Module 3 (Cryofocusser)	
Parameter	**Setting**
Cryofocusing Temperature	-130° C
Desorb Temperature	Approx. 70° C
Module 3 to GC desorb time	2 min
Bake temperature / event	Approx. 90° C / event 3
Delay time	10 min

Table A-7

Internal Standard (IS) Assignments and Quantitation Ions for Sulfides & Mercaptans

Compound	Quant Ion	Sec. Ion(s)
Bromochloromethane (IS)	49	130
Hydrogen sulfide	34	33, 36
Carbonyl sulfide	60	62, 32
Methyl mercaptan	47	48, 45
ethyl mercaptan	62	47, 29
dimethyl sulfide	62	45, 47
carbon disulfide	76	44, 78
Isopropyl Mercaptan	43	41, 76
tert-Butyl Mercaptan	41	57, 90
n-Propyl Mercaptan	76	47, 43
Ethyl Methyl Sulfide	61	76, 48

Compound	Quant Ion	Sec. Ion(s)
1,4-difluorobenzene (IS)	114	63
Thiophene	84	58, 45
Isobutyl Mercaptan	41	56, 90
diethyl sulfide	75	90, 47
Butyl Mercaptan	56	41, 90
dimethyl disulfide	94	79, 45

Compound	Quant Ion	Sec. Ion(s)
Chlorobenzene-D5 (IS)	54	82, 117
3-Methylthiophene	97	98, 45
Tetrahydrothiophene	60	88, 45
2-Ethylthiophene	97	112, 45
2,5-Dimethylthiophene	111	112,97
Diethyl Disulfide	122	66, 94

Appendix B

Data Acquistion Parameters and Analysis Modifications for Conducting SIM Analysis

SIM analysis is conducted when full scan sensitivity does not meet the data quality objectives (DQO) of the project and/or regulatory criteria. The acquisition method used to acquire full scan data simultaneously acquires SIM data using the SIM ions and windows specified in Table B-1. The following modifications to the full scan SOP must be done to generate data using the SIM signal:

- SIM level calibration standards must be analyzed w/ the full scan curve (0.02,0.05, and 0.1 ppbV)
- A calibration curve is generated using the SIM signal utilizing the lower level calibration standards and must meet the same criteria as the full scan calibration criteria.
- The continuing calibration /LCS should be analyzed at a lower concentration (5.0 ppbV). If a separate continuing calibration run is needed, the continuing calibration level of 10 ppbV may be utilized. Laboratory Method Blanks must be evaluated for the SIM reporting limit as listed in Table B-2.

The SIM signal only acquires data for a limited target analyte list. These target analytes and reporting limits are listed in Table B-2. Additional ions have been added to allow for more analytes to be added, if requested by client. All requirements stated in this SOP must be applied to any TO15-SIM analysis conducted in the laboratory.

Table B-1

Calibration Standard Levels for SIM Analysis

Calibration Level	Amount (ppbV)	Volume / Secondary Standard
1	0.02	50 mL of 0.10 ppbV sec. standard
2	0.05	125 mL of 0.1 ppbV sec. standard
3	0.10	250 mL of 0.1 ppbV sec. standard
4	0.20	50 mL of 1.0 ppbV sec. standard
5	0.50	125 mL of 1.0 ppbV sec. standard
6	1.0	250 mL of 1.0 ppbV sec. standard
7	5.0	125 mL of 10 ppbV sec. standard
8	10	250 mL of 10 ppbV sec. standard
9	20	50 mL of 100 ppbV sec. standard
10	50	125 mL of 100 ppbV sec. standard

Table B-2

Seletive Ion Monitoring (SIM) Groupings

Group #	1	2	3	5	6	7	8	9	10	11	12
Group Start Time, min	0	5.9	8.75	10.1	10.9	11.6	13.8	14.6	16.6	18.8	20.5
Dwell time, sec	25	10	25	25	25	15	25	15	3	5	25
Cycles/sec (calc)	2	2.5	3.3	2.1	2.3	1.8	5.7	2.2	7	7	2.3
Analyte Range, Compund #	C2-C7	C8-C20	C21-C26	C27-C29, BCM (IS)	C30-C34	C35-C44, 1,4-DFB (IS)	C45-C46	C47-C55	C56-C67, CHB-D5 (IS)	C68-C76	C77-C80
Ions	29	29 63	43	41	42	39 85	39	39 92	39 106	39	43
	31	31 64	57	43	49	41 87	43	41 94	43 110	43	57
	32	39 66	61	45	51	43 88	58	43 97	45 112	57	63
	39	40 67	63	47	57	45 93	75	45 98	54 114	71	89
	41	41 69	65	49	59	52 95	77	49 100	57 117	75	102
	42	43 72	72	57	62	56 97	100	56 107	75 120	89	109
	43	44 76	73	59	63	57 99		57 109	77 126	91	115
	44	45 84	86	61	64	58 100		58 114	78 128	105	118
	50	47 85	96	70	65	62 110		61 127	82 131	111	128
	51	49 94	98	77	67	63 114		73 129	83 133	115	134
	52	51 96	117	83	71	69 117		75 131	85 156	116	141
	54	52 101	198	85	72	73 119		76 166	91 171	117	142
	58	53 103		86	87	75 129		77	95 173	118	145
	62	55 106		87	97	78 130		83	97 174	119	180
	64	56 108		96	102	82 132		85	103 175	120	225
	67	57 151		97	119	83 174		91	104	126	260
	85	58		98		84			105	134	
	87	59		130						142	
	135	61								146	
										156	
										157	

Table B-3

TO15-SIM Target Analytes and Reporting Limits

COMPOUND	CAS #	SIM Reporting Limit, ppbV	SIM Reporting Limit, ug/m^3
1,1,1-trichloroethane	71-55-6	0.02	0.109
1,1,2,2-tetrachloroethane	79-34-5	0.02	0.137
1,1,2-trichloroethane	79-00-5	0.02	0.109
1,1-dichloroethane	75-34-3	0.02	0.081
1,1-dichloroethene	75-35-5	0.02	0.079
1,2,4-trimethylbenzene	95-63-6	0.02	0.098
1,2-dibromoethane	106-93-4	0.02	0.154
1,2-dichlorobenzene	95-50-1	0.02	0.12
1,2-dichloroethane	107-06-2	0.02	0.081
1,2-dichloropropane	78-87-5	0.02	0.092
1,2-dibromo-3-chloropropane	96-12-8	0.02	0.193
1,3,5-trimethylbenzene	108-67-8	0.02	0.098
1,3-butadiene	106-99-0	0.02	0.044
1,3-dichlorobenzene	541-73-1	0.02	0.12
1,4-dichlorobenzene	106-46-7	0.02	0.12
1,4-dioxane	123-91-1	0.10	0.36
2-hexanone	591-78-6	0.20	0.82
2,2,4-trimethylpentane	540-84-1	0.20	0.93
3-chloropropene	107-05-1	0.20	0.63
4-Ethyltoluene	622-96-8	0.02	0.098
benzene	71-43-2	0.10	0.223
benzyl chloride	100-44-7	0.20	1.03
bromodichloromethane	75-27-4	0.02	0.134
bromoform	75-25-2	0.02	0.207
bromomethane	74-83-9	0.02	0.078
carbon disulfide	75-15-0	0.20	0.62
hexachlorobutadiene	87-68-3	0.05	533
hexane	110-54-3	0.20	0.7
heptane	142-82-5	0.20	0.82
isopropyl alcohol	67-63-0	0.50	1.23
methylene chloride	75-09-2	0.50	1.74
MTBE	1634-04-4	0.02	0.072
m+p-xylene	108-38-3 106-42-3	0.04	0.174
o-xylene	95-47-6	0.02	0.087
propylene	115-7-1	0.50	0.85
styrene	100-42-5	0.02	0.085
tetrachloroethene	127-18-4	0.02	0.136
tetrahydrofuran	109-99-9	0.5	1.48
toluene	108-88-3	0.05	0.188
trans-1,2-dichloroethene	156-60-5	0.02	0.079
trans-1,3-dichloropropene	10061-02-6	0.02	0.091
trichlorofluoromethane	75-69-4	0.05	0.280
trichloroethene	79-01-6	0.02	0.107
1,2,4-trichlorobenzene	120-82-1	0.05	0.371
vinyl acetate	108-05-4	1.00	3.50
vinyl bromide	593-60-2	0.20	0.87
vinyl chloride	75-01-4	0.02	0.051
CT RSR Additional Analytes			
1,1,1,2-tetrachloroethane	630-20-6	0.02	0.137
acrylonitrile	107-13-1	0.50	1.08
isopropyltoluene	99-87-6	0.20	1.1
n-butylbenzene	104-51-8	0.20	1.1

carbon tetrachloride	56-23-5	0.02	0.126
chlorobenzene	108-90-7	0.10	0.460
chloroethane	75-00-3	0.10	0.265
chloroform	67-66-3	0.02	0.098
chloromethane	74-87-3	0.20	0.41
cis-1,2-dichloroethene	156-59-2	0.02	0.079
cis-1,3-dichloropropene	10061-01-5	0.02	0.091
cyclohexane	110-82-7	0.2	0.69
dibromochloromethane	124-48-1	0.02	0.17
dichlorodifluoromethane	75-71-8	0.20	0.99
ethanol	64-17-5	5.0	9.42
ethyl acetate	141-78-6	0.50	1.8
ethylbenzene	100-41-4	0.02	0.087
Freon-113	76-13-1	0.05	0.383
Freon-114	76-14-2	0.05	0.349
sec-butylbenzene	135-98-8	0.20	1.1
tert-butylbenzene	98-06-6	0.20	1.1
isopropylbenzene	98-82-8	0.20	0.98
2-butanone (MEK)	78-93-3	0.50	1.48
Acetone	67-64-1	1.00	2.35
4-methyl-2-pentanone (MIBK)	108-10-1	0.50	2.05
Project & State Specific Analytes			
1,2,3-trichlorobenzene	87-61-6	0.05	0.371
1,2,3-Trichloropropane	96-18-4	0.02	0.12
acrolein	107-02-8	0.05	0.115
bromobenzene	108-86-1	0.20	1.28
Dibromomethane	74-95-3	0.20	1.42
Naphthalene	91-20-3	0.05	0.262
tertiary butyl alcohol	75-65-0	0.50	1.51
All reporting limits are subject to change.			

Appendix C

Modifications to Data Review and Case Narrative to Comply with MADEP MCP TO-15 Method

This addendum addresses modifications to this SOP required to be in compliance with the MADEP MCP TO-15 method, specifically "Quality Control Requirements and Performance Standards for the ***Analysis of Volatile Organic Compounds in Air Samples (TO-15) by Gas Chromatography/Mass Spectrometry (GC/MS)*** in Support of Response Actions under the Massachusetts Contingency Plan (MCP)" Revision No. 0, Section IX B.

1) For duplicate analyses, the 25% RPD criteria stated in Sect. 9.6 of this SOP does not need to be applied to concentrations less than 5X the reporting limit.

2) Samples cannot be analyzed if any of the target analytes if the LCS recovery criteria stated in sect. 9.2 of this SOP is below 70% recovery. For compounds listed as difficult analytes (hexachlorobutadiene, 1,2,4-trichlorobenzene, naphthalene, acetone, and 1,4-dioxane), LCS recovery cannot be less than 50%.

3) Any analyte exceeding %RSD criteria of 30% during initial calibration that is a not listed in the MCP TO-15 method, but may still be reported to the client, must be noted in the case narrative.

Appendix E

Modifications to Data Review and Case Narrative to Comply with 2014 NJDEP Technical Guidance for EPA Method TO-15

This addendum addresses modifications to this SOP required to be in compliance with the NJDEP 2014 Technical Guidance, **"NJDEP Site Remediation Program, Data of Known Quality Protocol, Version 1, April 2014**". This guidance is to be used when analyzing samples via the EPA Method TO-15.

1) Per the Data of Know Quality Protocols Technical Guidance, surrogates are not required to be reported via EPA Method TO-15.

2) A target analyte list and reporting limits are specified in Table E-1, per the Analytical Laboratory Data Generation, Assessment and Usability Technical Guidance.

3) For the analytes ethanol and isopropyl alcohol, results are allowed to be reported outside the calibration range of the instrument, per the Analytical Laboratory Data Generation, Assessment and Usability Technical Guidance. Results reported that exceed the calibration range will be designated with an "E" qualifier.

4) **Laboratory Control Sample (LCS) criteria -** Must contain all target analytes, recovery range is 70-130%. Exceptions for difficult analytes (hexachlorobutadiene, 1,2,4-trichlorobenzene, naphthalene, acetone, dichlorodifluoromethane, and 1,4-dioxane) must exhibit percent recoveries between 40-160%. In addition, the CCAL analysis cannot be reported as the LCS even if it meets LCS requirements. The LCS must be a separate analysis, analyzed after a passing CCAL standard.

5) **Duplicate analyses** - The 25% RPD criteria stated in Sect. 9.6 of this SOP does not need to be applied to concentrations less than 5X the reporting limit.

6) **Tentatively Identified Compounds (TICs)** – up to 15 TICs must be reported, if present. If a reduced target analyte list is requested by client, TICs are not reported.

Table E-1

NJDEP 2014 Target Analytes and Reporting Limits via EPA Method TO-15

Required Compound Name	CAS Number	Molecular Weight	Reporting Limit ppbV	Reporting Limit ug/m³
Acetone	67-64-1	58.08	5.0	12
Allyl chloride	107-05-1	76.53	0.2	0.6
Benzene	71-43-2	78.11	0.2	0.6
Bromodichloromethane	75-27-4	163.8	0.2	1
Bromoform	75-25-2	252.8	0.2	2
Bromomethane	74-83-9	94.94	0.2	0.8
1,3-Butadiene	106-99-0	54.09	0.2	0.4
Chlorobenzene	108-90-7	112.6	0.2	0.9
Chloroethane	75-00-3	64.52	0.5	1
Chloroform	67-66-3	119.4	0.2	1
Chloromethane	74-87-3	50.49	0.5	1
Carbon disulfide	75-15-0	76.14	0.5	2
Carbon tetrachloride	56-23-5	153.8	0.2	1
2-Chlorotoluene	95-49-8	126.6	0.2	1
Cyclohexane	110-82-7	84.16	0.2	0.7
Dibromochloromethane	124-48-1	208.3	0.2	2
1,2-Dibromoethane	106-93-4	187.9	0.2	2
1,2-Dichlorobenzene	95-50-1	147.0	0.2	1
1,3-Dichlorobenzene	541-73-1	147.0	0.2	1
1,4-Dichlorobenzene	106-46-7	147.0	0.2	1
Dichlorodifluoromethane	75-71-8	120.9	0.5	2
1,1-Dichloroethane	75-34-3	98.96	0.2	0.8
1,2-Dichloroethane	107-06-2	98.96	0.2	0.8
1,1-Dichloroethene	75-35-4	96.94	0.2	0.8
1,2-Dichloroethene (cis)	156-59-2	96.94	0.2	0.8
1,2-Dichloroethene (trans)	156-60-5	96.94	0.2	0.8
1,2-Dichloropropane	78-87-5	113.0	0.2	0.9
1,3-Dichloropropene (cis)	10061-01-5	111.0	0.2	0.9
1,3-Dichloropropene (trans)	10061-02-6	111.0	0.2	0.9
1,2-Dichlorotetrafluoroethane	76-14-2	170.9	0.2	1
1,4-Dioxane	123-91-1	88.12	5	18
Ethanol	64-17-5	46.07	5	9
Ethylbenzene	100-41-4	106.2	0.2	0.9
4-Ethyltoluene	622-96-8	120.2	0.2	1
n-Heptane	142-82-5	100.2	0.2	0.8
1,3-Hexachlorobutadiene	87-68-3	260.8	0.2	2
n-Hexane	110-54-3	86.17	0.2	0.7
Isopropanol	67-63-0	60.10	5	12

Table E-1 continued

Required Compound Name	CAS Number	Molecular Weight	Reporting Limit ppbV	Reporting Limit ug/m^3
Methylene chloride	75-09-2	84.94	0.5	2
Methyl ethyl ketone	78-93-3	72.11	0.5	1
Methyl isobutyl ketone	108-10-1	100.2	0.5	2
Methyl methacrylate	80-62-6	100.1	0.5	2
Methyl tert-butyl ether	1634-04-4	88.15	0.2	0.7
Styrene	100-42-5	104.1	0.2	0.9
Tert-butyl alcohol	75-65-0	74.12	5	15
1,1,2,2-Tetrachloroethane	79-34-5	167.9	0.2	1
Tetrachloroethene	127-18-4	165.8	0.2	1
Tetrahydrofuran	109-99-9	72.11	5	15
Toluene	108-88-3	92.14	0.2	0.8
1,2,4-Trichlorobenzene	120-82-1	181.5	0.5	4
1,1,1-Trichloroethane	71-55-6	133.4	0.2	1
1,1,2-Trichloroethane	79-00-5	133.4	0.2	1
Trichloroethene	79-01-6	131.4	0.2	1
Trichlorofluoromethane	75-69-4	137.4	0.2	1
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	187.4	0.2	2
1,2,4-Trimethylbenzene	95-63-6	120.2	0.2	1
1,3,5-Trimethylbenzene	108-67-8	120.2	0.2	1
2,2,4-Trimethylpentane	540-84-1	114.2	0.2	0.9
Vinyl bromide	593-60-2	106.9	0.2	0.9
Vinyl chloride	75-01-4	62.50	0.2	0.5
Xylenes (m&p)	179601-23-1	106.2	0.5	2
Xylenes (o)	95-47-6	106.2	0.2	0.9
Naphthalene (reported on request)	91-20-3	128.2	0.2	1

All reporting limits are subject to change.

Appendix F

Modifications to EPA TO-15 SOP to comply with Ohio EPA Voluntary Action Program (VAP) Requirements

This Appendix defines requirements that are necessary to perform TO-15 analysis for any samples submitted via the VAP Program. No deviations from the SOP are allowed under the VAP program.

1) Sec. 3 caveat – reporting limits defined in this SOP are subject to change.

2) Sec. 7 caveat – Equipment and supplies are subject to change.

3) Initial calibration acceptance – %RSD criteria must be as defined in the EPA TO-15 method; only 2 analytes allowed greater than 30% RSD, and must be less than 40%.

4) The Laboratory check standard (LCS) may not be used as the continuing calibration verification (CCV). A CCV and LCS must be analyzed prior to samples.

5) Tentatively Identified Compounds (TICs) may not be reported as certified values.

6) CCV-10% rule not allowed. All analytes reported must be +/- 30% D. (Criteria in sections 10.4.2.6 and 2.1 do not apply to VAP samples.) All analytes in the CCV must be less than 30% RSD for VAP samples (criteria in Section 2.1, 10.4.2.6 and 10.4.2.7 do not apply.)

7) 10% Duplicate criteria not allowed. All duplicate %RPD results must be below 25%.

8) For Ohio projects, only the analytes listed in Table F-1 or as explained in the footnote to Table F-1 will be reported as certified data.

9) Affidavits are required with each report or for a series of reports generated for a particular project.

10) Surrogates are not required and will not be added to Ohio VAP samples.

11) The analysis of a Laboratory Control Sample Duplicate (LCSD) is not required and will not be analyzed for Ohio VAP samples.

12) The LCS is evaluated at +/- 30. Criteria in section 2.1 does not apply to VAP samples.

13) Corrective actions for the method blank are required if it contains analyte concentrations at or above the RL for reportable analytes.

Table F-1

Ohio EPA VAP Program Target Analyte List *		
chloromethane	1,2-dichloropropane	1,1-Dichloropropene
vinyl chloride	1,4-dioxane	1,2,3-Trichloropropane
1,3-butadiene	trichloroethene	1,2,4-Trimethylbenzene
acetaldehyde	2,2,4-trimethylpentane	1,2-Dichlorobenzene
bromomethane	cis-1,3-dichloropropene	1,3,5-Trimethylbenzene
chloroethane	4-methyl-2-pentanone	1,3-Dichlorobenzene
vinyl bromide	1,1,2-trichloroethane	1,3-Dichloropropane
acrolein	toluene	Acetone
acetonitrile	1,2-dibromoethane	Bromodichloromethane
acrylonitrile	tetrachloroethene	Butyl acetate
1,1-dichloroethene	chlorobenzene	cis-1,2-Dichloroethene
methylene chloride	ethylbenzene	Cyclohexane
3-chloropropene	m+p-xylene	Dibromochloromethane
carbon disulfide	bromoform	Dibromomethane
1,1-dichloroethane	styrene	Dichlorodifluoromethane
MTBE	1,1,2,2-tetrachloroethane	Ethyl acetate
vinyl acetate	o-xylene	Ethyl ether
2-butanone	isopropylbenzene	Methyl alcohol (methanol)
chloroform	Benzyl Chloride	Methyl Methacrylate
1,2-dichloroethane	1,4-dichlorobenzene	Naphthalene
hexane	1,2-dibromo-3-chloropropane	Tetrahydrofuran
1,1,1-trichloroethane	1,2,4-trichlorobenzene	trans-1,2-Dichloroethene
benzene	hexachlorobutadiene	trans-1,3-Dichloropropene
carbon tetrachloride	1,1,1,2-Tetrachloroethane	Trichlorofluoromethane

***** The analytes appearing in this table are subject to change, however, any changes will not include identification of compounds that are not included in the TO-15 method referenced at the beginning of this document. However, it is acceptable to analyze and report, as certified data, compound(s) not included in the TO-15 method referenced at the beginning of this document if the compound(s) appear on the current and valid certificate issued by VAP on the date of analysis and if the laboratory has followed all applicable VAP approved documents.

TABLE 1

Summary of Soil Vapor Chemicals of Concern to be Analyzed by Modified USEPA TO-15 Methods

Former Unisys Site, Lake Sucess, New York

CAS	Compound	MRL Requirements (ug/m^3)	MRL Requirements (ppbv)	Laboratory MRL (µg/L)	Laboratory MDL (µg/L)
71-55-6	1,1,1-Trichloroethane**	0.5	0.092	1.09	0.335
79-34-5	1,1,2,2-Tetrachloroethane	0.5	0.073	1.37	0.357
79-00-5	1,1,2-Trichloroethane	0.5	0.092	1.09	0.318
75-34-3	1,1-Dichloroethane	0.5	0.12	0.809	0.23
75-35-4	1,1-Dichloroethene*	0.5	0.13	0.793	0.225
75-37-6	1,1-Difluoroethane	0.5	0.19	Not Available, could report as a TIC	
120-82-1	1,2,4-Trichlorobenzene+	0.5	0.067	1.48	0.742
95-63-6	1,2,4-Trimethylbenzene	0.5	0.1	0.983	0.284
96-12-8	1,2-Dibromo-3-chloropropane	0.5	0.052	1.93	0.603
106-93-4	1,2-Dibromoethane	0.5	0.065	1.54	0.418
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 114)	0.5	0.072	1.4	0.352
95-50-1	1,2-Dichlorobenzene	0.5	0.083	1.2	0.372
107-06-2	1,2-Dichloroethane	0.5	0.12	0.809	0.319
540-59-0	1,2-Dichloroethene, Total	0.5	0.13	Not reported as a Total	
78-87-5	1,2-Dichloropropane	0.5	0.11	0.924	0.292
108-67-8	1,3,5-Trimethylbenzene+	0.5	0.1	0.983	0.295
106-99-0	1,3-Butadiene	0.5	0.23	0.442	0.137
541-73-1	1,3-Dichlorobenzene	0.5	0.083	1.2	0.467
106-46-7	1,4-Dichlorobenzene	0.5	0.083	1.2	0.497
123-91-1	1,4-Dioxane	0.5	0.14	0.721	0.194
540-84-1	2,2,4-Trimethylpentane (isooctane)+	0.53	0.08	0.934	0.323
306-83-2	2,2-Dichloro-1,1,1-trifluoroethane (Freon 123)	0.5	0.08	Not Available, could report as a TIC	
78-93-3	2-Butanone (MEK)	5	1.7	1.47	0.292
591-78-6	2-Hexanone	0.5	0.12	0.82	0.374
67-63-0	2-Propanol (Isoproppyl Alcohol)	5	2	1.23	0.669
107-05-1	3-Chloro-1-propene (Allyl Chloride)	0.5	0.16	0.626	0.269
622-96-8	4-Ethyltoluene	0.5	0.1	0.983	0.272
108-10-1	4-Methyl-2-pentanone	0.5	0.12	2.05	0.779
67-64-1	Acetone	5	2.1	2.38	1.22
71-43-2	Benzene+	0.5	0.16	0.639	0.205
75-27-4	Bromodichloromethane	0.5	0.075	1.34	0.462
75-25-2	Bromoform	0.5	0.048	2.07	0.616
74-83-9	Bromomethane	0.5	0.13	0.777	0.212
75-15-0	Carbon Disulfide	5	1.6	0.623	0.145
56-23-5	Carbon Tetrachloride*	0.1	0.016	1.26	0.432
108-90-7	Chlorobenzene	0.5	0.11	0.921	0.238
75-45-6	Chlorodifluoromethane (Freon 22)	0.5	0.14	0.707	0.164
75-00-3	Chloroethane	0.5	0.19	0.528	0.171
67-66-3	Chloroform	0.5	0.1	0.977	0.27
74-87-3	Chloromethane	0.5	0.24	0.413	0.119
76-15-3	Chloropentafluoroethane	0.5	0.079	Not Available, could report as a TIC	
76-15-3	Chloropentafluoroethane (Freon 115)	0.5	0.079	Not Available, could report as a TIC	
156-59-2	cis-1,2-Dichloroethene*	0.5	0.13	0.793	0.236
10061-01-5	cis-1,3-Dichloropropene	0.5	0.11	0.908	0.306
98-82-8	Cumene	0.5	0.1	0.983	0.305
110-82-7	Cyclohexane+	1	0.29	0.688	0.251
124-48-1	Dibromochloromethane	0.5	0.059	1.7	0.482
75-71-8	Dichlorodifluoromethane (Freon 120)	0.5	0.1	0.989	0.374
100-41-4	Ethylbenzene+	0.5	0.12	0.869	0.25
142-82-5	Heptane+	0.52	0.13	0.82	0.339
87-68-3	Hexachlorobutadiene	0.5	0.047	2.13	0.647
179601-23-	m,p-Xylenes+	0.5	0.12	1.74	0.543
79-20-9	Methyl Acetate	0.5	0.17	Not Available, could report as a TIC	
1634-04-4	Methyl tert-Butyl Ether	0.5	0.14	0.721	0.162
108-87-2	Methylcyclohexane	0.5	0.12	Not Available, could report as a TIC	
75-09-2	Methylene Chloride**	0.5	0.14	1.74	0.434
91-20-3	Naphthalene+	0.55	0.13	1.05	0.409
110-54-3	n-Hexane+	0.5	0.14	0.705	0.262
95-47-6	o-Xylene+	0.5	0.12	0.869	0.27
100-42-5	Styrene	0.5	0.12	0.852	0.254
127-18-4	Tetrachloroethene**	0.5	0.074	1.36	0.425
108-88-3	Toluene+	0.5	0.13	0.754	0.327
156-60-5	trans-1,2-Dichloroethene	0.5	0.13	0.793	0.299
10061-02-6	trans-1,3-Dichloropropene	0.5	0.11	0.908	0.355
79-01-6	Trichloroethene*	0.1	0.019	1.07	0.295
75-69-4	Trichlorofluoromethane	0.5	0.089	1.12	0.442
76-13-1	Trichlorotrifluoroethane (Freon 113)	0.5	0.065	1.53	0.388
75-01-4	Vinyl Chloride***	0.1	0.039	0.511	0.149

TABLE 1

Summary of Soil Vapor Chemicals of Concern to be Analyzed by Modified USEPA TO-15 Methods

Former Unisys Site, Lake Sucess, New York

CAS	Compound	MRL Requirements (ug/m^3)	MRL Requirements (ppbv)	Laboratory MRL (µg/L)	Laboratory MDL (µg/L)

Legends:

$\mu g/m^3$:	micrograms per cubic meter
*:	Compounds listed in soil vapor/indoor air matrix A; minimum reporting limit will be 0.20 $\mu g/m^3$ for indoor/ambient air and 1 $\mu g/m^3$ for sub-slab soil vapor
**:	Compounds listed in soil vapor/indoor air matrix B; minimum reporting limit will be 1 $\mu g/m^3$ for indoor/ambient air and 1 $\mu g/m^3$ for sub-slab soil vapor
***:	Compounds listed in soil vapor/indoor air matrix C; minimum reporting limit will be 0.20 $\mu g/m^3$ for indoor/ambient air and 1 $\mu g/m^3$ for sub-slab soil vapor
+:	Compounds listed in soil vapor/indoor air matrix D, E, and F; minimum reporting limit will be less than 1 $\mu g/m^3$ for indoor/ambient air and 1 $\mu g/m^3$ for sub-slab soil.

Analytical Method Information

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
8260 Standard in Water (SW-846 8260D)								
Preservation: HCl								
Container: VOA vial + HCl		**Amount Required:** 40 mL			**Hold Time:** 14 days			
Acetone	2.0	50 µg/L			70 - 130	30	70 - 160	25
Acrylonitrile	1.2	5.0 µg/L			70 - 130	30	70 - 130	25
tert-Amyl Methyl Ether (TAME)	0.15	0.50 µg/L			70 - 130	30	70 - 130	25
Benzene	0.14	1.0 µg/L			70 - 130	30	70 - 130	25
Bromobenzene	0.19	1.0 µg/L			70 - 130	30	70 - 130	25
Bromochloromethane	0.32	1.0 µg/L			70 - 130	30	70 - 130	25
Bromodichloromethane	0.19	0.50 µg/L			70 - 130	30	70 - 130	25
Bromoform	0.30	1.0 µg/L			70 - 130	30	70 - 130	25
Bromomethane	1.5	2.0 µg/L			70 - 130	30	40 - 160	25
2-Butanone (MEK)	1.4	20 µg/L			70 - 130	30	40 - 160	25
tert-Butyl Alcohol (TBA)	3.4	20 µg/L			70 - 130	30	40 - 160	25
n-Butylbenzene	0.16	1.0 µg/L			70 - 130	30	70 - 130	25
sec-Butylbenzene	0.16	1.0 µg/L			70 - 130	30	70 - 130	25
tert-Butylbenzene	0.17	1.0 µg/L			70 - 130	30	70 - 130	25
tert-Butyl Ethyl Ether (TBEE)	0.16	0.50 µg/L			70 - 130	30	70 - 130	25
Carbon Disulfide	1.5	5.0 µg/L			70 - 130	30	70 - 130	25
Carbon Tetrachloride	0.19	5.0 µg/L			70 - 130	30	70 - 130	25
Chlorobenzene	0.18	1.0 µg/L			70 - 130	30	70 - 130	25
Chlorodibromomethane	0.13	0.50 µg/L			70 - 130	30	70 - 130	25
Chloroethane	0.46	2.0 µg/L			70 - 130	30	70 - 130	25
Chloroform	0.19	2.0 µg/L			70 - 130	30	70 - 130	25
Chloromethane	0.50	2.0 µg/L			70 - 130	30	40 - 160	25
2-Chlorotoluene	0.21	1.0 µg/L			70 - 130	30	70 - 130	25
4-Chlorotoluene	0.16	1.0 µg/L			70 - 130	30	70 - 130	25
1,2-Dibromo-3-chloropropane (DBCP)	0.63	5.0 µg/L			70 - 130	30	70 - 130	25
1,2-Dibromoethane (EDB)	0.13	0.50 µg/L			70 - 130	30	70 - 130	25
Dibromomethane	0.24	1.0 µg/L			70 - 130	30	70 - 130	25
1,2-Dichlorobenzene	0.17	1.0 µg/L			70 - 130	30	70 - 130	25
1,3-Dichlorobenzene	0.15	1.0 µg/L			70 - 130	30	70 - 130	25
1,4-Dichlorobenzene	0.17	1.0 µg/L			70 - 130	30	70 - 130	25
trans-1,4-Dichloro-2-butene	1.1	2.0 µg/L			70 - 130	30	70 - 130	25
Dichlorodifluoromethane (Freon 12)	0.20	2.0 µg/L			70 - 130	30	40 - 160	25
1,1-Dichloroethane	0.15	1.0 µg/L			70 - 130	30	70 - 130	25
1,2-Dichloroethane	0.13	1.0 µg/L			70 - 130	30	70 - 130	25
1,1-Dichloroethylene	0.18	1.0 µg/L			70 - 130	30	70 - 130	25
cis-1,2-Dichloroethylene	0.20	1.0 µg/L			70 - 130	30	70 - 130	25
trans-1,2-Dichloroethylene	0.16	1.0 µg/L			70 - 130	30	70 - 130	25
1,2-Dichloropropane	0.17	1.0 µg/L			70 - 130	30	70 - 130	25
1,3-Dichloropropane	0.097	0.50 µg/L			70 - 130	30	70 - 130	25
2,2-Dichloropropane	0.33	1.0 µg/L			70 - 130	30	40 - 130	25
1,1-Dichloropropene	0.17	2.0 µg/L			70 - 130	30	70 - 130	25
cis-1,3-Dichloropropene	0.13	0.50 µg/L			70 - 130	30	70 - 130	25
trans-1,3-Dichloropropene	0.14	0.50 µg/L			70 - 130	30	70 - 130	25
Diethyl Ether	0.14	2.0 µg/L			70 - 130	30	70 - 130	25
Diisopropyl Ether (DIPE)	0.17	0.50 µg/L			70 - 130	30	70 - 130	25
1,4-Dioxane	11	50 µg/L			70 - 130	30	40 - 130	50

Page 1 of 4

Analytical Method Information

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Ethylbenzene	0.14	1.0 µg/L			70 - 130	30	70 - 130	25
Hexachlorobutadiene	0.31	0.60 µg/L			70 - 130	30	70 - 130	25
2-Hexanone (MBK)	1.3	10 µg/L			70 - 130	30	70 - 160	25
Isopropylbenzene (Cumene)	0.16	1.0 µg/L			70 - 130	30	70 - 130	25
p-Isopropyltoluene (p-Cymene)	0.16	1.0 µg/L			70 - 130	30	70 - 130	25
Methyl Acetate	0.48	1.0 µg/L			70 - 130	30	70 - 130	25
Methyl tert-Butyl Ether (MTBE)	0.17	1.0 µg/L			70 - 130	30	70 - 130	25
Methyl Cyclohexane	0.13	1.0 µg/L			70 - 130	30	70 - 130	25
Methylene Chloride	0.19	5.0 µg/L			70 - 130	30	70 - 130	25
4-Methyl-2-pentanone (MIBK)	1.4	10 µg/L			70 - 130	30	70 - 160	25
Naphthalene	0.25	2.0 µg/L			70 - 130	30	40 - 130	25
n-Propylbenzene	0.11	1.0 µg/L			70 - 130	30	70 - 130	25
Styrene	0.13	1.0 µg/L			70 - 130	30	70 - 130	25
1,1,1,2-Tetrachloroethane	0.21	1.0 µg/L			70 - 130	30	70 - 130	25
1,1,2,2-Tetrachloroethane	0.10	0.50 µg/L			70 - 130	30	70 - 130	25
Tetrachloroethylene	0.17	1.0 µg/L			70 - 130	30	70 - 130	25
Tetrahydrofuran	0.50	10 µg/L			70 - 130	30	70 - 130	25
Toluene	0.11	1.0 µg/L			70 - 130	30	70 - 130	25
1,2,3-Trichlorobenzene	0.22	5.0 µg/L			70 - 130	30	70 - 130	25
1,2,4-Trichlorobenzene	0.19	1.0 µg/L			70 - 130	30	70 - 130	25
1,3,5-Trichlorobenzene	0.18	1.0 µg/L			70 - 130	30	70 - 130	25
1,1,1-Trichloroethane	0.14	1.0 µg/L			70 - 130	30	70 - 130	25
1,1,2-Trichloroethane	0.18	1.0 µg/L			70 - 130	30	70 - 130	25
Trichloroethylene	0.17	1.0 µg/L			70 - 130	30	70 - 130	25
Trichlorofluoromethane (Freon 11)	0.14	2.0 µg/L			70 - 130	30	70 - 130	25
1,2,3-Trichloropropane	0.27	2.0 µg/L			70 - 130	30	70 - 130	25
1,1,2-Trichloro-1,2,2-trifluoroethane (Freo	0.16	1.0 µg/L			70 - 130	30	70 - 130	25
1,2,4-Trimethylbenzene	0.16	1.0 µg/L			70 - 130	30	70 - 130	25
1,3,5-Trimethylbenzene	0.17	1.0 µg/L			70 - 130	30	70 - 130	25
Vinyl Chloride	0.19	2.0 µg/L			70 - 130	30	40 - 160	25
m+p Xylene	0.25	2.0 µg/L			70 - 130	20	70 - 130	25
o-Xylene	0.16	1.0 µg/L			70 - 130	30	70 - 130	25
surr: 1,2-Dichloroethane-d4			70 - 130		70 - 130	30	70 - 130	25
surr: Toluene-d8			70 - 130		70 - 130	30	70 - 130	25
surr: 4-Bromofluorobenzene			70 - 130		70 - 130	30	70 - 130	25
Pentafluorobenzene						30		25
1,4-Difluorobenzene						30		25
Chlorobenzene-d5						30		25
1,4-Dichlorobenzene-d4						30		25

Page 2 of 4

Analytical Method Information

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
8260 Standard in Soil (SW-846 8260D)								
Preservation: Frozen -10°C								
Container: VOA vial + H2O		**Amount Required:** 5 g			**Hold Time:** 14 days			
Acetone	0.052	0.10 mg/Kg			70 - 130	30	70 - 160	25
Acrylonitrile	0.00096	0.0060 mg/Kg			70 - 130	30	70 - 130	25
tert-Amyl Methyl Ether (TAME)	0.00093	0.0010 mg/Kg			70 - 130	30	70 - 130	25
Benzene	0.00063	0.0020 mg/Kg			70 - 130	30	70 - 130	25
Bromobenzene	0.00061	0.0020 mg/Kg			70 - 130	30	70 - 130	25
Bromochloromethane	0.00086	0.0020 mg/Kg			70 - 130	30	70 - 130	25
Bromodichloromethane	0.00051	0.0020 mg/Kg			70 - 130	30	70 - 130	25
Bromoform	0.00088	0.0020 mg/Kg			70 - 130	30	70 - 130	25
Bromomethane	0.0018	0.010 mg/Kg			70 - 130	30	40 - 130	25
2-Butanone (MEK)	0.0084	0.040 mg/Kg			70 - 130	30	70 - 160	25
tert-Butyl Alcohol (TBA)	0.041	0.10 mg/Kg			70 - 130	30	40 - 130	25
n-Butylbenzene	0.00073	0.0020 mg/Kg			70 - 130	30	70 - 130	25
sec-Butylbenzene	0.00080	0.0020 mg/Kg			70 - 130	30	70 - 130	25
tert-Butylbenzene	0.00073	0.0020 mg/Kg			70 - 130	30	70 - 160	25
tert-Butyl Ethyl Ether (TBEE)	0.00086	0.0010 mg/Kg			70 - 130	30	70 - 130	25
Carbon Disulfide	0.010	0.020 mg/Kg			70 - 130	30	70 - 130	25
Carbon Tetrachloride	0.00058	0.0020 mg/Kg			70 - 130	30	70 - 130	25
Chlorobenzene	0.00048	0.0020 mg/Kg			70 - 130	30	70 - 130	25
Chlorodibromomethane	0.00066	0.0010 mg/Kg			70 - 130	30	70 - 130	25
Chloroethane	0.0014	0.020 mg/Kg			70 - 130	30	70 - 130	25
Chloroform	0.00065	0.0040 mg/Kg			70 - 130	30	70 - 130	25
Chloromethane	0.0012	0.010 mg/Kg			70 - 130	30	70 - 130	25
2-Chlorotoluene	0.00051	0.0020 mg/Kg			70 - 130	30	70 - 130	25
4-Chlorotoluene	0.00058	0.0020 mg/Kg			70 - 130	30	70 - 130	25
1,2-Dibromo-3-chloropropane (DBCP)	0.00081	0.0020 mg/Kg			70 - 130	30	70 - 130	25
1,2-Dibromoethane (EDB)	0.00073	0.0010 mg/Kg			70 - 130	30	70 - 130	25
Dibromomethane	0.00062	0.0020 mg/Kg			70 - 130	30	70 - 130	25
1,2-Dichlorobenzene	0.00064	0.0020 mg/Kg			70 - 130	30	70 - 130	25
1,3-Dichlorobenzene	0.00058	0.0020 mg/Kg			70 - 130	30	70 - 130	25
1,4-Dichlorobenzene	0.00062	0.0020 mg/Kg			70 - 130	30	70 - 130	25
trans-1,4-Dichloro-2-butene	0.00075	0.0040 mg/Kg			70 - 130	30	70 - 130	25
Dichlorodifluoromethane (Freon 12)	0.00088	0.020 mg/Kg			70 - 130	30	40 - 160	25
1,1-Dichloroethane	0.00061	0.0020 mg/Kg			70 - 130	30	70 - 130	25
1,2-Dichloroethane	0.00069	0.0020 mg/Kg			70 - 130	30	70 - 130	25
1,1-Dichloroethylene	0.00096	0.0040 mg/Kg			70 - 130	30	70 - 130	25
cis-1,2-Dichloroethylene	0.00069	0.0020 mg/Kg			70 - 130	30	70 - 130	25
trans-1,2-Dichloroethylene	0.00060	0.0020 mg/Kg			70 - 130	30	70 - 130	25
1,2-Dichloropropane	0.00062	0.0020 mg/Kg			70 - 130	30	70 - 130	25
1,3-Dichloropropane	0.00056	0.0010 mg/Kg			70 - 130	30	70 - 130	25
2,2-Dichloropropane	0.00074	0.0020 mg/Kg			70 - 130	30	70 - 130	25
1,1-Dichloropropene	0.00073	0.0020 mg/Kg			70 - 130	30	70 - 130	25
cis-1,3-Dichloropropene	0.00076	0.0010 mg/Kg			70 - 130	30	70 - 130	25
trans-1,3-Dichloropropene	0.00077	0.0010 mg/Kg			70 - 130	30	70 - 130	25
Diethyl Ether	0.0011	0.020 mg/Kg			70 - 130	30	70 - 130	25
Diisopropyl Ether (DIPE)	0.00082	0.0010 mg/Kg			70 - 130	30	70 - 130	25
1,4-Dioxane	0.045	0.10 mg/Kg			70 - 130	30	40 - 160	50

Page 3 of 4

Analytical Method Information

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Ethylbenzene	0.00058	0.0020 mg/Kg			70 - 130	30	70 - 130	25
Hexachlorobutadiene	0.00082	0.0020 mg/Kg			70 - 130	30	70 - 160	25
2-Hexanone (MBK)	0.0069	0.020 mg/Kg			70 - 130	30	70 - 160	25
Isopropylbenzene (Cumene)	0.00077	0.0020 mg/Kg			70 - 130	30	70 - 130	25
p-Isopropyltoluene (p-Cymene)	0.00065	0.0020 mg/Kg			70 - 130	30	70 - 130	25
Methyl Acetate	0.0013	0.0020 mg/Kg			70 - 130	30	70 - 130	25
Methyl tert-Butyl Ether (MTBE)	0.00088	0.0040 mg/Kg			70 - 130	30	70 - 130	25
Methyl Cyclohexane	0.00071	0.0020 mg/Kg			70 - 130	30	70 - 130	25
Methylene Chloride	0.00094	0.020 mg/Kg			70 - 130	30	40 - 160	25
4-Methyl-2-pentanone (MIBK)	0.0088	0.020 mg/Kg			70 - 130	30	70 - 160	25
Naphthalene	0.00099	0.0040 mg/Kg			70 - 130	30	40 - 130	25
n-Propylbenzene	0.00066	0.0020 mg/Kg			70 - 130	30	70 - 130	25
Styrene	0.00064	0.0020 mg/Kg			70 - 130	30	70 - 130	25
1,1,1,2-Tetrachloroethane	0.00057	0.0020 mg/Kg			70 - 130	30	70 - 130	25
1,1,2,2-Tetrachloroethane	0.00077	0.0010 mg/Kg			70 - 130	30	70 - 130	25
Tetrachloroethylene	0.00087	0.0020 mg/Kg			70 - 130	30	70 - 130	25
Tetrahydrofuran	0.0037	0.010 mg/Kg			70 - 130	30	70 - 130	25
Toluene	0.00059	0.0020 mg/Kg			70 - 130	30	70 - 130	25
1,2,3-Trichlorobenzene	0.00066	0.0020 mg/Kg			70 - 130	30	70 - 130	25
1,2,4-Trichlorobenzene	0.00066	0.0020 mg/Kg			70 - 130	30	70 - 130	25
1,3,5-Trichlorobenzene	0.00063	0.0020 mg/Kg			70 - 130	30	70 - 130	25
1,1,1-Trichloroethane	0.00059	0.0020 mg/Kg			70 - 130	30	70 - 130	25
1,1,2-Trichloroethane	0.00052	0.0020 mg/Kg			70 - 130	30	70 - 130	25
Trichloroethylene	0.00075	0.0020 mg/Kg			70 - 130	30	70 - 130	25
Trichlorofluoromethane (Freon 11)	0.0012	0.010 mg/Kg			70 - 130	30	70 - 130	25
1,2,3-Trichloropropane	0.00081	0.0020 mg/Kg			70 - 130	30	70 - 130	25
1,1,2-Trichloro-1,2,2-trifluoroethane (Freo	0.0010	0.010 mg/Kg			70 - 130	30	70 - 130	25
1,2,4-Trimethylbenzene	0.00096	0.0020 mg/Kg			70 - 130	30	70 - 130	25
1,3,5-Trimethylbenzene	0.00080	0.0020 mg/Kg			70 - 130	30	70 - 130	25
Vinyl Chloride	0.00078	0.010 mg/Kg			70 - 130	30	40 - 130	25
m+p Xylene	0.0014	0.0040 mg/Kg			70 - 130	30	70 - 130	25
o-Xylene	0.00068	0.0020 mg/Kg			70 - 130	30	70 - 130	25
surr: 1,2-Dichloroethane-d4			70 - 130		70 - 130	30	70 - 130	25
surr: Toluene-d8			70 - 130		70 - 130	30	70 - 130	25
surr: 4-Bromofluorobenzene			70 - 130		70 - 130	30	70 - 130	25
Pentafluorobenzene						30		25
1,4-Difluorobenzene						30		25
Chlorobenzene-d5						30		25
1,4-Dichlorobenzene-d4						30		25

Page 4 of 4

Date Created: 03/26/25
Created By: Jason Hebert
File: PM19103-1
Page: 1

Analyte	CAS #	RL	MDL	Units	LCS Criteria	MS Criteria	MS RPD	Duplicate RPD	Holding Time	Container
Aluminum, Total	7429-90-5	4	1.3	mg/kg	80-120	75-125	20	20	180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Antimony, Total	7440-36-0	2	1.54	mg/kg	80-120	75-125	20	20	180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Arsenic, Total	7440-38-2	0.4	0.1728	mg/kg	80-120	75-125	20	20	180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Barium, Total	7440-39-3	0.4	0.0424	mg/kg	80-120	75-125	20	20	180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Beryllium, Total	7440-41-7	0.2	0.022	mg/kg	80-120	75-125	20	20	180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Cadmium, Total	7440-43-9	0.4	0.022	mg/kg	80-120	75-125	20	20	180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Calcium, Total	7440-70-2	4	2.268	mg/kg	80-120	75-125	20	20	180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Chromium, Total	7440-47-3	0.4	0.3392	mg/kg	80-120	75-125	20	20	180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Cobalt, Total	7440-48-4	0.8	0.0992	mg/kg	80-120	75-125	20	20	180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Copper, Total	7440-50-8	0.4	0.0908	mg/kg	80-120	75-125	20	20	180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Iron, Total	7439-89-6	2	0.42	mg/kg	80-120	75-125	20	20	180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Lead, Total	7439-92-1	2	0.0952	mg/kg	80-120	75-125	20	20	180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Magnesium, Total	7439-95-4	4	0.652	mg/kg	80-120	75-125	20	20	180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Manganese, Total	7439-96-5	0.4	0.2144	mg/kg	80-120	75-125	20	20	180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Nickel, Total	7440-02-0	1	0.3232	mg/kg	80-120	75-125	20	20	180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Potassium, Total	7440-09-7	100	20.28	mg/kg	80-120	75-125	20	20	180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Selenium, Total	7782-49-2	0.8	0.1316	mg/kg	80-120	75-125	20	20	180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Silver, Total	7440-22-4	0.2	0.1192	mg/kg	80-120	75-125	20	20	180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Sodium, Total	7440-23-5	80	42.4	mg/kg	80-120	75-125	20	20	180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Thallium, Total	7440-28-0	0.8	0.3608	mg/kg	80-120	75-125	20	20	180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Vanadium, Total	7440-62-2	0.4	0.0604	mg/kg	80-120	75-125	20	20	180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Zinc, Total	7440-66-6	2	0.2424	mg/kg	80-120	75-125	20	20	180 days	1 - Metals Only-Glass 60mL/2oz unpreserved

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. ***(Soil/Solids only)***

Please Note that the information provided in this table is subject to change at anytime at the discretion of Pace Analytical Services.

Date Created: 03/26/25
Created By: Jason Hebert
File: PM19103-1
Page: 1

Analyte	CAS #	RL	MDL	Units	LCS Criteria	MS Criteria	MS RPD	Duplicate RPD	Holding Time	Container
Mercury, Total	7439-97-6	0.08	0.05216	mg/kg	80-120	80-120	20	20	28 days	1 - Metals Only-Glass 60mL/2oz unpreserved

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. ***(Soil/Solids only)***
Please Note that the information provided in this table is subject to change at anytime at the discretion of Pace Analytical Services.

Date Created: 03/26/25
Created By: Jason Hebert
File: PM19102-1
Page: 1

Analyte	CAS #	RL	MDL	Units	LCS Criteria	MS Criteria	MS RPD	Duplicate RPD	Holding Time	Container
Aluminum, Total	7429-90-5	0.1	0.0318	mg/l	80-120	75-125	20	20	180 days	1 - Plastic 500ml HNO3 preserved
Antimony, Total	7440-36-0	0.05	0.0071	mg/l	80-120	75-125	20	20	180 days	1 - Plastic 500ml HNO3 preserved
Arsenic, Total	7440-38-2	0.005	0.0019	mg/l	80-120	75-125	20	20	180 days	1 - Plastic 500ml HNO3 preserved
Barium, Total	7440-39-3	0.01	0.0021	mg/l	80-120	75-125	20	20	180 days	1 - Plastic 500ml HNO3 preserved
Beryllium, Total	7440-41-7	0.005	0.0009	mg/l	80-120	75-125	20	20	180 days	1 - Plastic 500ml HNO3 preserved
Cadmium, Total	7440-43-9	0.005	0.001	mg/l	80-120	75-125	20	20	180 days	1 - Plastic 500ml HNO3 preserved
Calcium, Total	7440-70-2	0.1	0.035	mg/l	80-120	75-125	20	20	180 days	1 - Plastic 500ml HNO3 preserved
Chromium, Total	7440-47-3	0.01	0.0021	mg/l	80-120	75-125	20	20	180 days	1 - Plastic 500ml HNO3 preserved
Cobalt, Total	7440-48-4	0.02	0.0017	mg/l	80-120	75-125	20	20	180 days	1 - Plastic 500ml HNO3 preserved
Copper, Total	7440-50-8	0.01	0.0022	mg/l	80-120	75-125	20	20	180 days	1 - Plastic 500ml HNO3 preserved
Iron, Total	7439-89-6	0.05	0.009	mg/l	80-120	75-125	20	20	180 days	1 - Plastic 500ml HNO3 preserved
Lead, Total	7439-92-1	0.01	0.0027	mg/l	80-120	75-125	20	20	180 days	1 - Plastic 500ml HNO3 preserved
Magnesium, Total	7439-95-4	0.1	0.0153	mg/l	80-120	75-125	20	20	180 days	1 - Plastic 500ml HNO3 preserved
Manganese, Total	7439-96-5	0.01	0.0016	mg/l	80-120	75-125	20	20	180 days	1 - Plastic 500ml HNO3 preserved
Nickel, Total	7440-02-0	0.025	0.0024	mg/l	80-120	75-125	20	20	180 days	1 - Plastic 500ml HNO3 preserved
Potassium, Total	7440-09-7	2.5	0.237	mg/l	80-120	75-125	20	20	180 days	1 - Plastic 500ml HNO3 preserved
Selenium, Total	7782-49-2	0.01	0.0035	mg/l	80-120	75-125	20	20	180 days	1 - Plastic 500ml HNO3 preserved
Silver, Total	7440-22-4	0.007	0.0028	mg/l	80-120	75-125	20	20	180 days	1 - Plastic 500ml HNO3 preserved
Sodium, Total	7440-23-5	2	0.12	mg/l	80-120	75-125	20	20	180 days	1 - Plastic 500ml HNO3 preserved
Thallium, Total	7440-28-0	0.02	0.0025	mg/l	80-120	75-125	20	20	180 days	1 - Plastic 500ml HNO3 preserved
Vanadium, Total	7440-62-2	0.01	0.002	mg/l	80-120	75-125	20	20	180 days	1 - Plastic 500ml HNO3 preserved
Zinc, Total	7440-66-6	0.05	0.0021	mg/l	80-120	75-125	20	20	180 days	1 - Plastic 500ml HNO3 preserved

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. ***(Soil/Solids only)***

Please Note that the information provided in this table is subject to change at anytime at the discretion of Pace Analytical Services.

Date Created: 03/26/25
Created By: Jason Hebert
File: PM19102-1
Page: 1

Analyte	CAS #	RL	MDL	Units	LCS Criteria	MS Criteria	MS RPD	Duplicate RPD	Holding Time	Container
Mercury, Total	7439-97-6	0.0002	0.0000915	mg/l	80-120	75-125	20	20	28 days	1 - Plastic 500ml HNO3 preserved

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. ***(Soil/Solids only)***

Please Note that the information provided in this table is subject to change at anytime at the discretion of Pace Analytical Services.

Analytical Method Information

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
8082 in Soil (SW-846 8082A)								
Preservation: Cool 4°C								
Container: 8 oz amber glass jar		**Amount Required:** 100 g			**Hold Time:** 365 days			
Aroclor-1016	0.0049	0.020 mg/Kg		50	40 - 140	30	40 - 140	30
Aroclor-1016 [2C]	0.0049	0.020 mg/Kg		50	40 - 140	30	40 - 140	30
Aroclor-1221	0.0093	0.020 mg/Kg		50		30		30
Aroclor-1221 [2C]	0.010	0.020 mg/Kg		50		30		30
Aroclor-1232	0.0049	0.020 mg/Kg		50		30		30
Aroclor-1232 [2C]	0.0050	0.020 mg/Kg		50		30		30
Aroclor-1242	0.0055	0.020 mg/Kg		50		30		30
Aroclor-1242 [2C]	0.0067	0.020 mg/Kg		50		30		30
Aroclor-1248	0.0048	0.020 mg/Kg		50		30		30
Aroclor-1248 [2C]	0.0050	0.020 mg/Kg		50		30		30
Aroclor-1254	0.0060	0.020 mg/Kg		50		30		30
Aroclor-1254 [2C]	0.0076	0.020 mg/Kg		50		30		30
Aroclor-1260	0.0042	0.020 mg/Kg		50	40 - 140	30	40 - 140	30
Aroclor-1260 [2C]	0.0053	0.020 mg/Kg		50	40 - 140	30	40 - 140	30
Aroclor-1262	0.0052	0.020 mg/Kg		50		30		30
Aroclor-1262 [2C]	0.0057	0.020 mg/Kg		50		30		30
Aroclor-1268	0.0053	0.020 mg/Kg		50		30		30
Aroclor-1268 [2C]	0.0064	0.020 mg/Kg		50		30		30
surr: Decachlorobiphenyl			30 - 150					
surr: Decachlorobiphenyl [2C]			30 - 150					
surr: Tetrachloro-m-xylene			30 - 150					
surr: Tetrachloro-m-xylene [2C]			30 - 150					

Analytical Method Information

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
8082 Reduced Volume in Water (SW-846 8082A)								
Preservation: Cool 4°C								
Container: 100 mL Amber			**Amount Required:** 100 mL			**Hold Time:** 365 days		
Aroclor-1016	0.13	0.20 µg/L		50	40 - 140	20	40 - 140	20
Aroclor-1016 [2C]	0.13	0.20 µg/L		50	40 - 140	20	40 - 140	20
Aroclor-1221	0.10	0.20 µg/L		50		20		20
Aroclor-1221 [2C]	0.085	0.20 µg/L		50		20		20
Aroclor-1232	0.094	0.20 µg/L		50		20		20
Aroclor-1232 [2C]	0.094	0.20 µg/L		50		20		20
Aroclor-1242	0.11	0.20 µg/L		50		20		20
Aroclor-1242 [2C]	0.10	0.20 µg/L		50		20		20
Aroclor-1248	0.094	0.20 µg/L		50		20		20
Aroclor-1248 [2C]	0.11	0.20 µg/L		50		20		20
Aroclor-1254	0.10	0.20 µg/L		50	40 - 140	20	40 - 140	20
Aroclor-1254 [2C]	0.11	0.20 µg/L		50	40 - 140	20	40 - 140	20
Aroclor-1260	0.12	0.20 µg/L		50	40 - 140	20	40 - 140	20
Aroclor-1260 [2C]	0.11	0.20 µg/L		50	40 - 140	20	40 - 140	20
Aroclor-1262	0.083	0.20 µg/L		50		20		20
Aroclor-1262 [2C]	0.090	0.20 µg/L		50		20		20
Aroclor-1268	0.076	0.20 µg/L		50		20		20
Aroclor-1268 [2C]	0.089	0.20 µg/L		50		20		20
surr: Decachlorobiphenyl			30 - 150					
surr: Decachlorobiphenyl [2C]			30 - 150					
surr: Tetrachloro-m-xylene			30 - 150					
surr: Tetrachloro-m-xylene [2C]			30 - 150					

Analytical Method Information

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Fluoride EPA 300.0 in Water (EPA 300.0)								
Preservation: Cool 4°C								
Container: 250 mL amber			**Amount Required:** 250 mL			**Hold Time:** 28 days		
Fluoride	0.068	0.10 mg/L		20	80 - 120	20	90 - 110	20

Page 1 of 1

Analytical Method Information

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
1,4-Dioxane SIM in Water (SW-846 8270E)								
Preservation: Cool 4°C								
Container: 1 L amber		**Amount Required:** 1L				**Hold Time:** 7 days		
1,4-Dioxane	0.18	0.20 µg/L			30 - 140	30	40 - 140	30
surr: 1,4-Dioxane-d8			15 - 110					
1,4-Dioxane-d8 (IS)								
1,4-Dichlorobenzene-d4								
1,4-Dioxane SIM in Soil (SW-846 8270E)								
Preservation: Cool 4°C								
Container: 8 oz amber glass jar		**Amount Required:** 8 oz				**Hold Time:** 14 days		
1,4-Dioxane	0.018	0.050 mg/Kg			30 - 140	30	40 - 140	30
surr: 1,4-Dioxane-d8			15 - 110					
1,4-Dioxane-d8 (IS)								
1,4-Dichlorobenzene-d4								

Analytical Method Information

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
PFAS EPA 1633 in Water (EPA 1633)								
Preservation: Store cool at 4°C								
Container: 500 mL plastic Unpreserved		**Amount Required:** 500 mL			**Hold Time:** 28 days			
Perfluorobutanoic acid (PFBA)	0.80	6.4 ng/L			70 - 140	25	70 - 140	25
Perfluoropentanoic acid (PFPeA)	0.45	3.2 ng/L			65 - 135	25	65 - 135	25
Perfluorohexanoic acid (PFHxA)	0.28	1.6 ng/L			70 - 145	25	70 - 145	25
Perfluoroheptanoic acid (PFHpA)	0.28	1.6 ng/L			70 - 150	25	70 - 150	25
Perfluorooctanoic acid (PFOA)	0.42	1.6 ng/L			70 - 150	25	70 - 150	25
Perfluorononanoic acid (PFNA)	0.65	1.6 ng/L			70 - 150	25	70 - 150	25
Perfluorodecanoic acid (PFDA)	0.39	1.6 ng/L			70 - 140	25	70 - 140	25
Perfluoroundecanoic acid (PFUnA)	0.51	1.6 ng/L			70 - 145	25	70 - 145	25
Perfluorododecanoic acid (PFDoA)	0.35	1.6 ng/L			70 - 140	25	70 - 140	25
Perfluorotridecanoic acid (PFTrDA)	0.48	1.6 ng/L			65 - 140	25	65 - 140	25
Perfluorotetradecanoic acid (PFTeDA)	0.15	1.6 ng/L			60 - 140	25	60 - 140	25
Perfluorobutanesulfonic acid (PFBS)	0.34	1.6 ng/L			60 - 145	25	60 - 145	25
Perfluoropentanesulfonic acid (PFPeS)	0.47	1.6 ng/L			65 - 140	25	65 - 140	25
Perfluorohexanesulfonic acid (PFHxS)	0.62	1.6 ng/L			65 - 145	25	65 - 145	25
Perfluoroheptanesulfonic acid (PFHpS)	0.85	1.6 ng/L			70 - 150	25	70 - 150	25
Perfluorooctanesulfonic acid (PFOS)	0.40	1.6 ng/L			55 - 150	25	55 - 150	25
Perfluorononanesulfonic acid (PFNS)	0.47	1.6 ng/L			65 - 145	25	65 - 145	25
Perfluorodecanesulfonic acid (PFDS)	0.51	1.6 ng/L			60 - 145	25	60 - 145	25
Perfluorododecanesulfonic acid (PFDoS)	0.72	1.6 ng/L			50 - 145	25	50 - 145	25
1H,1H,2H,2H-Perfluorohexane sulfonic ac	1.3	6.4 ng/L			70 - 145	25	70 - 145	25
1H,1H,2H,2H-Perfluorooctane sulfonic ac	3.0	6.4 ng/L			65 - 155	25	65 - 155	25
1H,1H,2H,2H-Perfluorodecane sulfonic ac	3.3	6.4 ng/L			60 - 150	25	60 - 150	25
Perfluorooctanesulfonamide (PFOSA)	0.56	1.6 ng/L			70 - 145	25	70 - 145	25
N-methyl perfluoroocatnesulfonamide (NM	0.27	1.6 ng/L			60 - 150	25	60 - 150	25
N-ethyl perfluorooctanesulfonamide (NEtF	0.33	1.6 ng/L			65 - 145	25	65 - 145	25
N-MeFOSAA (NMeFOSAA)	1.5	1.6 ng/L			50 - 140	25	50 - 140	25
N-EtFOSAA (NEtFOSAA)	0.65	1.6 ng/L			70 - 145	25	70 - 145	25
N-methylperfluorooctanesulfonamidoethar	1.3	16 ng/L			70 - 145	25	70 - 145	25
N-ethylperfluorooctanesulfonamidoethano	1.6	16 ng/L			70 - 135	25	70 - 135	25
Hexafluoropropylene oxide dimer acid (HI	1.5	6.4 ng/L			70 - 140	25	70 - 140	25
4,8-Dioxa-3H-perfluorononanoic acid (AD	0.85	6.4 ng/L			65 - 145	25	65 - 145	25
9Cl-PF3ONS (F53B Minor)	0.93	6.4 ng/L			70 - 155	25	70 - 155	25
11Cl-PF3OUdS (F53B Major)	1.7	6.4 ng/L			55 - 160	25	55 - 160	25
3-Perfluoropropyl propanoic acid (FPrPA)(	2.2	8.0 ng/L			65 - 130	25	65 - 130	25
2H,2H,3H,3H-Perfluorooctanoic acid(FPe	7.0	40 ng/L			70 - 135	25	70 - 135	25
3-Perfluoroheptyl propanoic acid (FHpPA)	9.0	40 ng/L			50 - 145	25	50 - 145	25
Perfluoro(2-ethoxyethane)sulfonic acid (Pl	0.57	3.2 ng/L			70 - 140	25	70 - 140	25
Perfluoro-3-methoxypropanoic acid (PFM	0.46	3.2 ng/L			55 - 140	25	55 - 140	25
Perfluoro-4-methoxybutanoic acid (PFMB	0.43	3.2 ng/L			60 - 150	25	60 - 150	25
Nonafluoro-3,6-dioxaheptanoic acid (NFD	2.1	3.2 ng/L			50 - 150	25	50 - 150	25
surr: 13C4-PFBA			5 - 130					
surr: 13C5-PFPeA			40 - 130					
surr: 13C5-PFHxA			40 - 130					
surr: 13C4-PFHpA			40 - 130					
surr: 13C8-PFOA			40 - 130					
surr: 13C9-PFNA			40 - 130					

Page 1 of 10

Analytical Method Information

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
surr: 13C6-PFDA			40 - 130					
surr: 13C7-PFUnA			30 - 130					
surr: 13C2-PFDoA			10 - 130					
surr: 13C2-PFTeDA			10 - 130					
surr: 13C3-PFBS			40 - 135					
surr: 13C3-PFHxS			40 - 130					
surr: 13C8-PFOS			40 - 130					
surr: 13C2-4:2FTS			40 - 200					
surr: 13C2-6:2FTS			40 - 200					
surr: 13C2-8:2FTS			40 - 300					
surr: 13C8-PFOSA			40 - 130					
surr: D3-NMeFOSA			10 - 130					
surr: D5-NEtFOSA			10 - 130					
surr: D3-NMeFOSAA			40 - 170					
surr: D5-NEtFOSAA			25 - 135					
surr: D7-NMeFOSE			10 - 130					
surr: D9-NEtFOSE			10 - 130					
surr: 13C3-HFPO-DA			40 - 130					
13C3-PFBA								
13C2-PFHxA								
13C4-PFOA								
13C5-PFNA								
13C2-PFDA								
18O2-PFHxS								
13C4-PFOS								

Page 2 of 10

Analytical Method Information

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
PFAS EPA 1633 in Soil (EPA 1633)								
Preservation: Store cool at 4°C								
Container: 125 mL plastic		**Amount Required:** 250 g			**Hold Time:** 90 days			
Perfluorobutanoic acid (PFBA)	0.27	0.80 µg/kg			70 - 140	25	70 - 140	25
Perfluoropentanoic acid (PFPeA)	0.13	0.40 µg/kg			60 - 150	25	60 - 150	25
Perfluorohexanoic acid (PFHxA)	0.082	0.20 µg/kg			65 - 140	25	65 - 140	25
Perfluoroheptanoic acid (PFHpA)	0.083	0.20 µg/kg			65 - 145	25	65 - 145	25
Perfluorooctanoic acid (PFOA)	0.069	0.20 µg/kg			70 - 150	25	70 - 150	25
Perfluorononanoic acid (PFNA)	0.075	0.20 µg/kg			70 - 155	25	70 - 155	25
Perfluorodecanoic acid (PFDA)	0.063	0.20 µg/kg			70 - 155	25	70 - 155	25
Perfluoroundecanoic acid (PFUnA)	0.083	0.20 µg/kg			70 - 155	25	70 - 155	25
Perfluorododecanoic acid (PFDoA)	0.075	0.20 µg/kg			70 - 150	25	70 - 150	25
Perfluorotridecanoic acid (PFTrDA)	0.064	0.20 µg/kg			65 - 150	25	65 - 150	25
Perfluorotetradecanoic acid (PFTeDA)	0.068	0.20 µg/kg			65 - 150	25	65 - 150	25
Perfluorobutanesulfonic acid (PFBS)	0.064	0.20 µg/kg			65 - 145	25	65 - 145	25
Perfluoropentanesulfonic acid (PFPeS)	0.064	0.20 µg/kg			55 - 160	25	55 - 160	25
Perfluorohexanesulfonic acid (PFHxS)	0.075	0.20 µg/kg			60 - 150	25	60 - 150	25
Perfluoroheptanesulfonic acid (PFHpS)	0.10	0.20 µg/kg			65 - 155	25	65 - 155	25
Perfluorooctanesulfonic acid (PFOS)	0.061	0.20 µg/kg			65 - 160	25	65 - 160	25
Perfluorononanesulfonic acid (PFNS)	0.050	0.20 µg/kg			55 - 140	25	55 - 140	25
Perfluorodecanesulfonic acid (PFDS)	0.065	0.20 µg/kg			40 - 155	25	40 - 155	25
Perfluorododecanesulfonic acid (PFDoS)	0.058	0.20 µg/kg			25 - 160	25	25 - 160	25
1H,1H,2H,2H-Perfluorohexane sulfonic ac	0.30	0.80 µg/kg			60 - 150	25	60 - 150	25
1H,1H,2H,2H-Perfluorooctane sulfonic ac	0.29	0.80 µg/kg			55 - 200	25	55 - 200	25
1H,1H,2H,2H-Perfluorodecane sulfonic ac	0.37	0.80 µg/kg			70 - 150	25	70 - 150	25
Perfluorooctanesulfonamide (PFOSA)	0.081	0.20 µg/kg			70 - 140	25	70 - 140	25
N-methyl perfluoroocatnesulfonamide (NM	0.056	0.20 µg/kg			70 - 155	25	70 - 155	25
N-ethyl perfluorooctanesulfonamide (NEtF	0.090	0.20 µg/kg			70 - 140	25	70 - 140	25
N-MeFOSAA (NMeFOSAA)	0.10	0.20 µg/kg			65 - 155	25	65 - 155	25
N-EtFOSAA (NEtFOSAA)	0.092	0.20 µg/kg			65 - 165	25	65 - 165	25
N-methylperfluorooctanesulfonamidoethar	0.65	2.0 µg/kg			70 - 140	25	70 - 140	25
N-ethylperfluorooctanesulfonamidoethano	0.71	2.0 µg/kg			70 - 135	25	70 - 135	25
Hexafluoropropylene oxide dimer acid (HI	0.34	0.80 µg/kg			70 - 145	25	70 - 145	25
4,8-Dioxa-3H-perfluorononanoic acid (AD	0.32	0.80 µg/kg			70 - 160	25	70 - 160	25
9Cl-PF3ONS (F53B Minor)	0.23	0.80 µg/kg			70 - 150	25	70 - 150	25
11Cl-PF3OUdS (F53B Major)	0.27	0.80 µg/kg			45 - 160	25	45 - 160	25
3-Perfluoropropyl propanoic acid (FPrPA)(	0.49	1.0 µg/kg			45 - 130	25	45 - 130	25
2H,2H,3H,3H-Perfluorooctanoic acid(FPe	1.5	5.0 µg/kg			60 - 130	25	60 - 130	25
3-Perfluoroheptyl propanoic acid (FHpPA)	1.6	5.0 µg/kg			60 - 150	25	60 - 150	25
Perfluoro(2-ethoxyethane)sulfonic acid (Pl	0.15	0.40 µg/kg			70 - 140	25	70 - 140	25
Perfluoro-3-methoxypropanoic acid (PFM	0.092	0.40 µg/kg			30 - 140	25	30 - 140	25
Perfluoro-4-methoxybutanoic acid (PFMB	0.12	0.40 µg/kg			60 - 150	25	60 - 150	25
Nonafluoro-3,6-dioxaheptanoic acid (NFD	0.25	0.40 µg/kg			60 - 155	25	60 - 155	25
surr: 13C4-PFBA			8 - 130					
surr: 13C5-PFPeA			35 - 130					
surr: 13C5-PFHxA			40 - 130					
surr: 13C4-PFHpA			40 - 130					
surr: 13C8-PFOA			40 - 130					
surr: 13C9-PFNA			40 - 130					

Page 3 of 10

Analytical Method Information

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
surr: 13C6-PFDA			40 - 130					
surr: 13C7-PFUnA			40 - 130					
surr: 13C2-PFDoA			40 - 130					
surr: 13C2-PFTeDA			20 - 130					
surr: 13C3-PFBS			40 - 135					
surr: 13C3-PFHxS			40 - 130					
surr: 13C8-PFOS			40 - 130					
surr: 13C2-4:2FTS			40 - 165					
surr: 13C2-6:2FTS			40 - 215					
surr: 13C2-8:2FTS			40 - 275					
surr: 13C8-PFOSA			40 - 130					
surr: D3-NMeFOSA			10 - 130					
surr: D5-NEtFOSA			10 - 130					
surr: D3-NMeFOSAA			40 - 135					
surr: D5-NEtFOSAA			40 - 150					
surr: D7-NMeFOSE			20 - 130					
surr: D9-NEtFOSE			15 - 130					
surr: 13C3-HFPO-DA			40 - 130					
13C3-PFBA								
13C2-PFHxA								
13C4-PFOA								
13C5-PFNA								
13C2-PFDA								
18O2-PFHxS								
13C4-PFOS								

Page 4 of 10

Analytical Method Information

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
PFAS EPA 1633 in Product/Solid (EPA 1633)								
Preservation: Store cool at 4°C								
Container: 125 mL plastic		**Amount Required:** 250 g			**Hold Time:** 90 days			
Perfluorobutanoic acid (PFBA)	0.27	0.80 µg/kg			70 - 140	25	70 - 140	25
Perfluoropentanoic acid (PFPeA)	0.13	0.40 µg/kg			60 - 150	25	60 - 150	25
Perfluorohexanoic acid (PFHxA)	0.082	0.20 µg/kg			65 - 140	25	65 - 140	25
Perfluoroheptanoic acid (PFHpA)	0.083	0.20 µg/kg			65 - 145	25	65 - 145	25
Perfluorooctanoic acid (PFOA)	0.069	0.20 µg/kg			70 - 150	25	70 - 150	25
Perfluorononanoic acid (PFNA)	0.075	0.20 µg/kg			70 - 155	25	70 - 155	25
Perfluorodecanoic acid (PFDA)	0.063	0.20 µg/kg			70 - 155	25	70 - 155	25
Perfluoroundecanoic acid (PFUnA)	0.083	0.20 µg/kg			70 - 155	25	70 - 155	25
Perfluorododecanoic acid (PFDoA)	0.075	0.20 µg/kg			70 - 150	25	70 - 150	25
Perfluorotridecanoic acid (PFTrDA)	0.064	0.20 µg/kg			65 - 150	25	65 - 150	25
Perfluorotetradecanoic acid (PFTeDA)	0.068	0.20 µg/kg			65 - 150	25	65 - 150	25
Perfluorobutanesulfonic acid (PFBS)	0.064	0.20 µg/kg			65 - 145	25	65 - 145	25
Perfluoropentanesulfonic acid (PFPeS)	0.064	0.20 µg/kg			55 - 160	25	55 - 160	25
Perfluorohexanesulfonic acid (PFHxS)	0.075	0.20 µg/kg			60 - 150	25	60 - 150	25
Perfluoroheptanesulfonic acid (PFHpS)	0.10	0.20 µg/kg			65 - 155	25	65 - 155	25
Perfluorooctanesulfonic acid (PFOS)	0.061	0.20 µg/kg			65 - 160	25	65 - 160	25
Perfluorononanesulfonic acid (PFNS)	0.050	0.20 µg/kg			55 - 140	25	55 - 140	25
Perfluorodecanesulfonic acid (PFDS)	0.065	0.20 µg/kg			40 - 155	25	40 - 155	25
Perfluorododecanesulfonic acid (PFDoS)	0.058	0.20 µg/kg			25 - 160	25	25 - 160	25
1H,1H,2H,2H-Perfluorohexane sulfonic ac	0.30	0.80 µg/kg			60 - 150	25	60 - 150	25
1H,1H,2H,2H-Perfluorooctane sulfonic ac	0.29	0.80 µg/kg			55 - 200	25	55 - 200	25
1H,1H,2H,2H-Perfluorodecane sulfonic ac	0.37	0.80 µg/kg			70 - 150	25	70 - 150	25
Perfluorooctanesulfonamide (PFOSA)	0.081	0.20 µg/kg			70 - 140	25	70 - 140	25
N-methyl perfluoroocatnesulfonamide (NM	0.056	0.20 µg/kg			70 - 155	25	70 - 155	25
N-ethyl perfluorooctanesulfonamide (NEtF	0.090	0.20 µg/kg			70 - 140	25	70 - 140	25
N-MeFOSAA (NMeFOSAA)	0.10	0.20 µg/kg			65 - 155	25	65 - 155	25
N-EtFOSAA (NEtFOSAA)	0.092	0.20 µg/kg			65 - 165	25	65 - 165	25
N-methylperfluorooctanesulfonamidoethar	0.65	2.0 µg/kg			70 - 140	25	70 - 140	25
N-ethylperfluorooctanesulfonamidoethano	0.71	2.0 µg/kg			70 - 135	25	70 - 135	25
Hexafluoropropylene oxide dimer acid (HI	0.34	0.80 µg/kg			70 - 145	25	70 - 145	25
4,8-Dioxa-3H-perfluorononanoic acid (AD	0.32	0.80 µg/kg			70 - 160	25	70 - 160	25
9Cl-PF3ONS (F53B Minor)	0.23	0.80 µg/kg			70 - 150	25	70 - 150	25
11Cl-PF3OUdS (F53B Major)	0.27	0.80 µg/kg			45 - 160	25	45 - 160	25
3-Perfluoropropyl propanoic acid (FPrPA)(	0.49	1.0 µg/kg			45 - 130	25	45 - 130	25
2H,2H,3H,3H-Perfluorooctanoic acid(FPe	1.5	5.0 µg/kg			60 - 130	25	60 - 130	25
3-Perfluoroheptyl propanoic acid (FHpPA)	1.6	5.0 µg/kg			60 - 150	25	60 - 150	25
Perfluoro(2-ethoxyethane)sulfonic acid (PI	0.15	0.40 µg/kg			70 - 140	25	70 - 140	25
Perfluoro-3-methoxypropanoic acid (PFMI	0.092	0.40 µg/kg			30 - 140	25	30 - 140	25
Perfluoro-4-methoxybutanoic acid (PFMB	0.12	0.40 µg/kg			60 - 150	25	60 - 150	25
Nonafluoro-3,6-dioxaheptanoic acid (NFD	0.25	0.40 µg/kg			60 - 155	25	60 - 155	25
surr: 13C4-PFBA			8 - 130					
surr: 13C5-PFPeA			35 - 130					
surr: 13C5-PFHxA			40 - 130					
surr: 13C4-PFHpA			40 - 130					
surr: 13C8-PFOA			40 - 130					
surr: 13C9-PFNA			40 - 130					

Page 5 of 10

Analytical Method Information

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
surr: 13C6-PFDA			40 - 130					
surr: 13C7-PFUnA			40 - 130					
surr: 13C2-PFDoA			40 - 130					
surr: 13C2-PFTeDA			20 - 130					
surr: 13C3-PFBS			40 - 135					
surr: 13C3-PFHxS			40 - 130					
surr: 13C8-PFOS			40 - 130					
surr: 13C2-4:2FTS			40 - 165					
surr: 13C2-6:2FTS			40 - 215					
surr: 13C2-8:2FTS			40 - 275					
surr: 13C8-PFOSA			40 - 130					
surr: D3-NMeFOSA			10 - 130					
surr: D5-NEtFOSA			10 - 130					
surr: D3-NMeFOSAA			40 - 135					
surr: D5-NEtFOSAA			40 - 150					
surr: D7-NMeFOSE			20 - 130					
surr: D9-NEtFOSE			15 - 130					
surr: 13C3-HFPO-DA			40 - 130					
13C3-PFBA								
13C2-PFHxA								
13C4-PFOA								
13C5-PFNA								
13C2-PFDA								
18O2-PFHxS								
13C4-PFOS								

Page 6 of 10

Analytical Method Information

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
PFAS EPA 1633 in Landfill leachate (EPA 1633)								
Preservation: Store cool at 4°C								
Container: 500 mL plastic Unpreserved		**Amount Required:** 500 mL			**Hold Time:** 28 days			
Perfluorobutanoic acid (PFBA)	4.0	32 ng/L			70 - 140	25	70 - 140	25
Perfluoropentanoic acid (PFPeA)	2.2	16 ng/L			65 - 135	25	65 - 135	25
Perfluorohexanoic acid (PFHxA)	1.4	8.0 ng/L			70 - 145	25	70 - 145	25
Perfluoroheptanoic acid (PFHpA)	1.4	8.0 ng/L			70 - 150	25	70 - 150	25
Perfluorooctanoic acid (PFOA)	2.1	8.0 ng/L			70 - 150	25	70 - 150	25
Perfluorononanoic acid (PFNA)	3.3	8.0 ng/L			70 - 150	25	70 - 150	25
Perfluorodecanoic acid (PFDA)	1.9	8.0 ng/L			70 - 140	25	70 - 140	25
Perfluoroundecanoic acid (PFUnA)	2.6	8.0 ng/L			70 - 145	25	70 - 145	25
Perfluorododecanoic acid (PFDoA)	1.7	8.0 ng/L			70 - 140	25	70 - 140	25
Perfluorotridecanoic acid (PFTrDA)	2.4	8.0 ng/L			65 - 140	25	65 - 140	25
Perfluorotetradecanoic acid (PFTeDA)	0.77	8.0 ng/L			60 - 140	25	60 - 140	25
Perfluorobutanesulfonic acid (PFBS)	1.7	8.0 ng/L			60 - 145	25	60 - 145	25
Perfluoropentanesulfonic acid (PFPeS)	2.3	8.0 ng/L			65 - 140	25	65 - 140	25
Perfluorohexanesulfonic acid (PFHxS)	3.1	8.0 ng/L			65 - 145	25	65 - 145	25
Perfluoroheptanesulfonic acid (PFHpS)	4.2	8.0 ng/L			70 - 150	25	70 - 150	25
Perfluorooctanesulfonic acid (PFOS)	2.0	8.0 ng/L			55 - 150	25	55 - 150	25
Perfluorononanesulfonic acid (PFNS)	2.3	8.0 ng/L			65 - 145	25	65 - 145	25
Perfluorodecanesulfonic acid (PFDS)	2.5	8.0 ng/L			60 - 145	25	60 - 145	25
Perfluorododecanesulfonic acid (PFDoS)	3.6	8.0 ng/L			50 - 145	25	50 - 145	25
1H,1H,2H,2H-Perfluorohexane sulfonic ac	6.6	32 ng/L			70 - 145	25	70 - 145	25
1H,1H,2H,2H-Perfluorooctane sulfonic ac	15	32 ng/L			65 - 155	25	65 - 155	25
1H,1H,2H,2H-Perfluorodecane sulfonic ac	16	32 ng/L			60 - 150	25	60 - 150	25
Perfluorooctanesulfonamide (PFOSA)	2.8	8.0 ng/L			70 - 145	25	70 - 145	25
N-methyl perfluoroocatnesulfonamide (N	1.4	8.0 ng/L			60 - 150	25	60 - 150	25
N-ethyl perfluorooctanesulfonamide (NEtF	1.7	8.0 ng/L			65 - 145	25	65 - 145	25
N-MeFOSAA (NMeFOSAA)	7.6	8.0 ng/L			50 - 140	25	50 - 140	25
N-EtFOSAA (NEtFOSAA)	3.2	8.0 ng/L			70 - 145	25	70 - 145	25
N-methylperfluorooctanesulfonamidoethar	6.5	80 ng/L			70 - 145	25	70 - 145	25
N-ethylperfluorooctanesulfonamidoethano	8.2	80 ng/L			70 - 135	25	70 - 135	25
Hexafluoropropylene oxide dimer acid (HI	7.6	32 ng/L			70 - 140	25	70 - 140	25
4,8-Dioxa-3H-perfluorononanoic acid (AD	4.2	32 ng/L			65 - 145	25	65 - 145	25
9Cl-PF3ONS (F53B Minor)	4.7	32 ng/L			70 - 155	25	70 - 155	25
11Cl-PF3OUdS (F53B Major)	8.4	32 ng/L			55 - 160	25	55 - 160	25
3-Perfluoropropyl propanoic acid (FPrPA)(	11	40 ng/L			65 - 130	25	65 - 130	25
2H,2H,3H,3H-Perfluorooctanoic acid(FPe	35	200 ng/L			70 - 135	25	70 - 135	25
3-Perfluoroheptyl propanoic acid (FHpPA)	45	200 ng/L			50 - 145	25	50 - 145	25
Perfluoro(2-ethoxyethane)sulfonic acid (PI	2.8	16 ng/L			70 - 140	25	70 - 140	25
Perfluoro-3-methoxypropanoic acid (PFMI	2.3	16 ng/L			55 - 140	25	55 - 140	25
Perfluoro-4-methoxybutanoic acid (PFMB	2.1	16 ng/L			60 - 150	25	60 - 150	25
Nonafluoro-3,6-dioxaheptanoic acid (NFD	11	16 ng/L			50 - 150	25	50 - 150	25
surr: 13C4-PFBA			5 - 130					
surr: 13C5-PFPeA			40 - 130					
surr: 13C5-PFHxA			40 - 130					
surr: 13C4-PFHpA			40 - 130					
surr: 13C8-PFOA			40 - 130					
surr: 13C9-PFNA			40 - 130					

Page 7 of 10

Analytical Method Information

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
surr: 13C6-PFDA			40 - 130					
surr: 13C7-PFUnA			40 - 130					
surr: 13C2-PFDoA			35 - 130					
surr: 13C2-PFTeDA			25 - 130					
surr: 13C3-PFBS			40 - 130					
surr: 13C3-PFHxS			40 - 130					
surr: 13C8-PFOS			40 - 130					
surr: 13C2-4:2FTS			40 - 220					
surr: 13C2-6:2FTS			40 - 170					
surr: 13C2-8:2FTS			40 - 145					
surr: 13C8-PFOSA			40 - 130					
surr: D3-NMeFOSA			40 - 130					
surr: D5-NEtFOSA			35 - 130					
surr: D3-NMeFOSAA			35 - 130					
surr: D5-NEtFOSAA			30 - 130					
surr: D7-NMeFOSE			20 - 130					
surr: D9-NEtFOSE			20 - 130					
surr: 13C3-HFPO-DA			40 - 130					
13C3-PFBA								
13C2-PFHxA								
13C4-PFOA								
13C5-PFNA								
13C2-PFDA								
18O2-PFHxS								
13C4-PFOS								

Page 8 of 10

Analytical Method Information

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
PFAS EPA 1633 in Biosolids (EPA 1633)								
Preservation: Store cool at 4°C								
Container: 125 mL plastic		**Amount Required:** 500 mL			**Hold Time:** 90 days			
Perfluorobutanoic acid (PFBA)	2.7	8.0 µg/kg			70 - 140	25	70 - 140	25
Perfluoropentanoic acid (PFPeA)	1.3	4.0 µg/kg			60 - 150	25	60 - 150	25
Perfluorohexanoic acid (PFHxA)	0.82	2.0 µg/kg			65 - 140	25	65 - 140	25
Perfluoroheptanoic acid (PFHpA)	0.83	2.0 µg/kg			65 - 145	25	65 - 145	25
Perfluorooctanoic acid (PFOA)	0.69	2.0 µg/kg			70 - 150	25	70 - 150	25
Perfluorononanoic acid (PFNA)	0.75	2.0 µg/kg			70 - 155	25	70 - 155	25
Perfluorodecanoic acid (PFDA)	0.63	2.0 µg/kg			70 - 155	25	70 - 155	25
Perfluoroundecanoic acid (PFUnA)	0.83	2.0 µg/kg			70 - 155	25	70 - 155	25
Perfluorododecanoic acid (PFDoA)	0.75	2.0 µg/kg			70 - 150	25	70 - 150	25
Perfluorotridecanoic acid (PFTrDA)	0.64	2.0 µg/kg			65 - 150	25	65 - 150	25
Perfluorotetradecanoic acid (PFTeDA)	0.68	2.0 µg/kg			65 - 150	25	65 - 150	25
Perfluorobutanesulfonic acid (PFBS)	0.64	2.0 µg/kg			65 - 145	25	65 - 145	25
Perfluoropentanesulfonic acid (PFPeS)	0.64	2.0 µg/kg			55 - 160	25	55 - 160	25
Perfluorohexanesulfonic acid (PFHxS)	0.75	2.0 µg/kg			60 - 150	25	60 - 150	25
Perfluoroheptanesulfonic acid (PFHpS)	1.0	2.0 µg/kg			65 - 155	25	65 - 155	25
Perfluorooctanesulfonic acid (PFOS)	0.61	2.0 µg/kg			65 - 160	25	65 - 160	25
Perfluorononanesulfonic acid (PFNS)	0.50	2.0 µg/kg			55 - 140	25	55 - 140	25
Perfluorodecanesulfonic acid (PFDS)	0.65	2.0 µg/kg			40 - 155	25	40 - 155	25
Perfluorododecanesulfonic acid (PFDoS)	0.58	2.0 µg/kg			25 - 160	25	25 - 160	25
1H,1H,2H,2H-Perfluorohexane sulfonic ac	3.0	8.0 µg/kg			60 - 150	25	60 - 150	25
1H,1H,2H,2H-Perfluorooctane sulfonic ac	2.9	8.0 µg/kg			55 - 200	25	55 - 200	25
1H,1H,2H,2H-Perfluorodecane sulfonic ac	3.7	8.0 µg/kg			70 - 150	25	70 - 150	25
Perfluorooctanesulfonamide (PFOSA)	0.81	2.0 µg/kg			70 - 140	25	70 - 140	25
N-methyl perfluoroocatnesulfonamide (NM	0.56	2.0 µg/kg			70 - 155	25	70 - 155	25
N-ethyl perfluorooctanesulfonamide (NEtF	0.90	2.0 µg/kg			70 - 140	25	70 - 140	25
N-MeFOSAA (NMeFOSAA)	1.0	2.0 µg/kg			65 - 155	25	65 - 155	25
N-EtFOSAA (NEtFOSAA)	0.92	2.0 µg/kg			65 - 165	25	65 - 165	25
N-methylperfluorooctanesulfonamidoethar	6.5	20 µg/kg			70 - 140	25	70 - 140	25
N-ethylperfluorooctanesulfonamidoethano	7.1	20 µg/kg			70 - 135	25	70 - 135	25
Hexafluoropropylene oxide dimer acid (HI	3.4	8.0 µg/kg			70 - 145	25	70 - 145	25
4,8-Dioxa-3H-perfluorononanoic acid (AD	3.2	8.0 µg/kg			70 - 160	25	70 - 160	25
9Cl-PF3ONS (F53B Minor)	2.3	8.0 µg/kg			70 - 150	25	70 - 150	25
11Cl-PF3OUdS (F53B Major)	2.7	8.0 µg/kg			45 - 160	25	45 - 160	25
3-Perfluoropropyl propanoic acid (FPrPA)(	4.9	10 µg/kg			45 - 130	25	45 - 130	25
2H,2H,3H,3H-Perfluorooctanoic acid(FPe	15	50 µg/kg			60 - 130	25	60 - 130	25
3-Perfluoroheptyl propanoic acid (FHpPA)	16	50 µg/kg			60 - 150	25	60 - 150	25
Perfluoro(2-ethoxyethane)sulfonic acid (PI	1.5	4.0 µg/kg			70 - 140	25	70 - 140	25
Perfluoro-3-methoxypropanoic acid (PFMI	0.92	4.0 µg/kg			30 - 140	25	30 - 140	25
Perfluoro-4-methoxybutanoic acid (PFMB	1.2	4.0 µg/kg			60 - 150	25	60 - 150	25
Nonafluoro-3,6-dioxaheptanoic acid (NFD	2.5	4.0 µg/kg			60 - 155	25	60 - 155	25
surr: 13C4-PFBA			5 - 130					
surr: 13C5-PFPeA			35 - 130					
surr: 13C5-PFHxA			40 - 130					
surr: 13C4-PFHpA			40 - 130					
surr: 13C8-PFOA			40 - 130					
surr: 13C9-PFNA			40 - 145					

Page 9 of 10

Analytical Method Information

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
surr: 13C6-PFDA			40 - 130					
surr: 13C7-PFUnA			40 - 130					
surr: 13C2-PFDoA			40 - 130					
surr: 13C2-PFTeDA			10 - 160					
surr: 13C3-PFBS			40 - 150					
surr: 13C3-PFHxS			40 - 140					
surr: 13C8-PFOS			40 - 130					
surr: 13C2-4:2FTS			40 - 300					
surr: 13C2-6:2FTS			40 - 300					
surr: 13C2-8:2FTS			40 - 300					
surr: 13C8-PFOSA			20 - 140					
surr: D3-NMeFOSA			20 - 130					
surr: D5-NEtFOSA			20 - 130					
surr: D3-NMeFOSAA			30 - 150					
surr: D5-NEtFOSAA			20 - 140					
surr: D7-NMeFOSE			25 - 130					
surr: D9-NEtFOSE			20 - 130					
surr: 13C3-HFPO-DA			40 - 130					
13C3-PFBA								
13C2-PFHxA								
13C4-PFOA								
13C5-PFNA								
13C2-PFDA								
18O2-PFHxS								
13C4-PFOS								

Page 10 of 10

APPENDIX D

Pace Analytical Laboratory QA and DUE Guidance Document

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Andy Rezendes Approved on 2/1/2025 7:50:41 AM
Chris Ouellette Approved on 2/23/2025 7:56:19 AM
Elena Dayn Approved on 1/29/2025 11:59:21 AM
John Trimble Approved on 1/27/2025 3:20:37 PM
Marco Soares Approved on 1/28/2025 8:23:25 AM
Pete Henriksen Approved on 1/24/2025 3:49:21 PM
Rusty Vicinie Approved on 2/2/2025 6:40:03 PM
Stephen Witkowski Approved on 2/24/2025 8:27:01 AM
Jason Hebert Approved on 2/24/2025 1:08:15 PM

Management Approval Page
Local Quality Manual
Pace Analytical Services, LLC (PAS)

Signatory Attestation: The employee's electronic signature on this management approval page affirms the approver's obligation, commitment, and responsibility to uphold the requirements of the PAS Quality Management System (QMS) described in this Quality Manual (manual) at each location for which this manual is prepared.

Refer to the page for Quality Manual Signatories to view the job title and physical address for each approver.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Title Page
Local Quality Manual
Pace Analytical Services, LLC (PAS)

This manual has been prepared for the following PAS laboratories and subsidiaries:

PAS-WES2 Pace Analytical Services, LLC - Westborough, MA
Analytical Laboratory
8 Walkup Drive
Westborough, MA 01581
Phone: 508-898-9220

PAS-MANS Pace Analytical Services, LLC - Mansfield, MA (320 Forbes)
Analytical Laboratory
320 Forbes Blvd.
Mansfield, MA 02048
Phone: 508-822-9300

PAS-MANS Pace Analytical Services, LLC - Mansfield, MA (120 Forbes)
Air Center of Excellence
120 Forbes Blvd.
Mansfield, MA 02048
Phone: 508-822-9300

Administrative Offices
145 Flanders Road
Westborough, MA 01581
Phone: 508-898-9220

Albany, NY Service Center
14 Walker Way, Suite 1
Albany, NY 12205
Phone: 518-869-0394

New Hampshire Service Center
222 International Drive, Suite 155
Portsmouth, NH 03801
Phone: 603-436-5111

Buffalo, NY Service Center
275 Cooper Avenue, Suite 105
Tonawanda, NY 14150
Phone: 716-783-9291

New Jersey Service Center
123 Tice Blvd. Suite 102
Woodcliff Lake, NJ 07677
Phone: 201-847-9100

Maine Service Center
72 Center Street, Suite 3
Brewer, ME 04412
Phone: 207-624-0713

Mid-Atlantic PA Service Center
1013 Ashland Ave
Folcroft, PA 19032
Phone: 610-532-5742

Rochester, NY Service Center
Metro Park Business Center, Suite M-105
Rochester, NY
Phone: 518-869-0394

Syracuse, NY Service Center
10 Adler Dr., Suite 104
Syracuse, NY 13057
Phone: 518-860-9724

Cleveland, OH Service Center
7575 Tyler Blvd, Bldg C, Suite C35
Mentor, OH
Phone: 614-357-3321

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Quality Manual Approver Information

The individuals listed below are approvers of this manual and are responsible for implementing the PAS Quality Management System and upholding the requirements of this manual at the location(s) for which this manual was prepared, at the time this version of the manual was made effective.

The manual is not revised and released under an updated version when there is a change to personnel. Personnel information is updated during the manual's normal review and revision cycle.

If an approver changes positions, leaves the company, or is on extended leave of absence, the responsibility to implement and uphold the PAS QMS automatically transfers to the primary or alternate deputy for the position until the approver is replaced and/or the approver returns to work. The individual replacing the approver automatically accepts the responsibilities associated with the original approver's attestation. Refer to Section 4.1.5.1.1 of this manual to view the deputies assigned to key personnel job titles.

PAS-Westborough

Name	Job Title	Location	Email
Albert (Rusty) Vicinie	Vice President of Operations	Corporate	rusty.vicinie@pacelabs.com
Christopher Ouellette	Director of Lab Operations	Corporate	chris.ouellette@pacelabs.com
Peter Henriksen	General Manager	8 Walkup Dr. Westborough, MA 01581	pete.henriksen@pacelabs.com
Stephen Witkowski	Quality Program Manager	Corporate	stephen.witkowski@pacelabs.com
Jason Hebert	Quality Manager	320 Forbes Blvd. Mansfield, MA 02048	jason.hebert@pacelabs.com
Marco Soares	Technical Manager (TNI)	8 Walkup Dr. Westborough, MA 01581	marco.soares@pacelabs.com
Elena Dayn	Technical Manager (TNI)	8 Walkup Dr. Westborough, MA 01581	elena.dayn@pacelabs.com

PAS-Mansfield

Name	Job Title	Location	Email
Albert (Rusty) Vicinie	Vice President of Operations	Corporate	rusty.vicinie@pacelabs.com
Christopher Ouellette	Director of Lab Operations	Corporate	chris.ouellette@pacelabs.com
Peter Henriksen	General Manager	8 Walkup Dr. Westborough, MA 01581	pete.henriksen@pacelabs.com
Stephen Witkowski	Quality Program Manager	Corporate	stephen.witkowski@pacelabs.com
Jason Hebert	Quality Manager	320 Forbes Blvd. Mansfield, MA 02048	jason.hebert@pacelabs.com
John Trimble	Technical Manager (TNI)	320 Forbes Blvd. Mansfield, MA 02048	john.trimble@pacelabs.com

PAS-Mansfield Air Center of Excellence

Name	Job Title	Location	Email
Albert (Rusty) Vicinie	Vice President of Operations	Corporate	rusty.vicinie@pacelabs.com
Christopher Ouellette	Director of Lab Operations	Corporate	chris.ouellette@pacelabs.com
Peter Henriksen	General Manager	8 Walkup Dr. Westborough, MA 01581	pete.henriksen@pacelabs.com
Stephen Witkowski	Quality Program Manager	Corporate	stephen.witkowski@pacelabs.com
Jason Hebert	Quality Manager	320 Forbes Blvd. Mansfield, MA 02048	jason.hebert@pacelabs.com
Andy Rezendes	Technical Manager (TNI)	320 Forbes Blvd. Mansfield, MA 02048	andy.rezendes@pacelabs.com

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Table of Contents

1.0 PURPOSE AND SCOPE 8

1.1 PURPOSE 8
1.2 SCOPE AND APPLICATION 8
1.2.1 QUALITY MANUAL TEMPLATE 9
1.2.2 QUALITY MANUAL 9
1.2.3 REFERENCES TO SUPPORTING DOCUMENTS 10

2.0 REFERENCES 10

3.0 TERMS AND DEFINITIONS 11

4.0 MANAGEMENT REQUIREMENTS 12

4.1 ORGANIZATION 12
4.1.1 LEGAL IDENTITY 12
4.1.2 COMPLIANCE RESPONSIBILITY 12
4.1.3 SCOPE OF THE QUALITY MANAGEMENT SYSTEM 12
4.1.4 ORGANIZATION HISTORY AND INFORMATION 12
4.1.5 MANAGEMENT REQUIREMENTS 13
4.2 QUALITY MANAGEMENT SYSTEM 19
4.2.1 QUALITY MANAGEMENT SYSTEM OBJECTIVES 19
4.2.2 QUALITY POLICY STATEMENT 21
4.2.3 MANAGEMENT COMMITMENT: QUALITY MANAGEMENT SYSTEM 22
4.2.4 MANAGEMENT COMMITMENT: CUSTOMER SERVICE 23
4.2.5 SUPPORTING PROCEDURES 23
4.2.6 ROLES AND RESPONSIBILITIES 24
4.2.7 CHANGE MANAGEMENT 24
4.3 DOCUMENT CONTROL 24
4.3.1 GENERAL 24
4.3.2 DOCUMENT APPROVAL AND ISSUE 25
4.3.3 DOCUMENT REVIEW AND CHANGE 25
4.4 ANALYTICAL SERVICE REQUEST, TENDER, AND CONTRACT REVIEW 25
4.5 SUBCONTRACTING (INTERNAL AND EXTERNAL) 26
4.6 PURCHASING SERVICES AND SUPPLIES 27
4.7 CUSTOMER SERVICE 27
4.7.1 COMMITMENT TO MEET CUSTOMER EXPECTATIONS 27
4.7.2 CUSTOMER FEEDBACK 28
4.8 COMPLAINTS 28
4.9 NONCONFORMING WORK 28

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

4.9.1 DEFINITION OF NONCONFORMING WORK 28
4.10 CONTINUOUS IMPROVEMENT 30
4.11 CORRECTIVE ACTION 31
4.11.1 CAUSE ANALYSIS (AKA ROOT CAUSE ANALYSIS) 31
4.11.2 EFFECTIVENESS REVIEW 31
4.11.3 ADDITIONAL AUDITS 32
4.12 PREVENTIVE ACTION 32
4.12.1 CHANGE MANAGEMENT 32
4.13 CONTROL OF RECORDS 32
4.13.1 GENERAL REQUIREMENTS 33
4.13.2 TECHNICAL RECORDS 34
4.14 AUDITS 35
4.14.1 INTERNAL AUDIT 35
4.15 MANAGEMENT REVIEW 36
4.16 DATA INTEGRITY 37

5.0 TECHNICAL REQUIREMENTS 37

5.1 GENERAL 37
5.2 PERSONNEL 38
5.2.1 PERSONNEL QUALIFICATIONS 38
5.2.2 REQUIRED TRAINING 38
5.2.3 PERSONNEL SUPERVISION 43
5.2.4 JOB DESCRIPTIONS 44
5.2.5 AUTHORIZATION OF TECHNICAL PERSONNEL 44
5.3 ACCOMMODATIONS AND FACILITIES 44
5.3.1 FACILITIES 44
5.3.2 ENVIRONMENTAL CONDITIONS 44
5.3.3 SEPARATION OF INCOMPATIBLE ACTIVITIES 44
5.3.4 SECURITY 45
5.3.5 GOOD HOUSEKEEPING 45
5.4 TEST METHODS 45
5.4.1 GENERAL REQUIREMENTS 45
5.4.2 METHOD SELECTION 45
5.4.3 LABORATORY DEVELOPED METHODS 45
5.4.4 NON-STANDARD METHODS 46
5.4.5 METHOD VALIDATION 46
5.4.6 MEASUREMENT UNCERTAINTY 50
5.4.7 CONTROL OF DATA 50
5.5 CALIBRATION REQUIREMENTS 52
5.5.1 AVAILABILITY OF EQUIPMENT 52
5.5.2 CALIBRATION 52
5.5.3 EQUIPMENT USE AND OPERATION 52
5.5.4 EQUIPMENT IDENTIFICATION 53

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

5.5.5 Equipment Lists and Records 53
5.5.6 Out of Service Protocol 54
5.5.7 Calibration Status 54
5.5.8 Returned Equipment Checks 54
5.5.9 Intermediate Equipment Checks 54
5.5.10 Safeguarding Equipment Integrity 54
5.6 Measurement Traceability 55
5.6.1 General 55
5.6.2 Equipment Correction Factors 55
5.6.3 Reference Standards and Reference Materials 55
5.7 Sampling 57
5.7.1 Sampling Plans and SOPs 58
5.7.2 Customer Requested Deviations 58
5.7.3 Recordkeeping 58
5.8 Sample Management & Handling 58
5.8.1 Procedures 58
5.8.2 Unique Identification 60
5.8.3 Sample Receipt Checks and Sample Acceptance Policy 60
5.8.4 Sample Control and Tracking 61
5.8.5 Sample Storage, Handling, and Disposal 62
5.9 Assuring the Quality of Test Results 63
5.9.1 Quality Control (QC) Procedures 63
5.9.2 QC Corrective Action 67
5.9.3 Data Review 67
5.9.4 Calibration Certificates 68
5.9.5 Opinions and Interpretations 69
5.9.6 Subcontractor Reports 69
5.9.7 Electronic Transmission of Results 69
5.9.8 Format of Test Reports 69
5.9.9 Amendments to Test Reports 69
5.10 Reporting 69
5.10.1 General Requirements 69
5.10.2 Test Reports: Required Items 70
5.10.3 Test Reports: Supplemental Items 70

6.0 REVISION HISTORY 72

7.0 APPENDICES 74

7.1 Appendix A: Certification / Accreditation Listing 74
7.1.1 PAS-WES2 8 Walkup Drive, Westborough, MA 74
7.1.2 PAS-MANS 320 Forbes Blvd. Mansfield, MA 74
7.1.3 PAS-MANS 120 Forbes Blvd. Mansfield, MA 75

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

7.2 APPENDIX B: CAPABILITY LISTING 75
7.3 APPENDIX C: GLOSSARY 75
7.4 APPENDIX D: ORGANIZATION CHART(S) 85
7.4.1 PAS CORPORATE ORGANIZATION CHART(S) 85
7.4.2 PAS QUALITY SYSTEMS MANAGEMENT ORGANIZATION CHART 86
7.4.3 PAS-WES2 8 WALKUP DRIVE, WESTBOROUGH, MA – ORGANIZATION CHART 87
7.4.4 PAS-MANS 320 FORBES BLVD, MANSFIELD, MA – ORGANIZATION CHART 88
7.4.5 PAS-MANS 120 FORBES BLVD. MANSFIELD, MA – ORGANIZATION CHART 89
7.5 APPENDIX E: EQUIPMENT LISTING 90

8.0 ADDENDUM: PROGRAM REQUIREMENTS 91

8.1 DOD 91
8.2 UNREGULATED CONTAMINANT MONITORING RULE 5 (UCMR5) 97

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

1.0 PURPOSE AND SCOPE

1.1 Purpose

This quality manual (manual) outlines the quality management system and management structure of Pace® Analytical Services, LLC. Throughout this manual, Pace® Analytical Services, LLC is also referred to by the acronym PAS. Building Sciences laboratories are a subset of specialized laboratories within PAS and may also be referred to by the acronyms BSCI or BDSG within the quality management system.

The QMS is also called the quality program throughout this manual and other PAS documents. "Quality Management System" and "Quality Program" are synonymous and inferred by the acronym QMS.

The QMS is the collection of policies and processes established by the senior leaders of PAS (top management) to ensure the services and products provided by PAS consistently meet relevant requirements and achieves the goal of Pace® to provide customers with high quality, cost-effective, analytical measurements, and services.

The QMS is planned to establish conformance[1] and compliance with the current published versions of these international and national quality system Standards:

- ISO/IEC 17025: *General requirements for the competence of testing and calibration laboratories*
- TNI Standard Volume 1: *Management and Technical Requirements for Laboratories Performing Environmental Analysis*

[1]The statement of conformity to these Standards pertains only to testing and sampling activities carried out by the laboratory at its physical address, in temporary or mobile facilities, in-network, or by laboratory personnel at a customer's facility.

The QMS is also planned to achieve regulatory compliance with the various federal and state programs for which PAS locations provide compliance testing and/or holds certification or accreditation. Federal or state requirements that do not apply to all PAS locations, are provided in addendum to this manual or in other documents that supplement the manual. Customer-specific project and program requirements are not included in the manual in order to maintain client confidentiality.

- A list of accreditation and certifications held by each location associated with this manual is provided in Appendix A.
- A list of analytical testing capabilities offered by each location associated with this manual is managed by local Quality and maintained in document ENV-FORM-WES2-0188 Analytical Testing Capabilities List.

1.2 Scope and Application

This manual applies to each location listed on the Title Page of this manual:

For purposes of the PAS QMS the term "location" refers to laboratories and/or service centers.

- The term "laboratory" refers to any PAS location, however named by Pace® that provides testing, collects samples (sampling), or conducts field measurement services in a fixed building, mobile unit, or in-situ (field).
- The phrase "service center" refers to any PAS location, however named by Pace® that does not perform any testing, sampling, or field measurements.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

PAS locations are defined by their physical address and other information:

- Laboratories are defined by physical address and certification/accreditation ID.
- Mobile units are defined by the address of the location to which they are assigned, by VIN (vehicle identification number), or by certification/accreditation ID.
- The phrase "satellite laboratory" is used by PAS to refer to a limited-service laboratory affiliated with a larger PAS business unit or location. Some PAS business groups refer to satellite laboratories as service centers for accounting purposes. This designation is not consistent with the definitions specified in this manual or throughout the supporting documents associated with the QMS. Regardless of any internal reference or jargon, any PAS location that generates a test result is a "laboratory" and all laboratories must comply with all requirements specified in this manual for analytical testing services.

1.2.1 Quality Manual Template

This manual was prepared from the PAS Quality Manual Template (template) created by the PAS Corporate Quality team.

The template, known as document ID ENV-TMP-CORQ-0007, specifies the minimum requirements that every PAS location must abide by, regardless of scope of services or number of personnel, in order to achieve the objectives of the PAS Quality Policy (Refer to Section 4.2.2).

The template is the mechanism used by top management[1] to communicate their commitment to continuously develop and improve the QMS for effectiveness, to meet customer expectations, and to comply with any statutory and regulatory requirements. Their signature of approval for the template is the mechanism used to document their responsibility.

[1]Top Management is the phrase in the TNI Standard that refers to the leaders of an organization that develop and/or release the PAS Quality Policy Statement and manual under their authority. For PAS, top management includes the PAS President, Vice President of Quality, Risk Management Officer, Senior Vice President of Operations (Sr. VPO), and the Chief Technical Officer (CTO).

The template and instructions for use of the template are released by corporate quality personnel to the local quality managers responsible for each location (Local Quality Manager (QM)). The local QM uses the template to prepare the location's manual by following the instructions provided to them. The local QM may not alter the font, structure, or content of the template, except where specified by instruction to do so.

The template is reviewed by corporate quality personnel annually and updated, if needed. More frequent review and revision may occur to manage change, to maintain conformance and compliance to relevant standards or to improve the QMS.

Refer to standard operating procedure (SOP) ENV-SOP-CORQ-00015 *Document Management and Control* for more information.

1.2.2 Quality Manual

The template and the manual include references to other organization documents that support the QMS such as policies and standard operating procedures (SOPs).

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

These references may include the document's document control number (DC#) and the document title. This information is subject to change at the discretion of PAS. The manual and/or template are updated to reflect the editorial change during the manual's next scheduled review/revision cycle or the next time a version of the manual is released, whichever is sooner.

Each location maintains a current list of documents used by the location to support the QMS. This list, known as the controlled document or master list is readily available to personnel for their use and it provides a cross reference to the legacy document ID, where applicable. Parties external to PAS may contact the location of interest to obtain the most current version of controlled document list if desired.

1.2.3 References to Supporting Documents

The template and the manual include references to other organization documents that support the QMS such as policies and standard operating procedures (SOPs).

These references may include the document's document control number (DC#) and the document title. This information is subject to change at the discretion of PAS. The manual and/or template are updated to reflect the editorial change during the manual's next scheduled review/revision cycle or the next time a version of the manual is released, whichever is sooner.

Each location maintains a current list of documents used by the location to support the QMS. This list, known as the controlled document or master list is readily available to personnel for their use and it provides a cross reference to the legacy document ID, where applicable. Parties external to PAS may contact the location of interest to obtain the most current version of controlled document list if desired.

2.0 REFERENCES

Incorporated by reference are the following documents that were used for the preparation of the quality manual, ensuring compliance with accreditation requirements.

- "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act." Federal Register, 40 CFR Part 136, most current version.
- "Test Methods for Evaluating Solid Wastes: Physical/Chemical Methods." SW-846.
- "Methods for Chemical Analysis of Water and Wastes," EPA 600-4-79-020, 1979 Revised 1983, U.S. EPA.
- U.S. EPA Contract Laboratory Program Statement of Work for Organic Analysis, current version.
- U.S. EPA Contract Laboratory Program Statement of Work for Inorganic Analysis, current version.
- "Standard Methods for the Examination of Water and Wastewater." Current Edition APHA-AWWA-WPCF.
- "Annual Book of ASTM Standards," Section 4: Construction, Volume 04.04: Soil and Rock; Building Stones, American Society of Testing and Materials.
- "Annual Book of ASTM Standards," Section 11: Water and Environmental Technology, American Society of Testing and Materials.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

- "NIOSH Manual of Analytical Methods," U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, most current version.
- "Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water," U.S. EPA, Environmental Monitoring and Support Laboratory – Cincinnati (Sep 1986).
- Quality Assurance of Chemical Measurements, Taylor, John K.; Lewis Publishers, Inc. 1987.
- Methods for Non-conventional Pesticides Chemicals Analysis of Industrial and Municipal Wastewater, Test Methods, EPA-440/1-83/079C.
- Environmental Measurements Laboratory (EML) Procedures Manual, HASL-300, US DOE, February 1992.
- Requirements for Quality Control of Analytical Data, HAZWRAP, DOE/HWP-65/R1, July 1990.
- AIHA Laboratory Accreditation Programs, LLC Policy Modules, AIHA, most current version.
- ISO/IEC 17025, General requirements for the competence of testing and calibration laboratories, 2nd Edition 2005-05-15; 3rd Edition 2017-11

  The following are implemented by normative reference to ISO/IEC 17025:

  - ISO/IEC Guide 99, International vocabulary of metrology –Basic and general concepts and associated terms
  - ISO/IEC 17000, Conformity assessment – Vocabulary and general principles
- Department of Defense Quality Systems Manual (QSM), most current version.
- TNI (The NELAC Institute) Standard, 2016 version.
- UCMR Laboratory Approval Requirements and Information Document, most current version.
- US EPA Drinking Water Manual, most current version.
- National Voluntary Laboratory Accreditation Program (NVLAP) - Procedures and General Requirements. NIST Handbook 150: 2020
- National Voluntary Laboratory Accreditation Program (NVLAP) - Bulk Asbestos Analysis. NIST Handbook 150-3: 2006
- National Voluntary Laboratory Accreditation Program (NVLAP) – Airborne Asbestos Analysis. NIST Handbook 150-13: 2006
- EPA National Lead Laboratory Accreditation Program: Laboratory Quality System Requirements, Revision 3.0, July 05, 2007

3.0 TERMS AND DEFINITIONS

Refer to Appendix C for terms, acronyms, and definitions used in this manual and in other documents used by PAS to support the QMS.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

4.0 MANAGEMENT REQUIREMENTS

4.1 Organization

4.1.1 Legal Identity

Pace® Analytical Services, LLC is the responsible entity authorized by the State of Minnesota to do business as a limited liability company, under the parent company, PAS Parent, Inc.

4.1.1.1 Change of Ownership

If there is a change of ownership, if a PAS location goes out of business, or if the entire organization ceases to exist, PAS management must notify regulatory authorities of the change within the time required by each state agency for which the location is certified or accredited.

Specifications for retention of records and other business information are addressed in the ownership transfer agreement and in accordance with appropriate regulatory requirements. These details are not included in this manual because each situation is specific to the change event.

4.1.2 Compliance Responsibility

PAS management has the responsibility and authority to establish and implement procedures and to maintain resources necessary to ensure its testing activities are carried out in such a way to meet applicable federal and statutory requirements in addition to the requirements specified in this manual and QMS supporting documents

4.1.3 Scope of the Quality Management System

The QMS applies to work carried out at each location covered by this manual including permanent facilities, at sites away from its permanent facilities, or in associated temporary or mobile facilities.

The permanent and mobile facilities to which this manual applies are listed on the Title Page of this manual.

4.1.4 Organization History and Information

Founded in 1978, Pace® Analytical Services, LLC is a privately held scientific services firm operating one of the largest full-service contract laboratory and service center networks in the United States.

The business purpose of PAS is to deliver the highest standard of testing and scientific services in the market. We offer the most advanced solutions in the industry, backed by transparent data, a highly trained team, and the service and support that comes from over four decades of experience.

4.1.4.1 Organization Structure

Each PAS location is led by a management team referred to as local management[1]. Local management is responsible for making day-to-day decisions regarding the operations of the facility and implementing, and sustaining the requirements, policies, and procedures of the PAS quality program.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

[1] The term "local management" does not mean "on-site" management. Some of the roles included in the local management team, work off site or from a different PAS location.

For purpose of the QMS, the job titles associated with the local management team include Vice President of Operations (VPO), General Manager (GM), Director of Laboratory Operations (DLO), Quality Program Manager (QPM), and Quality Manager.

The local management team is supported by department supervisors and team leaders, and business groups that support the organization such as HR, IT, Sales & Marketing, Finance, and EHS (Environmental Health & Safety).

Technical oversight for each location is provided by local personnel with support and guidance from the PAS Chief Technical Officer. Locations that hold TNI accreditation, also have personnel appointed to serve as the "acting technical manager for TNI, however named" to perform the duties and responsibilities of this designation per the TNI Standard. Refer to Section 4.1.5.2.1 for more information on this TNI requirement.

The reporting relationships and responsibilities of quality personnel are independent of operations in order to safeguard impartiality. Refer to Section 4.1.5.2 for more information.

Refer to the organization charts provided in Appendix D to view the organization structure, reporting relationships, and the interrelationships between positions.

4.1.5 Management Requirements

4.1.5.1 Personnel

Each PAS location is staffed with administrative and/or technical personnel who perform and verify work under the supervision of their direct line supervisor.

All personnel are required to perform their duties in accordance with the policies and processes outlined in this manual and in accordance with standard operating procedures and other quality system documents. PAS policies and procedures are designed for impartiality and integrity. When these procedures are fully implemented, personnel remain free from undue pressure and other influences that adversely impact the quality of their work or data.

4.1.5.1.1 Key Personnel

Key personnel are management positions that have the authority and responsibility to plan, direct, and control activities related to the QMS for the entire division (PAS Corporate), or for one or more PAS locations (Local).

PAS Key Personnel Positions & Deputy Assignments by Role

Job Title	Primary / Alternate Deputy
Chief Executive Officer	President

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Chief Compliance Officer	VPQ / As Assigned
President	CEO / Sr. VPO
Vice President of Quality	RMO or CTO
Quality Program Manager	CQD / Peer QPM / As Assigned
Chief Technical Officer	VPQ / As Assigned
Risk Management Officer	VPQ or CTO
Sr. VP of Operations	President / VPO
Vice President of Operations	Sr. VPO / Peer VPO
Director of Lab Operations[1]	VPO / Peer DLO or Sr. VPO
Health and Safety Director	As Assigned
IT Director	CIO
Quality Manager	QPM /Peer QM / QAA
General Manager[1]	VPO / Sr. VPO or Peer GM
Operations Manager[1]	GM / DL or VPO
Technical Manager (TM)[1]	CTO / Peer TM
TNI or NLLAP Approved TM[2]	Another Qualified Employee

[1:] Position is not in place at all locations.

[2:] The TNI TM is not a PAS position. Refer to Section 4.1.5.2.1 for more information.

Some certification and accreditation programs require notification any time there is a change in key personnel. Notification requirements are tracked and upheld by the local QM, when these requirements apply.

4.1.5.2 Roles and Responsibilities

The qualifications, duties, and responsibilities for each position at Pace® are detailed in job descriptions maintained by the Pace® Human Resource (HR) personnel.

The following sections provide a general overview of various management and supervisory roles and are presented in no particular order.

Chief Executive Officer: Provides leadership for overall operations; development of growth strategies; and long-range capital and strategic planning for Pace®.

Chief Compliance Officer: Provides leadership for compliance related activities.

President: Provides leadership for overall operations; oversight of regulatory and compliance standards; development of growth strategies; and long-range capital and strategic planning for PAS.

Chief Technical Officer: Provides technical oversight and leadership to all PAS locations. Responsible for innovation and standardization of technical activities.

Vice President of Quality (VPQ): Responsible for developing the PAS quality program and the policies and procedures that support the QMS. The VPQ leads the

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

quality team, establishing functions, responsibilities, duties, and organizational structure for PAS.

Risk Management Officer (RMO): Responsible for the risk management program and initiatives within PAS. Specializes in the identification, assessment, and mitigation of operational and regulatory risk. The RMO leads the risk management team to ensure the development and implementation of risk management strategies.

Corporate Quality Program Manager: Responsible for helping local management implement, monitor, maintain and improve the PAS quality program for one or more locations in the network and for direct supervision of Quality Manager(s).

Director of Information Technology: Oversees and delivers the systems and processes of information technology used by PAS. These systems include Laboratory Information Management Systems (LIMS); data acquisition, reduction, and reporting software; virus-protection, communication tools, and ensuring the integrity, security of electronic data, and associated policies and procedures.

Sr. Vice President of Operations: Provides leadership, direction, and insight necessary to achieve strategic initiatives. Develops and improves processes, structure, and allocation of resources for operations for all PAS.

Vice-President of Operations: Provides leadership, guidance, and resources, including allocation of personnel, necessary to achieve the strategic goals of the organization and the PAS quality program to one or more PAS locations.

Director of Laboratory Operations: Refer to descriptions for VPO and General Manager. The DLO is an intermediary management position that provides leadership and resources to one or more locations.

General Manager: The GM is responsible for overall administration and operation of one or more PAS locations. Although task duties associated with this responsibility may be delegated, the GM is responsible for ensuring all duties and activities of the locations they oversee comply with the PAS QMS, the PAS EHS program, and with any applicable statutory, regulatory requirements or program requirements. If a GM is not assigned to the location, these responsibilities are transferred to the Operations Manager (OM) or DLO; if no DLO, to the VPO.

Any GM of a TNI Accredited laboratory is also responsible for the designation of technical personnel to serve as acting technical managers for TNI for the fields of accreditation held by the laboratory (Refer to Section 4.1.5.2.1) and for notifying the quality team of any extended absence or reassignment of these designations.

Quality Manager: The QM oversees and monitors the implementation, compliance, and improvement of the QMS and communicates gaps, deviations, and opportunities for improvement to local and corporate laboratory management. The QM is independent of the operation and analytical activities for which they provide oversight and has the authority to carry out the roles and responsibilities of their position without outside influence.

The QM:

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

- serves as the focal point for QA/QC protocol decisions and oversees review of QC data for trend analysis;
- evaluates data objectively and performs assessments without outside influence;
- has documented training and experience in QA/QC procedures and the PAS quality system;
- has a general knowledge of the analytical methods offered by the laboratory;
- coordinates and conducts internal systems and technical audits;
- notifies laboratory management of deficiencies in the quality system;
- monitors corrective actions;
- provides support to technical personnel and may serve as the primary deputy for the acting TNI Technical Manager(s).

Client Services Manager (CSM): This position is responsible for the training and supervision of project manager(s) and/or shipping, receiving and courier personnel. The primary responsibility of the CSM is to ensure projects are successfully managed to meet the expectations and needs of PAS customers.

Department Managers, or however named: These positions are responsible for administrative and operations management and implementation of the QMS in the work area he/she oversees. These responsibilities include but are not limited to: training and supervision of personnel, monitoring work activity to maintain compliance with this manual, SOPs, policies and other instructional documents that support the QMS; method development, validation and the establishment and implementation of SOPs to assure regulatory compliance and suitability for the intended purpose; monitoring QA/QC performance, proper handling and reporting of nonconforming work; purchasing of supplies and equipment adequate for use; maintaining instrumentation and equipment in proper working order and calibration; and general maintenance of administrative and technical processes and procedures established by the laboratory.

Operations Manager: The OM is responsible for management of production and/or other duties assigned by the GM..

4.1.5.2.1 Approved Technical Manager (TNI or ELLAP/NLLAP Accreditation Only)

The requirements in this subsection apply only to PAS locations that are NELAC/TNI or ELLAP/NLLAP accredited.

The TNI Standard and National Lead Laboratory Accreditation Program: Laboratory Quality System Requirements (NLLAP LQSR) specify requirements for the qualification and duties of technical personnel. The TNI Standard lists these duties under the reference "technical manager(s), however named."

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

At PAS, these duties closely correlate with the responsibilities and duties outlined in the PAS job descriptions for managers, supervisors, team leads, and/or scientists. However, these duties do not need to be associated with any specific job title and can be assigned to any one or more PAS employees that meets the qualifications specified in the TNI Standard.

Refer to the applicable version of the TNI Standard to view the required qualifications for each discipline. The required qualifications for a laboratory accredited by ELLAP/NLLAP shall be the same as those listed in the TNI Standard.

PAS locations that are TNI accredited must designate one or more employees to perform these duties and submit these qualifications to the TNI accreditation body for approval.

Employees approved by the TNI AB, to perform these duties retain their Pace® assigned job title.

When TNI Accreditation Bodies refer to these employees as 'technical manager' or 'technical director' on the official certificate or the scope of accreditation, this reference is referring to their approval to perform duties of the 'technical manager, however named' as specified in the TNI Standard and not to a PAS job title.

The duties of any approved technical manager for TNI, however named, can be completed in person or remotely. If an employee that is an approved technical manager for TNI is completely absent from work or on a leave of absence for more than 15 calendar days, the duties and responsibilities specified in the TNI Standard are temporarily reassigned to another employee that meets the qualifications for the technology or field of accreditation. If the employee's absence exceeds 35 calendar days, the local QM must formally notify the TNI primary AB of the absence and the details of reassignment of duties in writing.

4.1.5.3 Conflict of Interest

A conflict of interest is a situation where a person has competing interests that may affect impartiality. It is the policy of Pace® to ensure business relationships, decisions and transactions do not place personal interest ahead of the organization, customers, colleagues, job responsibilities or the public we serve. Conflict of interest is avoided by making personnel aware of circumstances that conflict or appear to conflict with impartiality and/or designing process and procedures to include checks and balances to prevent conflict and ensure impartiality.

Refer to the current version of policy COR-POL-0004 *Code of Ethics and Professional Conduct* for more information.

4.1.5.4 Confidentiality

PAS management is committed to preserving the confidentiality of Pace® customers and confidentiality of Pace® business information.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Client information obtained or created during work activities is considered confidential and is protected from intentional release to any person or entity other than the client or the client's authorized representative, except when Pace® is required by law to release confidential information to another party, such as a regulatory agency or for litigation purposes. In which case, Pace® will notify the client of the release of information and the information provided, unless notification is prohibited by law.

When Pace® obtains information about the customer from a source other than the customer, Pace® will keep the source of the information confidential unless disclosure is agreed upon by the source.

The terms of client confidentiality are included in PAS Standard Terms and Conditions (T&C) which can be found on the Hub (**https//info.pacelabs.com/hubfs/pas-standard-term.pdf**). With the acceptance of the T&C and/or the implicit contract for analytical services that occurs when the client sends samples to PAS for testing, the client authorizes Pace® to release confidential information when required. Other procedures used by PAS to maintain confidentiality include:

- A Code of Ethics and Professional Conduct policy that covers this topic (COR-POL-0004);
- A Confidentiality Agreement which supervisory and sales personnel and other positions are required to sign at the time of employment and abide by the conditions of throughout employment;
- Record retention and disposal procedures that ensure confidentiality is maintained; and
- Physical access controls and encryption of electronic data.

Refer to policy COR-POL-0004 *Code of Ethics and Professional Conduct* for more information.

4.1.5.5 Communication

Communication is defined as the imparting or exchanging of news and information. Effective (good) communication occurs when the people included in the communication get the point and understand it.

4.1.5.5.1 Workplace Communication

Effective communication in the workplace is necessary to ensure work is performed correctly, efficiently, and in accordance with client specifications.

Instructions for how to conduct testing and other work activities are communicated to personnel via written policies, standard operating procedures, and other work instructions.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Information about PAS performance (positive and negative) and ideas for improvement are communicated to personnel using various communication channels such as face to face meetings, video conferencing, conference calls, email, memoranda, written reports, and posters.

4.1.5.5.2 External Communication

Communication with external parties such as customers, vendors, business partners, and regulatory agencies takes place every day.

PAS management is responsible for training personnel to communicate in professional and respectful ways to build strong relationships and to avoid misunderstanding.

4.2 Quality Management System

4.2.1 Quality Management System Objectives

The objectives of the PAS QMS are to provide clients with consistent, exemplary professional service, and objective work product that is of known and documented quality that meets their requirements for data usability and regulatory compliance.

Objective work products are analytical services, data, test results, and information that is not influenced by personal feeling or opinions. The quality of being objective is also known as 'impartiality.'

4.2.1.1 Impartiality

PAS achieves and maintains impartiality by establishing an organizational structure that safeguards impartiality (Refer to Section 4.1.4.1) and implementing and adhering to the policies and processes of the QMS outlined in this manual, which are based on industry accepted standards and methodologies.

PAS procedures for handling nonconforming work (Refer to Section 4.9), corrective and preventive actions (Refer to Section 4.11, 4.12) and management review (Refer to Section 4.15) are the primary mechanisms used to identify risk to impartiality and to prompt actions necessary to eliminate or reduce the threat when risk to impartiality is suspected or confirmed.

4.2.1.2 Risk and Opportunity Assessment

Risks are variables that make achieving the goals and objectives of the QMS uncertain.

An opportunity is something that has potential positive consequences for the organization.

PAS personnel manage risks and opportunities on a daily basis by following policies, procedures and processes that support the QMS. Some ways in which the QMS is designed to identify, minimize, or eliminate risk on a daily basis include but are not limited to:

- Capability and capacity reviews of each analytical service request to assure the laboratory can meet the customer's requirements;

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

- Maintenance of accreditation and certification for test methods in multiple states and programs to cover a broad range of authority for regulatory compliance;
- SOPs and other controlled instructional documents are provided to personnel to eliminate variability in the process. These documents include actions to counter risk factors inherent in the process and are reviewed on a regular basis for on-going suitability and relevancy;
- Participation in proficiency testing programs and auditing activities to verify on-going competency and comparability in performance;
- Provision of on-the-job training and established protocol for quality control (QC) corrective action for nonconforming events;
- An established program for ethics, and data integrity;
- Tiered data review process;
- Culture of continuous improvement;
- Monitoring activities to assess daily and long-term performance; and
- Annual critical review of the effectiveness of the QMS.

PAS also promotes a continuous improvement culture based on the principles of lean manufacturing. These principles include 3P (Process, Productivity, Performance) and Kaizen. 3P is a platform used by PAS to share best practices and standardization across the network to achieve operational excellence. Kaizen is a team-based process used to implement tools and philosophies of lean to reduce waste and achieve flow with the purpose of improving both external and internal customer satisfaction. The PAS lean program and activities help to mitigate risk because they generate a collective understanding of vulnerabilities and utilize group-effort to develop and implement solutions at all levels.

Risk and opportunities may also be formally identified using specific risk and opportunity assessment methods such as SWOT Analysis (Strength, Weakness, Opportunity, Threats) and 3-Stage Impact/Probability Grids.

4.2.1.3 Communication of the Quality Management System

This manual is the primary mechanism used by PAS management to communicate the QMS to personnel.

To ensure personnel understand and implement the quality program outlined in the manual:

- PAS personnel are required to sign a Read and Acknowledgement Statement to confirm the employee has:

  1) been informed of the manual by management;

  2) has access to the manual;

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

3) has read the manual;

4) understands the content of the manual; and

5) agrees to abide by the requirements, policies, and procedures therein.

- Personnel are informed that the manual provides the "what" of the QMS. The "how to" implementation of the QMS is provided in policy, SOPs, standard work instructions, and other instructional documents.
- This manual and supporting policies and procedures are made readily accessible to personnel in the area where the work activity is performed.

4.2.2 Quality Policy Statement

The quality policy of PAS is to provide customers with data of known and documented quality fit for their intended purpose. PAS achieves this policy by implementing the QMS defined in this manual, by following industry accepted protocol for analytical testing and quality assurance and quality control activities, by conformance with published and industry accepted testing methodologies, and by compliance with international and national standards for the competency and/or accreditation of testing laboratories.

Intrinsic to this policy statement is each of the following principles:

- PAS will provide customers with reliable, consistent, and professional service. This is accomplished by making sure each PAS location has the resources necessary to maintain capability and capacity; that staff are trained and competent to perform the tasks they are assigned; that client-facing staff are trained and prepared to find solutions to problems and to assist customers with their needs for analytical services. Customer feedback, both positive and negative, is shared with personnel and used to identify opportunities for improvement.
- PAS maintains a quality program that complies with applicable state, federal, and industry standards for analytical testing and competency.
- PAS management provides training to personnel so that all personnel are familiar with the QMS outlined in this manual and that they understand that implementation of the QMS is achieved by adherence to the Pace® and PAS policies and procedures.
- PAS management continuously evaluates and improves the effectiveness of the QMS by responding to customer feedback, and other measures of performance, such as but not limited to the results of internal/external audits, proficiency testing, metrics, trend reports, and annual and periodic management reviews..

4.2.2.1 Ethics Policy / Data Integrity Program

Pace® has established a comprehensive ethics and data integrity program that is communicated to all Pace® employees so that they understand what is expected of them. The program is designed to promote a mindset of ethical behavior and professional conduct that is applied to all work activities.

The key elements of the Pace® Ethics / Data Integrity Program include:

- Ethics Policy (COR-POL-0004);

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

- Standardized data integrity training course taken by all new employees on hire and a yearly refresher data integrity training course for all existing employees;
- Policy Acknowledgement Statements that all Pace® personnel, including contract and temporary, are required to sign at the time of employment and again during annual refresher training to document the employee's commitment and obligation to abide by the company's standards for ethics, data integrity and confidentiality;
- SOPs that provide instructions for how to carry out a test method or process to ensure tasks are done correctly and consistently by each employee;
- On the Job Training;
- Data integrity monitoring activities which include, but are not limited to: primary, secondary and completeness data reviews, internal technical and system audits, data audits, data surveillance, and proficiency testing; and
- Confidential reporting process for alleged ethics and data integrity issues.

All PAS managers and supervisors are expected to provide a work environment where personnel feel safe and can report unethical or improper behavior in complete confidence without fear of retaliation. Retaliation against any employee that reports a concern is not tolerated.

Pace® has engaged Lighthouse Services, Inc. to provide personnel with an anonymous reporting process available to them 24 hours per day/7 days per week. The alert line may be used by any employee to report potential violations of the company's ethics and data integrity program. Reports are forwarded to Pace® leadership to investigate and resolve the matter. Investigations concerning data integrity are kept confidential.

Refer to COR-POL-0001 *Compliance Alertline* for more information.

Posters and flyers with the compliance alert line information must be prominently posted in each PAS location for personnel reference.

Compliance Alert Line Information:

English Speaking US & Canada	(844) 940-0003
Spanish Speaking North America	(800) 216-1288
Internet	www/lighthouse-services.com/pacelabs
Email	reports@lighthouse-services.com

4.2.3 Management Commitment: Quality Management System

Evidence of management's commitment for the development, maintenance, and on-going improvement of the QMS is provided by the application of their signature of approval to the template and/or manual. Their signature confirms they understand their responsibility to implement the QMS outlined in this manual, to communicate the quality program to personnel, and to uphold requirements of the program during work activities.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

4.2.4 Management Commitment: Customer Service

Management communicates the importance of meeting customer and regulatory requirements to personnel by training personnel on the QMS outlined in this manual, implementing the QMS outlined in this manual, and upholding these requirements for all work activities.

4.2.5 Supporting Procedures

References to processes and procedures that support the QMS are included throughout this manual. The structure of the document management system is outlined in SOP ENV-SOP-CORQ-0015 *Document Management* and summarized in the following subsections.

4.2.5.1 Quality Management System Document Structure

Documents associated with the QMS are classified into document types that identify the purpose of the document and establish how the document is managed and /or controlled.

Examples: Types of PAS Internally Created Documents

Document Type	Purpose
Quality Manual	Outlines the PAS QMS and structure and how it works for a system including policy, goals, objectives and detailed explanation of the system and the requirements for implementation of system. Includes roles and responsibilities, relationships, procedures, systems, and other information necessary to meet the objectives of the system described.
Policy	Provide requirements and rules for a process and is used to set course of actions and to guide and influence decisions. Policy describes the "what," not the "how."
Standard Operating Procedure	Provide written and consistent set of instructions or steps for execution of a routine process, method, or set of tasks performed. Ensures that activities are performed properly in accordance with applicable requirements.
Standard Work Instruction	Provide step by step visual and/or written instruction to perform a specific task to improve competency, minimize variability, reduce work injury and strain, or to boost efficiency and quality of work (performance). SWI are associated with an SOP unless the task described is unrelated to generation of or contribution to environmental data or analytical results.
Template	Pre-formatted document that serves as a starting point for a new document.
Guide	Assists users in using a particular product; or a technical interpretation of a method or process by which PAS locations must abide.
Form / Worksheet	Used for a variety of purposes such as to provide a standardized format to record observations, to provide information to supplement an SOP.

Examples: Types of External Documents used by PAS

Certificate	Lists parameters, methods, and matrices for which the location is certified/accredited to perform within the authority of the issuing regulatory agency or accreditation body.
Reference Document	Provide information, protocol, instructions, and/or requirements. Issued by the specifier. Examples include ISO/IEC, TNI, DoD/DOE and published referenced methods such as Standard Methods, ASTM, SW846, EPA, and federal and state regulatory bodies.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Project Document	Provides requirements necessary to meet individual client expectations for intended use of data. Examples include project quality assurance plans (QAPP), client-program technical specifications, contracts, and other agreements.

Project documents are managed as external documents and any requirements for work specified are followed when work for the project is performed. If the project document is less stringent than the PAS QMS, policies, or SOPs, and/or is less stringent than applicable federal or state requirements, PAS locations are still required to meet the minimum requirements of the PAS QMS and any applicable statutory or federal requirements in addition to the requirements specified in the project document. Information and requirements from project documents are not incorporated into PAS policy or SOPs in order to maintain client confidentiality.

Document types are ranked to identify which documents take precedence when there is an actual or perceived conflict between documents and to establish the hierarchal relationships between documents. The ranking system also provides information to document writers and reviewers to ensure downline documents agree with documents of higher rank.

PAS Document Hierarchy

Rank	Document Type
1	External Reference Documents (Standards, Test Methods)
2	Quality Manual Template
3	Corporate & Division Policy
4	Corporate & Division SOP
5	Division SWI, Guides, Forms/Worksheets
6	Local Quality Manual
7	Local SOP
8	Local SWI, Guides, Forms/Worksheets

4.2.6 Roles and Responsibilities

The roles and responsibilities for technical management and the quality manager are provided in section 4.1.5.2.

4.2.7 Change Management

When significant changes to the PAS QMS are planned, these changes are managed by corporate quality personnel to assure that the integrity of the QMS is maintained.

4.3 Document Control

4.3.1 General

PAS uses electronic document management software (eDMS) to control documents that support the PAS QMS. eDMS provides centralized distribution and access to all documents used by PAS. All PAS locations must use the PAS eDMS system unless an exemption to this requirement has been granted by the PAS Corporate Quality Director.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

eDMS automates the process for unique document identification, version control, approval, access, and archival and restricts access to archived documents except to authorized users to prevent the use of obsolete documents.

The local QM maintains a master list of controlled documents used at each location. The master list minimally includes the document control number, document title, and current revision status and is made available to personnel for their reference.

Refer to SOP ENV-SOP-CORQ-0015 *Document Management* for more information.

4.3.2 Document Approval and Issue

Documents that support the QMS are reviewed by qualified personnel and approved by management prior to release for use.

Only the approved versions of documents are available to personnel for use unless a draft document is authorized by management.

The managers responsible for authorization of each document are specific to the document type.

Refer to SOP ENV-SOP-CORQ-0015 *Document Management* for more information.

4.3.3 Document Review and Change

Unless a more frequent review is required by regulatory, certification or accreditation program documents are reviewed at least every two years to ensure the documents remain current, appropriate, and relevant.

Documents are also informally reviewed every time the document is used. Personnel are expected to refer to and follow instructions in controlled documents when they conduct their work activities. Consequently, any concerns or problems with the document should be caught and brought to the attention of management on an on-going basis.

Documents are revised whenever necessary to ensure the document remains usable and correct. Older document versions and documents no longer needed are made obsolete and archived for historical purposes.

PAS does not allow hand-edits of documents. If an interim change is needed pending re-issue of the document, the interim change is communicated to those that use the document using a formal communication channel, such as change in progress form, email, or memorandum.

The document review, revision, and archival process is managed by quality personnel at the location from which the document was released using the procedures established in SOP ENV-SOP-CORQ-0015 *Document Management*.

4.4 Analytical Service Request, Tender, and Contract Review

PAS management and/or client service personnel perform thorough reviews of requests and contracts for analytical services to verify the location(s) performing the work has the capability, capacity, and resources necessary to successfully meet the customer's needs. These review procedures are described in SOP ENV-SOP-WES2-0125 Review of Analytical Requests.

The procedures in this SOP(s) are established to ensure:

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

- The PAS location(s) performing the work understands the purpose of data collection in order to ensure the test methods requested are appropriate for the intended use of the data and capable of meeting the client's data quality objectives;
- PAS locations and any external subcontractor(s) have the capability, capacity, and resources to meet the project requirements and expectations within the requested time for delivery of work product;
- Any concerns that arise from review are discussed and resolved with the client;
- Any discrepancies between the PAS QMS, statutory or regulatory requirements and the client request are resolved; and
- The results of review and any correspondence with the client related to this process and/or any changes made to the contract are recorded and retained for historical purposes.

Capability review confirms that the PAS locations contracted to perform the work and any internal or external subcontractors hold required certification/accreditation for the test method, matrix, and analyte and verifies the location can achieve the client's target compound list and data quality objectives (DQOs) for analytical sensitivity and reporting limits, QA/QC protocol, and hardcopy test report and electronic data deliverable (EDD) formats.

Capacity review verifies that the in-network locations and any potential subcontractors are able to manage the sample load and deliver work production within the delivery time requested.

Resource review verifies that the location and any potential subcontractors have adequate qualified personnel with the skills and competency to perform the test methods and services requested and sufficient and proper equipment and instrumentation needed to perform the services requested.

Customers must be notified when there is a deviation from the contract after acceptance of the contract by both parties. Instructions for this notification process must be included in the laboratory's SOP for this process.

4.5 Subcontracting (Internal and External)

The terms 'subcontract' and "subcontracting" refers to analytical work done by an organization external to Pace® (External Subcontracting) or by a Pace® location with an address different than the address listed on the cover page of the test report (Internal Subcontracting).

The PAS network offers comprehensive analytical capability and capacity to ensure Pace® can meet a diverse range of client needs for any type of project. If a PAS laboratory receives a request for analytical services and it cannot fulfill the project specifications, the location's client services team will collaborate with the client to place the work within the PAS network.

When it is not possible to place the work within network, the location will, with documented client approval, subcontract the work to a subcontractor that has the capabilities to meet the project specifications and can meet the same commitment agreed on between the location and the client.

Whenever work is subcontracted, the PAS location responsible for management of the project verifies each of these qualifications:

- The internal or external subcontractor has the proper accreditation/certifications required for the project and these are current; and

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

- The use of the internal or external subcontractor is approved by the client and/or regulatory agency when such approval is required by the customer. Record of customer approval is retained in the project record.

External subcontractors selected by Pace® must be pre-qualified by quality personnel to verify their QMS is similar to Pace® and complies with all relevant Standards such as ISO/IEC 17025 and the TNI Standard(s) and/or federal and state regulatory requirements. The list of approved subcontractors for each location is maintained by local quality personnel. Pre-qualification of a subcontractor does not eliminate the requirement for the PAS location placing work to verify the subcontractor has the certifications, capability, capacity, and resources to perform work on behalf of Pace® on a project-specific basis.

For all subcontracted work, the PAS location placing the work internally or externally is responsible to ensure project specifications are always communicated to and understood by the subcontractor.

4.6 Purchasing Services and Supplies

Vendors that provide services and supplies to PAS are qualified to meet the needs of Pace®. These needs include but are not limited to competitive pricing, capacity to fill purchase orders, quality of product, customer service, and business reputation and stability. Evidence of this qualification is the availability to purchase services and supplies from the vendor in the corporate purchasing system.

PAS locations may purchase goods and services from any supplier in the purchasing system.

The specifications (type, class, grade, tolerance, purity, etc.) of supplies, equipment, reagents, standard reference materials and other consumables used in the testing process are specified in SOPs. The SOP specifications are based on the governing requirements of the approved reference methods and any additional program driven regulatory specification, such as drinking water compliance.

All requisitions for materials and consumables are approved by local management who is responsible for ensuring the services and supplies procured and received are fit for intended use.

4.7 Customer Service

Project details and management are managed by PAS client services personnel.

4.7.1 Commitment to Meet Customer Expectations

PAS personnel collaborate closely with our customers to ensure their needs are met and to establish their confidence in the capability of PAS to meet their needs for analytical services and expectations for service.

The project manager (PM) is the customer's primary point of contact for each analytical service request (work order). The PM gathers information from the customer to ensure the details of their request are understood. After samples are received, the PM monitors the progress of the project and alerts the customer of any delays or excursions that may adversely impact data usability. Supervisors are expected to keep the PM informed of project status and any delays or key issues, so that the PM can keep the client informed.

PAS encourages customers to visit our locations to learn more about the capabilities, observe performance and to meet personnel.

PAS customers expect confidentiality. Personnel will not divulge or release information to a third party without proper authorization unless the information is required for litigation

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

purposes. Refer to Section 4.1.5.4 of this manual and policy COR-POL-0004 *Code of Ethics and Professional Conduct* for more information on the policy for client confidentiality.

4.7.2 Customer Feedback

PAS actively seeks positive and negative feedback from customers through surveys and direct communication. Information from the client about their experience working with PAS and their satisfaction with work product is used to enhance processes and practices and to improve decision making. Customer feedback is reviewed to identify risk and opportunity. Corrective, preventive, or continuous improvement actions are taken based on nature of and/or feedback trends.

Refer to Sections 4.9, 4.10, 4.11, 4.12, 4.14, and 4.15 for more information about how customer feedback is managed by PAS and used to enhance the QMS.

4.8 Complaints

Per ISO/IEC 17025:2017, a complaint is a formal expression of dissatisfaction with the performance of a service or product originating from a party external to the organization. PAS believes complaints provide opportunities to improve processes and/or build stronger working relationships with our clients.

The PAS complaint resolution process is specified in corporate SOP ENV-SOP-CORQ-0020 and all PAS locations are required to use this SOP as their process.

Complaints are thoroughly reviewed to determine if they are valid. If the complaint is valid, action is taken to resolve the situation with the customer. In accordance with ISO/IEC 17025 requirements, the response to the customer is independently reviewed before it is given to ensure the response from PAS is thorough and proper for the situation.

Complaint information is captured in a centralized database and the data is used by PAS management personnel to identify trends and opportunities for improvement during Annual Management Review – Refer to Section 4.15 for more information about annual management review.

4.9 Nonconforming Work

4.9.1 Definition of Nonconforming Work

Nonconforming work is work that does not conform to customer requirements, standard specifications, policies, and procedures, or that does not meet acceptance criteria.

The discovery of non-conforming work comes from various sources which include, but are not limited to:

- results of quality control samples and instrument calibrations;
- quality checks on consumables and materials;
- general observations of personnel;
- data review;
- proficiency testing;
- internal and external audits;

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

- complaints and feedback;
- management review and reports; and
- regulatory and certification and accreditation actions.

The way in which the laboratory or service center manages nonconforming work depends on the significance and impact (risk) of the issue. Some issues may simply require correction, others may require investigation, corrective action (Refer to Section 4.11) and/or data recall (Refer to Section 4.16). When the location releases data and test results associated with nonconforming QC and acceptance criteria, test results are qualified, or non-conformances are noted in the final analytical report to apprise the data user of the situation. (Refer to Section 5.10)

Nonconforming work also includes unauthorized departure from policies, procedures, and test methods. Authorized departures are explained in the following subsections. Situations that do not conform to these conditions are considered unauthorized departure(s).

4.9.1.1 Authorized Departure from SOPs

Departures from an SOP may sometimes be necessary to correct an error in an SOP or to resolve a complex problem. For example, to mitigate complex matrix interference.

An authorized departure from a test method SOP is one that has been reviewed and approved by the department leader, however named, of the work area in which the test method is performed. The leader, when authorizing a departure from an SOP, accepts full responsibility to ensure the departure does not conflict with Pace® or PAS policy or procedure, does not affect statutory, regulatory or program compliance and does not adversely affect data integrity or usability.

Departure from administrative or process-oriented SOPs must be approved by the local QM.

Documentation of the reason for the SOP departures must be retained with management approval. Approved departures from test method SOPs should be noted in the final test report to advise the data user.

Refer to SOP ENV-SOP-CORQ-0016 *SOP for SOPs and SWI*, for more information.

4.9.1.2 Authorized Departure from Test Methods (Method Modifications)

When test results are associated with a published reference test method, the location's test method SOP must be consistent with the test method. If the test method is mandated for use by a specific regulatory program such as drinking water, wastewater or a certification or accreditation program, such as TNI/NELAC, the SOP must comply with or include these requirements, or the resulting data and test results cannot be used for regulatory compliance purposes.

If the procedures in the SOP are modified from the test method, these modifications must be clearly identified in the SOP. The conditions under which the location may establish an SOP that is modified from these reference methods or regulatory

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

program and what is considered a modification are specified in ENV-SOP-CORQ-0011 *Method Validation and Instrument Verification*.

Client requests to deviate from the test method are managed as client requests to depart from the test method SOP since it is the SOP that the location follows when performing work.

4.9.1.3 Stop Work Authority

Stop Work Authority provides PAS personnel with the capability to temporarily stop work when there is a perceived unsafe condition or situation that may affect data integrity or the safety of personnel.

All personnel have the authority to initiate and request a stop work order when necessary to preserve data integrity or safety of workers.

The need for the stop work order and resolution of the problem must be confirmed by subject matter experts and resumption of work must be approved as follows:

- For stop work orders related to environmental health and safety and/or waste management, the decision to stop work may be made in real time to protect the safety of the worker. Actions taken to correct the problem and lift the stop work order are made by the EHS Director, or the deputies assigned to these positions.
- Any employee may request a temporary stop work order for concerns related to data integrity. However, the request must be reviewed and the need to stop work affirmed by the Quality Manager to confirm the concern is valid. The decision to uphold the stop work order must be made jointly by the local QM, the QPM, the GM or DLO, and the VPO. The Corporate Quality Director and Chief Technical Officer, and other members of PAS management are consulted as needed. The actions taken to correct the problem and authorization to lift the stop work order are made by the same management team.

4.10 Continuous Improvement

The PAS QMS is designed to achieve continuous improvement through the implementation of the quality policy and objectives outlined in this manual. Information about laboratory and service center activities and performance is gained from sources such as customer feedback, audits, QC, trend analysis, business analytics, management reports, proficiency testing, and management systems review. This information is subsequently used during the corrective action (Refer to Section 4.11) and preventive action (Refer to Section 4.12) processes and during annual review of the management system (Refer to Section 4.15) to establish goals and objectives for improvement.

PAS also promotes a continuous improvement culture based on the principles of lean manufacturing. These principles include 3P and Kaizen. 3P is a platform used by Pace to share best practices and standardization across the network to achieve operational excellence. Kaizen is a team-based process used to implement tools and philosophies of lean to reduce waste and achieve flow with the purpose of improving both external and internal customer satisfaction. All activities of 3P and Lean must conform with the requirements of this quality manual and supporting policies and procedures.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

4.11 Corrective Action

Corrective action is a process used to eliminate the cause of a detected nonconformity. It is different from a correction. A correction is an action taken to fix an immediate problem but that does not resolve the underlying cause of why the problem occurred. The objective of corrective action is to find the underlying cause(s) of the problem and to put in place fixes to prevent the problem from happening again. The corrective action process, referred to as CAPA, is one of the most effective tools used by PAS to prevent nonconforming work, identify risk and opportunity, and improve service to our customers.

PAS has two general processes for corrective action, the application of which process is used depends on the type of nonconformity.

Quality control (QC) exceptions (nonconformance) that occur during routine testing is investigated through troubleshooting and required actions for correction is specified in policies and SOPs. When action is not taken, cannot be taken, or is not successful, test results associated with the nonconforming work are qualified in the final test report. Documentation of the nonconformance and corrective action taken is documented in the analytical record.

A 7-stage corrective action process is used when there is a recurring problem. These problems are identified through various activities such as but not limited to quality control trends, internal and external audits, management review, customer feedback, and general observation.

The 7 Stage CAPA Process for PAS includes:

1) Identification and Containment
2) Evaluation
3) Investigation
4) Cause Analysis
5) Action Plan
6) Implementation
7) Follow Up and Effectiveness Review

PAS procedures for corrective action are specified in corporate SOP ENV-SOP-CORQ-0018, *Procedure for Corrective and Preventive Action*. Some key concepts and activities related to the PAS corrective action process are provided in the next three subsections.

4.11.1 Cause Analysis (AKA Root Cause Analysis)

Cause analysis is the process of investigation used to identify the underlying cause(s) of the problem. After causal factors are identified, ways to mitigate the causal factors are identified and action(s) most likely to eliminate these factors are taken.

PAS uses different methods to conduct cause analysis. The most common approach is 5-Why, 4M, Fishbone Diagrams, or brainstorming may be appropriate depending on the situation. The method used is case specific and is documented in the CAPA record.

4.11.2 Effectiveness Review

Monitoring corrective actions for effectiveness is an essential part of the corrective action process. Effectiveness means the actions taken were appropriate and sustainable. Appropriate

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

means the action(s) taken prevented recurrence of the problem since the time corrective action was taken and sustainable means the actions taken are still in place.

The data from CAPA records are used by PAS to identify opportunities for preventive action or to gain lessons learned when actions taken were not adequate to solve the problem. Refer to Section 4.12 (Preventive Action) and 4.15 (Management Review) for more information.

4.11.3 Additional Audits

When cause analysis and investigation of a problem casts doubt on compliance with PAS policies, procedures, or to regulatory requirements; a special audit of the area of activity may be performed as part of the corrective action process. These special audits are used to determine the scope of the problem and to provide information for the CAPA process. Additional full-scale audits are done when a grave issue or risk to the business is identified.

4.12 Preventive Action

Preventive action(s) are actions taken to eliminate the cause of a potential nonconformity before it happens.

Some examples of preventive action include, but are not limited to:

- Routine instrument maintenance (Preventive maintenance)
- Addition of Staff and Equipment
- Professional Development Activities
- Implementation of New Technology

PAS looks for opportunities for preventive action from a variety of sources including employee ideas, customer feedback, business partners input, trend analysis, business analytics, management reviews, proficiency testing results, and risk-benefit analysis.

PAS management evaluates the success of preventive actions taken in any given year during annual management review. Refer to Section 4.15 for more information.

4.12.1 Change Management

Preventive actions may sometimes result in significant changes to processes and procedures used by PAS locations. PAS management evaluates the risks and benefits of change and includes in its implementation of change process, actions to minimize or eliminate any risk. The types of changes for which risk are considered and managed include infrastructure change, change in analytical service offerings, certification or accreditation status, instrumentation, LIMS changes, and changes in key personnel.

4.13 Control of Records

PAS records document activities and provide evidence of conformity to the requirements established in the QMS. These records may be hardcopy or electronic on any form of media.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

4.13.1 General Requirements

4.13.1.1 Procedure

PAS requirements for control of records are specified in corporate policy ENV-POL-CORQ-0013 *Record Managemen*t.

The policy was established to assure quality and technical records are identified, retained, indexed, and filed to allow for retrieval during the entire retention time. During storage, records are kept secure and protected from deterioration. At the end of the retention time, the records are disposed of properly in order to maintain client confidentiality and to protect the interests of the company.

In general, PAS records fall into three categories: quality, technical, and administrative.

Examples of each are provided in the following table:

Record Type	Includes Records of:
Quality	Audits: Internal and External Certificates and Scopes of Accreditation Corrective & Preventive Action Management Review Data Investigations Method Validation Instrument Verification Training Records
Technical	Raw Data Logbooks Certificates of Traceability Analytical Record Test Reports & Project Information Technical Training Records & Demonstration of Capability
Administrative	Personnel Records Finance/Business

4.13.1.2 Record Legibility and Storage

Records are designed to clearly identify the information recorded. Manual entries are made in indelible ink; automated entries are in a typeface and of sufficient resolution to be read. The records identify personnel that performed the activity or entered the information. Records are archived and stored in a way that they are retrievable. Access to archived records is controlled and managed.

For records stored electronically, the capability to restore or retrieve the electronic record is maintained for the entire retention period. Hardcopy records are filed and stored in a suitable environment to protect from damage, deterioration, or loss. Hardcopy records may be scanned to PDF for retention. Scanned records must be checked against the hardcopy to verify the scan is complete and legible.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Administrative records are kept for a minimum of 5 years and technical and quality records are kept for 10 years unless otherwise specified by the client or regulatory program. All records for Building Science and Absaraka Air Science (Sheridan, WY) laboratories are kept for 5 years.

The date from which retention time is calculated depends on the record. In general, the retention time of technical records of original observation and measurement is calculated from the date the record is created. If the technical record is kept in a chronological logbook, the date of retention may be calculated from the date the logbook is archived. The retention time of test reports and project records, which are considered technical records, is calculated from the date the test report was issued. The retention time of quality records is usually calculated from the date the record is archived.

Refer to the record management policy and the location specific SOP for more information

4.13.1.3 Security

PAS locations are secure facilities and access to records is restricted to authorized personnel.

4.13.1.4 Electronic Records

The data systems used to store electronic records is backed up in accordance with SOP ENV-SOP-WES2-0115, *Computer System Backup Control*. Access to archived records stored electronically is maintained by personnel responsible for management of the electronic system.

4.13.1.5 Electronic Signature Policy

Work done by PAS locations includes activities that require the application of a signature. Some work products are in electronic format and signatures are applied electronically.

The Electronic Signatures in Global and National Commerce Act (E-Sign Act) clarifies that electronic signatures are legally valid and enforceable under United States law.

Refer to guide ENV-GUI-CORQ-0007 *Electronic Signatures* for more information.

4.13.2 Technical Records

In addition to the requirements specified in subsections 4.13.1.1 through 4.13.1.5, the requirements in the following subsections also apply to technical records.

4.13.2.1 Description

Technical records are the accumulation of data and information generated from the analytical process. These records may include forms, worksheets, workbooks, checklists, notes, raw data, calibration records, final test reports, and project records. The accumulated record needs to provide adequate detail to historically reconstruct the process and identify the personnel that performed the tasks associated with a test result.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

4.13.2.2 Real Time Recordkeeping

Personnel are instructed and expected to always record observations, data, and calculations at the time they are made. PAS managers are responsible for ensuring that data entries, whether made electronically or on hardcopy, are identifiable to the task

4.13.2.3 Error Correction

Errors in records must never be erased, deleted, or made illegible. Use of correction fluid, such as white-out is prohibited. In hardcopy records, the error is corrected by a single strike through the original entry and the new entry recorded alongside or footnoted to allow for readability. Corrections are initialed and dated by the person making the correction. If the correction is not self-explanatory, a reason for the correction is recorded. Maintenance of proper practices for error correction is monitored through the tiered data review process described in Section 5.9.3.

For electronic records, equivalent measures of error correction or traceability of changes made are kept. For example, audit trails provide records of change.

4.14 Audits

Quality personnel, or their designee, perform internal systems and technical audits to assess implementation of the QMS and compliance to this manual, policy, and procedures that make up the QMS.

PAS locations are also audited by external parties such as regulatory agencies, customers, consultants, and non-government assessment bodies (NGAB).

Information from internal and external audits is used by local and corporate PAS management to address deficiencies and to identify opportunities to improve customer service and quality of work, including reliability and usability of data and test results.

Deficiencies, observations, and recommendations from audits are managed by the local QM using the CAPA process. Refer to Section 4.11 for more information.

4.14.1 Internal Audit

Internal audits are conducted to ensure laboratory and business practices match what we say we do and what we say we do is compliant with the PAS QMS and relevant standards and requirements.

The internal audit program is managed by the local QM who prepares an audit plan at the beginning of each calendar year. The schedule is prepared to ensure that all work areas are reviewed over the course of the year and test methods are audited every two years, unless a more frequent test method audit is required by program. Conformance to the schedule is monitored on a monthly basis.

PAS management is responsible for ensuring the audit schedule is maintained. PAS supervisors are expected to cooperate with the quality personnel to provide them with complete access to the work area, personnel, and records needed to conduct the audit.

Internal audits may be performed by non-quality personnel when the auditor is approved by the local QM. Non-quality personnel may not audit their own work activities unless it can be

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

demonstrated that an effective and objective audit will be conducted. The person conducting the audit must be trained, qualified, and familiar enough with the objectives and policies of the PAS QMS and knowledgeable with process and test method SOPs related to the activities audited. The auditor should be trained in auditing practices in order to perform a thorough and effective evaluation.

Test method audits include reviews of test reports to verify the product is consistent with customer/project requirements, the work was conducted in accordance with policy and SOPs, the SOP complies with the cited reference method, test results are accurate, and of known and documented quality and properly qualified, when necessary.

Special audits are performed as needed to follow up on a specific issue such as a client complaint, negative feedback, concerns of data integrity or ethics, or a problem identified through other audits. Special audits may be scheduled or unscheduled. Unscheduled internal audits are conducted whenever doubts are cast on compliance with regulatory requirements or its own policies and procedures. These unscheduled internal audits may be conducted at any time and may be performed without an announcement to the location or work area audited.

When observations and findings from any audit (internal or external) cast doubt on the validity of testing results, the location takes immediate action to investigate the problem and take corrective action. (Also refer to Section 4.11 and 4.16)

4.14.1.1 Corporate Compliance Audit

PAS locations may also be audited by Pace® corporate personnel at discretion. The purpose of the corporate compliance audit is to assess whether the location's practices, processes and procedures conform with the PAS QMS and to identify risk and opportunity.

4.15 Management Review

Local management conducts an annual business review of each location under their purview to assess performance and to establish goals, objectives, and action plans for the upcoming year.

The procedure used to conduct this review is specified in corporate SOP ENV-SOP-CORQ-0005 *Management Review*.

At a minimum, the following topics are reviewed and discussed during annual management review:

- Changes in internal and external issues relevant to the location;
- Fulfillment of objectives and initiatives;
- suitability of policies and procedures, including EHS and waste management;
- status of actions from previous performance reviews;
- The outcome of recent internal audits;
- Corrective and preventive actions;
- Assessments by external bodies;

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

- The results of interlaboratory comparisons or proficiency tests;
- Changes in the volume and type of the work;
- Customer and personnel feedback, including complaints;
- Effectiveness of improvements / preventive actions made since last review;
- Adequacy of resources;
- results of risk identification;
- Proficiency testing performance and other measures related to the assurance of validity of test results; other relevant factors, such as QC trends and training status.

The discussion and results of this review are documented in a report prepared by local management. This report includes a determination of the effectiveness of the management system and its processes, goals, and objectives for improvements in the coming year with timelines and responsibilities, and any other need for change.

Goals and action items from annual management systems review are shared with local employees and with corporate management to highlight focus areas for improvement in addition to areas in which the location has excelled.

4.16 Data Integrity

PAS procedures for the investigation and response to events that may affect data integrity are described in the PAS corporate SOP ENV-SOP-CORQ-0017 *Data Impact Assessment*s.

Customers whose data are affected by the problem are notified in a timely manner, usually within 30 days after the impact of the problem is understood. Some accreditation programs also require notification to the accreditation body within a certain timeframe from date of discovery. PAS locations must follow any program or project specific requirements for notification, when applicable.

5.0 TECHNICAL REQUIREMENTS

5.1 General

Multiple factors contribute to the correctness and reliability of the technical work performed by PAS.

These factors fall under these broad categories:

- Human Performance
- Facility and Environmental Conditions
- Test Method Performance and Validation
- Measurement Traceability
- Handling of Samples

The impact of each of these factors varies based on the type of work performed. To minimize negative effects from each of these factors, PAS accounts for the contribution from each of these categories

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

when developing test method and process (administrative) SOPs, evaluating personnel qualifications and competence, and in the selection of equipment and supplies used.

5.2 Personnel

5.2.1 Personnel Qualifications

PAS personnel are qualified and competent to perform the roles and responsibilities of their position based on education, experience, and training.

Qualifications, duties, responsibilities, and authorities of each position are specified in job descriptions maintained by corporate HR (Refer to Section 5.2.4). These job descriptions provide the general basis for the selection of personnel for hire and are used by the location to communicate to personnel the duties, responsibilities, and authorities of their position. Qualification records may include but are not limited to diploma, transcripts, and curriculum vitae (CV).

The term "personnel" refers to individuals employed by PAS or a PAS subsidiary directly as full-time, part-time, or temporary, and individuals employed by PAS by contract, such as through an employment agency. The term "personnel" is used interchangeably with the term "employee" throughout this manual. For the purposes of this manual, these terms are equivalent.

5.2.1.1 Competence

Competence is the ability to apply a skill or series of skills to complete a task or series of tasks correctly within defined expectations.

PAS requirements for competence of personnel (education, qualification, work experience, technical skills, and responsibilities) are specified in job descriptions created by management and kept by human resources. The job description provides the basis for the selection of personnel for each position.

An employee is considered competent when they have completed the required training specified in Section 5.2.2.

5.2.2 Required Training

Training requirements are outlined in Pace® policies COR-POL-0023 *Mandatory Training Policy, COR*-POL-0004 *Code of Ethics and Professional Conduct* and this Quality Manual.

5.2.2.1 Training Program

The PAS training program includes these elements:

- Scheduling
- Execution
- Documentation
- Evaluation of Effectiveness

Training is scheduled by corporate personnel, local quality personnel, and the employee's direct supervisor.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Training is delivered using various methods that incorporate techniques that appeal to the four main learning styles: visual, aural, linguistic, and kinesthetic. Delivery methods include, on-the-job (OJT), instructor-led, self-study, eLearning, and blended.

Training must be documented with a training record to prove training occurred. Required training (Section 5.2.2.1.1-5.2.2.1.5) must be complete before the employee is authorized to work independently on client samples. Complete means the employee has successfully completed training and evidence of training is filed in the employees training record maintained by the corporate training group, the corporate group that assigned training, such as IT, HR, or EHS, and/or and the local quality department.

The employee's direct supervisor is responsible for monitoring completion of the employee's required training program and for providing adequate time to the employee to complete training assignments. The supervisor and employee are jointly responsible to ensure the employee's training status and training records for all required training are current, complete, documented and the training records are accessible.

Until the required training is complete, the employee's direct supervisor is responsible and accountable for all work produced by the employee under their supervision.

Training status is tracked by local quality personnel and made readily available to all employees so they can access and monitor their status in real time.

The following subsections specify the required PAS training for new hires and requirements for on-going training.

5.2.2.1.1 New Hire Required Training

New hire training requirements apply to personnel new to Pace® and to existing employees starting in a new position or different work area.

Required new hire training includes each of the following topics:

- Ethics and Data Integrity (5.2.2.1.3)
- Quality Management System Policy and Procedure (5.2.2.1.4)
- Environmental Health and Safety
- Demonstration of Capability (DOC) (5.2.2.1.5): Employees that prepare and test samples may also be required to successfully complete a DOC for the test method they are assigned before working independently on customer samples and to verify capability on a routine basis thereafter. Independent means without direct supervision of the work activity by the supervisor or a qualified trainer.

5.2.2.1.2 On-Going Required Training

All personnel receive on-going training on each of the following topics:

- Ethics and Data Integrity
- Quality Management System Policy and Procedure

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

- EHS

5.2.2.1.3 Ethics and Data Integrity

Ethics and data integrity training is provided to all new personnel upon hire and refresher training is provided to all employees minimally on an annual basis and more frequently as needed.

The training materials emphasize expectations, what to do, what not to do and the potential consequences that result from scientific misconduct and improper practices. Employees are informed that Pace® has a Zero Tolerance Policy for scientific misconduct, improper practices, and fraud. The employment of any employee found to have conducted, sanctioned, or instructed an employee to engage in these infractions will be terminated and the employee may be subject to debarment, and civil/criminal prosecution.

The following topics are covered:

- Pace® Policy for honest, transparent, and objective reporting of test results and data;
- Practices that are considered scientific misconduct, fraudulent and improper;
- How and when to report data integrity concerns or ethical violations;
- Record Keeping. The training emphasizes the importance of accurate, complete, and legible documentation of work activities;
- Procedures used by Pace® to prevent and monitor for infractions;
- Specific examples of breaches of ethical behavior such as improper data manipulations, adjustments of instrument time clocks, and inappropriate changes in concentrations of standards.

Refer to COR-POL-0004 for more information.

5.2.2.1.4 Management System Documents Training

The primary documents that support the PAS QMS include the Quality Manual, policies, and SOPs.

These documents specify what we do, how, and why and are the documents all employees must abide. The employee's commitment to abide by these documents is acknowledged with a Read and Acknowledgement Attestation (R&A). PAS employees must have an R&A on record for the local Quality Manual, and the policies and SOPs relevant to their job responsibilities. The R&A acknowledges the employee has received, read, and understands the content of the management system document, the employee agrees to follow any instructions and requirements specified in the document when carrying out their work tasks; and the employee understands that unauthorized changes or departure

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

from procedures and requirements specified in the documents not allowed unless authorized, documented and disclosed.

Other documents that support the management system include forms and worksheets that record original observations and/or calculate test results, guides, project-specific documents, or other reference materials. Employees are not required to have a R&A for these types of documents – how to use the document is learned on the job.

Employee understanding, application, and adherence to the content specified in management system documents is continuously reinforced by on-the-job training and routine checks and balances, such as secondary data review and internal audits.

5.2.2.1.5 Demonstration of Capability (DOC) Requirements

A DOC is a procedure that establishes the ability of the analyst to perform a test procedure and obtain test results with acceptable accuracy and/or precision.

Newly hired employees that prepare or test samples are required to successfully complete an initial demonstration of capability (IDOC) for the test method before they are permitted to work independently on real world samples.

On-going demonstration of capability (ODOC) must be demonstrated on an annual basis thereafter.

The procedure for IDOC and ODOC can differ based on technology, analyte group and/or the regulatory or accreditation/certification program requirements that apply. In general, the options for ODOC are more flexible than for an IDOC on the premise that the analyst has routinely analyzed samples by the test method during the calendar year.

When more than 365 days (1 Year) have passed since the employee last analyzed real world samples by the test method; the employee must successfully redemonstrate capability with an IDOC to remain authorized to independently test real world samples.

A successfully complete DOC (IDOC or ODOC) is one where:

1) The DOC study data has been compiled, reviewed, and verified to meet acceptance criteria;

2) The DOC record has been approved by the department supervisor;

3) The DOC record has been verified complete by local quality personnel; and

4) The DOC record has been archived in the employee's training file for accessibility and reference.

If any of the above conditions is not met, the DOC is not complete.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Until the required training is complete, the employee's direct supervisor is responsible and accountable for all work produced by the employee under their supervision.

DOC procedures and acceptance criteria vary by program, technology, analyte group - therefore all options are not specified in this manual.

PAS locations must put in place a local DOC program appropriate for the testing services offered and that complies with relevant regulatory and/or accreditation/certification program requirements.

For example – an acceptable DOC program for laboratories accredited to the TNI Standard might look like this:

- A DOC for chemistry test methods where spiking is an option is based on the employee's capability to achieve acceptable precision and accuracy for each analyte accredited from a series (usually 4) of replicates that were spiked at a specific concentration, and prepared and analyzed using the laboratory's test method SOPs.
- A DOC for a test method where spiking is not an option is based on an employee's capability to achieve comparable results to a peer.

If the above options are not feasible, a DOC may consist of:

  - Analysis of one or more blind samples. Blind samples may be prepared by the trainer or other personnel and may consist of in-house prepared samples, reference slides, or previous PT studies.
  - ODOC may be demonstrated through continued analysis of blind samples or successful completion of inter- and intra-analyst QC performed on five (5) percent of samples, or at least one (1) each month samples are received, whichever is greater.

AIHA-LAP, LLC Procedure for Initial D.O.C. of Lead Analysts & Technicians:

- For each matrix (wipe, air, paint, soil) prepare five aliquots of a suitable reference material. Prepare and analyze by routine procedures. Repeat this process on four different days for each matrix. Acceptance criteria shall meet the criteria of the method. Any outlier shall be addressed as a non-conforming event.

Specific instructions and acceptance criteria for DOCs for each test method may be specified in the test method SOP or a stand-alone SOP for DOC.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

5.2.2.2 Effectiveness of Training

Training effectiveness is measured by the employee's demonstrated ability to comprehend the training material and apply knowledge and skills gained to their job task. These evaluations include but are not limited to:

- Testing of the employee's knowledge of the QMS, policies, and technical and administrative procedures through various mechanisms, such as quizzes, and interviews.
- Demonstrated ability to convey information correctly and factually in written and verbal communication.
- Demonstrated ability to follow instructions and adhere to policy and procedure.
- Demonstrated ability to make sound decisions based on guidance and information available and to defend decisions made.
- Demonstrated initiative to seek help or guidance when the employee is unsure of how to proceed.

5.2.2.3 Supplemental Learning

Supplemental learning objectives may be established for newly hired personnel to aid in their development of administrative and technical skills. These learning objectives and materials, referred to as Learning Plans (LP), are managed by the employee's direct supervisor.

Pace® also offers a wide variety of supplemental learning courses that are made available to all employees for professional development. The learning may be self-initiated based on an employee's interest or may be assigned to the employee at the discretion of management as professional development as part of an employee's annual goals.

Supplemental learning assignments are not prerequisites for competency (Section 5.2.1.1) and are not included in the required training program.

5.2.3 Personnel Supervision

Every employee is assigned a direct supervisor, however named, who is responsible for their supervision.

General supervisory responsibilities may include but are not limited to:

- Hiring Employees
- Training Employees
- Performance Management
- Development, oversight, and execution of personnel training plans
- Monitoring personnel work product to ensure the work is conducted in accordance with this quality manual, policies, SOPs, and other documents that support the QMS.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

5.2.4 Job Descriptions

Job Descriptions that define the required education, qualifications, experience, skills, roles and responsibilities, and reporting relationships for each Pace® position are established by top management and kept by corporate HR. The job descriptions apply to employees who are directly employed by Pace®, part-time, temporary, technical, and administrative and by those that are under contract with Pace® through other means.

The job descriptions include the education, expertise, and experience required for the position and the responsibilities and duties, including any supervisory or managerial duties assigned to the position.

5.2.5 Authorization of Technical Personnel

Technical personnel are authorized to perform the technical aspects of their position after laboratory management has verified that the employee meets the qualifications for the position and has successfully completed the required training (Section 5.2.2.1). After initial authorization, technical personnel are expected to maintain a current and complete training record, demonstrate on-going capability at least annually for each test method performed, and produce reliable results through accurate analysis of certified reference materials, proficiency testing samples, and/or routine quality control samples in order to remain authorized to continue to perform their duties.

Records used to support authorization which may include but are not limited to, transcripts, resumes, training records, experience, training, and certificates are kept by the PAS location or business function to which the employee is assigned, if the employee is in a role that support more than one location or business unit.

5.3 Accommodations and Facilities

5.3.1 Facilities

PAS facilities are designed to support the activity performed. Access to PAS facilities is controlled by various measures, such as card access, locked doors, and staffed main entry.

5.3.2 Environmental Conditions

Each location is equipped with energy sources, lighting, heating, and ventilation necessary to facilitate proper and safe performance of calibrations and tests. Local management ensures that housekeeping, electromagnetic interference, humidity, line voltage, temperature, sound, and vibration levels are appropriately controlled to ensure the integrity of specific measurement results and to prevent adverse effects on accuracy or increases in the uncertainty of each measurement.

Environmental conditions are monitored, controlled, and recorded as required by the relevant specifications, methods, and procedures. Operations are stopped if it is discovered that the environmental conditions would jeopardize the integrity of analytical results or other work products.

5.3.3 Separation of Incompatible Activities

The layout and infrastructure of each work area including air handling systems, power supplies, and gas supplies of each work area are designed for the type of analytical activity performed. Effective separation between incompatible work activities is maintained. For example, sample

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

storage, preparation, and chemical handling for volatile organic analysis (VOA) is kept separate from semi-volatile organic analysis (SVOA).

Samples known or suspected to contain high concentration of analytes are separated from other samples to avoid the possibility of cross-contamination. If contamination is found, the source of contamination is investigated and resolved

5.3.4 Security

Security is maintained by controlled access to the building and by surveillance of work areas by authorized personnel. Access to each area may be controlled depending on the required personnel, the sensitivity of the operations performed, and potential safety concerns.

5.3.5 Good Housekeeping

Local management must maintain good housekeeping practices in their facilities and maintain a standard of cleanliness necessary for analytical integrity and personnel health and safety.

5.4 Test Methods

5.4.1 General Requirements

PAS locations must use test methods and procedures that are appropriate for the scope of analytical test services the laboratory offers.

Instructions on the use and operation of equipment and sample handling, preparation, and analysis of samples must be specified in SOPs. The instructions in SOPs may be supplemented with other documents including, but not limited to, standard work instructions, manuals, guides, project documents, and other reference materials..

5.4.2 Method Selection

The test methods offered by PAS are primarily industry accepted published reference test methods. Each PAS laboratory bases its test method SOP on the latest version of the reference method unless regulatory requirements specify an earlier version must be used.

The laboratory confirms that it can perform the test method and achieve desired outcome before analyzing samples following method validation protocols specified in Section 5.4.5.

The test methods used by the laboratory to test real world samples must meet the needs of the customer, be appropriate for the intended use of the data, and must conform with applicable federal, statutory, or program requirements.

When a customer does not specify the test method(s) to be used, the laboratory may suggest test methods that are appropriate for the intended use of the data and the type of samples to be tested. The laboratory will also inform customers when test methods requested are considered inappropriate for their purpose and/or out of date. This discourse takes place during review of analytical service requests (Refer to Section 4.4).

5.4.3 Laboratory Developed Methods

A laboratory developed method is a test method developed wholly by PAS or a modification to a published method that is substantially modified from the specifications and procedures of a published test method.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Laboratory developed methods must be validated prior to use (Refer to Section 5.4.5) and the procedure documented in a test method SOP.

The requirements for non-standard methods (Section 5.4.4) also apply to PAS developed methods.

5.4.4 Non-standard Methods

A non-standard method is a testing protocol that is not published or approved for use by conventional industry standards.

Use of a non-standard method for testing must be agreed upon with the customer. The agreement, which is retained by the laboratory in the project record, must include the specifications of the client's requirements, the purpose of testing, and their authorization for use of the non-standard method.

5.4.5 Method Validation

The laboratory confirms that it can successfully perform the test method before analyzing samples through a process called method validation. Method validation is partially or fully repeated when there is a change in the published reference method or a change in the way the laboratory performs the test method that may affect selectivity, sensitivity, accuracy, precision, or general performance of the method.

5.4.5.1 Validation Description

Validation is the process of confirmation and the provision of objective evidence that the stated requirements for a specific method/procedure are fulfilled.

The laboratory's requirements and procedures for method validation are outlined in SOP ENV-SOP-CORQ-0011 *Method Validation and Instrument Verification.*

5.4.5.2 Validation Summary

All test methods offered by the laboratory are validated before use to confirm the procedure works as expected and the data and test results are accurate and precise.

The record of validation is retained and kept in accordance with method validation SOP and PAS corporate policy ENV-CORQ-POL-0013 *Record Management*.

5.4.5.3 Validation of Customer Need

The laboratory's validation process includes measures to assess accuracy, precision, sensitivity, selectivity, linearity, repeatability, reproducibility, robustness, and cross-sensitivity of the laboratory's procedure against general customer expectations for data usability.

The following subsections describe some of these concepts in relation to organic and inorganic chemistry (chemical testing). These descriptions and the requirements specified are pertinent to chemical testing and may not apply in the same context to other testing services offered by PAS such as radiochemistry, whole effluent toxicity (WET), asbestos, and microbiology. For more information about validation measures for these testing services, refer to the laboratory's test method SOPs.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

5.4.5.3.1 Accuracy

Accuracy is the degree to which the result of a measurement, calculation, or specification conforms to the correct value or a standard. When the result is within a range from the known value (control limit); the result is considered accurate.

5.4.5.3.2 Precision

Precision refers to the closeness of two or more measurements to each other. It is measured by calculating the relative percent difference (RPD) or relative standard deviation (RSD) of results from separate analysis of the same sample. Precision provides information about repeatability, reproducibility, and robustness of the laboratory's procedure.

5.4.5.3.3 Sensitivity in Chemical Testing

Sensitivity refers to the smallest amount of substance in a sample that can accurately be measured.

In chemical testing, this threshold is commonly known as the detection limit (DL) or method detection limit (MDL).

The DL is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results.

The DL is either a statistically derived value obtained by multiplying the standard deviation from a series of spiked replicates by the student-T value that correlates to the number of replicates analyzed or it is set to the concentration greater than found in a population of method blanks.

Detections of target analytes below the DL are not reported – unless specified by regulatory program protocol, because presence of target analytes at this level cannot be differentiated from noise.

Limits of Quantitation represent the threshold of the laboratory's procedure for quantitative sensitivity.

- The LOQ is the minimum level, concentration, or quantity of a target analyte that can be reported with a specified degree of confidence.
- The LLOQ is simply the concentration of the lowest calibration standard included in the calibration curve.

Although the LOQ and LLOQ may be and often are the same value; the definitions are not the same.

The LOQ is static – it is set when the DL is determined. The LOQ value must be routinely verified to confirm the laboratory can detect the concentration within a range of accuracy.

The LLOQ fluctuates based on the series of standards included in each calibration curve – the LLOQ is always the concentration of the lowest

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

calibration standard included in the curve fit and for which samples are quantitated against. The LLOQ is not the concentration of the lowest standard analyzed, if the lowest concentration standard is not included in the curve, it is not relevant to sample quantitation. Unless otherwise specified by test method, regulatory program or project-specific protocol, accuracy at the LLOQ does not need to be verified independent of the evaluation of relative error or relative standard error.

Target analytes detected at concentrations between the DL and LOQ are known as estimated values – they are within the range of qualitative identification and outside the range of quantitative accuracy. If reported, the results must be qualified to indicate the test result is estimated.

The meaning of Limit of Detection (LOD) varies based on the context by which the term is used. Outside of the DoD program, LOD is another term used to refer to the DL or MDL.

PAS laboratories that are accredited for DoD, must also establish an LOD. The DoD defines the LOD as the smallest concentration of a substance that must be present in a sample in order to be detected at the DL with 99% confidence. This definition is different from the definition of DL - the DL represents the theoretical value at which a detection is distinguishable from a blank.

For DoD, the LOD is a value between the DL and the LOQ. The value of the LOD set by the laboratory must meet all criteria for qualitative identification and quantitative accuracy based on the signal to noise ratio.

For DoD/DOE project work, target analytes that are not detected at the DL are reported as undetected at the LOD and results between the DL and the LOQ are reported as estimated values.

The reporting limit (RL) is the value to which test results are reported as detected or not detected. The RL may be project-defined based on project data quality objectives and it may be above or below the LOQ or LLOQ. In the absence of project specific requirements, the RL is usually the same value as the LLOQ. The RL is also called the practical quantitation limit (PQL) – but this can be misleading if the RL is less than the LLOQ or LOQ.

In general, the RL should always be greater than or equal to the value that establishes the threshold for quantitative sensitivity, but it is common for clients to request laboratories to report undetected target analytes at the DL value. This instruction has evolved as an acceptable reporting practice; however, data users should understand the DL is a statistically derived value that does not represent the limit of quantitation.

Unless otherwise specified by regulatory program or test method, detection, quantitation, and reporting limits are adjusted for the amount of sample used (preparation factor) and the dilution factor and are adjusted for percent moisture when samples are reported on a dry weight basis.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

To ensure detection and quantitation limits are sound and defensible, the procedures that PAS laboratories use to establish detection, quantitation and reporting limits for chemical testing must comply with the current version of each of the following documents:

- EPA document EPA-821-R-16-006 Definition and Procedure for the Determination of the Method Detection Limit;
- 2016 TNI Environmental Laboratory Standard Volume 1 Module 4; and
- TNI GUID-3-109-Rev. 0, V1M4 2016 Standard Update Guidance on Detection and Quantitation.

5.4.5.3.4 Sensitivity in Microbiological Testing

In microbiological testing, the detection limit (DL) is the lowest microbial density that can be measured. It is determined by using dilutions of reference cultures and measuring recovery among replicates of each dilution. For most microbiological methods the sensitivity is defined in the method. For example, in most colony counting methods the sensitivity is 1 cfu. In microbial testing, the LOQ and LLOQ are the same as the DL.

5.4.5.3.5 Sensitivity in Asbestos Testing

Analytical sensitivity for Transmission Electron Microscopy (TEM) in waters is defined as the waterborne concentration represented by the finding of one asbestos structure in the total area of filter examined. This value will depend on the fraction of the filter sampled and any dilution factor.

Analytical sensitivity for (TEM) in air is defined as the airborne concentration represented by the finding of one asbestos structure in the total area of filter examined. This value will depend on the effective surface area of the filter, the filter area analyzed, and the volume of air sampled.

The normal quantitative working range for Phase Contrast Microscopy (PCM) is 0.04 to 0.5 fiber/ cm2 for a 1000 L air sample. An ideal counting range on the filter shall be 100 to 1300 fibers/mm2. The limit of detection (LOD) is estimated to be 5.5 fibers per 100 fields or 7 fibers/mm2. The LOD in fiber/cc will depend on sample volume and quantity of interfering dust but shall be <0.01 fiber/cm2 for atmospheres free of interferences.

Refer to the method SOP for analytical sensitivity for Polarized Light Microscopy (PLM).

5.4.5.3.6 Selectivity

Selectivity refers to the ability of a method to correctly determine an analyte or species without interference from the surrounding matrix.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

5.4.5.3.7 Linearity

Linearity is a mathematical concept applied to calibration models that employ multiple points to establish a calibration range used for quantitative analysis. Linearity is measured differently based on the calibration model. In general, if linearity is demonstrated then the slope of the response of standards is sufficiently close to one another. The accuracy of the linear regression and non-linear curves is verified by checking percent error or relative standard error (RSE), which is the process of refitting calibration data back to the model to determine if the results are accurate. For linear curves that use average calibration or response factor, error is measured by relative standard difference. Linearity also establishes the range of quantitation for the test method used which directly impacts the sensitivity of the test method and uncertainty in measurement results. As previously noted, the LLOQ establishes the lower limit of quantitation. The upper range of linearity establishes the upper limit of quantitation. For most technologies, results outside of this range are considered qualitative values. However, some inorganic test methods allow the linear range to be extended above the upper limit of quantitation when accuracy at this level is verified. Linearity can also be used to establish repeatability, reproducibility, and robustness of the laboratory's test method. When linearity is demonstrated using a specific calibration model during method validation, then use of this same calibration model to achieve linearity on a day-to-day basis confirms the laboratory's method is repeatable, reproducible, and robust.

5.4.6 Measurement Uncertainty

PAS provides an estimate of uncertainty with analytical results on request, or when required. For example, for radiochemistry testing, uncertainty is always reported with the test result.

For chemistry the uncertainty of the test method is embedded in the control limits used to assess performance of quality control samples. Language in ISO/IEC 17025 clarifies that measurement uncertainty is satisfied when a well-recognized test method specifies limits that account for source of bias, the laboratory has satisfied the requirements on analytical uncertainty by following the test method and reporting instructions. Refer to Section 5.9.1.1.9 for more information.

For BDSG microbiology and asbestos refer to ENV-GUI-BDSG-0009 *Measurement of Uncertainty*

5.4.7 Control of Data

PAS has policies and processes in place to ensure that reported data is free from calculation and transcription errors, manual changes to data are thoroughly reviewed for need and correctness, and software systems used to generate or store data is secure.

5.4.7.1 Calculations, Data Transfer, Reduction and Review

Data reduction is performed using commercially available data processing/reduction software, the LIMS and/or programs and worksheets created by PAS.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

PAS does not permit manual calculation of results – that is the calculation of a test result by pen and paper or calculator. When there is no commercial software or LIMS option, PAS laboratories must create a worksheet from a spreadsheet program, such as Excel, to calculate results based on raw inputs and original observations. Spreadsheets for these purposes must be validated and controlled in accordance with policy ENV-POL-CORQ-0015 *Spreadsheet Validation.*

5.4.7.1.1 Manual Integration

The PAS policy and procedures for manual integration are specified in PAS SOP ENV-SOP-CORQ-0006 *Manual Integration.*

This SOP includes the conditions under which manual integration is allowed and the requirements for documentation.

Required documentation of manual integration minimally includes:

- complete audit trail to permit reconstruction of before and after results;
- identification of the analyst that performed the integration and the reason the integration was performed; and
- identification of the individual(s) that reviewed the integration and verified the integration was done and documented in compliance with the SOP.

5.4.7.2 Use of Computers and Automated Acquisition

Whenever possible, PAS uses software and automation for the acquisition, processing, recording, reporting, storage, and/or retrieval of data.

In-house developed software is validated by Pace® corporate IT for adequacy before release for routine use. Commercial off-the-shelf software is considered sufficiently validated when the location follows the manufacturer or vendor's manual for set-up and use. Records of validation are kept by the corporate information technology group or by the group that performed the validation.

The PAS process for the protection of data stored in electronic systems includes:

- Individual usernames and passwords for Laboratory Information Management Systems and auxiliary systems used to store or process data.
- Employee Training in Computer Security Awareness
- Validation of spreadsheets used for calculations to verify formulas and logic yield correct results and protection of these cells to prevent unauthorized change.
- Operating system and file access safeguards
- Protection from Computer Viruses
- Regular system backup; and testing of retrieved data

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

- Verification the software application works as expected and is adequate for use and fulfills compliance requirements, such as the need to record date/time of data generation.
- Change control to ensure requests for changes are reviewed and approved by management before the change is made.
- Communication channels to assure all staff are aware of changes made.
- Version Control and maintenance of historical records.

5.5 Calibration Requirements

5.5.1 Availability of Equipment

Local management ensures the laboratory is furnished with all equipment and instrumentation necessary to correctly perform the tests offered in compliance with the specifications of the test method and to achieve the accuracy and sensitivity required.

5.5.2 Calibration

Equipment and instrumentation are checked prior to use to verify it performs within tolerance for its intended application.

5.5.2.1 Support Equipment

Support equipment is verified to be in proper working order, and to meet the tolerance specifications for the purpose(s) for which it will be used prior to placement in service. Thereafter, periodic checks are performed to verify on-going performance per a schedule maintained by local quality personnel. Support equipment that does not meet specifications is removed from service and either repaired or replaced. Records of repair and maintenance activities are maintained.

Procedures used to conduct and record these checks are outlined in SOP SOP ENV-SOP-WES2-0036, *Balance Calibration Verification*, ENV-SOP-WES2-0039 *Thermometer Calibration*, ENV-SOP-WES2-0123 *Autopipet and Wet Chem Titrator Calibration Verification.*

5.5.2.2 Analytical Instruments

Analytical instruments are checked prior to placement in service in accordance with SOP ENV-SOP-CORQ-0011 *Method Validation and Instrument Verification.* After the initial service date, the calibration of instruments and verification of calibration is performed in accordance with local test method SOPs.

The calibration procedures in the test method SOPs must comply with the requirements for acceptable calibration practices outlined in corporate policy ENV-POL-CORQ-0005 *Acceptable Calibration Practices*, the reference methods, and any applicable regulatory or program requirements.

5.5.3 Equipment Use and Operation

Up-to-date instructions and procedures for the use and maintenance of analytical equipment are included in SOPs and/or supplemental documents such as standard work instructions or

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

instrument manuals which are made readily accessible in the work area to all laboratory personnel.

5.5.4 Equipment Identification

Each piece of equipment is uniquely identified by serial number or any other unique ID system. The identifier is included in the equipment list maintained by the quality department and may not be reused or used interchangeably. New equipment and replacement equipment are assigned a new unique ID. When transferring equipment between PAS locations, the laboratory receiving the equipment assigns a new unique ID and the lab that sent the equipment retires the ID previously assigned.

5.5.5 Equipment Lists and Records

5.5.5.1 Equipment List

Each PAS location maintains a list of equipment that includes information about the equipment including a description, manufacturer, serial number, date placed in service, condition when received, identity, and the work area where the equipment is used. The equipment list(s) for each location covered by this manual is managed by local Quality and maintained in the QA groups in Teams.

5.5.5.2 Equipment Records

In addition to the equipment list, other equipment records maintained by PAS include:

- Verification that equipment conforms with specifications.
- Calibration records including dates, results, acceptance criteria, and next calibration dates.
- Maintenance plan and records.
- Records of damage, malfunction, or repair.

The laboratory follows an equipment maintenance program designed to optimize performance and to prevent instrument failure which is described in the analytical method SOPs.

The maintenance program includes routine maintenance activities which are performed as recommended by the manufacturer at the frequency recommended and non-routine maintenance, which is performed to resolve a specific problem such as degradation of peak resolution, shift in calibration relationship, loss of sensitivity, or repeat failure of instrument performance checks and quality control samples.

Maintenance is performed by PAS personnel or by outside service providers.

All maintenance activities performed by PAS personnel are recorded by the individual(s) that performed the activity at the time the maintenance was performed in an instrument maintenance log.

The maintenance record minimally includes the date of maintenance, the initials of the person(s) performing maintenance, a description of the activity performed, why

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

(when the maintenance is non-routine), and the return to analytical control. When maintenance is performed by an external vendor, the service record must be maintained and accessible for easy retrieval. The location must provide personnel with unrestricted access to instrument maintenance logs in order to promote good instrument maintenance and recordkeeping practices.

If an instrument must be moved, the location will use safe practices for handling and transport to minimize damage and contamination

5.5.6 Out of Service Protocol

Equipment that has been subjected to overloading, mishandling, gives suspect results, has been shown to be defective, or is performing outside of specified limits is taken out of service and either removed from the work area or labeled to prevent accidental use until it has been repaired and verified to perform correctly.

When analytical equipment is taken out of service because it no longer meets tolerance specifications, the potential effect the nonconformity may have had on previously reported analytical results is evaluated.

5.5.7 Calibration Status

Support equipment is labeled to identify its calibration status.

The calibration status of analytical instruments is identified in the instrument run log, in the data processing software or other systems the laboratory may use for processing of data. Analysts verify on-going acceptability of calibration status prior to use and with instrument performance check standards. These procedures are described in test method SOPs.

5.5.8 Returned Equipment Checks

When equipment or an instrument is sent out for service, the function and calibration status of the equipment must be rechecked and shown to be satisfactory before the equipment is returned to service. This requirement must be included in the laboratory's protocols for servicing equipment.

5.5.9 Intermediate Equipment Checks

PAS performs intermediate checks on equipment to verify the on-going calibration status. For example, most test methods require some form of continuing calibration verification check, and these procedures are included in the test method SOP. Periodic checks of support equipment are also performed; Refer to SOP ENV-SOP-WES2-0036 *Balance Calibration Verification*, ENV-SOP-WES2-0039 *Thermometer Calibration*, ENV-SOP-WES2-0039 Autopipet and *Wet Chem Titrator Calibration Verification* for more information.

5.5.10 Safeguarding Equipment Integrity

Equipment integrity in maintained by:

- Following manufacturer's specification for instrument use so that settings do not exceed manufacturer's recommendation or stress the performance of the equipment;
- Established maintenance programs;
- Transparent maintenance records and unrestricted access to maintenance logs;

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

- Validation and approval of software before use;
- Audits to confirm instrument settings are consistent with SOPs; and
- On-the-job training for safe and proper use of laboratory equipment.

5.6 Measurement Traceability

5.6.1 General

Measurement traceability is best described as the way to ensure measurements take into consideration all uncertainties and are representative of the most accurate measurement captured. Traceability is accomplished with the recording of the lot numbers of materials and equipment used in the testing process and by purchasing materials traceable to the international standards of units (SI), International Bureau of Weights and Measures (BIPM) and/or National Measures Institute (NMI).

When traceability to SI units, BIPM, or NMI cannot be achieved, traceability is accomplished with the use of reference standards and equipment obtained from competent suppliers that provide calibration certificates and/or certificates of analysis (COA).

5.6.2 Equipment Correction Factors

Measurements are adjusted by the correction factor when the equipment used for the measurement has a correction factor.

5.6.2.1 Requirements for Calibration Laboratories

PAS does not offer calibration services, therefore, the ISO/IEC 17025 requirements for calibration laboratories do not apply.

5.6.2.2 Requirements for Testing Laboratories

Requirements to verify equipment is calibrated prior to being put into service and to maintain measurement traceability are described in sections 5.5.2 and 5.6, respectively.

5.6.3 Reference Standards and Reference Materials

5.6.3.1 Reference Standards

The laboratory uses measurement reference standards to verify adequacy of working weights and thermometers. The working weights are the weight(s) used for daily balance calibration checks and the working thermometers are used for daily temperature measurements.

Working weights and thermometers are periodically checked to verify on-going adequacy for use between the calibrations performed by an external calibration laboratory using reference standards traceable to SI or a national standard and that are used solely for verification purposes.

For example:

- An acceptable reference standard to verify working thermometers is a NIST Certified thermometer or a NIST Traceable thermometer that is not used for any other purpose other than to check the adequacy of the working thermometer.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

- An acceptable reference standard for the working weights is a set of Class S weights that is not used for any other purpose than to verify the weights used daily.

The working weights are checked against the reference standard annually and recertified by an ISO accredited calibration body every 5 years. "Annually" means within thirteen (13) months from the date of the last check.

Working thermometers are checked against the reference thermometer prior to placement in service to establish a correction factor (CF) and then re-checked annually (within 13 months from date of last check) or if electronic, every three (3) months (within 100 days from date of last check).

Exceptions to the 3-month recheck for battery operated sensors are allowed when the sensor is embedded in a unit and the manufacturer/vendor has evidence to show that the accuracy of the sensor is not affected by battery life.

Liquid in Glass NIST Certified reference thermometers must be recertified by an ISO/IEC accredited calibration laboratory every 5 years. If the reference thermometer is NIST Traceable or is a digital NIST Certified thermometer, the reference thermometer must be recertified annually by an ISO/IEC 17025 accredited calibration laboratory or service provider that provides traceability to a national standard.

5.6.3.2 Reference Materials

PAS purchases chemical reference materials (also known as stock standards) from vendors that are accredited to ISO 17034 or Guide 34. Purchased reference materials must be received with a Certificate of Analysis where available. If a reference material cannot be purchased with a COA, it must be verified by analysis and comparison to a certified reference material and/or there must be a demonstration of capability for characterization. COAs are reviewed for adequacy and retained by the laboratory for future reference.

All prepared standards, reference materials, and reagents are verified to meet the requirements of the test method through routine analyses of quality control samples.

The laboratory procedure for traceability and use of these materials is provided in SOP ENV-SOP-WES2-0038 *Reagent Solvent and Standard Control.*

This SOP must minimally include each of the following requirements:

- Procedures for receipt and tracking of reference and working standards to ensure the record includes material name, name of the material, lot number, receipt date, and manufacturer's expiration date.

- Storage conditions and the requirement that reference standards are stored separately from samples, extracts, and digestates.

- Requirements to assure that preparation of intermediate or working solutions are recorded and assigned a unique identification number for tracking. Records of preparation include the lot number of the stock standard(s) used, the type and lot number of the solvent, the formulation, date, new expiration date, and the

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

preparer's initials. The lot number of working standards is recorded in the analytical record to provide traceability to the standard preparation record. The preparation record provides traceability to the COA, which is traceable to SI or the national measurement standard.

- A requirement that the expiration dates of prepared standards may not exceed the expiration date of the parent standard. Standards, reference materials, and reagents are not used after their expiration dates unless it is not possible to procure a new standard, and the reliability of the expired material is verified and documented by the location using a procedure approved by corporate quality personnel. Otherwise, the expired material is promptly removed from the work area or clearly labeled as acceptable for qualitative/troubleshooting purposes only.
- The second source materials used for verification of instrument calibration are obtained from a different manufacturer or may be a different lot from the same manufacturer, when only one vendor or manufacturer provides the standard.
- Procedures to check reference materials for degradation and replacement of material if degradation or evaporation is suspected.
- Procedures for labeling. At a minimum, the container must identify the material, the ID of the material and the expiration date. Original containers should also be labeled with date opened.

5.6.3.3 Intermediate Checks

Checks to confirm the acceptability of reference standards and materials are specified in test method SOPs and are appropriate for the purpose for which the standard is used. For example, a second source standard analyzed after an initial calibration may help the analyst identify if degradation of the standards used for calibration has occurred.

5.6.3.4 Transport and Storage

PAS handles, transports and stores reference standards in a manner that protects the integrity of the materials. The integrity of the reference standard is protected by segregation from incompatible materials and/or minimizing exposure to degrading environments or materials. As previously stated, standards and reference materials are stored separately from samples, extracts, and digestates to prevent contamination. All standards are stored according to the manufacturer's recommended conditions. Temperatures colder than the manufacturer's recommendation are acceptable if it does not compromise the integrity of the material (e.g., remains in liquid state and does not freeze solid).

Specific requirements are provided in test method SOPs.

5.7 Sampling

Sampling refers to both the field collection of samples and to subsamples taken by the laboratory for analysis.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Subsampling procedures are included in each test method SOP or a stand-alone SOP to assure the aliquot used for testing is representative of the field collected sample.

The requirements in the following subsections apply when sampling is performed by PAS.

5.7.1 Sampling Plans and SOPs

When PAS performs field collection of samples, the sampling is conducted in accordance with a project sampling plan and sampling SOPs to ensure representative samples are collected.

5.7.2 Customer Requested Deviations

When the customer requests deviations, additions, or exclusions from the project sampling plan and/or the SOP, the laboratory records the client's change request in detail with the sampling record, communicates the change to sampling personnel, and includes this information in the final test report..

5.7.3 Recordkeeping

PAS assures the sampling record includes the sampling procedure used, any deviations from the procedure, the date and time of sampling, the identification of the sampler, environmental conditions (if relevant), and the sampling location.

5.8 Sample Management & Handling

5.8.1 Procedures

The procedures for sample management and handling are outlined in SOP ENV-SOP-WES2-0003 *Sample Receipt and Login* and SOP ENV-SOP-WES2-0002 *Sample Custody and Tracking*. The procedures in the local SOP must meet the requirements specified in this quality manual to guarantee the integrity of the sample from receipt to disposal.

5.8.1.1 Chain of Custody

All samples received by PAS must be accompanied by a Chain of Custody (COC). The COC is the legal record that documents the collection of samples and the transfer of samples to the laboratory. The COC provides PAS with information about the samples collected and tests requested.

The COC is completed by the sample collector and must minimally include the following information:

- Client name, address, phone number;
- Project Reference;
- Client Sample Identification (Client ID);
- Date, Time, and Location of Sampling;
- Sampler's Name or Initials;
- Matrix;
- Type of container, and total number collected;
- Preservative;

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

- Analyses Requested;
- Mode of collection;
- Any special instructions; and
- The date and time and signature of sample transfer from collection to PAS. When samples are shipped to the laboratory by a 3rd party such as UPS or Fed EX, the COC is placed inside the sealed shipping container at time of collection and the container is not opened until it is received by PAS. Thus, the intermediate courier does not sign the COC. The shipping manifest and/or air bill is the record of possession of samples during transport to the laboratory. The shipping manifest and/or air bill is part of the COC record and must be retained and provided in the test report with the COC record, when required. (Refer to Section 5.10.3).

A complete and legible COC is required. When the COC is incomplete, illegible, or cannot be understood, the client is contacted for resolution.

Hand entries on the COC must be made in indelible ink and errors corrected by drawing a single line through the original entry, so the original entry is not obscured and entering the correct information with the date the change was made and the initials of the person making the change.

5.8.1.2 Legal Chain of Custody

Legal chain of custody is an industry defined protocol that is sometimes used for evidentiary or legal purposes that establishes an intact, continuous record of the physical possession, storage, and disposal of samples, including sample aliquots and prepared samples.

The legal COC record accounts for all time periods associated with the samples and identifies all individuals who physically handled them from the point established by legal authority, which is usually at the time the sample containers are provided for sample collection or at the time of sample collection.

A sample is in someone's legal custody if:

- It is in one's physical possession;
- It is in one's view after being in one's physical possession;
- It has been in one's physical possession and then locked or sealed so that no one can tamper with it; and/or
- It is kept in a secure area, restricted to authorized personnel only.

Legal COC is not a common request, but if it is requested and the laboratory agrees to the project specification; the laboratory must maintain a procedure or process to guarantee all aspects of the protocol are met.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

5.8.2 Unique Identification

Each sample received by PAS is assigned a unique identification number (Lab ID) after the sample has been accepted by PAS in accordance with the PAS sample acceptance policy (Refer to Section 5.8.3). The Lab ID is affixed to the sample container using a durable label.

The lab ID is linked to the field ID (client ID) in the sample receipt and log-in record so that both IDs are traceable to testing activities performed.

5.8.3 Sample Receipt Checks and Sample Acceptance Policy

The condition and integrity of samples is checked on receipt and the samples received are verified to match the COC. Any problem with the samples or discrepancy between the COC is recorded. If the problem impacts the suitability of the sample for analysis or if the COC is incomplete, the client is notified for resolution. Decisions and instructions from the client regarding the samples are maintained in the project record.

5.8.3.1 Sample Receipt Checks

The following checks are performed:

- The COC is complete and legible;
- Sample container labels include the client sample ID, the date and time of collection, and the preservative used;
- The container type and preservative are appropriate for the test requested;
- The required volume is received for each test requested;
- There is no evidence of damage or tampering;
- There is no headspace in VOA vials greater than 5-6 mm (the size of a pea);
- Thermal Preservation, when required. When thermal preservation is required, temperature on receipt is typically considered acceptable if the temperature is ≤6°C and the samples are not frozen solid unless otherwise specified by federal, statutory, program or test method. If samples are received on the same day of collection, there must be evidence that the chilling process has begun, such as arrival of the samples on ice.
- Chemical Preservation, as required.
- Holding Time. When the holding time for the test method is longer than 15 minutes from time of collection and samples are received out of hold, the client is notified of the situation so they can make a decision to proceed or cancel analysis. Tests with a holding time of 15 minutes or less from time of collection are those where the method specifies the holding time as "immediate" are excluded from the notification requirement because the customer is aware that the holding time cannot be met unless the test is performed in the field (in situ).

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

5.8.3.2 Sample Acceptance Policy

PAS maintains a sample acceptance policy to clearly establish the circumstances in which samples are accepted.

When these conditions are not met, the exception must be documented, and the client notified. Decisions to accept or reject the samples are documented and when required, test results are qualified in the test report. How the notification requirement is achieved must be included in a laboratory SOP.

Criteria for Sample Acceptance:

- All samples received must be listed on the COC and the information provided must include the client ID of the sample, date and time of collection, collector's name, preservation type and type of sample;
- The sample containers must be properly labeled to uniquely identify the sample; and the label must be both durable and legible;
- The sample container must be appropriate for the tests requested;
- Samples must be received within holding time. Exceptions are made for samples where the test method specifies a holding time of "immediate or immediately" – which is translated to within 15 minutes from sample collection. For these test methods, samples are always received out of hold and/or there is no expectation that the laboratory perform the test within the 15-minute holding time.
- Sufficient sample volume must be provided to perform the test method per the laboratory's SOP. If the test is performed for regulatory compliance and the method requested is mandated; the volume provided must be adequate for the laboratory to perform the test per the test method without modification.
- Be received within appropriate temperature ranges unless program requirements or customer contractual obligations mandate otherwise.
- Be free of evidence of tampering or signs of contamination; and
- Meet applicable requirements for thermal and chemical preservation.

Additional conditions may also apply depending on the services offered. For example, some PAS locations will not accept samples known to be radioactive.

5.8.4 Sample Control and Tracking

Samples received by PAS are tracked using the laboratory's Laboratory Information Management System (LIMS).

After the sample receipt process is complete, samples are logged into the LIMS and a Lab ID is assigned and affixed to each container with a durable label. The Lab ID is used to track the samples through the testing process through test report generation and sample disposal.

Minimally, the following information is included in the log-in for each sample:

- Client Name and Contact Information;

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

- The laboratory ID linked to the client ID;
- Date and time of sample collection;
- Date and time of sample receipt;
- Matrix; and
- Tests Requested.

After log-in is complete, the log-in record must be independently reviewed by the PAS Project Manager (PM) responsible for the work order to verify the log-in is complete and correct per the testing agreement with the customer and the chain-of-custody so that any log-in errors or questions about the samples received are corrected and resolved before work begins.

5.8.5 Sample Storage, Handling, and Disposal

5.8.5.1 Sample Storage

The samples are stored according to the specification in the test method and any appliable program and regulatory requirements. Samples are stored separately from standards, reagents, or other potential sources of contamination and in a manner that prevents cross contamination. All sample fractions, extracts, leachates, and other sample preparation products are stored in the same manner as actual samples or as specified by the analytical method.

Refrigerated storage areas are maintained at ≤6 (but not frozen) and freezer storage areas are maintained at ≤-10°C, unless otherwise required per method or regulatory program. The temperature of each storage area is checked and documented at least once for each day of use. If the temperature falls outside the acceptable limits, corrective actions are taken and documented.

Samples are placed in the storage location immediately after sample receipt and log-in procedures are completed. All sample storage areas have limited access. Samples are removed from storage areas by designated personnel and returned to the storage areas as soon as possible after the required sample quantity has been taken.

5.8.5.2 Sample Retention and Disposal

The procedures used by the location for sample retention and disposal are detailed in SOP ENV-SOP-WES2-0002 *Sample Custody and Tracking* and ENV-SOP-MANS-0077 *Hazardous Waste Management and Sample Disposal.*

In general, PAS retains unused sample volume and prepared samples such as extracts, digestates, distillates and leachates (samples) per Pace® Terms & Conditions, https://info.pacelabs.com/hubfs/pas-standard-terms.pdf.

After analysis, samples may be stored at ambient temperature until time of sample disposal, unless otherwise specified by regulation or agreed upon contract specifications.

After the retention time has expired non-hazardous samples are properly disposed. Hazardous samples are returned to the customer, unless other arrangements for disposal have been made with the laboratory.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

5.9 Assuring the Quality of Test Results

5.9.1 Quality Control (QC) Procedures

PAS monitors the validity and reliability of test results using quality control samples that are prepared and analyzed concurrently with and in the same manner as field samples. QC results are always associated with and reported with the field samples they were prepared and analyzed with.

When the results are not within acceptance criteria correction and corrective action(s) are taken. These actions may include retesting or qualification of test results and/or disclosure of the situation in the test report to alert the data user of the situation.

Other control measures to maintain quality of test results include the use of certified reference materials (Refer to Section 5.6.3), participation in interlaboratory proficiency testing (Refer to Section 5.9.1.2), verification that formulae used for reduction of data and calculation of results is accurate (Refer to Section 5.9.3), on-going monitoring of environmental conditions that could impact test results (Refer to Section 5.3.2), and evaluation and verification of method selectivity and sensitivity (Refer to Section 5.4.5).

QC results are also used for trend analysis and to establish acceptance criteria when no method or regulatory criteria exist. (Refer to Section 5.9.1.1.9).

5.9.1.1 Essential QC

QC protocol is technology and test method specific and is specified in test method SOPs. The SOP includes the type of QC required, frequency for analysis, acceptance criteria, recommended corrective actions, and procedures for reporting test results associated with QC exceptions.

PAS ensures the QC requirements in the SOP conform to the reference method and applicable regulations for which results of the test are used and to any program requirements for the process required by the certification/accreditation program required for testing.

- When a project requires more stringent QC protocol than specified in PAS policy or the test method SOP, the project specification is followed.
- When the project requires less stringent QC protocol than PAS policy or the SOP, the project specification may be followed as an authorized departure if the project specification still meets the requirements in the test method and any applicable regulatory and certification/accreditation requirements.

The following sections describe essential QC for chemistry. These QC types may not apply to other technologies and disciplines such as microbiology, radiochemistry, whole effluent toxicity, and/or asbestos. For essential QC for these test offerings, refer to test method SOPs.

5.9.1.1.1 Calibration Verification (Second Source)

A second source standard is a standard from a different vendor or from a different lot than the standards used for initial calibration. A different lot

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

from the same vendor is permissible, when the standard is only available from a single vendor.

It is a positive control used to verify the accuracy of instrument calibration relative to the purity of the standards used for calibration. This check may be referred to in published test methods and quality system standards as the initial calibration verification (ICV) or a quality control sample (QCS). For most test methods, it is analyzed immediately after the calibration and before analysis of any samples. When the ICV is not within acceptance criteria, a problem with the purity or preparation of the standards may be indicated. The source of the problem should be investigated and corrected prior to use of the calibration/instrument for sample analysis.

5.9.1.1.2 Calibration Verification (CCV)

The CCV is used to determine if the analytical response has significantly changed since calibration. The CCV is usually made from the same standards used for initial calibration, but a second source standard may be used.

When the response of the CCV is within criteria, the calibration is considered valid. If not, there may be a problem that requires further investigation and correction. The actions taken are technology and method specific.

It is sometimes acceptable to report test results associated with a CCV that does not meet criteria.

For example, when a CCV exceeds criteria above the limit; high bias is suspected in the measurement system. If the analyte is not detected in the sample; then the high bias has no impact on the validity of the test result. If the analyte is detected in sample, then corrective action to bring the CCV within criteria is expected to eliminate the possibility that the detection is biased.

5.9.1.1.3 Blanks

Blanks are negative controls used to assess for contamination.

The method blank (MB) is a clean matrix similar to the associated samples that is known to be free of analytes of interest. The MB, unless otherwise specified by the test method, is processed with, and carried through all preparation and analytical steps as the associated samples.

The criteria used to assess for contamination depends on the intended use of data. In general, detections in the MB above the RL or ½ the RL indicate contamination. When contamination is indicated, the source is investigated, and corrections are taken to reduce or eliminate it. Analytical results associated with MB that do not meet criteria are qualified in the final test report.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Other types of blanks that serve as negative controls in the process may include:

- Trip Blanks (VOA)
- Storage Blanks
- Equipment Blanks
- Field Blanks
- Calibration Blanks
- Cleanup Blanks
- Instrument Blanks

5.9.1.1.4 Laboratory Control Sample (LCS)

The LCS is a positive control used to measure accuracy. The LCS is a blank matrix spiked with standard solution that includes target analytes or it may be a pre-made certified reference standard. Like the MB, unless otherwise specified in the test method, the LCS is processed with and carried through all preparation and analytical steps as the associated samples.

When the percent recovery (%R) of the LCS is within the established control limit, the test is within control. If not, the cause of the problem is investigated and corrected, and the procedure may be repeated. Analytical results associated with LCS that do not meet criteria are qualified in the final test report.

5.9.1.1.5 Matrix Spike (MS) and Matrix Spike Duplicate (MSD)

The MS and MSD are replicates of a client sample that is spiked with known amount of target analyte. When there is not a client-designated matrix spike on any sample in the batch, the MS/MSD may be performed on a randomly selected sample and these MS/MSD are called "batch" MS/MSD.

MS/MSD results provide information about the effects the sample matrix has on recovery and reproducibility of target analytes on site samples. MS/MSD results are not used to control performance of the preparation or analytical batch because the way in which the matrix impacts efficiency and robustness of the test cannot be mitigated or controlled by the laboratory.

The heterogeneity of the sample submatrix influences accuracy and precision. For example, MS/MSD results for a sample that is mostly sand will not be the same for a sediment sample even though both matrices are "soil" and both samples subjected to the same test procedure in the same batch. For this reason, batch MS/MSD results may not be representative of the effect the matrix has on accuracy and precision on test results for all

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

samples in the batch – except when all samples in the batch are from the same collection site and are identical in composition.

5.9.1.1.6 Sample Duplicate (SD)

A sample duplicate is a second replicate of sample taken through the testing process used to measure precision and/or homogeneity of samples collected.

The relative percent difference between replicates is evaluated against the established acceptance criteria and if the RPD is not met, associated test results are reported with qualification.

5.9.1.1.7 Surrogates

Surrogates are compounds not normally found in the environment but that have similar physical and chemical properties of target analytes that are added to environmental samples, QC, and calibration standards prior to preparation and analysis. They are used to evaluate extraction efficiency and matrix interference on a sample specific basis.

The percent recovery of surrogates is evaluated against method-specified limits or statistically derived in-house limits. Project-specific limits and/or program-specific limits are used when required. Results with surrogate recovery out of limits in samples are reported with qualification. Samples with surrogate failures can also be re-extracted and/or re-analyzed to confirm that the out-of-control value was caused by the matrix of the sample and not by some other systematic error.

5.9.1.1.8 Internal Standards

Internal Standards are compounds not expected to occur naturally in field samples. They are added to every standard and sample at a known concentration prior to analysis for the purpose of adjusting the response factor used in quantifying target analytes. The location follows specific guidelines for the treatment of internal standard recoveries and further information can be found in the applicable test method SOP.

5.9.1.1.9 QC Acceptance Criteria and Control Limits

QC acceptance criteria are specified in test method SOPs. The criteria in the SOP are based on the requirements in the published test method or regulatory program. When there are no established acceptance criteria, the location develops acceptance criteria in accordance with recognized industry standards.

Some methods and programs require the laboratory to establish control limits for LCS, MS/MSD, and surrogate evaluation using historical data. PAS developed limits are referred to as "in-house" control limits. In-house control limits represent ± 3 Standard Deviations (99% confidence level) from the average recovery of at least 20 data points generated using the same preparation and analytical procedure in a similar matrix.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Refer to SOP SOP ENV-SOP-WES2-0119 *Control Limit Generation* for more information about the procedures used to establish in-house control limits.

5.9.1.2 Proficiency Testing (PT)

PAS participates in interlaboratory proficiency testing studies to measure our performance of the test method.

PT participation is based on the certification and accreditation requirements held by the laboratory. The PT samples are obtained from accredited proficiency testing providers (PTP) and treated as field samples which means they are incorporated into our normal analytical processes and do not receive extraordinary attention due to their nature.

PAS locations do not share PT samples with other PAS locations, does not communicate with other PAS locations regarding current PT sample results during the duration of the study, and does not attempt to obtain the assigned value of any PT sample from the PT provider.

PT results scored unacceptable are investigated and correction action taken, when necessary.

Refer to corporate policy ENV-POL-CORQ-0002, *PT Policy* for more information.

5.9.2 QC Corrective Action

When the results of QC are not within acceptance criteria or expectations for method performance, correction and corrective action(s) are taken per the specifications in the test method SOP. These actions may include retesting or reporting of data with qualification to alert the end user of the situation.

5.9.3 Data Review

PAS uses a tiered system for data review. The tiered process includes as series of sequential checks to verify data transfer is complete; manual calculations, if performed, are correct, manual integrations are appropriate and documented, calibration and QC requirements are met, appropriate corrective action was taken when required, test results are properly qualified, process and test method SOPs were followed, project specific requirements were met, when applicable, and the test report is complete.

The sequential process includes multi-tier review consisting of a primary review, a secondary review, and where applicable and appropriate, an administrative/completeness review.

Detailed procedures for the review process are described in SOP ENV-SOP-WES2-0124 *Data Review*. General expectations for the tiered data review process are specified in the following sections:

5.9.3.1 Primary Review

Primary review is performed by the individual that performed the task. All PAS personnel are responsible for the review of their own work to ensure it is complete, accurate, documented, and consistent with PAS policy and SOPs.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Checks performed during primary review include but are not limited to:

- Verification that data transfer and acquisition is complete;
- Manual calculations, if performed, are documented and accurate;
- Manual integrations, if performed, are documented, and comply with SOP ENV-SOP-CORQ-006 *Manual Integration;*
- Calibration and QC criteria were met, instrument calibration conforms with policy ENV-POL-CORQ-005 *Acceptable Calibration Practices*, and/or proper correction and corrective actions were taken, and data and test results associated with QC and criteria exceptions are properly qualified;
- Work is consistent with SOPs and any other relevant instructional document such as SWI, program requirements, or project quality assurance plans.

5.9.3.2 Secondary Review

Secondary review is an independent review of the data set performed by qualified personnel. Secondary review includes a repeat of the checks performed during primary review in addition to chromatography review to verify the accuracy of quantitative analyte identification.

5.9.3.3 Completeness Review

Completeness review is an administrative review that is performed prior to release of the test report to the customer to verify the final test report is complete and meets project specifications. This review also ensures that information necessary for the client's interpretation of results is explained in the case narrative or footnoted in the test report.

5.9.3.4 Data Audits

Test reports are randomly audited by local quality personnel to verify compliance with SOPs and to check for data integrity, technical accuracy, and compliance with the PAS QMS and any applicable federal, statutory, and program requirements. These audits are not part of the tertiary data review process that is performed prior to release of the test report. These audits are performed on test reports that have been previously released to the customer to avoid potential risks to impartiality and other factors that may influence thoroughness of review.

If any problems with the data or test results are found during the data audit, the impact of the nonconforming work is evaluated using the process described in Section 4.9.

Also refer to Section 4.14 for internal audits

5.9.4 Calibration Certificates

PAS does not perform calibration activities for its customers and calibration certificates are not offered or issued.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

5.9.5 Opinions and Interpretations

PAS provides objective data and information to its customers of sufficient detail for their interpretation and decision making. Objective data and information are based solely on fact and PAS does not attempt to explain the meaning (interpret) or offer a view or judgement (opinion) on usability of data.

PAS personnel are not permitted to provide opinions on how a nonconformance impacts the usability of results or how test results and information should be used, or suggestions or guidance to the customer for improvement.

5.9.6 Subcontractor Reports

When analytical work is subcontracted to an organization external to PAS or its subsidiaries, PAS includes the test report from the subcontractor in its entirety as an amendment to the final test report.

Test results performed by multiple locations within the PAS network (internal subcontracting) may be merged into a single test report so long as the test report issued clearly identifies the location and address of each network location that performed testing, and which tests each PAS location performed. (Refer to Section 5.10.2)

5.9.7 Electronic Transmission of Results

When test results and/or reports are submitted to the customer through electronic transmission, the procedures established in this manual for confidentiality and protection of data apply.

5.9.8 Format of Test Reports

The test formats offered by PAS are designed to accommodate each type of analytical test method performed and to minimize the possibility of misunderstanding or misuse of analytical results. The format of electronic data deliverables follows the specifications for the EDD.

5.9.9 Amendments to Test Reports

Test reports that are revised or amended by the location after the date of release of the original final test report to the customer are issued as a new test report that is clearly identified as an amendment or revision and that includes a reference to the originally issued final test report.

The customer is the organization doing business with PAS external to PAS.

Changes made to test results and data before the final test report is issued to the customer are not amendments or revisions and do not need to be tracked or marked as such, these changes are simply corrections to errors found during data review.

The procedure for report amendments and revision are outlined in SOP ENV-SOP-WES2-0120 *Report Generation and Approval.*

5.10 Reporting

5.10.1 General Requirements

PAS offers a wide variety of test report formats to meet project needs of Pace® customers and federal and state regulatory program requirements

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

The type and level of deliverable, including the electronic data deliverable format is established between PAS and the customer during the contracting process. The report specifications include the test report format, protocol for the reporting limit, conventions for the reporting of results less than the limit of quantitation, and specification for the use of project or program specific data qualifiers. Information about review of analytical service requests is provided in Section 4.4.

5.10.2 Test Reports: Required Items

Regardless of deliverable or report requested, every test report issued by PAS and its subsidiaries includes each of the following items:

a) A Title;

b) The name and address of the location issuing the test report and for each location where testing was performed if different than address of the location issuing the report. When testing is done at multiple PAS locations, the report must also clearly identify which PAS location performed each test method;

c) Unique identification of the test report and on each page an identification number to link each page to the test report, and clear identification of the end of the report;

d) The name and address of the customer;

e) Identification of test methods used. When testing is done at multiple PAS locations, the report must also clearly identify which PAS location performed each test method;

f) Cross reference between client sample identification number (Sample ID) and the identification number for the sample (Lab ID) to provide unambiguous identification of samples;

g) The date of receipt of samples, condition of samples on receipt, and identification of any instance where receipt of the samples did not meet sample acceptance criteria;

h) Date and times of sample collection, receipt, preparation, and analysis;

i) Dilution and/or preparation factor;

j) Test results and units of measurement, and qualification of results associated with QC criteria exceptions, and identification of reported results outside of the calibration range;

k) All chains of custody including records of internal transfer between locations within PAS;

l) Name, title, signature of the person(s) authorizing release of the test report and date of release;

m) A statement that the results in the test report relate only to the items tested; and

n) Statement that the test report may not be reproduced except in full without written approval from PAS.

5.10.3 Test Reports: Supplemental Items

5.10.3.1 Supplemental Requirements

The following items are included in the test report when required or relevant:

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

a) Shipping manifests/bill of ladings as applicable when common couriers are utilized for shipment of samples,

b) Explanation of departure from test method SOPs including what the departure was and why it was necessary.

c) Statistical methods used. (Required for Whole Effluent Toxicity)

d) For solid samples, specification that results are reported on a dry weight or wet weight basis.

e) Signed Affidavit, when required by client or regulatory agency.

f) A statement of compliance/non-compliance with requirements or specifications (client, program, or standard) that includes identification of test results that did not meet acceptance criteria.

g) When requested by the client, statement of estimated measurement uncertainty. In general, for environmental testing, estimated uncertainty of measurement is extrapolated from LCS control limits. Control limits incorporate the expected variation of the data derived from the laboratory's procedure. When the control limits are specified by the test method or regulatory program, the control limits represent the expected variation of the test method and/or matrices for which the test method was designed.

h) If a claim of accreditation/certification is included in the test report, identification of any test methods or analytes for which accreditation/certification is not held by the location if the accrediting body offers accreditation/certification for the test method/analyte. The fields of accreditation/certification vary between agencies, and it cannot be presumed that because accreditation/certification is not held that it is offered or required.

i) Certification Information, including certificate number and issuing body.

For PAS locations accredited to ISO/IEC 17025:2017:

- Data included in the test report provided by a customer should be clearly identified.
- A statement that the test results apply only to the samples as received.

PAS does not provide opinion or interpretations about usability of data or test results in order to maintain impartiality with the testing services provided.

5.10.3.2 Test Reports: Sampling Information

The following items are included in the test report when samples are collected by PAS or when this information is necessary for the interpretation of test results:

a) Date of Sampling.

b) Unambiguous identification of material samples.

c) Location of sampling including diagrams, sketches, or photographs.

d) Reference to the sampling plan and procedures used.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

e) Details of environmental conditions at the time of sample that may impact test results.

f) Any standard or other specification for the sampling method or procedure, and deviations, additions to or exclusions from the specification concerned.

6.0 REVISION HISTORY

This Version (Template Version 4):

SECTION	DESCRIPTION OF CHANGE
Header	Updated Copyright
Approval Page	Changed Address, City, State, Zip to Location. Changed Phone to Email. Added a line for Laboratory Supervisor (State LAP).
1.1	Added information on Building Sciences acronyms. Removed NELAC. Removed reference to Appendix B, testing capabilities and referenced where these could be found.
1.2.1	Changed who created the template to Corporate Quality team. Updated list for top management.
2.0	Updated References
4.1.5.1.1	Updated Key Personnel
4.1.5.2	Added Vice President of Quality and Risk Management Officer. Clarified under General Manager who to notify for extended absences/reassignments.
4.1.5.2.1	Added ELLAP/NLLAP information to this section.
4.1.5.4	Added location of the Terms & Conditions
4.13.1.2	State Building Sciences and Absarka Air Sciences use 5 year record retention.
5.2.2.1.5	Added more options for DOC and DOC requirements for AIHA-LAP, LLC
5.4.5.3.3	Removed 2-4x greater than DL but less than LLOQ or LOQ for DoD LOD.
5.4.5.3.4	New section for Microbiology
5.4.5.3.5	New Section for Asbestos
5.4.5.3.6	Add species for micro methods
5.4.6	Added reference to BDSG Uncertainty SOP
5.5.4	Added requirement for transferring equipment to another location
5.5.5.1	Removed reference to appendix E. Added see local quality and where to find the list.
5.6.3.1	Changed +/- to within
5.8.3.1	Changed 0-6 to <6

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

5.8.4	Removed reference to Sample Acknowledgement Form. Deleted a paragraph due to redundant information.
5.8.5.1	Changed to ≤6 and ≤-10.
5.9.3	Changed to multi-tier review
5.9.3.2	Clarified secondary review is completed by qualified personnel
5.10.2	Added dilution and/or prep factor
Appendix B	Updated to remove the table and add location the information can be found.
Appendix C	Added definition of Analyst. Updated definitions for Analyte, Annual, Batch, Confirmation, Holding time, Incremental Sampling Method, Quantitation Range, Selectivity, Sensitivity, Traceability
Appendix D	Updated Org Charts
Appendix E	Updated to remove the table and add location the information can be found.
8.1	Updated information to be consistent with DoD QSM 6.0
8.2	Added information on changes to personnel
8.3	Added information from AIHA-LAP, LLC manual
8.5	New section on UCMR 5
Throughout Document	Grammatical fixes and removal of redundant acronyms.

This document supersedes the following documents:

Document Number	Title	Version
ENV-TMP-CORQ-0007	Quality Manual Template	03
ENV-TMP-CORQ-0007	Quality Manual Template	02
ENV-TMP-CORQ-0007	Quality Manual Template	01
ENV-MAN-CORQ-0001	Quality Manual	00

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

7.0 APPENDICES

7.1 Appendix A: Certification / Accreditation Listing

Disclaimer: The certifications / accreditation lists provided in this Appendix are those that were held by the PAS location on the effective date of this manual. This information is subject to change without notice and must not be considered valid proof of certification or accreditation status. This manual is not updated with each change made. Current certificates are accessible via the eDMS Portal for PAS employees. External parties should contact the location for the most current information.

7.1.1 PAS-WES2 8 Walkup Drive, Westborough, MA

Authority	ID	Authority	ID
Connecticut	PH-0826	North Carolina (DW)	25700
Illinois	200077	North Carolina (NPW/SCM)	666
Indiana	C-MA-03	Ohio - VAP	Based on NH
Kentucky	KY98045	Oregon	MA-1316
Maine	MA00086	Pennsylvania	68-03671
Maryland	348	Rhode Island	LAO00065
Massachusetts	M-MA086	Texas	T104704476-17-14
New Hampshire Primary	2064	Vermont	VT-0935
New Jersey	MA935	Virginia	460195
New York	11148		

7.1.2 PAS-MANS 320 Forbes Blvd. Mansfield, MA

Authority	ID	Authority	ID
Connecticut	PH-0825	New Jersey	MA015
ANAB/DoD	L2474	New York	11627
Illinois	200081	North Carolina	685
Indiana	C-MA-04	Ohio-VAP	Based on NH
Kentucky	KY98046	Oregon	MA-0262
Louisiana	3090	Pennsylvania	68-02089
Maine	MA00030	Rhode Island	LAO00299
Maryland	350	Texas	T104704419
Massachusetts	M-MA030	Vermont	VT-0015
Michigan	9110	Virginia	460194
Minnesota	025-999-495	Washington	C954
New Hampshire Primary	2062		

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

7.1.3 PAS-MANS 120 Forbes Blvd. Mansfield, MA

Authority	ID	Authority	ID
ANAB/DoD	L2474	New York	12191
Maine	MA01156	Oregon	4203
Minnesota	025-999-498	Texas	T104704583
New Hampshire Primary	2249	Virginia	460311
New Jersey	MA025	Washington	C1104

7.2 Appendix B: Capability Listing

- The capabilities for PAS-WES2, PAS-MANS 320 Forbes Blvd., and PAS-MANS 120 Forbes Blvd. are maintained by the Quality Assurance department. For a current listing of laboratory capabilities, consult the Quality Assurance Manager identified in the QAM approval list on page 3 of this document.

7.3 Appendix C: Glossary

This glossary provides common terms and definitions used in environmental testing; it is not intended to be a complete list of all terms and definitions used; some terms are defined in the context of the document or application. The definitions have been compiled mostly from the TNI Standard and DoD QSM. Although this information has been reproduced with care, errors cannot be entirely excluded.

Term	Definition
Acceptance Criteria	Specified limits placed on characteristics of an item, process, or service defined in requirement documents.
Accreditation	The process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory.
Accreditation Body	The organization having responsibility and accountability for environmental laboratory accreditation, and which grants accreditation.
Accuracy	The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations; a data quality indicator.
Aliquot	A discrete, measured, representative portion of a sample taken for analysis.
Analysis	A combination of sample preparation and instrument determination.
Analysis Sequence	A compilation of all samples, standards and quality control samples run during a specific amount of time on a particular instrument in the order they are analyzed.
Analyst	The designated individual who performs the "hands-on" analytical methods and associated techniques, and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Analyte	A substance, organism, physical parameter, property, or chemical constituent(s) for which an environmental sample is being analyzed. DOD Clarification - The specific chemicals or components for which a sample is analyzed; it may be a group of chemicals that belong to the same chemical family and are analyzed together.
Analytical Method	A formal process that identifies and quantifies the chemical components of interest in a sample.
Analytical Uncertainty	A subset of Measurement Uncertainty that includes all laboratory activities performed as part of the analysis.
Annual (or annually)	A period not to exceed 13 months
Assessment	The evaluation process used to measure or establish the performance, effectiveness, and conformance of an organization and/or its system to defined criteria (to the standards and requirements of laboratory accreditation).
Atomic Absorption Spectrometer	Instrument used to measure concentration in metals samples.
Audit	A systematic and independent examination of facilities, equipment, personnel, training, procedures, record-keeping, data validation, data management, and reporting aspects of a system to determine whether QA/QC and technical activities are being conducted as planned and whether these activities will effectively achieve quality objectives.
Batch	Environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one to 20 environmental samples of the same quality systems matrix, meeting the above-mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours or the time specified by the regulatory program. An **analytical batch** is composed of prepared environmental samples (extracts, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various quality system matrices and can exceed 20 samples. DOD Clarification - An analytical batch/sequence shall use the same instrument calibration and shall be bracketed by calibration verifications within acceptance criteria.
Bias	The systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value).
Blank	A sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage, or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results (Refer to Method Blank).
Blind Sample	A sub-sample for analysis with a composition known to the submitter. The analyst/laboratory may know the identity of the sample but not its composition. It is used to test the analyst's or laboratory's proficiency in the execution of the measurement process.
Calibration	A set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Calibration Curve	The mathematical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response.
Calibration Method	A defined technical procedure for performing a calibration.
Calibration Range	The range of values (concentrations) between the lowest and highest calibration standards of a multi-level calibration curve.
Calibration Standard	A substance or reference material used for calibration.
Certified Reference Material	Reference material accompanied by a certificate, having a value, measurement uncertainty, and stated metrological traceability chain to a national metrology institute.
Chain of Custody	An unbroken trail of accountability that verifies the physical security of samples, data, and records.
Client /Customer	Any individual or organization external to Pace for whom items or services are furnished or work performed in response to defined requirements and expectations.
Code of Federal Regulations (CFR)	A codification of the general and permanent rules published in the Federal Register by agencies of the federal government.
Comparability	An assessment of the confidence with which one data set can be compared to another.
Completeness	The percentage of valid data obtained from a measurement system compared to the amount of valid data expected under normal conditions. This attribute is always calculated by the end data user, not by the laboratory.
Confirmation	Verification of the identity of a component through the use of an approach with a different scientific principle from the original method. DOD Clarification - Includes verification of the identity and quantity of the analyte being measured by another means (e.g., by another determinative method, technology, or column). Additional cleanup procedures alone are not considered confirmation techniques.
Continuing Calibration Blank (CCB)	A blank sample used to monitor the cleanliness of an analytical system at a frequency determined by the analytical method.
Continuing Calibration Check Compounds (CCC)	Compounds listed in mass spectrometry methods are used to evaluate an instrument calibration from the standpoint of the integrity of the system.
Continuing Calibration Verification (CCV) Standard	A standard used to verify the initial calibration of compounds in an analytical method. May be referred to as a CCC in some programs, such as UCMR.
Control Limit	A range within which specified measurement results must fall to verify that the analytical system is in control.
Correction	Action taken to eliminate a detected non-conformity.
Corrective Action	The action taken to eliminate the causes of an existing non-conformity, defect, or other undesirable situation in order to prevent recurrence.
Data Integrity	The condition that exists when data are sound, correct, and complete, and accurately reflect activities and requirements.
Data Quality Objective (DQO)	Strategic planning tool that identifies and defines the type, quality, and quantity of data needed to satisfy a specified use or end user.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Data Reduction	The process of transforming the number of data items by arithmetic or statistical calculation, standard curves, and concentration factors, and collating them into a more usable form.
Demonstration of Capability (DOC)	A procedure to establish the ability of the analyst to generate analytical results of acceptable accuracy and precision.
Detection Limit (DL)	The minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from the method blank results.
Dry Weight	The percent of sample that is not water, which may be used to adjust the reported results.
Electronic Data Deliverable (EDD)	A summary of environmental data which clients request for ease of data review and comparison to historical results.
Environmental Protection Agency (EPA)	An agency of the federal government of the United States which was created for the purpose of protecting human health and the environment by writing and enforcing regulations based on laws passed by Congress.
Equipment Blank	A sample of analyte-free media used to rinse common sampling equipment to check effectiveness of decontamination procedures.
Extracted Internal Standard Analyte	Isotopically labeled analogs of analytes of interest added to all standards, blanks and samples analyzed. Added to samples and batch QC samples prior to the first step of sample extraction and to standards and instrument blanks prior to analysis. Used for isotope dilution methods.
False Negative	A result that fails to identify (detect) an analyte to be present.
False Positive	A result that erroneously identifies (detects) an analyte to be present.
Field Blank	A blank sample prepared in the field by filling a clean container with reagent water and appropriate preservative, if any, for the specific sampling activity being undertaken.
Field Measurement	Testing performed in the field outside of a fixed-laboratory or outside of an enclosed structure that meets the requirements of a mobile laboratory.
Flame Atomic Absorption Spectrometer (FAA)	Instrumentation used to measure the concentration of metals in an environmental sample based on the fact that ground state metals absorb light at different wavelengths. Metals in a solution are converted to the atomic state by use of a flame.
Flame Ionization Detector (FID)	A type of gas detector used in GC analysis where samples are passed through a flame which ionizes the sample so that various ions can be measured.
Gas Chromatography (GC)	Instrumentation which utilizes a mobile carrier gas to deliver an environmental sample across a stationary phase with the intent to separate compounds out and measure their retention times.
Gas Chromatograph/ Mass Spectrometry (GC/MS)	In conjunction with a GC, this instrumentation utilizes a mass spectrometer which measures fragments of compounds and determines their identity by their fragmentation patterns (mass spectra).
Gasoline Range Organics (GRO)	A range of compounds that denote all the characteristic compounds that make up gasoline (range can be state or program specific).

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Graphite Furnace Atomic Absorption Spectrometry (GFAA)	Instrumentation used to measure the concentration of metals in an environmental sample based on the absorption of light at different wavelengths that are characteristic of different analytes.
High Pressure Liquid Chromatography (HPLC)	Instrumentation used to separate, identify, and quantitate compounds based on retention times which are dependent on interactions between a mobile phase and a stationary phase.
Holding Time	The maximum time that may elapse from the time of sampling to the time of preparation or analysis, or from preparation to analysis, as applicable.
Homogeneity	The degree to which a property or substance is uniformly distributed throughout a sample.
Incremental Sampling Method (ISM)	Structured composite sampling and processing procedure that is designed to reduce data variability and provide a reasonably unbiased estimate of mean contaminant concentrations in a volume of particulate material (e.g., soil and sediment).
Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES)	Analytical technique used for the detection of trace metals which uses plasma to produce excited atoms that emit radiation of characteristic wavelengths.
Inductively Coupled Plasma- Mass Spectrometry (ICP/MS)	An ICP that is used in conjunction with a mass spectrometer so that the instrument is not only capable of detecting trace amounts of metals and non-metals but is also capable of monitoring isotopic speciation for the ions of choice.
Infrared Spectrometer (IR)	An instrument that uses infrared light to identify compounds of interest.
Initial Calibration (ICAL)	The process of analyzing standards, prepared at specified concentrations, to define the quantitative response relationship of the instrument to the analytes of interest.
Initial Calibration Blank (ICB)	A blank sample used to monitor the cleanliness of an analytical system at a frequency determined by the analytical method.
Initial Calibration Verification (ICV)	A standard obtained or prepared from a source independent of the source of the initial calibration standards to verify the initial calibration.
Instrument Blank	An analyte free matrix processed through the instrumental steps of the measurement process; use to determine instrument contamination.
Interference	The suppression or elevation of result of an analyte of interest due to the presence of other compounds.
Internal Standard	A known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical method.
International Organization for Standardization (ISO)	An international standard-setting body composed of representatives from various national standards organizations.
Intermediate Standard Solution	Reference solutions prepared by dilution of the stock solutions with an appropriate solvent.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

International System of Units (SI)	The coherent system of units adopted and recommended by the General Conference on Weights and Measures.
Ion Chromatography (IC)	Instrumentation or process that allows the separation of ions and molecules based on the charge properties of the molecules.
Isomer	One of two or more compounds, radicals, or ions that contain the same number of atoms of the same element but differ in structural arrangement and properties. For example, hexane (C6H14) could be n-hexane, 2-methylpentane, 3-methylpentane, 2,3-dimethylbutane, 2,2-dimethylbutane.
Laboratory	A facility that performs testing, whether in-house or in the field.
Laboratory Control Sample (LCS)	Also known as laboratory fortified blank (LFB): A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes, which is taken through all sample preparation and analytical steps of the procedure.
Laboratory Information Management System (LIMS)	The entirety of an electronic data system (including hardware and software) that collects, analyzes, stores, and archives electronic records and documents.
Legal Chain-of-Custody Protocols	Industry defined protocol that is sometimes used for evidentiary or legal purposes that establishes an intact, continuous record of the physical possession, storage, and disposal of samples, including sample aliquots and prepared samples.
Limit(s) of Detection (LOD)	The smallest concentration of a substance that must be present in a sample in order to be detected at the DL with 99% confidence.
Limit(s) of Quantitation (LOQ)	The minimum level, concentration, or quantity of a target analyte that can be reported with a specified degree of confidence.
Lower Limit of Quantitation (LLOQ)	The concentration of the lowest calibration standard included in the calibration curve.
Linear Dynamic Range	Concentration range where the instrument provides a linear response.
Liquid chromatography/ tandem mass spectrometry (LC/MS/MS)	Instrumentation that combines the physical separation techniques of liquid chromatography with the mass analysis capabilities of mass spectrometry.
Lot	A definite amount of material produced during a single manufacturing cycle and intended to have uniform character and quality.
Matrix	The substrate of a test sample.
Matrix Duplicate	A replicate matrix prepared in the laboratory and analyzed to obtain a measure of precision.
Matrix Spike (MS)	A sample prepared, taken through all sample preparation and analytical steps of the procedure, to which a known amount of target analyte is added to a specified amount of sample for which an independent test result of target analyte concentration is available.
Matrix Spike Duplicate (MSD)	A replicate matrix spike prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Measurement System	A method, as implemented at a particular laboratory, and which includes the equipment used to perform the test and the operator(s).
Measurement Uncertainty	An estimate of the error in a measurement often stated as a range of values that contain the true value within a certain confidence level.
Method	A body of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, quantification).
Method Blank	A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures.
Method Detection Limit (MDL)	The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.
Method of Standard Additions	A set of procedures adding one or more increments of a standard solution to sample aliquots of the same size in order to overcome inherent matrix effects.
Minimum Detectable Activity (MDA)	Estimate of the smallest true activity that ensures a specified high confidence, $1 - \beta$, of detection above the Critical Value, and a low probability β of false negatives below the Critical Value. For radiometric methods, β is often set at 0.05.
Negative Control	A sample included in the method that is treated the same as all others but is expected to have a detection of analytes of interest.
Nonconformance	An indication or judgment that a product or service has not met the requirement of the relevant specifications, contract, or regulation; also, the state of failing to meet the requirements.
Positive Control	A sample included in the method that is treated the same as all others and is expected to have a detection of the analytes of interest.
Practical Quantitation Limit (PQL)	Another term for a method reporting limit.
Precision	The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves.
Preservation	Any conditions under which a sample must be kept in order to maintain chemical, physical, and/or biological integrity prior to analysis.
Primary Accreditation Body (Primary AB)	The TNI-approved state agency responsible for assessing a laboratory's total quality system, on-site assessment, and PT performance tracking for fields of accreditation.
Procedure	Written instructions detailing the performance of a task, process, or other laboratory activity.
Proficiency Testing (PT)	A means to evaluate a laboratory's performance under controlled conditions relative to a given set of criteria, through analysis of unknown samples provided by an external source.
Proficiency Testing Reporting Limit (PTRL)	A statistically derived value that represents the lowest acceptable concentration for an analyte in a PT sample, if the analyte is spiked into the PT sample. The PTRLs are specified in the TNI FoPT tables.
Qualitative Analysis	Analysis designed to identify the components of a substance or mixture.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Quality Assurance (QA)	An integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the client.
Quality Assurance Project Plan (QAPP)	A formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved.
Quality Control (QC)	The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality; also the system of activities and checks used to ensure that measurement systems are maintained within prescribed limits, providing protection against "out of control" conditions and ensuring that the results are of acceptable quality.
Quality Control Sample (QCS)	A sample used to assess the performance the measurement system.
Quality Manual	A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users.
Quality Management System	A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required quality assurance and quality control activities.
Quantitation Range	The range of values (concentrations) in a calibration curve between the LOQ and the highest successfully analyzed initial calibration standard used to relate instrument response to analyte concentration. The quantitation range (adjusted for initial sample volume/weight, concentration/dilution, and final volume) lies within the calibration range.
Quantitative Analysis	Analysis designed to determine the amounts or proportions of the components of a substance.
Raw Data	The documentation generated during sampling and analysis. This documentation includes, but is not limited to, field notes, electronic data, magnetic tapes, untabulated sample results, QC sample results, print outs of chromatograms, instrument outputs, and handwritten records.
Record	Documentation, data, or other records constituting a piece of evidence about the past, especially an account of an act or occurrence kept in writing or some other permanent form. Records may be in electronic or hardcopy media. Unless otherwise specified, the term "record" refers to both electronic and hardcopy media.
Reference Material	Material or substance one or more of whose property values are sufficiently homogenized and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials.
Reference Method	A published method issued by an organization recognized as competent to do so. (When the ISO language refers to a "standard method," that term is equivalent to "reference method").

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Reference Standard	Standard used for the calibration of working measurement standards in a given organization or at a given location.
Relative Percent Difference (RPD)	A measure of precision defined as the difference between two measurements divided by the average concentration of the two measurements.
Reporting Limit (RL)	The value to which test results are reported as detected or not detected.
Representativeness	A quality element related to the ability to collect a sample reflecting the characteristics of the part of the environment to be assessed.
Retention Time	The time between sample injection and the appearance of a solute peak at the detector.
Sample	The item submitted for testing.
Sampling	Activity related to obtaining a representative sample for analysis.
Selected Ion Monitoring (SIM)	A mode of analysis in mass spectrometry where the detector is set to scan over a very small mass range, typically one mass unit.
Selectivity	The ability to analyze, distinguish, and determine a specific analyte from another component that may be a potential interferent or that may behave similarly to the target analyte within the measurement system.
Sensitivity	The capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest.
Serial Dilution	The stepwise dilution of a substance in a solution.
Standard Operating Procedure (SOP)	A written document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps.
Standard Reference Material (SRM)	A certified reference material produced by the US NIST or other equivalent organization and characterized for absolute content, independent of analytical method.
Stock Standard	A concentrated reference solution containing one or more analytes prepared in the laboratory using an assayed reference compound or purchased from a reputable commercial source.
Storage Blank	A sample of analyte-free media prepared by the laboratory and retained in the sample storage area.
Suitability	The quality of being appropriate for a particular purpose.
Surrogate	A substance with properties that mimic the analyte of interest, and unlikely to be found in environmental samples.
Systems Audit	An on-site inspection or assessment of a laboratory's quality system.
Target Analytes	Analytes or chemicals of primary concern identified by the customer on a project-specific basis.
Technology	A specific arrangement of analytical instruments, detection systems, and/or preparation techniques.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

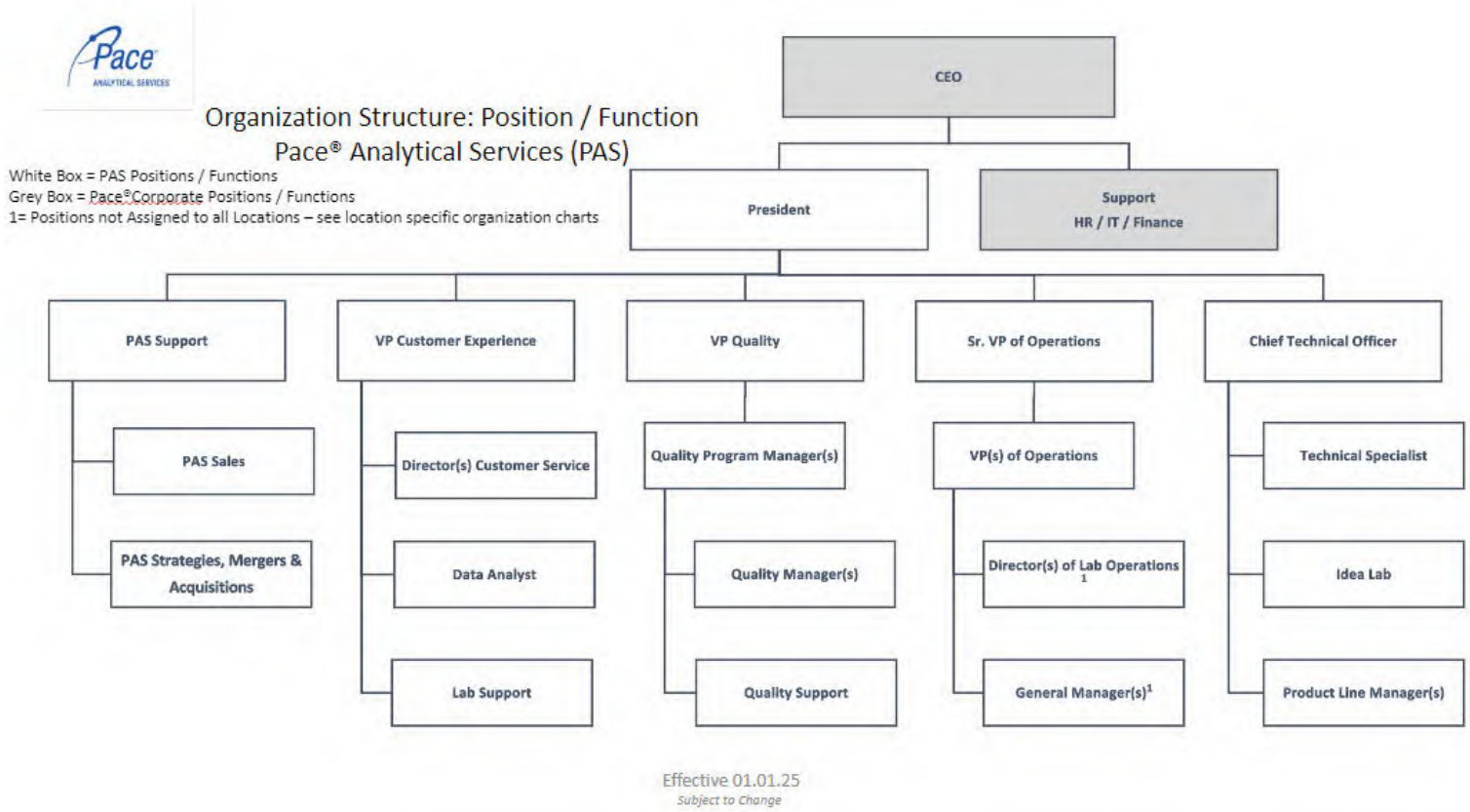
Traceability	The ability to trace the history, application, or location of an entity by means of recorded identifications. In a calibration sense, traceability relates measuring equipment to national or international standards, primary standards, basic physical constants or properties, or reference materials. In a data collection sense, it relates calculations and data generated throughout the project back to the requirements for the quality of the project.
Trip Blank	A cleaned sample container filled with laboratory reagent water that is stored, shipped, and analyzed with its associated samples to detect sample contamination during transport and storage of the sample.
Tuning	A check and/or adjustment of instrument performance for mass spectrometry as required by the method.
Validation	The confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled.
Verification	Confirmation by examination and objective evidence that specified requirements have been met. In connection with the management of measuring equipment, verification provides a means for checking that the deviations between values indicated by a measuring instrument and corresponding known values of a measured quantity are consistently smaller than the maximum allowable error defined in a standard, regulation, or specification peculiar to the management of the measuring equipment.
Working Standard	Dilution made of a stock or intermediate standard used in the analytical process.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

7.4 Appendix D: Organization Chart(s)

7.4.1 PAS Corporate Organization Chart(s)

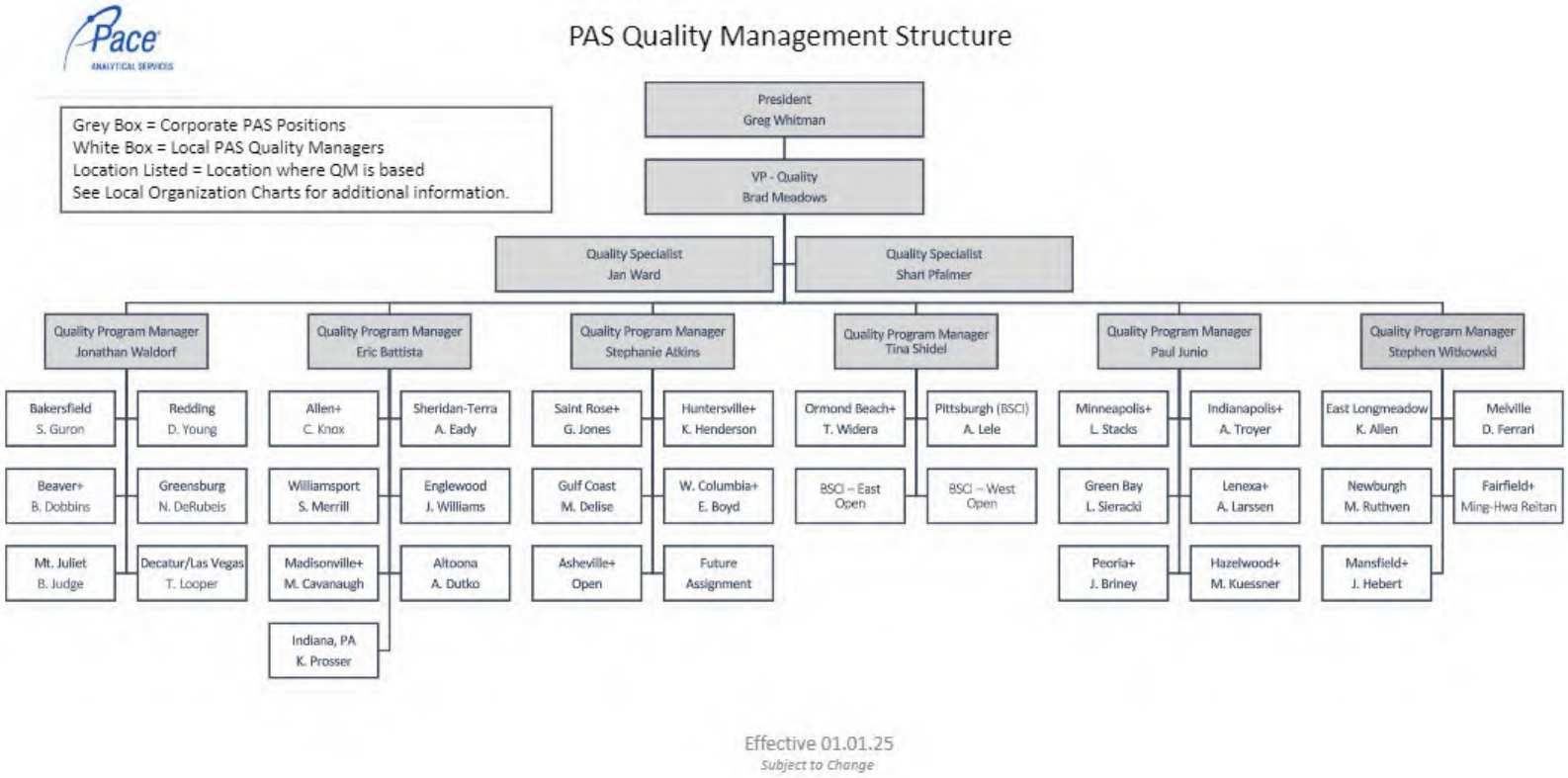
The information in this organization chart is subject to change. Please contact PAS for the most up-to-date version.



COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

7.4.2 PAS Quality Systems Management Organization Chart

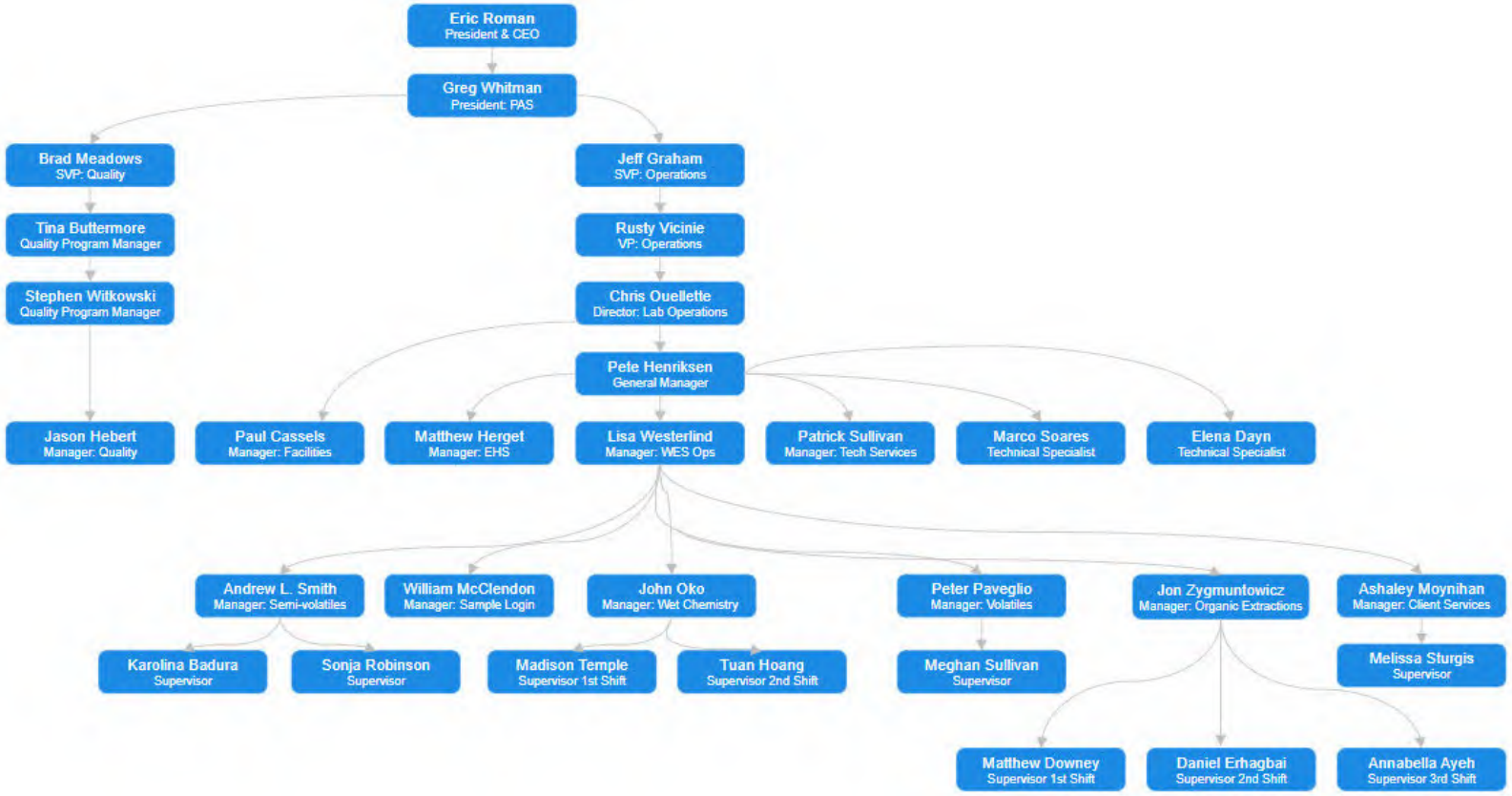
The information in this organization chart is subject to change. Please contact PAS for the most up-to-date version.



COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

7.4.3 PAS-WES2 8 Walkup Drive, Westborough, MA – Organization Chart

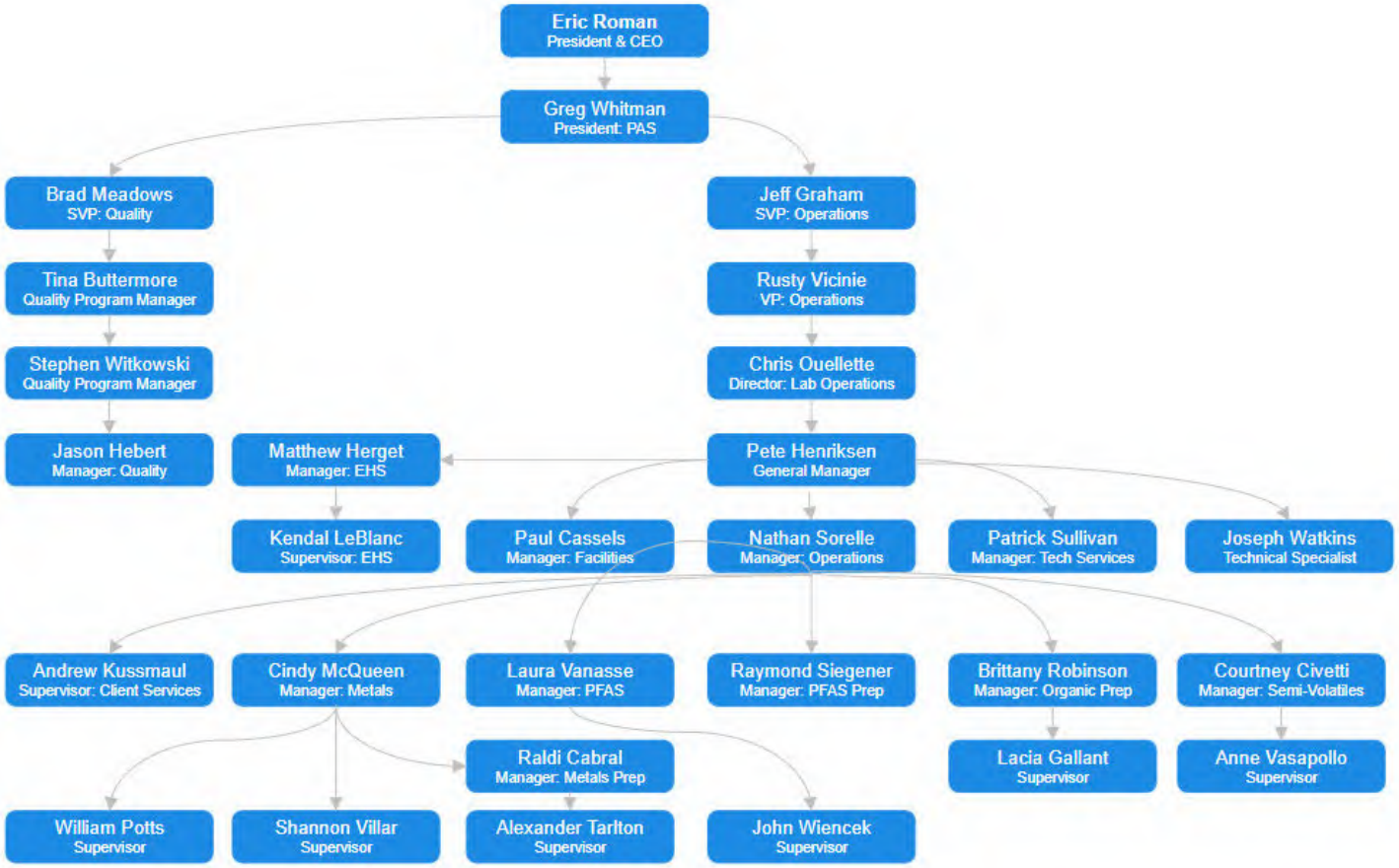
The information in this organization chart is subject to change. Please contact PAS for the most up-to-date version.



COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

7.4.4 PAS-MANS 320 Forbes Blvd, Mansfield, MA – Organization Chart

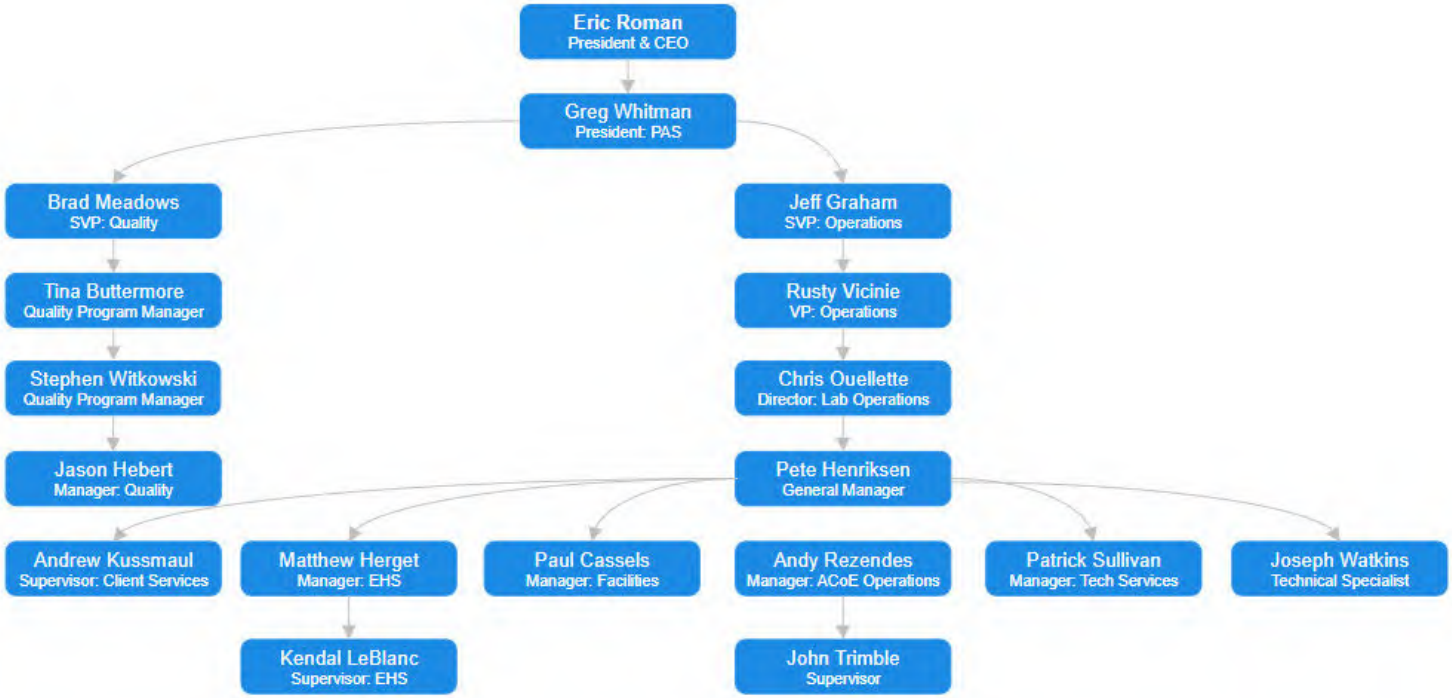
The information in this organization chart is subject to change. Please contact PAS for the most up-to-date version.



COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

7.4.5 PAS-MANS 120 Forbes Blvd. Mansfield, MA – Organization Chart

The information in this organization chart is subject to change. Please contact PAS for the most up-to-date version.



COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

7.5 Appendix E: Equipment Listing

The equipment list for PAS-WES2, PAS-MANS 320 Forbes Blvd., and PAS-MANS 120 Forbes Blvd. is maintained by the Quality Assurance department. For a current listing of laboratory equipment, consult the Quality Assurance Manager identified in the QAM approval list on page 3 of this document.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

8.0 ADDENDUM: PROGRAM REQUIREMENTS

Section 8.0 provides additional requirements the locations covered by this manual are required to follow when performing work under the program. Only requirements that are not covered by the main body of the manual are listed in addendum.

8.1 DoD

PAS-MANS maintains accreditation for DoD Environmental Laboratory Approval Program (ELAP).

This addendum outlines additional policies and processes established by this laboratory to maintain compliance with DoD program specific requirements as outlined in the DoD Consolidated Quality Systems Manual (QSM) for Environmental Laboratories. The QSM incorporates ISO/IEC 17025 and the TNI Standard and includes additional program-specific requirements for laboratories that perform analytical testing services for DoD, and which must be followed for DoD projects.

Section 4.2.1.2 Risk and Opportunity Assessment

The laboratory identifies and plans mitigation measures for risks and opportunities associated with its activities, as outlined in QSM 6.0, Module 2, clauses 8.5.4.a through 8.5.4.o. The Risk Management Officer (RMO) maintains records of risk identification and mitigation. For further details, refer to the DoD/DOE QSM 6.0 Risk Mitigation Plan.

Section 4.3.3 Document Review and Change

The review frequency for technical SOPs used for DoD testing is annual, instead of every 2 years.

Section 4.4 Review of Analytical Service Requests

Laboratory deviations from the requirements specified in the DoD/DOE QSM are requested on a project basis and include technical justifications for the deviation. These requests are submitted to and approved by the DoD project chemist or contractor, as well as the PAS client. Records of approval are maintained by the laboratory and included in all affected data packages.

For DoD projects, customer clarification or feedback is sought for the following situations:

- Methods which require modification to ensure achievement of customer objectives contained in planning documents;
- Project planning documents are missing or requirements in the documents require clarification;
- The laboratory has encountered problems with sampling that may impact results (e.g. improper sample preservation)

The laboratory maintains records of customer approval for use of an external provider to perform any of the following:

- Sampling or subsampling;
- Sample preparation;
- Sample analysis;
- Data reduction;

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

- Data review; or
- Reporting

Section 4.5 Subcontracting

The laboratory verifies that subcontractors hold the necessary accreditation or certifications required for the project and maintains records of their accreditation. Approval from the customer is obtained before any subcontracted laboratory analyzes samples.

The requirements for subcontracted laboratories also apply to laboratories within the same corporate group but located at different facilities or locations.

All subcontracted or outsourced management system elements (e.g., data review, data processing, project management, and IT support), as well as outsourced personnel, must comply with accreditation requirements.

Section 4.6 Purchasing and Supplies

The laboratory establishes procedures detailing the selection, purchasing, receipt, and storage of services and supplies impacting laboratory activities.

If the laboratory provides sample containers to customers, it maintains records demonstrating that each lot of containers, along with any included preservatives, is free of likely contaminants exceeding ½ the LOQ for the associated analysis.

Section 4.9.3 Nonconforming Work

The laboratory shall upon discovery of potential data quality issues resulting from nonconforming work, notify all affected customers within 15 business days. Records of corrective actions taken or proposed corrective actions to resolve the nonconformance shall be submitted to the customer within 30 business days of discovery. For data reported to affected customers more than 90 days prior to the discovery of the potential data quality issue, the AB shall also be notified. Notification shall be performed according to the laboratory's procedure for client notification.

Section 4.13 Control of Records

All records shall be maintained for five years from last use. A record is considered in use when it supports current laboratory activities.

Requirements for amendments to technical records also apply to changes to the original output of the automated software algorithms such as manual integrations and eliminating laboratory determined "false positives" (e.g. "Q delete"). These changes to the original output of the automated software algorithms shall be reviewed by a technically qualified supervisor or data review specialist. Records of this review shall be maintained.

For the purpose of preparation batch processing, the start and stop dates and times of the preparation batch preparation shall be recorded. The start time of sample preparation is the time when analytes from the first sample in a batch of samples begin to be removed from the matrix. The stop time of sample preparation is the time when the last sample extract or digestate is ready for additional clean up or analysis.

Section 4.14 Internal Audit

The internal audit schedule shall ensure that all areas of the laboratory are reviewed over the course of one year, with no area exceeding a period of 18 months between audit events.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Section 5.2.1 Personnel Qualifications

Records of communication with personnel regarding their duties, responsibilities, and authorities in their positions shall be maintained.

Section 5.2.2 Required Training

Employees shall receive initial training in computer security awareness upon employment, followed by annual refresher training. Records of the training shall be maintained.

Section 5.3 Accommodations and Facilities

Standards and reference materials shall be stored separately from samples, extracts, and digestates.

Section 5.4.5.3.3 Sensitivity in Chemical Testing

For each combination of analyte-matrix-method listed on the laboratory's scope of accreditation, the laboratory shall determine a DL, LOD, and LOQ, unless it falls within one of the stated exceptions below:

- DL, LOD, and LOQ determinations are not required for methods/analytes for which a DL, LOD and LOQ is not applicable such as pH, color, odor, temperature, residues, or leaching procedures.
- DL determinations, LOD determinations, and LOD and LOQ verifications are not required for analytes for which no low-level spiking solutions are available.
- DL and LOD determinations are not required if results are not reported below the LOQ, unless required by regulation or method.

The laboratory is not required to establish separate DL, LOD, and LOQ for every combination of preparation and cleanup techniques. However, it shall determine these values using the combination of processes most likely to impact sensitivity, including preparation methods and all applicable cleanup steps, such as drying, grinding, and incremental sampling, where relevant.

The DL, LOD and LOQ shall be reported for all analyte-matrix-method combinations unless it is not applicable to the test or specifically excluded by customer requirements.

Records of all supporting data for DL, LOD, and LOQ determinations and verifications shall be maintained. The laboratory shall provide the following when DL, LOD, and LOQ summary information is requested:

- an indication of which analyte/matrix/prep method/analytical method and instrument used;
- DL;
- claimed LOD;
- concentration of initial LOD spike and verification spike, if different;
- statement of compliance with analyte identification requirements;
- signal-to-noise value or statement of compliance with requirements;
- claimed LOQ;
- concentration of LOQ spike;

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

- recovery or result of LOQ spike;
- calculated precision and bias at the LOQ that incorporates historic and current data;
- accuracy acceptance criteria at the LOQ;
- description of precision and bias calculations; and
- if specifically requested, raw data to support parameters reported.

Limit of Detection (LOD)

For DoD, the LOD is defined as the lowest concentration empirically determined to consistently provide a response meeting identification and minimum signal requirements for a specific analyte-matrix-method combination. This is an estimate of the smallest concentration of an analyte that shall be present in order to be detected with a result at or above the DL with 99% confidence. The LOD is also the minimum concentration for reliably reporting a non-detect result for an analyte.

After each DL determination, the laboratory establishes the LOD by spiking a quality system matrix at a concentration greater than or equal to the DL. The LOD is equal to the concentration of this spike.

The laboratory verifies the LOD at least quarterly. For methods used infrequently, the laboratory may opt to perform LOD verification on a per-batch basis prior to sample analysis as an alternative to quarterly verification. The chosen verification frequency must be maintained consistently for a minimum of 12 months. If the laboratory chooses per-batch LOD verification, the verification data must be reported to the customer.

LOD verification is performed by repeating the LOD spike process at a concentration between half and double the current/claimed LOD, provided the spike concentration is greater than or equal to the DL (i.e. DL ≤ 1/2x LOD ≤ Ongoing LOD Spike ≤ 2x LOD).

The ongoing LOD verification must meet the same acceptance criteria as the initial LOD verification for signal-to-noise ratio and analyte identification. If the acceptance criteria are met, the initial LOD is verified and may continue to be used. If the verification fails, the laboratory shall redetermine the LOD and, if necessary, the DL, or implement its nonconforming work procedure, until the requirements are met.

If there are multiple instruments that will be assigned the same LOD, then the LOD verification spikes shall be distributed across all the instruments and the results shall meet the acceptance criteria on each instrument.

If the method is altered in a way other than routine maintenance, and the change can be expected to elevate the detection limit, the LOD shall be reverified using the ongoing LOD verification procedure.

Limit of Quantitation (LOQ)

For DoD, the LOQ is defined as the smallest concentration that produces a quantitative result with known and recorded precision and bias.

For methods using multi-level calibration, the laboratory shall select an LOQ for each analyte that is greater than or equal to the LOD and greater than or equal to the lowest non-zero calibration standard. For methods using a single-point calibration, the LOQ shall be greater than or equal to the LOD and greater than or equal to the low-level calibration check standard.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

The LOQ is verified by analyzing verification samples. The LOQ verification sample consists of a spiked quality system matrix with a concentration greater than or equal to the LOD or half the LOQ, whichever is lower, and less than or equal to double the LOQ (i.e. LOD or ½ LOQ ≤ LOQ spike ≤ 2x LOQ).

The LOQ verification must meet the same criteria as the initial LOD verification for signal-to-noise ratio and analyte identification and must fall within the laboratory's stated acceptance criteria. These criteria are determined as a maximum of three standard deviations from the mean of historical data but must not exceed the LCS acceptance criteria with an additional allowance of ±20%. Furthermore, the lower limit must be greater than or equal to 10% recovery.

In the event the verification fails, the laboratory shall redetermine the LOQ and, if necessary, the DL and/or LOD; or implement its nonconforming work procedure, until the requirements are met.

If there are multiple instruments that will be assigned the same LOQ, then these LOQ verification spikes shall be distributed across all the instruments and the results shall be included in the precision and bias determination.

The laboratory shall verify the LOQ quarterly, at a minimum. The precision and bias shall be updated annually, at a minimum, using any additional LOQ verification sample results.

In situations where methods are set up and used on an infrequent basis, the laboratory may choose to perform Ongoing LOQ verifications on a one-per-batch basis, before sample analysis, in lieu of quarterly verification. The verification data shall meet requirements and be reported to the customer. Whichever verification frequency is chosen shall be continued for a minimum of 12 months.

The LOQ and associated precision and bias shall be reported in each data package. When reporting precision and bias at the LOQ within a data package, a table for each analyte-matrix-method must present the LOQ concentration and the associated precision and bias at that concentration. The table should also identify how precision and bias were calculated, the spike concentration if different from the LOQ, and how many data points (results) were used in the calculation.

The laboratory's procedure for DL, LOD, and LOQ determination and verification is detailed in SOP ENV-SOP-WES2-0112.

Section 5.4.7 Control of Data

The laboratory shall have a procedure to ensure all LIMS users have unique login authentication credentials. The mechanism employed may be a unique username and password combination, or biometric authentication. Where passwords are used, the passwords shall be changed a minimum of once per year.

Physical access to servers shall be limited by security measures such as locating they system within a secured facility or room and/or utilizing cipher locks or key cards.

Section 5.5.5.2 Equipment Records

Records retained for equipment shall include instrument configuration and settings.

Section 5.7 Sampling

Subsampling procedures shall address recording the presence of extraneous materials present in samples. The procedure shall comply with recognized consensus standards, where applicable.

Section 5.8 Sample Management and Handling

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

The laboratory shall maintain procedures for communicating to all affected laboratory personnel when samples that require non-routine analysis, additional sample preparation steps, or customer-required deviations are received. Records of these communications shall be maintained.

Chemical preservation shall be checked at the time of sample receipt for all samples, unless it is not technically acceptable to check preservation upon receipt (e.g. VOA and Oil and Grease samples).

Samples that are completely consumed during analysis shall be recorded as such for their final disposition.

Section 5.9.1 Quality Control

For DoD, storage blanks are essential QC to monitor the storage of samples for volatile organic analysis (VOA). The SOP for storage of VOA samples must include a contamination monitoring program based on the performance of storage blanks.

A storage blank shall be stored with all volatile organic samples, regardless of suspected concentration levels. Storage blanks shall be used to determine if cross-contamination may have occurred. If cross-contamination greater than ½ LOQ (Methylene chloride, Acetone, 2-Butanone, greater than LOQ) is found in the storage blank, the laboratory shall implement the nonconforming work procedure. The laboratory shall have procedures and acceptance criteria for evaluating storage blanks appropriate to the types of samples being stored. The storage blanks shall be stored in the same manner as the customer samples. The storage blanks shall be analyzed every 14 days at a minimum.

Section 5.9.1.1.9 QC Acceptance Criteria and Control Limits

Control limits are monitored at least quarterly to identify shifts in mean recovery, changes in standard deviation, and emerging trends. The laboratory may use representative compounds for control charts to conduct trend analyses. The basis for selecting representative compounds shall be documented and shall be scientifically valid.

Section 5.10.2 Test Reports: Required Items

Unless specifically waived by the customer, reports shall include:

- LOQ and associated precision and bias at the LOQ, where determination of precision and/or bias at the LOQ is required and the LOD and LOQ verification data when the infrequent method option described in module 4 is used.
- Records of customer approval and technical justification for any waiver from QSM requirements shall be included in all affected reports
- All QC required by the method and specified in the applicable Appendix B Table, including acceptance criteria used by the laboratory.
- Case narrative identifying deviations of any calibration standards or QC sample results from acceptance limits and a discussion of the associated actions taken by the laboratory to address the deviation.
- Case narrative identifying a list of preparation batches for which no matrix spike and/or matrix spike duplicate were performed due to lack of adequate sample material
- Case narrative identifying occurrence of analytes for which manual integration occurred.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

8.2 Unregulated Contaminant Monitoring Rule 5 (UCMR5)

This addendum outlines additional policies and processes established by this laboratory to maintain compliance with UCMR 5 program specific requirements. These requirements are outlined in the UCMR 5 Laboratory Approval Requirements and Information Document. Data may not be uploaded to the Safe Drinking Water Accession and Review System (SDWARS) if it does not comply with these requirements.

Section 5.8.3: Sample Receipt Checks and Sample Acceptance Policy

Samples that are not received in a secure manner, are received in inappropriate containers, are received outside the required temperature range, are received outside the recognized holding time, are received with inadequate identification on sample containers and/or COC or are improperly preserved cannot be reported to SDWARS for UCMR compliance.

Section 5.8.3.1: Sample Receipt Checks - Thermal Preservation

Samples must be received at the laboratory within 48 hours of collection and must be ≤ 10oC. After arrival or within 48 hours of collection, whichever is sooner, the samples must be refrigerated at ≤ 6°C. Samples received more than 48 hours after collection are valid only if they are received at ≤ 6°C and the laboratory can obtain documentation from the client to verify that they were refrigerated between collection and shipment. Temperature requirements apply to all UCMR samples with the exception of metals by EPA 200.8.

Section 5.9.1.1.3: Method Blank

The method blank will be considered contaminated if the concentration of any target analyte in the method blank is greater than 1/3 the MRL for that analyte. If samples cannot be re-processed, then samples must be re-collected. Data with a failing method blank cannot be reported to SDWARS.

Section 5.9.1.1.4: Laboratory Control Sample (LCS)

If the LCS recovery fails, then all data for the problem analyte are considered invalid for all samples in the Extraction or Digestion Batch. Data associated with a failing LCS must not be reported to SDWARS. If the LCS surrogate or internal standard fails QC criteria, all data for the Extraction or Digestion Batch must not be reported to SDWARS.

Section 5.9.1.1.5: Matrix Spikes (MS/MSD)

A UCMR sample must be used as the parent sample for the MS/MSD in batches containing UCMR samples. The spike concentration of the MS/MSD must be alternated between a low- and mid-level concentration.

There are no method analyte recovery acceptance criteria specific for MS/MSD results. Data should not be rejected based on the recovery of the fortified target analytes or on the precision between the MS and MSD, provided internal standard and surrogate standard recoveries and all other QC results are valid. If surrogate or internal standard recovery fails criteria in the MS and MSD, do not report results. If one of the fortified samples fails QC, the results of the fortified sample that passes, should be reported as the MS. The entire analysis batch does not need to be reanalyzed because of a failure of a surrogate or internal standard in MS or MSD. Recollection of the field sample is not required with a surrogate or internal standard fails criteria in the MS/MSD.

COPYRIGHT © 2019-2023 Pace® Analytical Services, LLC.

Section 5.9.1.1.7: Surrogates

A sample that fails QC criteria for surrogate recovery should be rerun in case a mis-injection occurred. If the sample continues to fail surrogate QC criteria, the laboratory should process a new aliquot of the sample. Typically, data for samples with failed surrogate recovery must not be reported to SDWARS.

If the surrogate recovery fails the acceptance criteria in a MB or LCS, the MB or LCS may be reanalyzed later in the Analysis Batch. If surrogate recovery fails again, all field sample results for the associated Extraction Batch are invalid and must not be reported. If the surrogate recovery fails in an MB that is needed to pass an Analysis Batch, all data for that Analysis Batch are invalid and must not be reported. If possible, the laboratory should process new aliquots of the affected samples; if this is not possible, the affected field samples must be recollected. One LCS must pass surrogate recovery within a 24-h period of analysis. If not, the samples in the Analysis Batches that correspond to that required LCS, cannot be reported.

Section 5.9.1.1.8: Internal Standards

If the internal standard recovery in a sample fails the acceptance criteria, then the results for the analytes that are associated with the internal standard in that sample are invalid. Data that fail internal standard criteria must not be reported to SDWARS. If possible, the laboratory should process a new aliquot of the sample; if this is not possible, the field sample must be recollected.

For an Extraction Batch or Digestion Batch, if the internal standard recoveries in an MB or LCS fail the acceptance criteria, all data for the analytes that are associated with that internal standard in that Extraction Batch or Digestion Batch are invalid and must not be reported. If the internal standard recoveries in a MB or LCS fail the acceptance criteria in an Analysis Batch, all data for the analytes that are associated with that internal standard in the Analysis Batch are invalid and must not be reported. If possible, the laboratory should process new aliquots of the affected samples.

APPENDIX I

SITE MANAGEMENT FORMS

NYSDEC
Division of Environmental Remediation

NEW YORK STATE | Department of Environmental Conservation

Contract No.

DEC Insp. –

DEC PM –

Contractor Supt. –

Engineer PM –

Engineer Insp. –

Site Location:

Weather Conditions				
General Description		AM		PM
Temperature		AM		PM
Wind		AM		PM

Health & Safety
If any box below is checked "Yes", provide explanation under "Health & Safety Comments".

Were there any changes to the Health & Safety Plan?	*Yes	No	NA
Were there any exceedances of the perimeter air monitoring reported on this date?	*Yes	No	NA
Were there any nuisance issues reported/observed on this date?	*Yes	No	NA

Health & Safety Comments

Summary of Work Performed	Arrived at site:		Departed Site:	

Equipment/Material Tracking
If any box below is checked "Yes", provide explanation under "Material Tracking Comments".

Were there any vehicles which did not display proper D.O.T numbers and placards?	*Yes	No	NA
Were there any vehicles which were not tarped?	* Yes	No	NA
Were there any vehicles which were not decontaminated prior to exiting the work site?	* Yes	No	NA

Personnel and Equipment

Individual	Company	Trade	Total Hours

Equipment Description	Contractor/Vendor	Quantity	Used

Material Description	Imported/ Delivered to Site	Exported off Site	Waste Profile (If Applicable)	Source or Disposal Facility (If Applicable)	Daily Loads	Daily Weight (tons)*

Visitors to Site			
Name	**Representing**	**Entered Exclusion/CRZ Zone**	
		Yes	**No**
		Yes	**No**
		Yes	**No**
		Yes	**No**
		Yes	**No**
		Yes	**No**
		Yes	**No**
		Yes	**No**
		Yes	**No**

Site Representatives	
Name	**Representing**

Project Schedule Comments

Issues Pending

Interaction with Public, Property Owners, Media, etc.

Include (insert) figures with markups showing location of work and job progress

Site Photographs (Descriptions Below)	

Comments	
Site Inspector(s):	**Date:**

Videos of discreet operations have been provided to the DEC Project Manager to facilitate understanding of the ongoing work? Yes ☐ No ☐ N/A ☐

REMEDIAL ACTIVITIES AT OTHER PROPERTIES
[Residential, Adjacent, AWS, non-Site Properties]
(Section may be deleted for ongoing remedial sites)

1. Does the Department and its Contractor(s) have permission to enter the property or properties for the day's work?	Yes ☐	No ☐
2. Does anyone at this location have any symptoms of a respiratory infection (e.g., cough, sore throat, fever, or shortness of breath)?	Yes ☐	No ☐
3. Has anyone at this location been tested and confirmed to have COVID-19?	Yes ☐	No ☐
4. If Yes to 1, 2 or 3, follow the latest NYSDOH COVID-19 guidance: https://coronavirus.health.ny.gov/home	Yes ☐	No ☐
Comments:		

ON-SITE WASTE STORAGE

Drums, roll offs and piles are staged in secure areas?	Yes ☐	No ☐	N/A☐
Liners and berms have been installed if necessary to prevent cross contamination of clean areas?	Yes ☐	No ☐	N/A☐
Containers are in good condition or properly overpacked?	Yes ☐	No ☐	N/A☐
Waste materials are scheduled to be properly characterized and disposed of prior to demobilization?	Yes ☐	No ☐	N/A☐
Complying with RCRA 90 day storage limitation for hazardous waste?	Yes ☐	No ☐	N/A☐
Piles are securely covered when not in use?	Yes ☐	No ☐	N/A☐
Containers are closed when not in use?	Yes ☐	No ☐	N/A☐
Staging areas should be inspected periodically and any issues addressed immediately?	Yes ☐	No ☐	N/A☐
Signage and labeling comply with RCRA requirements for all staging areas and containers?	Yes ☐	No ☐	N/A☐
If any issues noted, has Contractor been notified?	Yes ☐	No ☐	N/A☐
Comments:			

NUISANCE CHECKLIST

Were there any community complaints related to work on this date?	Yes ☐	No ☐	N/A☐
Were there any odors detected on this date?	Yes ☐	No ☐	N/A☐
Was noise outside specification and/or above background on this date?	Yes ☐	No ☐	N/A☐
Were vibration readings outside specification and/or above background on this date?	Yes ☐	No ☐	N/A☐
Any visible dust observed beyond the work perimeter on this date?	Yes ☐	No ☐	N/A☐
Any visible contrast (turbidity) beyond engineering controls observed on this date?	Yes ☐	No ☐	N/A☐
Was turbidity checked at the outfall(s)?	AM ☐	PM ☐	N/A☐
Were any property owners NOT provided advance notice for work performed on this property on this date?	Yes ☐	No ☐	N/A☐

Was the temporary fabric structure closed at the end of the day?	Yes ☐	No ☐	N/A☐
Has Contractor failed to protect all foundations and structures adjacent to and adjoining the site which are affected by the excavations or other operations connected with performance of the Work?	Yes ☐	No ☐	N/A☐
If yes, has Contractor been notified?	Yes ☐	No ☐	N/A☐
Comments:			

RESILIENCE/GREEN REMEDIATION CHECKLIST

Is site power procured from renewable energy sources (e.g., solar, wind, geothermal, biomass and biogas)?	Yes ☐	No ☐	N/A☐
Is the Contractor employing 2007 or newer or retrofitted (BART*) diesel on-road trucks and non-road equipment?	Yes ☐	No ☐	N/A☐
Is vehicle idling adequately reduced per 6NYCRR Part 217-3?	Yes ☐	No ☐	N/A☐
Have equipment operators been trained in the idling requirements of 6NYCRR Part 217-3?	Yes ☐	No ☐	N/A☐
Is BART-equipped equipment properly maintained and working?	Yes ☐	No ☐	N/A☐
Is work being sequenced to avoid double handling?	Yes ☐	No ☐	N/A☐
Is there an onsite recycling program for CONTRACTOR-generated wastes and is it complied with?	Yes ☐	No ☐	N/A☐
Are office trailer heating and cooling systems maintained at efficient set points, have programable thermostats been installed?	Yes ☐	No ☐	N/A☐
Are products and materials used in performance of the work appropriately certified (e.g., LEED, Energy Star, Sustainable Forestry Initiative®, etc.)?	Yes ☐	No ☐	N/A☐
Are resiliency features included in the design, or completed remedy properly installed and/or maintained (flood control, storm water controls, erosion measures, etc.)?	Yes ☐	No ☐	N/A☐
Are green remediation elements included in the design, or completed remedy properly installed and/or maintained (e.g., porous pavement, geothermal, variable speed drives, native plantings, natural stream bank restoration, etc.)?	Yes ☐	No ☐	N/A☐
Has Contractor been notified of any deficiencies?	Yes ☐	No ☐	N/A☐
Are remote/call in job meetings being held in lieu of meeting in person where possible?	Yes ☐	No ☐	N/A☐
Comments:			

* BART – Best Available Retrofit Technology

SITE MANAGEMENT FORM

NYSDEC Site # 152016

Port Jefferson Station

Suffolk County, New York

Date/Time:_____

Reason for Inspection :_____

Inspector:_____

Inspection Item	Satisfactory/Unsatisfactory
Monitoring Well Integrity	
Are all Site monitoring wells visible?	
Are all surface seals present?	
Are protective casings/covers in good condition?	
Are any protective casings missing bolts?	
Change of Use	
Any indications of active construction at the property?	
Any indications of construction at adjacent properties?	
Waste Generation	
Any solid/water waste generation at the Site?	
Was waste kept on-site?	
Site Usage	
Is the Site being used for uses outside of commercial or industrial use?	
Is site groundwater being used without necessary water quality treatment from NYSDOH or Suffolk County DOH to render it safe for use as drinking water or industrial?	
Have any private wells been installed at the Site?	
Is the Site being used for vegetable gardening or farming?	

Comments:_____

_____

_____

_____

_____

_____

LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE #152016
LAI GWT SYSTEM INSPECTION CHECKLIST
PORT JEFFERSON, NY

Field Technician _____

Date _____

Time _____

SYSTEM PARAMETER	Flow Rate (gpm)	Totalizer Reading (gallons)	Water Table (feet)	Pressure at Well (psi)	pH	Temperature (c*)	Time	Comments
Extraction Well No. 1								
Extraction Well No. 2								
Extraction Well No. 3								
Injection Well No. 1								
Injection Well No. 2								
Injection Well No. 3								
Injection Well No. 4								
Injection Well No. 5								
PLC Totalizer Reading								

SYSTEM UNITS	Pressure IN (psi)	Pressure OUT (psi)	Comments
Bag Filter No. 1			
Blue LPGAC Unit 1			
Blue LPGAC Unit 2			
Fiberglass LPGAC Unit 1A			
Fiberglass LPGAC Unit 2A			

MAINTENANCE TASK	Check?	Comments
Change Bag Filters		
Check vapor GAC and stack for moisture collection and drain as necessary.		
Grease blower driveshaft bearings.		
Re-start and Update Computers		
Inspect well vaults for leaks.		

MISCELLANEOUS	Name		Representing	Reason for Visit
Visitors to Site				

Interaction with Public, Police? _____

Notes/Observations: _____

Monthly Test of Emergency Lights (30 seconds): _____

Annual Test of Emergency Lights (90 minutes): _____

Monthly inspection of fire extinguishers: _____

LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
INSPECTION CHECKLIST
GROUNDWATER TREATMENT SYSTEM
PORT JEFFERSON, NY

Old Mill Pond Facility

Plant Operator _____

Date _____

Time _____

SYSTEM PARAMETER	Flow Rate (gpm)	Totalizer Reading (gallons)	Water Table (feet)	Pressure at Well (psi)	Comments
Extraction Well No. 1					
Extraction Well No. 2					
Extraction Well No. 3					
Extraction Well No. 4					
Extraction Well No. 5					
Extraction Well No. 6					
PLC Totalizer Reading					

SYSTEM UNITS	Pressure IN (psi)	Pressure OUT (psi)	Comments
Bag Filter No. 1			
Bag Filter No. 2			
Blue LPGAC Unit 1			
Blue LPGAC Unit 2			

MAINTENANCE TASK	Check?	Comments
Change Bag Filters (No.of Filter Bags Used).		
Re-start and Update Computers.		
Inspect well vaults for leaks.		

MISCELLANEOUS	Name	Representing	Reason for Visit
Visitors to Site			

Interaction with Public, Police? _____

Notes/Observations: _____

Monthly Test of Emergency Lights (30 seconds): _____

Annual Test of Emergency Lights (90 minutes): _____

Monthly inspection of fire extinguishers: _____

APPENDIX J-1

LAI O&M MANUAL

MOVE YOUR ENVIRONMENT FORWARD

OPERATIONS AND MAINTENANCE PLAN AND MANUAL
(LAI GROUNDWATER TREATMENT SYSTEM)

Lawrence Aviation Industries – Site # 152016
100 Sheep Pasture Road
Port Jefferson Station, NY 11776

Prepared For:

New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, NY 12233-7012

Contract#: D009808, WA No. 27

Prepared By:

HRP Associates, Inc.
197 Scott Swamp Road
Farmington, CT 06032

HRP#: DEC1027.OM

Issued On: March 19, 2025

TABLE OF CONTENTS

1.0 INTRODUCTION 1

1.1 Operations and Maintenance Plan and Manual Organization 1
1.2 Remedial Action Objectives and Goals 2
1.3 Treatment System Overview 3
1.4 Project Organization and Staffing Plan 4

2.0 SITE DESCRIPTION AND HISTORY 5

2.1 Site Location and Description 5
2.2 Physical Setting 5
2.2.1 Land Use 5
2.2.2 Geology 5
2.2.3 Hydrogeology 6
2.3 Investigation and Remedial History 6

3.0 SITE PERMITS 8

4.0 SYSTEM COMPONENTS 9

4.1 Extraction Wells, Pumps, and Piping 9
4.2 Holding Tank Discharge Pump 11
4.3 Particle Filtration Units 12
4.4 Liquid Phase Granular Activated Carbon Units 12
4.5 Process Area Sump Pump 12
4.6 Discharge Locations 12
4.7 Process Control and Operations 13
4.8 Electrical Distribution 13
4.9 Heating, Ventilation, and Air Conditioning 14
4.10 Potable Water 14
4.11 Building and Landscaping 14
4.12 One-Call Markouts 15

5.0 SYSTEM OPERATIONS 15

5.1 Operator Interface 15
5.1.1 MAIN Screen 15
5.1.2 MOTORS Screen 16
5.1.3 CONTROLLERS Screen 17
5.1.4 WATER TABLE ELEVATION CALCULATION Screen 18
5.1.5 TREND Screen 19
5.2 Initial Conditions 20
5.3 Startup Sequence 20
5.4 Shutdown Sequences 21
5.4.1 Operator Shutdown 21
5.4.2 Controlled System Shutdown 21
5.4.3 Extended Shutdown 21

5.5 Emergency Procedures 22
5.5.1 Equipment Malfunction 22
5.5.2 Spill 22
5.5.3 Power Failure 22
5.5.4 Manual Shutdown 22
5.5.5 Evacuation 23
5.5.6 Emergency Contact Information and Hospital Location 23
5.5.7 Reporting Permit Non-Compliance, Chemical Spills, and Release of Contaminants to Groundwater 24
5.6 Carbon Change-Out Events 24

6.0 INSPECTIONS AND MAINTENANCE 25

6.1 System Inspections and Monitoring 26
6.2 System Maintenance 26
6.3 Injection Well Redevelopment 27

7.0 SAMPLING AND MONITORING ACTIVITIES 27

7.1 Performance and Compliance Monitoring 27

8.0 RECORD KEEPING AND REPORTING 28

8.1 Progress and Status Reports 28
8.2 Compliance Reporting 29

9.0 HEALTH AND SAFETY 30

10.0 REFERENCES 33

Figures

Figure 1 Site Location
Figure 2 Site Layout Map
Figure 2a Site Layout, LAI Treatment System
Figure 3 Treatment System Building Layout, LAI
Figure 4 Process Flow Diagram, LAI Treatment System

Exhibits (EMBEDDED IN TEXT)

Page

Exhibit 1 MAIN Screen 16
Exhibit 2 MOTORS Screen 17
Exhibit 3 CONTROLLERS Screen 18
Exhibit 4 WATER TABLE ELEVATION CALCULATION Screen 19
Exhibit 5 TREND Screen 20

Tables (EMBEDDED IN TEXT)

Page

Table 1 NYS Groundwater Quality Standards 3
Table 2 Project Contacts 4
Table 3 LAI GWE&T System SPDES Equivalent Permit Limits 8-9
Table 4-1 Extraction Well Construction Details 9-10
Table 4-2 Extraction Well Design and Typical Flow Rates 10
Table 4-3 Extraction Well Pump Design Data 11
Table 4-4 Extraction Well Pump Manufacturer and Distributor Contact Information 11
Table 4-5 Discharge Pump Design and Manufacturer 11
Table 4-6 Carbon Media Design Data 12
Table 5-1 Emergency Contact Information 23
Table 6-1 Treatment System Performance and Compliance Monitoring Schedule 28

Appendices

Appendix A LAI Treatment System As Builts
Appendix B NYSDEC State Pollutant Discharge Elimination System Permit Equivalent
Appendix C Equipment Manuals
Appendix D Monthly O&M Inspection and Sample Log

GENERAL INFORMATION

Project/Site Information:
Lawrence Aviation Industries
100 Sheep Pasture Road
Town of Brookhaven
Port Jefferson Station, NY 11776

Consultant Information:
HRP Associates, Inc.
197 Scott Swamp Road
Farmington, CT 06032
Phone: (860) 674-9570
Fax: (860) 674-9624
E-mail: derek.roy@hrpassociates.com
Project Number: DEC1027.OM

Client Information:
New York State Department of Environmental Conservation
625 Broadway
Albany, NY 12233

Report Date: March 19, 2025

Report Author:
Chris Tedder
Senior Project Manager

Client Manager:
Derek Roy, PG
Project Manager

EP Certification:

I Derek Roy certify that I am currently a New York State Qualified Environmental Professional as in defined in 6 NYCRR Part 375 and that this Operations and Maintenance Plan was prepared in accordance with all applicable statutes and regulations.

Derek Roy, PG
Project Manager

1.0 INTRODUCTION

This Operations and Maintenance (O&M) Plan and Manual has been prepared by HRP Associates, Inc. (HRP) for the Lawrence Aviation Industries (LAI) groundwater extraction and treatment (GWE&T) system operating at the LAI Site (No. 152016), located at 100 Sheep Pasture Road (**Figure 1**), Town of Brookhaven, Port Jefferson Station, New York ("Site"). **Figure 2** depicts the Site and local area. This O&M Plan and Manual has been prepared under the New York State Department of Environmental Conservation (NYSDEC) Contract# D009808, Work Authorization (WA) No. 27.

This document is intended to be the primary reference for the O&M of the GWE&T system. The O&M specifications for key system components are described in this document. The document must be read in conjunction with the following project planning documents:

- *Site Specific Health and Safety Plan (HASP)-Revised* (HASP, HRP, 2023)
- *Site Management Plan* (SMP; HRP, 2025)
- *Quality Assurance Project Plan* (QAPP, HRP, 2025)

This document may be updated periodically to reflect any changes in operating, sampling, or reporting procedures that are introduced in the future.

1.1 Operations and Maintenance Plan and Manual Organization

The text of this report is divided into eleven sections. Immediately following the text are the references, figures, and appendices. A summary of each report section is provided below.

Section 1.0 – Introduction: The purpose and organization of the O&M Plan and Manual, the remedial action objectives (RAOs), an overview of the treatment system, and the organization and staffing plan for the project.

Section 2.0 – Site Description and History: Provides a description of the site and the historical operations.

Section 3.0 – Site Permits: Describes the permits required for system operation.

Section 4.0 – System Components: Describes each remedial system component and its operation.

Section 5.0 – System Operations: Describes the procedures for system start-up and shutdown.

Section 6.0 – Inspections and Maintenance: Summarizes the system maintenance requirements and inspections. This section also discusses the warrantees for the treatment plant.

Section 7.0 – Sampling and Monitoring Activities: Provides a summary of the system sampling and monitoring activities, including performance and compliance sampling.

Section 8.0 – Record Keeping and Reporting: Summarizes the remedial system record keeping and reporting requirements.

Section 9.0 – Health and Safety: Provides a summary of the O&M health and safety (H&S) requirements.

Section 10.0 – References: Material references within the O&M Manual.

1.2 Remedial Action Objectives and Goals

The RAOs for the Site as listed in the Record of Decision (ROD) dated September 29, 2006.

The RAOs for the treatment system are to restore the groundwater aquifer to drinking water quality and prevent human ingestion of contaminated groundwater. These objectives are met by extracting contaminated groundwater, treating it through granular activated carbon (GAC), then discharging the treated water to the injection wellfield.

RAOs for Groundwater

- Prevent or minimize potential, current, and future human exposures including inhalation, ingestion, and dermal contact with volatile organic compound (VOC)-contaminated groundwater.
- Minimize the potential for offsite migration of VOC-contaminated groundwater.
- Restore groundwater to levels which meet New York State (NYS) Groundwater and Drinking Water Quality Standards within a reasonable time frame.
- Prevent or minimize VOC-contaminated groundwater from discharging into Port Jefferson Harbor.

RAOs for Soil

Prevent or minimize human exposure with soils having polychlorinated biphenyl (PCB) contaminant concentrations in excess of soil cleanup objectives:

- Manage ecological risks.

RAOs for Surface Water

- Prevent or minimize potential, current, and future human exposures including inhalation, ingestion, and dermal contact with VOC-contaminated surface water.
- Restore surface water to levels which meet Surface Water Quality Standards within a reasonable time frame.
- Prevent or minimize VOC-contaminated surface water that exceeds water quality standards from discharging into Port Jefferson Harbor.

RAOs for Sediment

Potential risks to ecological receptors from exposures to the VOCs detected in sediment were determined to be low and after remediation of groundwater, Site-related VOC contamination will not persist in the surface water sediments. Therefore, no remedial action was required for surface water sediments in Old Mill Pond (OMP) and Old Mill Creek.

The following RAOs have been identified for LAI Facility catch basin sediments:

- Prevent current and future ecological and human exposures to contaminated sediment.
- Prevent or minimize the potential release of contamination in catch-basin sediments to soil and/or groundwater.

The NYS Groundwater Quality Standards for site related VOCs and associated daughter products are presented in **Table 1**.

Table 1
NYS Groundwater Quality Standards (TOGS 1.1.1)

Parameter	New York Groundwater Quality Standards (µg/L)
Vinyl Chloride (VC)	2
Tetrachloroethene (PCE)	5
Trichloroethene (TCE)	5
cis-1,2-Dichloroethylene (cis-1,2-DCE)	5
1,1,1-Trichloroethane (1,1,1-TCA)	5
1,1-Dichloroethane (1,1-DCA)	5
1,1-Dichloroethylene (1,1-DCE)	5
Chloroform	7
µg/L: micrograms per liter	

1.3 Treatment System Overview

The LAI GWE&T system includes three extraction wells (EW-01, EW-02, and EW-03) that extract groundwater from the contaminated portion of the aquifer, for a total influent flow rate of approximately 80 to 100 gallons per minute (GPM). The combined influent groundwater is pumped to the treatment building, where the water passes through particulate bag filters and then passes through four liquid phase GAC (LPGAC) vessels where the VOCs are stripped out of the water. Treated water is discharged to five injection wells (IW-01 through IW-05) in the injection wellfield.

The treatment system is highly automated for control, monitoring, alarms, and shutdowns. Further details for the system components and controls, and operation of the treatment system, are included in **Sections 4.0** and **5.0**.
The LAI GWE&T system, treatment wells, and conveyance piping are shown on **Figure 2a**. The site layout for the LAI system is shown on **Figure 3** and the layout of the treatment system building

depicting the treatment system process water components, system instrumentation, and process piping are shown is shown on **Figure 4**. The treatment system as-built drawings are presented in **Appendix A**.

1.4 Project Organization and Staffing Plan

The LAI treatment system construction was completed, and operation began in 2010. HRP assumed O&M activities on behalf of NYSDEC in September 2021. The project is staffed by qualified personnel to ensure the treatment system is operated and maintained to meet the RAOs.

A minimum of two treatment system operators will be available to travel to the Site to perform O&M tasks. One operator will act as the person responsible for routine plant operation, responding to system shutdowns, et cetera (etc.), and the second operator will serve as a backup in the event the primary operator is unavailable, or additional resources are needed to complete O&M tasks. The operator will perform monthly monitoring of the treatment system and will respond to alarm conditions as soon as possible.

A minimum of two people will be onsite for periodic O&M tasks when safety concerns or Site operations warrant, in accordance with the approved site-specific HASP. When a single person travels to the Site to perform O&M tasks, a security check-in/check-out notification will be implemented.

The primary persons responsible for ensuring the continued operation of the treatment system are shown in **Table 2**.

TABLE 2

Name	Project Role	Company	Phone	Email
Payson Long	DEC Site Project Manager	NYSDEC Central Office (Albany)	518-402-9651	payson.long@dec.ny.gov
Mark Sergott	Environmental and Exposure Evaluation	NYS Department of Health (NYSDOH)	518-402-7860	mark.sergott@health.ny.gov
Derek Roy	HRP Project Manager	HRP	860-773-3633	Derek.Roy@hrpassociates.com
Mark Wright	HRP Contract Manager	HRP	518-978-2380	Mark.Wright@hrpassociates.com
Thomas Battles	HRP Engineering Practice Leader	HRP	860-470-2724	Thomas.Battles@hrpassociates.com
Joel Hara	HRP Field Team Leader	HRP	860-773-3618	Joel.hara@hrpassociates.com
David Adam	HRP Field Team Leader – Alternate	HRP	860-773-3610	david.adam@hrpassociates.com

2.0 SITE DESCRIPTION AND HISTORY

2.1 Site Location and Description

The Site is located in Port Jefferson Station, Suffolk County, New York and is formerly composed of six parcels comprising approximately 124 acres. The site is bounded by The Long Island Railroad (LIR) and Sheep Pasture Road to the north, the Setauket Greenway and wooded area to the southeast, and primarily residential homes to the east and to the west (**Figure 2**).

In 2025, NYSDEC is reclassifying the Site from Class-2 to a Class-4 Site including a boundary modification. The Class-4 Site will be modified to be an approximate 5.50-acre area along the west-central, western, and southern property boundaries. The Class-4 Site includes the groundwater treatment facility, conveyance piping, utilities, and treatment area that includes approximately 25 wells used for ongoing treatment and monitoring.

2.2 Physical Setting

2.2.1 Land Use

The Site consists of the following: the 38-acre former LAI Industrial Facility composed of three parcels (159-1-26, 159-2-19, and 180-4-1-0 on the Suffolk County Tax Map) which currently includes the water treatment facility and the former industrial operations area. Lawrence Aviation Drive is included at the LAI Facility as the access road that connects the site entrances at Park Avenue and Sheep Pasture Drive. The remainder of the Site includes undeveloped wooded areas referred to as the LAI outlying parcels (159-2-20, 136-2-22, 180-4-2-1, and 180-4-22). As of 2025, following the Site reclassification and boundary modification, the outlying parcels are no longer associated with Site operations. Access will be established for 180-4-1-0 to continue to operate and maintain the five injection wells on that Parcel. The Site is zoned as commercial/ light industrial, and is currently vacant with proposed redevelopment plans by the current owner, Suffolk County Land Bank (SCLB).

2.2.2 Geology

The Site is located on a localized plateau at the top of the Harbor Hill moraine. Ground surface topography reaches an elevation of 271 feet above mean sea level (ft amsl) immediately north of the Site and drops to sea level at Port Jefferson Harbor, approximately 1.3 miles north of the Site. The Site area is relatively hilly, with rolling hills and valleys, compared with the topography to the west and south, which is predominantly flat. The Site is directly underlain by 325 to 350 feet of Pleistocene-age glacial deposits. The upper seventy feet of glacial material is composed of till of the Harbor Hill moraine, composed primarily of sand and gravel with occasional lenses of silty sand and silt. The Harbor Hill moraine is the terminal moraine of the most recent Wisconsin glacial advance. The moraine deposits thin to the south and to the north of the Site. Ten to twenty feet of recent alluvium are present near OMP and Old Mill Creek in the downgradient plume area, comprised of silty sand, peat, and clay. The Upper Glacial deposits range in thickness from more than 300 feet at the LAI facility to approximately 100 feet at Port Jefferson Harbor.

2.2.3 Hydrogeology

The Upper Glacial aquifer is generally under unconfined conditions and the upper limit is defined by the water table. Synoptic groundwater level data from the 2008 baseline and subsequent monitoring events were used to evaluate the horizontal and vertical distribution of hydraulic head at the site. It was determined that groundwater flows from the LAI facility to the north, toward Port Jefferson Harbor under an average hydraulic gradient of approximately 0.0048 feet per foot (ft/ft). Viewed in cross-section, along the approximate centerline of the plume, a downward vertical hydraulic gradient is evident at the LAI facility that changes to an upward gradient further to the north, in proximity to Port Jefferson Harbor. These vertical gradients are indicative of groundwater recharge and discharge zones. The Upper Glacial aquifer appears to be under artesian conditions at MPW-09, which is near the OMP treatment facility. The local artesian conditions are believed to be a result of low permeability silts, clay lenses, and silty sands in that area. Submarine groundwater discharge into Port Jefferson Harbor is unlikely; however, diffuse discharge along the shoreline, within the high and low tidal extents, is more likely. Diffuse discharge in the vicinity of OMP is suggested by the upward vertical hydraulic gradient, artesian wells, natural springs that are developed along the escarpment, localized pond features, and transition to overland flow in drainages north of the escarpment.

2.3 Investigation and Remedial History

Historical uses of the Site include a turkey farm owned by LAI's corporate predecessor, Ledkote Products Co. of New York. In 1951, Ledkote Products Co. established a business operation at the Site to produce lead gutters and downspouts for roof drains. In 1959, the business was re-established as LAI and began manufacturing titanium sheet metal for the aeronautics industry and other consumer products. The LAI industrial facility ceased operations in 2004.

Past disposal practices resulted in releases of various contaminants including TCE, PCE, acid wastes, oils, sludge, grease, heavy metals, and other industrial plant wastes. Initial investigations conducted in the vicinity of the site suggested that releases of hazardous substances from the facility had affected site soils, groundwater, sediments, and surface water downgradient of the site.

The following narrative provides a remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the Site. Full titles for each of the reports referenced below are provided in Section 8.0 of HRP's *Site Management Plan*.

Limited Remedial Investigation [RI] Report, LAI Site, Prepared by NYSDEC, dated May 1997

Preliminary Remedial Investigation Report, LAI Site, Prepared by Camp Dresser & McKee (CDM), dated May 2000

Several investigations led by Suffolk County and the NYSDEC concerning contamination of the LAI industrial facility were conducted during the 1970s and 1980s. During these studies, fluoride, toluene, carbon tetrachloride, and metals were detected in samples collected from sumps, puddles, laboratory cesspools, and surface water runoff at the LAI facility. Fluoride, nitrates, TCE, 1,1-DCE, cis-1,2-DCE, PCE, and metals were detected in groundwater samples collected from adjacent residential wells. The NYSDEC Region 1 Resource Conservation and Recovery Act Hazardous Substance Group oversaw a major drum removal action at the site in 1991. The Suffolk County

Water Authority, under contract with the NYSDEC, connected homes affected by groundwater contamination attributed to LAI to public water supplies throughout the 1990s. NYSDEC conducted a limited RI in 1997. The results of this investigation revealed that chlorinated VOCs (CVOCs) were present in the groundwater and surface water.

Final Remedial Investigation Report/Feasibility Study [FS], LAI Site, Prepared by CDM, dated March 2006

In April 2003, NYSDEC performed a multi-media inspection of the LAI site as a result of previous findings of contamination. NYSDEC documented violations of air, soil, solid waste, chemical bulk storage, and hazardous waste regulations. LAI was ordered by NYSDEC to cease production until all violations were resolved. The property has been inactive and unoccupied since 2004.

The U.S. Environmental Protection Agency (EPA) conducted an RI at the site from August 2003 to May 2005 which documented a CVOC plume and identified PCB-contaminated soil at the site. During the RI, the EPA's Region 2 Removal Action Branch removed approximately 1,300 drums, cylinders, and other containers containing various flammable solids, acids, bases, gases, and unknown compounds, and inventoried the laboratory area, identifying at least 390 containers. Approximately 13.5 tons of transformers and capacitors filled with suspected PCB liquid were removed from the site and disposed of as part of the 2004 removal action.

A FS was completed in July 2006 by CDM Smith, which presented remedial alternatives for groundwater, soil, surface water and sediment. A ROD for the Site that addressed both soil and groundwater was signed on September 29, 2006. The soil and sediment remedies were completed in March 2011 and included excavation and removal of approximately 16,000 tons of contaminated material and soil from the Site. The groundwater remedy included the installation of the two groundwater extraction and treatment systems, one at LAI and the second within the plume area near OMP. The treatment system at the LAI property is designed to capture and treat contaminated groundwater to drinking water standards and to minimize further downgradient migration of the groundwater plume. The downgradient treatment system located near OMP is designed to capture and treat contaminants in groundwater that have migrated from the LAI property and to minimize contaminated water from discharging into OMP, Old Mill Creek, and Port Jefferson Harbor.

Remedial Action Report, Groundwater Extraction and Treatment System for the Groundwater Remedy on the LAI Property, Prepared by CDM, dated August 2011

The soil and sediment remedies were completed in March 2011 and included excavation and removal of approximately 550 tons of PCB-contaminated material from the site. The groundwater remedy included the installation of two groundwater extraction and treatment systems: one at LAI and one at OMP and in situ chemical oxidation (ISCO) injections at the LAI onsite source area.

Remedial Action Report, LAI Site, Prepared by the EPA Removal Support Team 3, dated September 2014

Additional excavation of PCB-impacted soils was completed in July 2013, December 2013, and January 2014. Nine designated areas of concern were excavated by the EPA. Post excavation soil samples were collected and analyzed for PCBs to determine the extent of each excavation. The EPA also removed and disposed of sludge and liquid wastes from the Electrode Melt Facility that contained

PCBs, in addition to 28 drums filled with lubricant waste and disposal of a roll-off container of waste sludge.

Final 2017 Comprehensive Sampling Report, LAI Superfund Site, Prepared by HDR Engineering, Inc. (HDR), dated March 2018

A third extraction well was installed at the downgradient OMP groundwater treatment facility and became operational in 2014. In 2017, multiple upgrades to the OMP treatment facility plumbing and system flow capacity were completed. Groundwater samples were collected to measure the performance of the two remediation systems in 2017. Based on dissolved oxygen and positive ORP levels observed in most groundwater samples collected in 2017, it was determined that decreases in contamination are primarily due to remedial activities performed at the Site and not natural attenuation.

Recent Site History and Progress

All remaining transformers were drained and removed from the Site during the 2023-2024 site demolition activities. Between October 2023 and February 2024 site demolition activities were performed and all Site structures were demolished and removed, including all remaining buildings, transformers, equipment, machinery, propane aboveground storage tanks (ASTs), and associated wastes which were disposed of and/or recycled offsite. Additionally, as part of demolition activities, machinery pits and sumps were properly drained of fluids, trash removed, cleaned, and abandoned in place by breaking up the bottom of each pit to allow for water infiltration and then backfilled to grade with recycled concrete aggregate (RCA).

In addition to the demolition activities, HRP performed sampling of all known and accessible Site sanitary structures, cesspools, and dry wells. The former building foundations, sanitary systems, and two underground storage tanks (USTs) remaining at the Site are slated for abandonment in the year 2025.

3.0 SITE PERMITS

Extracted groundwater is treated by LPGAC and re-injected into the aquifer via five injection wells (IW-01 through IW-05) under a NYSDEC State Pollutant Discharge Elimination System (SPDES) permit equivalent. The SPDES equivalent permit has an effective date of June 14, 2021, and expires on June 13, 2026. The permit discharge limits are below in **Table 3** and a copy included in **Appendix B**.

Table 3
LAI GWE&T System SPDES Equivalent Permit Limits

Outfall and Parameters	Frequency	Daily Max Limits Discharge Limit	Unit
Flow	Continuous	200	GPM
Flow	Continuous	monitor	GPD
pH	Weekly	5.1-8.5	SU
1,1-Dichloroethane (1,1-DCA)	Monthly	5	µg/L

Table 3 LAI GWE&T System SPDES Equivalent Permit Limits			
Outfall and Parameters	**Frequency**	**Daily Max Limits Discharge Limit**	**Unit**
cis-1,2-Dichloroethylene (cis-1,2-DCE)	Monthly	5	µg/L
1,1,1-Trichloroethane (1,1,1-TCA)	Monthly	5	µg/L
Trichloroethene (TCE)	Monthly	5	µg/L
Tetrachloroethene (PCE)	Monthly	5	µg/L
Aluminum	Monthly	2	µg/L
Chromium, Total	Monthly	100	µg/L
Fluoride	Monthly	3	mg/L
Iron	Monthly	600	mg/L
Lead, Total	Monthly	50	µg/L
Manganese	Monthly	600	µg/L
Nickel, Total	Monthly	200	µg/L
Sum of Iron and Manganese	Monthly	1	µg/L

4.0 SYSTEM COMPONENTS

The treatment system consists of three active groundwater extraction wells, a 1,071 square foot, above grade building that houses the treatment system equipment, and discharge piping to the injection wellfield. The treatment system building also contains all of the electrical distribution equipment, instrumentation and control equipment for the groundwater treatment process, and other building support systems.

4.1 Extraction Wells, Pumps, and Piping

The treatment system utilizes three active groundwater extraction wells: EW-1, EW-2, and EW-3. The extraction wells are located along the western boundary of the LAI property. The locations of the extraction wells are presented on **Figure 2a**. The treatment well construction details are provided below in **Table 4-1**.

Table 4-1 Extraction Well Construction Details							
Well Number	**Top of Casing Elevation (ft amsl)**	**X Coordinate**	**Y Coordinate**	**Well Diameter (inches)**	**Top of Screened Interval (ft bgs)**	**Bottom of Screened Interval (ft bgs)**	**Well Depth (ft bgs)**
EW-1	219.30	1241213.95	278985.42	10	182* 238*	222* 248*	252
EW-2	222.61	1241367.23	279180.5	10	182* 229*	214* 240*	250

Table 4-1
Extraction Well Construction Details

Well Number	Top of Casing Elevation (ft amsl)	X Coordinate	Y Coordinate	Well Diameter (inches)	Top of Screened Interval (ft bgs)	Bottom of Screened Interval (ft bgs)	Well Depth (ft bgs)
EW-3	228.25	1241397.043	278955.772	6	185	225	230

- Each well is constructed of polyvinyl chloride (PVC) pipe
- ft bgs: feet below ground surface
- X and Y coordinates are in NYS Plane-Long Island, Datum: NAD83, units of feet
- *: indicates the approximate elevations of the upper and lower well screens intervals

The layout of the extraction wells was selected to provide hydraulic control of the groundwater plume and to recover VOC-impacted groundwater for treatment. Groundwater is extracted from each well using a submersible groundwater pump. Each pump has a variable frequency drive (VFD) motor that allows the pump operation to be adjusted to the desired flow rate. A water level transducer is located in each extraction well to provide water level inputs to the Pro Logic Control Unit (PLC). Extraction well flow rate information is displayed by the human-machine interface (HMI).

Table 4-2 provides the design flow rates for each of the active extraction wells. The extraction well flow rates have been adjusted as necessary based on the field monitoring of water levels and an evaluation of the contaminant plume. The extraction well pumping rates are evaluated and optimized to achieve maximum contaminant removal from the aquifer that is within the capacity of the treatment system.

The design flow rate for the extraction wells is 150 GPM. They can operate up to a flow rate of 200 GPM. The current influent flow rate for the treatment system is approximately 60-90 GPM.

Table 4-2
Extraction Well Design and Typical Flow Rates

Well Number	Design Flow Rate (GPM)	Typical Operation Flow Rate (GPM)
EW-1	40	30
EW-2	75	30
EW-3	35	30
Total	150	90

Inside the treatment building, pipes from the three extraction wells terminate at the holding tank, to be pumped to the LPGAC vessels. The individual well pipes contain sample ports for process water sampling.

Table 4-3 provides manufacturer name plate data for each of the extraction well pumps.

Table 4-3 Extraction Well Pump Design Data		
	EW-1 and EW-2	**EW-3**
Manufacturer	Grundfos	Grundfos
Model	85S150-10	77S50-10
Size, inches	6	4

Table 4-4 provides manufacturer and distributor contact information.

Table 4-4 Extraction Well Pump Manufacturer and Distributor Contact Information		
Manufacturer	Grundfos Pump Corporation 17100 West 118th Terrace Olathe, KS 66061 Phone: 913-227-3400 Fax: 913-227-3500	
Local Area Representative	NY Pump and Motor Repair, 144 Centre Street, Brooklyn, NY 11231 Phone: 718-768-8700	Morris Industries, 777 NJ Route 23 Pompton Plains, NJ 07444 Phone: 973-835-6600

The manufacturer's equipment information and O&M manual for the extraction well pumps are contained in **Appendix C**.

4.2 Holding Tank Discharge Pump

Process water from the holding tank is pumped through two bag filter units to remove particulate matter prior to treatment in the LPGAC vessels. The holding tank centrifugal discharge pump is powered by a variable-frequency drive motor to allow adjustments for the speed of the pump to maintain water flow through the LPGAC units.

Table 4-5 Discharge Pump Design Data	
Manufacturer	Absolute Water Pumps
Model	4250-95
Number of units	1
Capacity (GPM)	330
Motor, hp	10
Electrical requirements	3-phase
Equipment Manufacturer	Absolute Water Pumps 1901 Bell Avenue, Suite 6, Des Moines, Iowa 50315 Phone: 888-264-2241

The manufacturer's equipment information and O&M manual for the holding tank discharge pump are contained in **Appendix C**.

4.3 Particle Filtration Units

The treatment system includes two particle filter units to remove particulate matter from water prior to treatment in the LPGAC vessels. The particle filters minimize the amount of fouling in the LPGAC vessels and injection wells. Two Cary Company units, model number 24-30-6F-3-150-CS-BS-PB-DP, each with six size #2 bag filters.

4.4 Liquid Phase Granular Activated Carbon Units

Four LPGAC units treat the extracted groundwater to meet the NYSDEC SPDES permit equivalency limits. LPGAC Units 1 and 2 contain 1,000 pounds (lbs) each of virgin coconut GAC and Units 1A and 2A each contain 600 lbs of virgin coconut GAC, for a total of 3,200 lbs of GAC. The LPGAC carbon media adsorbs the VOCs as the water passes through the carbon beds. Each of the LPGAC units has a differential pressure indicating transmitter to monitor the differential pressure across the carbon vessel.

Flow is manifolded to LPGAC Units 1 and 2, then from Unit 1 to Unit 1A, and from Unit 2 to Unit 2A. Shutoff valves are present on the upstream and downstream sides of the flow through Unit 1/1A and Unit 2/2A to allow for carbon media change-out without taking the system offline.

Table 4-6
Liquid Phase Carbon Media Design Data

Manufacturer	Carbon Activated Corporation
Model	10007-55
Mesh Size	8 x 30
Material	Activate carbon Coconut Shell
Expected Contaminant Removal Percent (%)	> 99%
Media Replacement Firm	Carbon Activated Corporation 3774 Hoover Road Blasdell, NY 14219 Phone: 716.821.7830

4.5 Process Area Sump Pump

The process area includes a sump to collect water that is drained from treatment system components for maintenance activities, etc. The sump contains a submersible sump pump to transfer water into the treatment system.

4.6 Discharge Locations

After the water has passed through the particle filters and LPGAC vessels, the effluent is discharged to a field of five injection wells located hydraulically upgradient of the site. The injection well locations are depicted on **Figure 2a**.

4.7 Process Control and Operations

The facility equipment is primarily monitored and controlled via a control panel located in the control room inside the treatment system building. This panel is equipped with a programmable logic controller (PLC) system to execute automatic control logic and an HMI to display equipment status, alarms, and input/output diagnostics; to enter operational parameters (operating mode (automatic or manual), set points, etc.); to compile system data trends; and to historically log data. The system can be remotely accessed via a secure internet connection.

The color of motors, valves, and level switches indicates their current operating status. For valves and motors, green indicates operational/within the established parameters and gray indicates not operating/outside of established parameters.

Extraction well pumps are controlled by the water level in the well, the status of the holding tank, and the established flow rate set point on the HMI. The well pumps will turn off if the water level decreases to the established "stop" water level set point, or if the holding tank discharge pump is shut down or disabled.

The manufacturer's equipment information and O&M manuals for instrumentation and controls system items are included in **Appendix C**.

The LAI treatment system has multiple alarms to shut down the treatment process:

- No Flow: A no flow issue indicates a pump failure or clogged LPGAC units and stops the extraction wells from pumping more contaminated water into the holding tank. A controlled system shutdown will occur if a no flow condition is detected.
- Holding Tank Water High Level: A high-water level alarm in the holding tank indicates a holding tank discharge pump failure or clogging of the particle filter units. A controlled system shutdown will occur if a water high level condition is detected.
- Extraction Well Low Flow: A low flow issue indicates a pump failure or a piping leak between the pump and the flow meter. A controlled system shutdown will occur if a low flow condition is detected.

4.8 Electrical Distribution

The treatment system receives its power from a single 480-volt feed from Public Service Energy Group (PSEG Long Island). The power is fed to a single motor control center where the power is branched out to the individual loads. The treatment system is not equipped with any alternative power sources to power the treatment system or building.

As-Built drawings "Power Connection #1" and "Power Connection #2" in **Appendix A** illustrate the power distribution and the power panel schedule.

The site also has internet communications. The internet and ISL Online Software are used to remotely monitor the treatment system. The telephone and internet communication service is provided by Verizon.

4.9 Heating, Ventilation, and Air Conditioning

The heating system in the treatment system building consists of a geothermal heater. The treatment system building also contains exhaust fans for regulating the building temperature in warm weather and a wall-mounted heater in the bathroom.

4.10 Potable Water

Potable water taps are present in the treatment building. In the treatment building, the potable water system is protected by one reduced pressure zone backflow prevention device. The device prevents contamination of the potable water distribution system by the treatment system if a siphon is created. The primary use of potable water is for the restroom in the treatment building and for cleaning.

4.11 Building and Landscaping

The treatment system building is approximately 1,071 square feet in area. The treatment building is a pre-engineered metal structure. The sanitary system is composed of gravity lines. The floor drain in the bathroom discharges to the sanitary system and the floor drain in the process room drains to the building sump, which discharges to the treatment system.

When pumping out the building sump, to increase the flow rate of the building sump pump, the flow from the extraction wells can be temporarily reduced. This will allow the sump pump to increase the amount of water it pumps into the treatment stream. After the building sump pump is stopped, the extraction well pumps should be checked, and their flow rates may need to be adjusted to ensure they are pumping at their desired flow rates.

The perimeter fence, locks, and other security items should be checked for integrity and operation. The surrounding vegetation will be kept in a neat and orderly manner. Specifically, the contractor will:

- Cut brush and weeds in all areas within the GWE&T building fence as necessary to maintain proper working conditions and site appearance, including mowing of all grassed areas a minimum of six times per year within the fence and adjacent to the access road.
- Properly dispose of all litter, cut brush and weeds, and other similar onsite generated waste.
- Immediately repair minor onsite soil erosion within the site fence to prevent major erosion problems.
- Maintain a litter-free site at all times.
- Maintain neat and clean work areas and equipment at all times.
- Keep trash, debris, and rubbish picked up from the floor, walkways, stairways, and passageways.
- Keep walkways free of grease and oil. Keep all roads, drives, and parking areas clear and clean; provide repairs to the parking lot and other areas, if damaged.

- Provide snow removal for the parking area and building entrance to afford continuous operations. If required, ice should be physically removed or have salt placed on it to melt the ice to prevent slips and falls.

4.12 One-Call Markouts

The contractor shall be responsible for performing New York One-Call markouts for the underground extraction well headers and the discharge piping in response to markout requests. Operations personnel receive notifications from New York 811 that provide notice of any planned excavation activities in the area of the groundwater treatment facility or associated buried utilities. Markouts shall be conducted promptly.

5.0 SYSTEM OPERATIONS

This section of this O&M Manual provides guidance on system startup, shutdown, and what actions to complete in case of an emergency. This section also contains guidance for what actions are required to perform a GAC media change out for the LPGAC units.

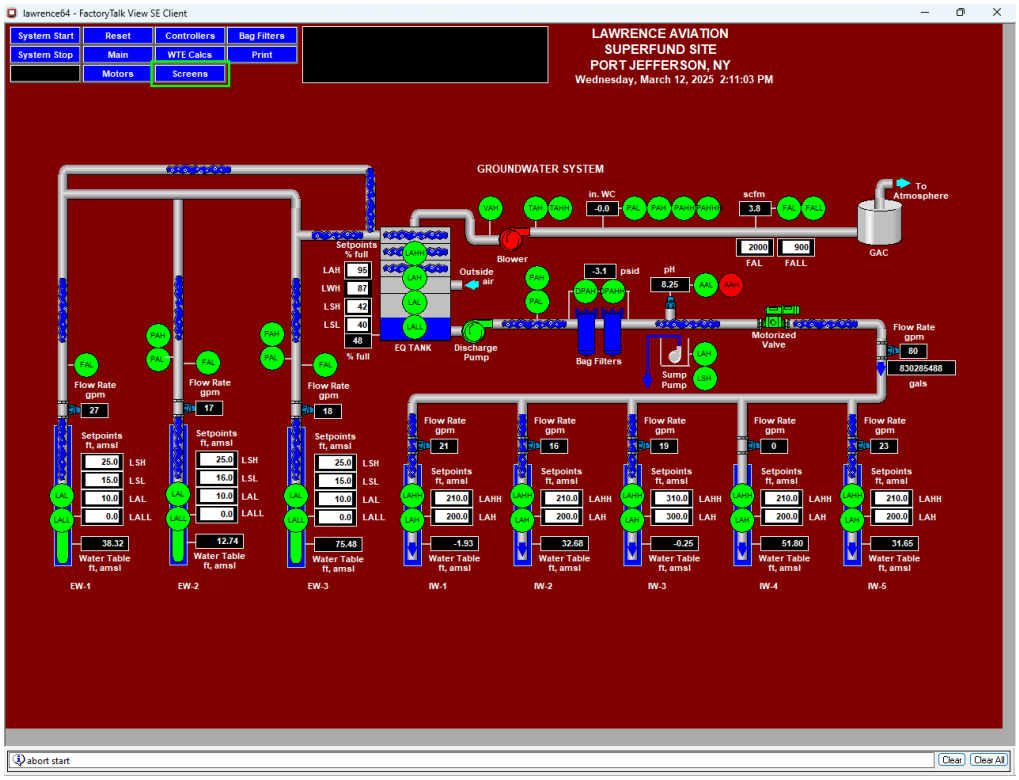
The GWE&T system is fully automated. Operations are controlled by an Allen Bradley Compact Logix 5380 PLC. A C-More EA9-T15CL-R touch screen HMI provides access to the system controls by the operator. The system controls are the same as described in the previous O&M Manual (CDM Smith Federal Programs and Arrowhead Contracting, Inc., 2011), with the exception of additional display and operations functionality for groundwater extraction well EW-3.

5.1 Operator Interface

5.1.1 MAIN Screen

The MAIN screen (**Exhibit 1**) includes all of the process equipment controlled by the PLC, analog and discrete input/output, and alarm conditions for the system. The functionality of this screen includes real-time numerical displays of water table elevation in extraction wells and injection wells, influent groundwater flow rate, totalized influent, and effluent gallons at holding water tank, and motor status. To access the other operator interface (OI) screens, the operator clicks one of the buttons at the top, which are common to all screens, or the SCREENS button, which brings up a list of all screens configured in the OI.

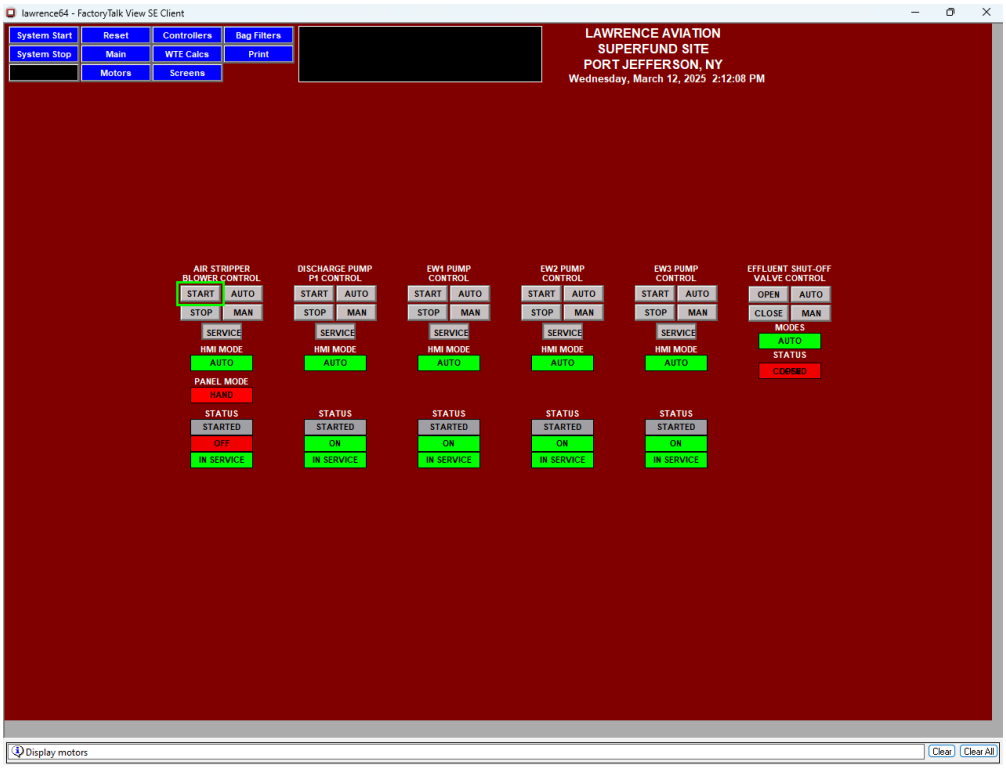
Exhibit 1



5.1.2 MOTORS Screen

The motor control panels are available on the MOTORS screen (**Exhibit 2**). The motor controls provide AUTO or MAN(ual) modes of operation for each motor. In AUTO mode all control and safety interlocks are applied to the motor control circuits. Conversely, in MAN mode no interlocks are applied. The motor control panels also include status indicators for AUTO/MAN modes, START and STOP switch status, and the current ON/OFF status of the motor. When the operator initiates system start up by pressing the system START button available at the top of all OI screens, the PLC control program automatically places all motors in AUTO mode and then sequentially starts each piece of equipment beginning with the holding tank discharge pump. When the operator stops the system with the system STOP button all motors are stopped immediately as though the operator had stopped each individual motor through its motor control panel. All motors remain in AUTO mode during startup and shutdown unless MAN modes are selected by the operator. A SERVICE button and indicator are provided so that the operator may take individual motors out of service to prevent starting in response to a system START command. An effluent shut off valve also is controlled from the MOTORS screen. When placed in AUTO mode this valve is programmed to automatically shut off effluent flow whenever the effluent pH is out of the acceptable range of 5.1 to 8.5 standard units (SU). The valve is opened and closed automatically with a system START and system STOP command, respectively. The valve can be opened or closed at any time in MAN(ual) mode. Note the holding tank discharge pump P-l will not operate in AUTO mode with the effluent shut off valve closed.

Exhibit 2



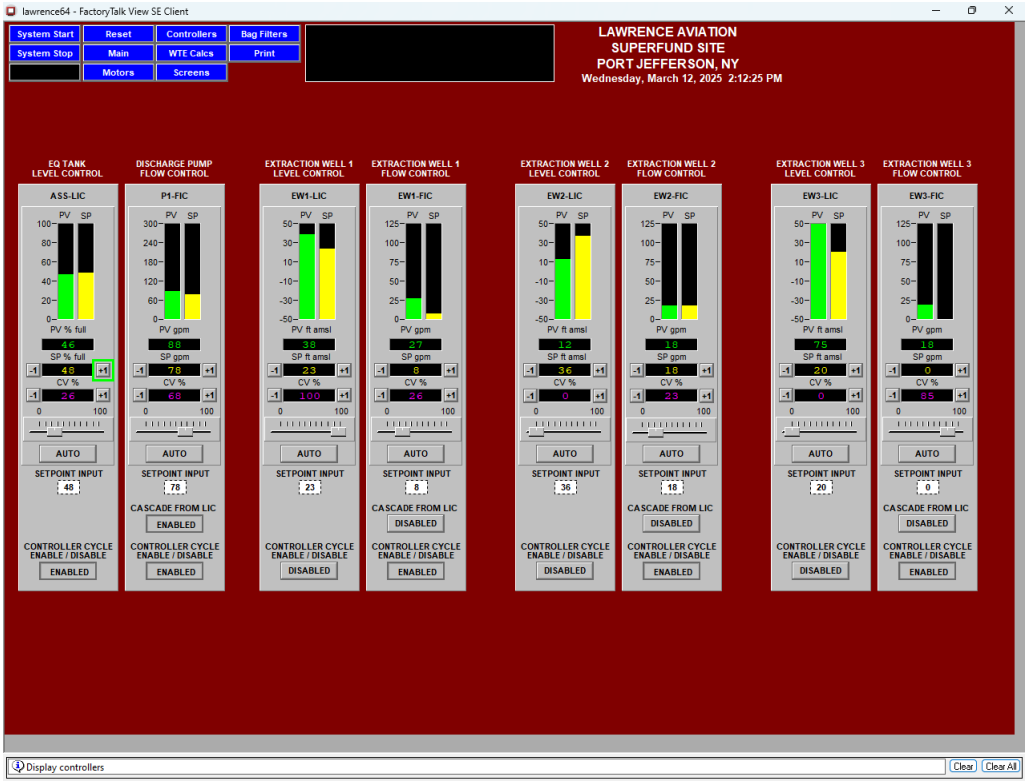
5.1.3 CONTROLLERS Screen

The CONTROLLERS screen includes proportional-integral-derivative (PID) process controllers for well pump flow rates, holding tank discharge pump flow rates, and holding tank water level control. (The term "PID" comes from the PID actions that this type of controller can make in response to an analog input, e.g., flow rate.) Using EW-1 flow rate control as an example, the operator selects a set point for the flow rate in GPM by touching or mouse-clicking repeatedly on the increment (+I) or decrement (I) push buttons provided on either side of the set point numerical display on the level (PID) controller until the desired set point is displayed. Alternatively, the operator may type the desired set point value into the numeric input field provided at the bottom of the controller. If the PID controller is in AUTO mode, the controller will automatically manipulate the speed of the extraction well pump through its analog output to the VFD to achieve the set point flow rate. Manual control of pump speed is provided by the controller by selecting MAN mode and incrementing or decrementing the pushbuttons on either side of the controlled variable (CV) numeric display. The CV display is ranged from 0 to 100%, which corresponds to a 4 to 20 milliamperes (mA) analog output signal to the controlled device, i.e., VFD for the pump. The range of the VFD speed for all pumps is currently set at 30 to 60 hertz corresponding to CV values from 0 to 100%.

The PID controllers allow the operator to enable or disable automatic cycling of the controller between AUTO and MAN modes of operation. During normal operations, PID controllers are cycled automatically (cycling enabled) between AUTO and MAN modes to maintain a constant controller output when the associated process equipment cycles off. For example, if the transfer pump should

cycle off on detecting a low level in the holding tank, then the PID controller needs to cycle off or make drastically different adjustments than before to accommodate the very different (and meaningless) process dynamics associated with a pump that is not running. By automatically cycling to MAN mode when water flow stops, the PID controller output will be exactly where it was just before the water flow stopped, and therefore, much closer to where it needs to be when the pump cycles back on. The CONTROLLERS screen also includes level controllers for the extraction wells. As discussed earlier, these level controllers are currently not used (cascade to the flow controller is disabled) but are available for use if needed. The PID - CONTROLLERS screen is shown below as **Exhibit 3**.

Exhibit 3

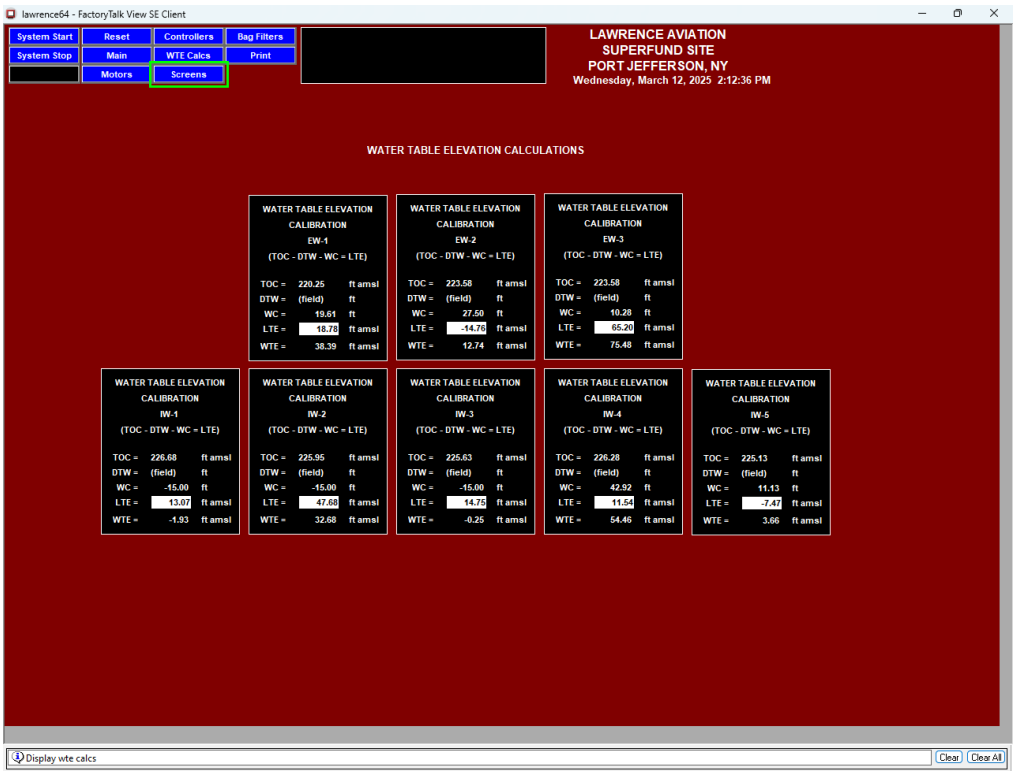


5.1.4 WATER TABLE ELEVATION CALCULATION Screen

A WATER TABLE ELEVATION (WTE) CALCULATION screen is provided to assist the Operator in routinely re-calibrating all water table elevation measurements. Knowing the top of casing elevation, which is displayed for each well, an operator takes a manual depth to water measurement while a second operator or offsite support personnel simultaneously reads the water column value generated by the submersible liquid level transmitter. The measured depth to water and water column values are subtracted from the top of casing to calculate a new level transmitter elevation which is entered into the field provided for each well on the screen. The ladder logic computes the recalibrated water table elevation and all future WTE values are based on the revised level transmitter elevation. This procedure is recommended on a monthly basis or whenever the level transmitter is moved for

maintenance or repair. The WATER TABLE ELEVATION CALCULATION screen is shown below as **Exhibit 4**.

Exhibit 4

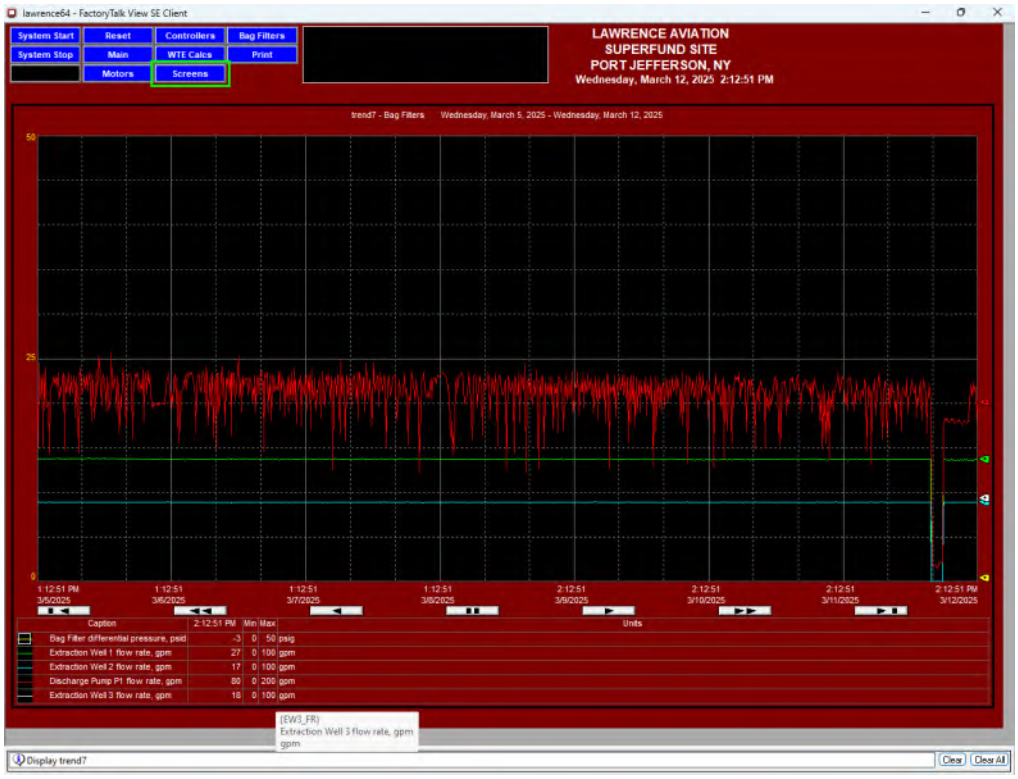


5.1.5 TREND Screen

A real-time trend screen (**Exhibit 5**) is configured for the holding tank water level controls, extraction well flow rates, water table elevations, and bag filter flow status, and are accessible through the "Screens" tab. Real-time level, set point, and controller output from the most recent two-hour period scroll across this screen from right to left. Real-time trend data is not cached when the OI software (Factory Talk View) is not running and therefore this trend will initially be empty of data when the program is started.

A historical trend screen has been configured for the same process variables shown in the real time trend above. These trend screens obtain data from the "PV" data log files and display 28 days of data over any given time period selected by the operator using the scroll backward and scroll forward buttons provided at the bottom of the screen.

Exhibit 5



5.2 Initial Conditions

The following items are assumed to be completed prior to any startup of the treatment system.

- Power is available, and all electrical breakers are in their correct position;
- All valves are in their correct position;
- Potable water is available;
- All machinery safety guards are installed;
- All maintenance and repairs are complete;
- All instrumentation is operating correctly;
- All programming is complete and correct;
- Carbon is loaded into all GAC units; and
- All equipment is ready for operation.

5.3 Startup Sequence

During system startup and restart, the system will require a manual restart. This manual startup procedure will involve a series of steps that the PLC will sequence to startup the system. The steps required for the startup of the treatment system include the following:

1. Select the lead/lag positioning for each of the GAC units.
2. Start the applicable extraction well pumps through the HMI.
3. Vent the individual extraction well pumps through their manual vents after startup of the individual pump.
4. Check that all pressure and flow indications match expected values for the extraction well pumps.
5. Check that the holding tank discharge pump starts and maintains the holding tank level.
6. Check the differential pressure across all the GAC units to verify the units are not clogged.
7. Check the injection well water level to ensure that the treated water is being injected into the aquifer.
8. Complete operator round sheets and check that all parameters are within their normal expected values.
9. Conduct operational groundwater quality monitoring.
10. Test external communications by triggering a building entry alarm. This should send an alarm notification without affecting the treatment system processes.

5.4 Shutdown Sequences

5.4.1 Operator Shutdown

When an operator determines a shutdown is required, the following actions shall be taken.

1. Stop all extraction well pumps via the HMI. Check to ensure all flow rates and pressures from the extraction wells are indicating "zero."
2. After two minutes, stop the holding tank discharge pump via the HMI. Check to ensure the water flow rate into the LPGAC units is indicating "zero." This will make sure no water is being discharged and that there is no siphoning from the discharge piping into the treatment system.

5.4.2 Controlled System Shutdown

When the PLC determines that a controlled system shut down is required, the PLC performs the following actions:

1. Stop all of the extraction well pumps.
2. Stop the holding tank discharge pump.

5.4.3 Extended Shutdown

When the treatment system has to be shut down for a long period of time (greater than one week), an extended shut down procedure needs to be completed:

1. Complete the actions described in **Sections 5.41** or **5.4.2** of this document.

2. Open all electrical power supply breakers to all of the extraction well pumps.
3. Open the electrical power supply breakers to the holding tank discharge pump.
4. Drain the process piping of water to the maximum extent possible by opening and shutting various vents and drain valves.

5.5 Emergency Procedures

Emergency procedures provided below should be followed in the event of the following circumstances. NYSDEC shall be notified immediately of all incidents and shutdowns.

5.5.1 Equipment Malfunction

During normal operations, the PLC will determine if operational parameters are out of specification based on the set points of the various instruments and the control logic. If the PLC determines any item is not functioning correctly, it will complete a controlled shutdown of the treatment system (**Section 5.4.2**). Malfunctioning extraction well pumps will automatically shut down via the low flow alarm or the pump low pressure alarm. The PLC will send automated email messages to system operators reporting the alarm, and operations will remain suspended until the issue is resolved and cleared from the PLC.

System operators who will be notified by automated email messages currently HRP operators and Site managers.

5.5.2 Spill

The treatment system building includes a sump that is equipped with a high-level float switch. In the event of a liquid spill within the O&M building, liquid will collect within the sump. If the high-level float switch is triggered, the PLC will complete a controlled shut down of the treatment system. The PLC will send automated email messages to system operators reporting the alarm, and operations will remain suspended until the issue is resolved and cleared from the PLC. A spill may occur due to errors associated with automated controls for pumping rates, holding tank water level, or may result from damage to system equipment or piping.

5.5.3 Power Failure

In the event of power loss to the treatment system building, treatment plant operations will cease, and the PLC will send automated email messages to system operators reporting the alarm. Operations will remain suspended until power is restored, and the system is restarted from the PLC.

5.5.4 Manual Shutdown

In the event of an emergency observed by the operator which does not trigger a controlled shutdown, the facility will be shut down manually by one of two methods: 1) an operator- initiated shutdown at the HMI performed in accordance with **Section 5.4.2**; or 2) an emergency shut down at the main breaker switch.

If at any time, the operator observes an emergency, becomes aware of a hazard to personnel, or believes a piece of equipment is not operating correctly, the operator should shut down the treatment system. System shut down at the HMI will be performed in accordance with **Section 5.4.2**, if time allows, and the operator can safely access the HMI. Alternately, if time or hazardous conditions do not allow the operator to shut down the facility through the HMI, the operator will go to the main breaker switch in the control room and flip the switch to the "off" position.

5.5.5 Evacuation

Depending on the emergency, personnel may need to evacuate the facility. Personnel should evacuate the facility and perform a head count of personnel that were onsite at the time of the emergency. Personnel will gather at the Park Avenue gate and contact appropriate emergency response personnel as described herein and in the site-specific HASP.

5.5.6 Emergency Contact Information and Hospital Location

In the event of a situation or unplanned occurrence requiring assistance, the appropriate contact(s) should be made from the following list:

Table 5-1
Emergency Contact Information

Emergency Contact	Phone Number(s)
Fire/Police/Ambulance/Paramedics - Emergency	911
Emergency Hospital: Mather Hospital, 75 N. Country Road, Port Jefferson, NY 11777	631-473-1320
Poison Control Center	800-222-1222
National Response Center (NRC; All spills in reportable quantities)	800-424-8802
NYSDEC Spill Control	800-457-7362
NYSDEC Site Project Manager: Payson Long	518-402-9813
NYSDOH Environmental and Exposure Evaluation: Mark Sergott	518-402-7860
HRP Project Manager: Derek Roy	860-428-9366
HRP Contract Manager: Mark Wright	203-308-0983
HRP Engineering Practice Leader: Thomas Battles	860-670-1534
HRP Field Team Leader: Joel Hara	860-707-0892
HRP Field Team Leader – Alternate: David Adam	860-205-2849
HRP Office H&S Coordinator: Spencer Walker	860-818-2391
HRP Corporate H&S Officer: Jessica Eubanks	864-696-3764

The nearest hospital is Mather Hospital, which is located at 75 North Country Road, Port Jefferson, New York. A map and directions to the hospital are provided in the Site-Specific HASP available on

site and posted in the treatment system building control room. General first aid equipment is provided onsite; however, please seek immediate medical assistance, if necessary.

5.5.7 Reporting Permit Non-Compliance, Chemical Spills, and Release of Contaminants to Groundwater

In the event of permit non-compliance, injection well malfunction, or other catastrophic failure of the treatment system, NYSDEC needs to be notified of the event by calling **1-800-457-7362**. NYSDEC must be notified within two hours of the commencement of the discharge or of becoming aware of the discharge in the event of permit non-compliance. Information that is provided during the phone call should be recorded in the facility logbook. In addition, the NRC shall also be notified at **1-800-424-8802**.

Notifications should contain the following information:

- Chemical name (whether the material is extremely hazardous or a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) substance);
- Exact (if known) or estimated quantity of release;
- Time and duration of incident;
- Medium or media into which the release occurred;
- Any known or anticipated health effects and advice regarding medical attention, precautions taken as a result of the release; and
- Name and phone number of the person who may be contacted for further information.

Release notification must be made immediately. If a facility operator fails to report a release, he or she may be subject to penalties. Written follow-up notifications should be submitted no later than 30 days following the release incident. The actual telephone release notification(s) should be made as described above.

5.6 Carbon Change-Out Events

LPGAC

The LAI treatment system has two LPGAC units that operate in a sequential arrangement, with two additional LPGAC units which operate in a parallel arrangement. Effluent sample results and LPGAC pressure readings are used to determine when a carbon change out event is required. LPGAC media change out events are scheduled when the VOC removal for one or more units begins to decrease significantly. The media in multiple LPGAC units can be replaced during a change out event.

The procedure for completing an LPGAC media change out for either LPGAC Units 1/1A or Units 2/2A is provided below:

1. Isolate the LPGAC Units (1/1A or 2/2A) by closing the valves located at the inlet to the leading LPGAC unit and closing the valve at the outlet of the lag unit.

2. Lockout/tagout (LOTO) the lead and lagging LPGAC units following all applicable local, state, and Federal laws and HRP LOTO procedures.
3. Open the access hatches to the lead LPGAC unit.
    a. Prior to opening the GAC unit, staff must wear all appropriate personal protective equipment (PPE) as required by the LPGAC Safety Data Sheets (SDS).
4. Use a vacuum truck or other piece of equipment, carefully remove the spent LPGAC media and place it in appropriate containers that are United Nations/Department of Transportation approved for transportation to an offsite regeneration facility. Note: Verify EPA Offsite Rule (OSR) procedures have been followed (the contractor has submitted regeneration facility information to EPA OSR personnel and received approval).
5. Label the spent LPGAC media containers and include a non-hazardous manifest for proper documentation of the shipment.
6. Use a flashlight to inspect the interior of the LPGAC unit. Ensure all of the distribution manifolds are installed and are not damaged.
    a. If damage is observed, implement confined space entry procedures, including having an entrant and attendant/supervisor onsite, conduct air monitoring within the LPGAC unit, and perform a confined space entry to repair or replace distribution manifolds, as necessary.
7. Using an appropriate method, place 1,000 lbs of fresh, reactivated LPGAC media into the vessel (LPGAC Vessels 1 and 2, or 600 lbs in Vessels 1A or 2A). Be certain to exercise caution while installing the fresh media, to avoid damaging the manifolds within the LPGAC unit.
8. Shut and tighten all access hatches.
9. Start the treatment system.
10. inspect all of the LPGAC hatches for leaks using soap bubbles to check for air leaks.
11. Record the differential pressure across each of the LPGAC units.
12. Address any leaks that may have been found.

6.0 INSPECTIONS AND MAINTENANCE

The treatment system requires periodic monitoring, inspections, and maintenance to detect any electrical, mechanical, or process issues that may affect the performance of the treatment system. The goal of the monitoring, inspection, and maintenance program will be to achieve a minimum operational readiness rate of 90%. The readiness rate is defined as the number of fully capable operational days divided by number of available operational days in any particular month. If the readiness rate drops below 90%, the contractor may need to develop specific actions to improve operations. Actions may include additional spare parts or maintenance of equipment, equipment improvements, additional O&M training, and/or revised operating procedures.

6.1 System Inspections and Monitoring

The physical inspection and review of equipment and operating parameters will be performed during each operator visit (a minimum of once per month). Inspections will include, at a minimum, visual observations that all equipment is working as intended and that no leaks are observed in any treatment equipment or piping. During the inspections, the operator will collect operational parameter readings from the treatment system and note any abnormalities that are observed.

The treatment system also will be monitored by obtaining water at several locations through the treatment train to determine the treatment efficiency; confirm that the system is operating in accordance with the requirements of the permits and equivalencies; and to estimate the frequency of carbon change out events. The system sampling and monitoring is described in **Section 7.2**.

6.2 System Maintenance

The treatment system equipment requires periodic maintenance to achieve the required system readiness rate and to ensure the equipment is able to operate at its design capacity for long periods of time. Maintenance activities include:

- Routine maintenance including lubrication, belt tensioning, adjustment of pump packing glands, and routine adjustments;
- Preventive maintenance including inspection, cleaning, lubrication, adjustment, calibration, and minor part and component replacement (e.g., filters, hoses, oil, and grease) as required to minimize malfunctions, breakdown, and deterioration of equipment; and
- Corrective maintenance and repair work that is required to return a system or component to its proper operating condition, including overhauling, reprocessing, or replacing parts or materials that have deteriorated by action of the elements or usage and have not been addressed through preventative maintenance.

An inventory of spare parts, tools, and materials will be maintained onsite as necessary to operate the system in accordance with equipment manufacturers' information, including H&S supplies, personnel protection equipment, and first aid supplies. The contractor will replenish the spare parts, tools, and materials inventory as parts and materials are used for maintenance and will keep the inventory up-to-date and fully stocked.

The contractor will operate and maintain all equipment, systems, processes, and appurtenances in accordance with the manufacturers' recommendations to ensure the warranties or guarantees are not voided. Corrective maintenance performed by suppliers, manufacturers or subcontractors on warranted equipment, components, materials, or workmanship will be coordinated by the contractor with the supplier, subcontractor, or manufacturer. Corrective maintenance involving replacement due to normal failure of equipment and materials not under warranty will be performed by the contractor utilizing the onsite maintenance staff to the greatest extent possible.

The contractor will characterize, dispose, and handle all debris and waste generated by the treatment system O&M activities and sampling events, including the offsite regeneration of spent carbon. If

site waste is characterized as hazardous waste, it shall be handled in accordance with the accumulation and storage requirements of a Small Quantity Generator. All hazardous waste will be disposed of at EPA-approved disposal facilities in accordance with OSR procedures. General refuse will be picked up as part of the normal neighborhood collection service.

6.3 Injection Well Redevelopment

The injection wells tend to become fouled and their capacity to accept water from the treatment system decreases due to water chemistry- related factors. An injection well redevelopment event is performed once each year, or as necessary to optimize system performance.

In 2021, the injection wells were redeveloped via high-velocity jetting. Jetting was performed within the wetted portion of the screen interval, with pressures up to 4,000 to 5,000 lbs per square inch. A low range of pressure was used to not damage the well screen or sand pack. The four-nozzle, rotating jetting tool was run continually up and down the entire screen interval rather than concentrating on smaller intervals for long periods of time (e.g., several minutes/foot) and moving to successive intervals. Simultaneously with jetting, water was pumped from the well with an electric submersible pump positioned below the jetting nozzle. The well casing was surged with air lifting to re-establish the gravel pack and to remove fine material from the well.

During some previous redevelopment events, nitrogen burst, and dry penetrating agent were used to redevelop the injection wells. Minimal information is available about the methodology used for these events.

7.0 SAMPLING AND MONITORING ACTIVITIES

This section provides an overview of the sampling and monitoring activities that have been developed to monitor the performance of the treatment system and compliance with permit requirements. All sampling activities will be performed in accordance with the HRP Quality Assurance Project Plan (HRP, 2025) and SPDES permit equivalencies. Site permit equivalencies are provided in **Appendix B**.

7.1 Performance and Compliance Monitoring

Performance and compliance sampling and monitoring will be performed to confirm that the treatment system is operating as intended and the permit discharge criteria are being met. A summary of the performance and compliance sampling and monitoring is summarized below. Analytical detection limits must be sufficiently low to achieve the applicable permit limits.

Table 6 Treatment System Performance and Compliance Monitoring Schedule				
Equipment	**Purpose**	**Frequency**	**Medium**	**Analytical Required**
Treatment System Discharge				
Treated Water Effluent to Injection Wells	Compliance: NYSPDES	Monthly	Water	VOCs, select metals (total), fluoride, pH (field parameter)
LPGAC				
LPGAC – Mid-carbon	Performance	Quarterly	Water	VOCs
Extraction Wells				
EW-1, EW-2, and EW-3 Influents	Performance	Monthly	Water	VOCs, select metals (total), fluoride, pH (field parameter)

8.0 RECORD KEEPING AND REPORTING

Records documenting the O&M of the treatment system will be maintained via physical records (visual site inspection, maintenance logs, and logbooks), and digital copies maintained. A regular backup schedule will be employed to prevent inadvertent loss of electronic data. The records will be retained as hard copies onsite and electronically as scanned copies. Site inspection and maintenance logs will be completed during the monthly routine site inspections, and during emergency site inspections (e.g., following a system shutdown) to document system operation and maintenance activities.

8.1 Progress and Status Reports

Treatment system electronic data deliverables (EDDs) will be prepared and submitted to the NYSDEC to aid in tracking system performance and effectiveness in achieving the RAOs on a monthly basis. The EDDs will be submitted to the NYSDEC (pending receipt of data from the laboratory) and will include system sampling data, flow volumes, system down time, and any updates to system components as applicable.

The progress reports will include, but not be limited to, discussions of the following items:

- H&S activities, including safety hours (hours onsite) status, H&S problems encountered, safety instruction, accidents, corrective actions, and any deficiencies noted during routine inspections;
- A description of all O&M activities that occurred;
- Total water and air volumes treated and estimates for contaminant mass removed in each unit process per month, and total removal to date;
- Readiness rate determined by fully capable operational days divided by available operational days in the reporting period;

- A summary of performance and compliance sampling, analytical results, problems, and corrective actions;
- A summary of data logged by the PLC per month;
- Carbon use per month, to date, and projection for the timing of the next change out;
- If used, chemical consumption per month, to date, and projection for next month, including quantities and cost to contractor;
- Updated O&M logs;
- Identification of problems, suggested correction actions, and activities performed by the contractor to correct the problem;
- Planned activities and schedule for significant operations, maintenance, laboratory, and administrative activities to be performed; and
- All other factors that affect the operation, maintenance, and management of the treatment system.

8.2 Compliance Reporting

Annual O&M reports shall be prepared for the LAI treatment system and submitted to NYSDEC by the end of the first quarter of the following year.

The annual report will include, but not be limited to, discussions of the following items:

- H&S activities, including safety hours (hours onsite) status, H&S problems encountered, safety instruction, accidents, corrective actions, and any deficiencies noted during routine inspections;
- A description of all O&M activities that occurred;
- Total water and air volumes treated and estimates for contaminant mass removed in each unit process per month, and total removal to date;
- Readiness rate determined by fully capable operational days divided by available operational days in the reporting period;
- A summary of performance and compliance sampling, analytical results, problems, and corrective actions;
- A summary of data logged by the PLC per month;
- Carbon use per month, to date, and projection for the timing of the next change out;
- If used, chemical consumption per month, to date, and projection for next month, including quantities and cost to contractor;
- Updated O&M logs;
- Identification of problems, suggested correction actions, and activities performed by the contractor to correct the problem;

- Planned activities and schedule for significant operations, maintenance, laboratory, and administrative activities to be performed; and
- All other factors that affect the operation, maintenance, and management of the treatment system.

9.0 HEALTH AND SAFETY

The Contractor is responsible for all aspects of H&S associated with O&M activities. All work will be performed in accordance with the HASP and the Hazard Analysis forms that have been prepared and submitted for site activities. The contractor will:

- Maintain up-to-date H&S records for all onsite personnel;
- Inform the NYSDEC of all near misses, incidents, onsite accidents, and related claims;
- Ensure all contractor personnel are equipped with necessary PPE prior to proceeding with the work;
- Provide hard hats, safety glasses, reflective vests, and hearing protection to NYSDEC personnel and other visitors; and
- Maintain proper Occupational Safety and Health Administration (OSHA)-approved 40-hour H&S training and subsequent 8-hour refreshers for all workers associated with any activity that may be exposed to contaminated materials.

A H&S Checklist is provided in the site-specific HASP for guidance on the number and type of equipment that is housed within the treatment system building. SDS are included in the hazardous communications binder, which is located onsite. SDS for new materials that are brought onsite will be added to the binder. The SDS binder will be reviewed for accuracy a minimum of once per year to ensure all required information is included.

Hazards

During normal O&M of the treatment system, operators will be exposed to the following hazards:

- **Process Equipment and Electrical Components**: Operators should be aware of all the potential physical hazards associated with the use of motorized equipment (e.g., pumps and blowers) and electrical equipment (e.g., electrical panels, motors, instrumentation, and wiring) during the operation of the treatment system components.
- **Heavy Equipment**: Operators must be aware of the potential physical hazards associated with the use of heavy equipment (such as vacuum trucks) during the O&M of the treatment system.
- **Slip/Trips/Falls**: Significant slip/trip/fall hazards exist within the treatment system building. This includes piping, vaults, equipment skids, secondary containment berms, and outdoor components of the groundwater extraction and treatment system.

- **Chemical Vapors**: Volatile organic vapors may be released from process equipment and piping due to leaks. These vapors could potentially accumulate within the process building at unsafe levels.
- **Hazardous Energy**: All maintenance and repairs that are completed for the treatment system must be compliant with the OSHA standard for The Control of Hazardous Energy (LOTO) (Code of Federal Regulations (CFR), 29 CFR 1910.147). Hazardous energy includes pressurized fluids, gases, compressed springs, and electrical equipment as examples. Controlling hazardous energy includes removing the energy by depressurizing piping and removing electrical power from components and completing a full and proper LOTO of the components. Prior to any work being completed, staff should test their LOTO boundaries to ensure the hazardous energy is removed. If the isolations do not remove all of the hazardous energy, or the component must be operational to troubleshoot or repair, notify supervisors and only qualified personnel should conduct the repairs or troubleshooting.
- **Confined Space Entry**: The LPGAC vessels are considered permit required confined spaces. Although it is highly unlikely the vessels will need to be entered, whenever operators are required to enter the spaces, confined space procedures must be followed. This includes initial and continuous monitoring of the atmosphere inside the spaces prior to and during entry.
- **Ladder Safety**: Operators must utilize proper ladder safety procedures when using fixed and portable ladders. Portable ladders must be secured to a fixed surface that will support more than the anticipated total load. When climbing or descending a ladder, personnel must face the ladder and maintain three points of contact at all times.
- **Elevated Work Locations and Fall Protection**: Work performed at heights greater than 6 feet where a fall hazard exists requires fall protection. Fall protection may include guardrails, safety nets, or personal fall arrest systems. Fall protection must be used in accordance with the OSHA Standard for Fall Protection (29 CFR 1926 Subpart M). Operators should not use fall arrest equipment until they have been properly trained.
- **Pressurized Equipment**: Pressurized conditions resulting from pump operations are regulated under normal conditions by process control equipment. Any observed leaks within piping or loose components of equipment should be immediately repaired to prevent spills or pressurized releases. Routine equipment and piping inspections should be performed as preventative measures to minimize hazards that may result from pressurized releases. Operators must wear appropriate PPE at all times.
- **Noise**: Noise (decibel) levels inside the process area can be expected to exceed OSHA permissible exposure limits. It is recommended that hearing protection be used whenever personnel will be inside the process area within the treatment system building.
- **PPE**: Operators must wear all appropriate PPE before entering the treatment system building and the extraction vaults. At a minimum, nitrile gloves, safety glasses, hard hat, hearing protection, and steel toe shoes should be worn or used.

All activities conducted onsite must be compliant with all local, state, and Federal rules and regulations. Examples of such activities include ladder use and working in confined spaces.

H&S information including the hospital map and directions, emergency contact list, safety checklists, and regulatory postings are posted in the treatment plant control room.

10.0 REFERENCES

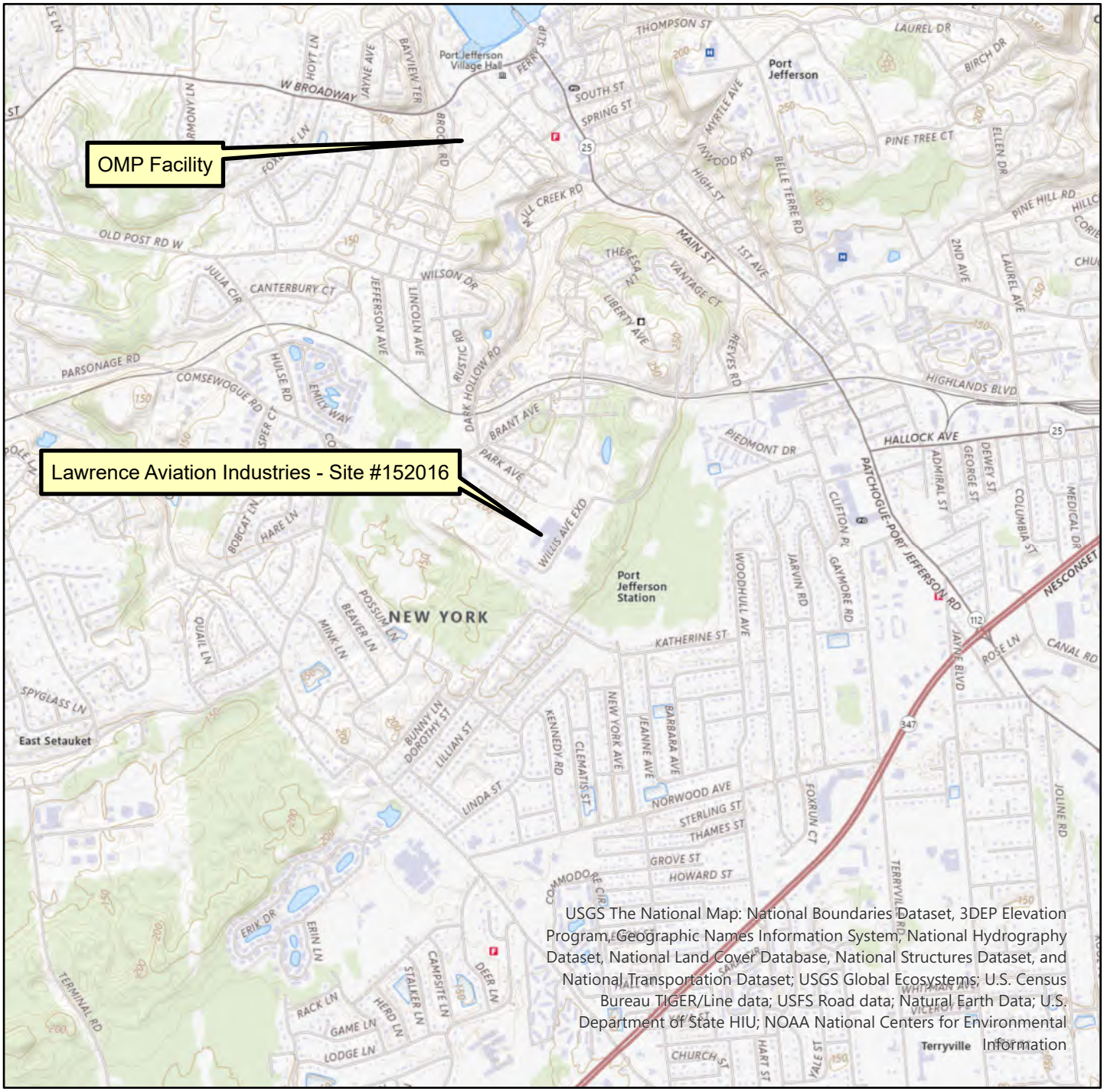
NYSDEC, DER-10/Technical Guidance for Site Investigation and Remediation. May 3, 2010.

NYSDEC Division of Environmental Remediation Site Briefing Report, December 24, 2021

Franke, O.L., and McClymonds, N.E., 1972. Summary of the Hydrologic Situation on Long Island, New York, as a Guide to Water-Management Alternatives. Geological Survey Professional Paper 627-F.

Koszalka, E.J., 1984. Geohydrology of the northern part of the Town of Brookhaven, Suffolk County, New York. USGS Water-Resources Investigations Report 83-4042.

FIGURES



N

0 1,000 2,000 4,000 6,000 8,000

Feet

1:24,000

USGS Quadrangle Information
Quad ID: o40073h1
Name: Port Jefferson

Figure 1
Site Location
100 Sheep Pasture Road,
Port Jefferson Station, Brookhaven, NY
HRP #DEC1027.OM
Scale 1" = 2,000'

HRP
MOVE YOUR ENVIRONMENT FORWARD
ONE FAIRCHILD SQUARE
SUITE 110
CLIFTON PARK, NY 12065
(518) 877-7101
HRPASSOCIATES.COM

Path: S:\Data\NYDEC - NYSDEC\BROOKHAVEN\SHEEP PASTURE ROAD, PORT JEFFERSON STATION, NY 11776\DEC1027OM\GIS\GWM Figures\Site Location\Site Location.aprx

Esri, NASA, NGA, USGS, FEMA, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Sources: Esri, Maxar, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap, and the GIS user community

Port Jefferson Harbor

Garant Harborfront Park

Port Jefferson

The Steam Room

Port Jefferson Free Library

Port Jefferson Village Hall

Port Jefferson Fire Department

Jefferson School

Maryhaven Center of Hope

Infant Jesus Roman Catholic Church

Greek Orthodox Church of the Assumption

Verizon

A

A'

SW-15

SW-16

SW-07

SW-06

SW-08

SW-05

ERT-MW-2A

ERT-MW-2B

ERT-MW-2C

ERT-MW-2D

ERT-MW-1A

ERT-MW-1B

SDW-01

ERT-MW-5A

ERT-MW-5B

ERT-MW-4A

ERT-MW-4B

MPW-08

ERT-MW-6A

ERT-MW-6B

ERT-MW-3

MPW-09

ERT-EW-5

ERT-EW-4

MW-PD-15

ERT-EW-2

ERT-EW-1

ERT-EW-6

ERT-EW-3

OMP Facility

MW-PD-16

MW-PD-17

MPW-05

MPW-06

MW-PD-14

MW-PD-13

MW-PD-12

MPW-10

MW-PD-11

MPW-03

MPW-04

MPW-02

EW-02

EW-03

EW-01

MW-ISCO-02

MW-ISCO-01

IW-ISCO-11

MW-ISCO-04

IW-ISCO-06

IW-ISCO-5

PZ-05

PZ-07

PZ-06

MW-05

IW-ISCO-13

IW-ISCO-10

IW-ISCO-08

PZ-01

IW-ISCO-09

MW-ISCO-03

IW-ISCO-07

IW-ISCO-03

MPW-07

PZ-04

IW-ISCO-02

MW-ISCO-05

PZ-02

IW-02

IW-03

IW-04

IW-01

IW-05

IW-ISCO-0

MPW-01

LAI Facility

Former LAI Industrial Area

Approximate Former LAI Outlying Properties

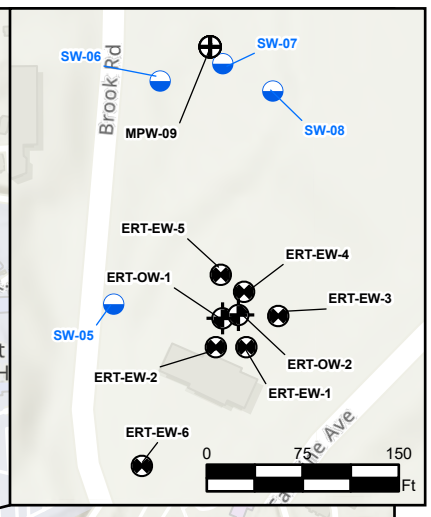
231 ft

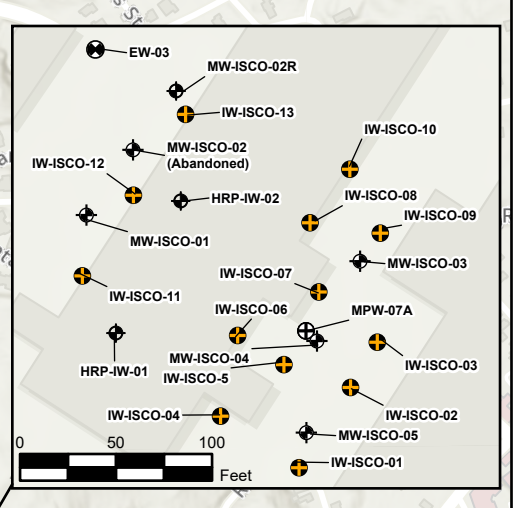
241 ft

181 ft

182 ft

153 ft





Legend

- Cross Section A-A'
- Former LAI Outlying Properties
- Outfall to Old Mill Pond
- Surface Water Body
- ISCO Injection Well
- Piezometer
- ERT Extraction Well
- Injection Well
- Multiport Well
- Monitoring Well
- Surface Water Sample
- LAI Site Boundary

HRP
MOVE YOUR ENVIRONMENT FORWARD

197 SCOTT SWAMP ROAD
FARMINGTON, CT 06032
(860) 674-9570
HRPASSOCIATES.COM

Site Layout Map
Lawrence Aviation Industries
SITE No. 152016
Sheep Pasture Road
Port Jefferson, New York

JH DESIGNED BY:	11X17 SHEET SIZE:
BOB DRAWN BY:	06/18/2024 DATE:
DR REVIEWED BY:	DEC1027.OM PROJECT NUMBER:

North

1" = 700'

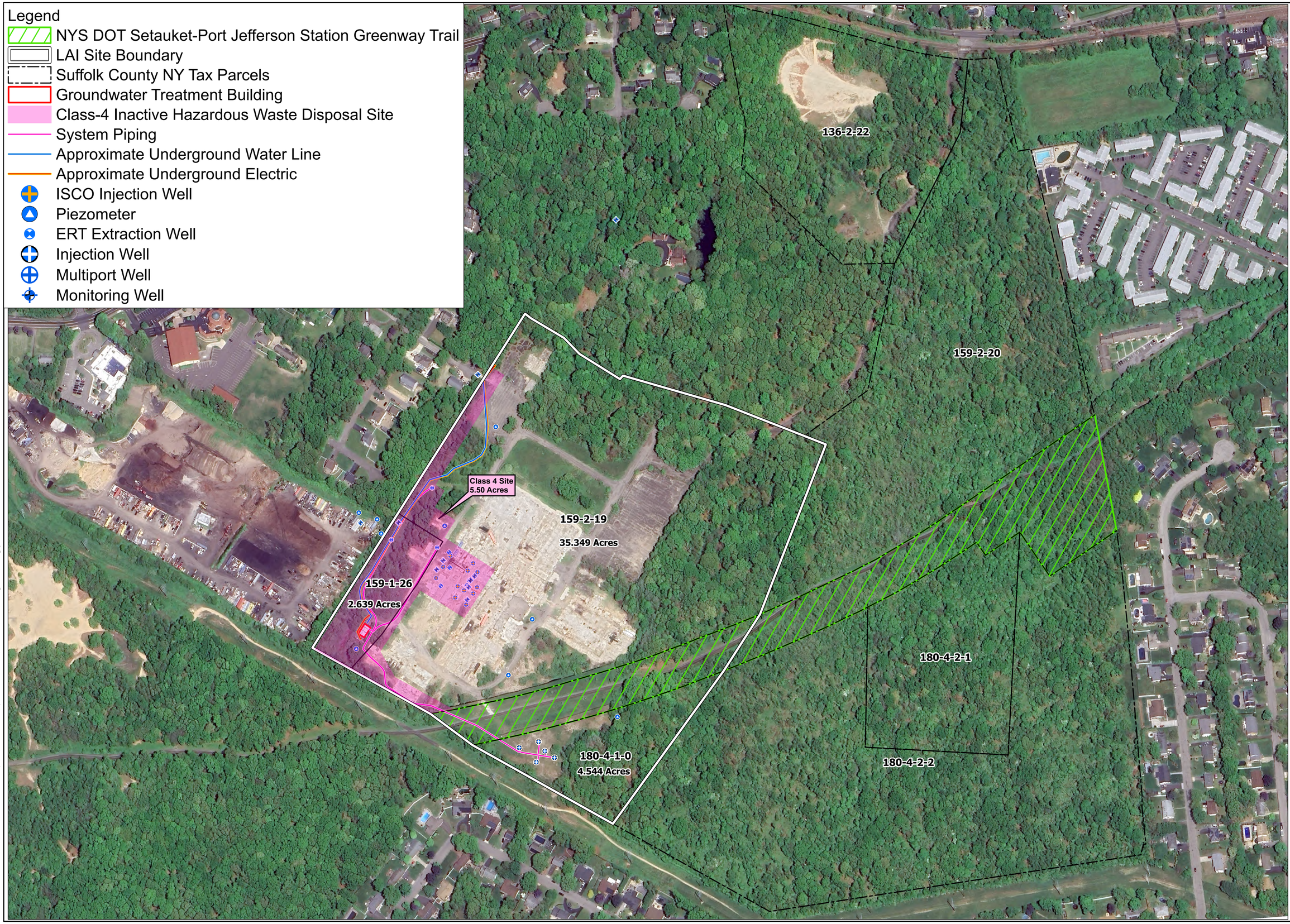
0 350 700 Ft

FIGURE 2

Path: S:\Data\NNYDEC - NYSDEC\BROOKHAVEN\SHEEP PASTURE ROAD, PORT JEFFERSON STATION, NY 11776\DEC1027OM\GIS\GWM Figures\Figures.aprx

Legend

- NYS DOT Setauket-Port Jefferson Station Greenway Trail
- LAI Site Boundary
- Suffolk County NY Tax Parcels
- Groundwater Treatment Building
- Class-4 Inactive Hazardous Waste Disposal Site
- System Piping
- Approximate Underground Water Line
- Approximate Underground Electric
- ISCO Injection Well
- Piezometer
- ERT Extraction Well
- Injection Well
- Multiport Well
- Monitoring Well



HRP
MOVE YOUR ENVIRONMENT FORWARD
197 SCOTT SWAMP ROAD
FARMINGTON, CT 06032
(860) 674-9570
HRPASSOCIATES.COM

NORTH

0 75 150 Feet

REVISIONS

NO	DATE	DESCRIPTION

DESIGNED:	DRAWN:	REVIEWED:	APPROVED:
DR	BOB	DR	DR

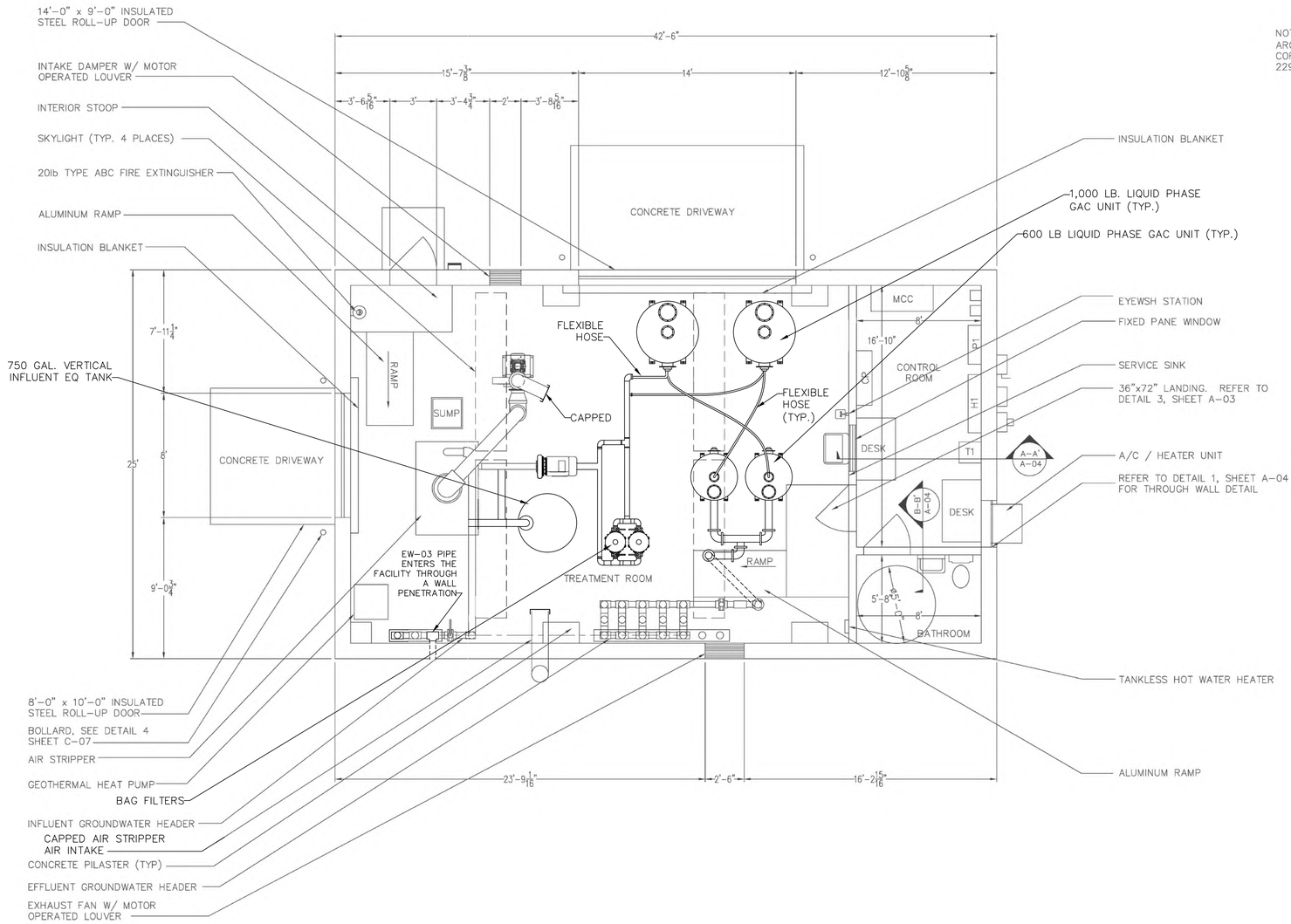
SCALE:	ISSUE DATE:	PROJECT NUMBER:	SHEET SIZE:
1"=150'	03/06/2025	DEC1027.OM	24"X36"

Lawrence Aviation Industries
Site #152016
100 Sheep Pasture Road
Port Jefferson Station, New York

Class-4 Site Boundary

FIGURE NO.
2a

Path: S:\Data\NY\DEC - NY\SEC\BROOKHAVEN\SHEEP PASTURE ROAD, PORT JEFFERSON STATION, NY 11776\DEC1027.OM\GIS\Demolition\Parcels - Delisting\Parcels - Delisting.aprx



NOTE:
ARCHITECTURAL ELEVATION 100'-0" CORRESPONDS TO CIVIL ELEVATION 229.6 FT AMSL

MAP REFERENCE:
"GROUNDWATER TREATMENT PLANT, BUILDING PLAN, LAWRENCE AVIATION SUPERFUND SITE, PORT JEFFERSON STATION, NEW YORK" BY HYDROGEOLOGIC, INC; SHEET REFERENCE NO. A-01; DATE JANUARY 27, 2010; AS-BUILT REVISIONS 11/15/21;

HRP
MOVE YOUR ENVIRONMENT FORWARD
ONE FAIRCHILD SQUARE
SUITE 110
CLIFTON PARK, NY 12065
(518) 877-7101
HRPASSOCIATES.COM

NORTH

0 2' 4'

REVISIONS

NO.	DATE	DESCRIPTION

DESIGNED: GN	SCALE: 1/4" = 1'
DRAWN: BOB	ISSUE DATE: 07/07/2023
REVIEWED: GN	PROJECT NUMBER: DEC1027.OM
APPROVED: GN	SHEET SIZE: 24"x36"

LAWRENCE AVIATION SUPERFUND SITE

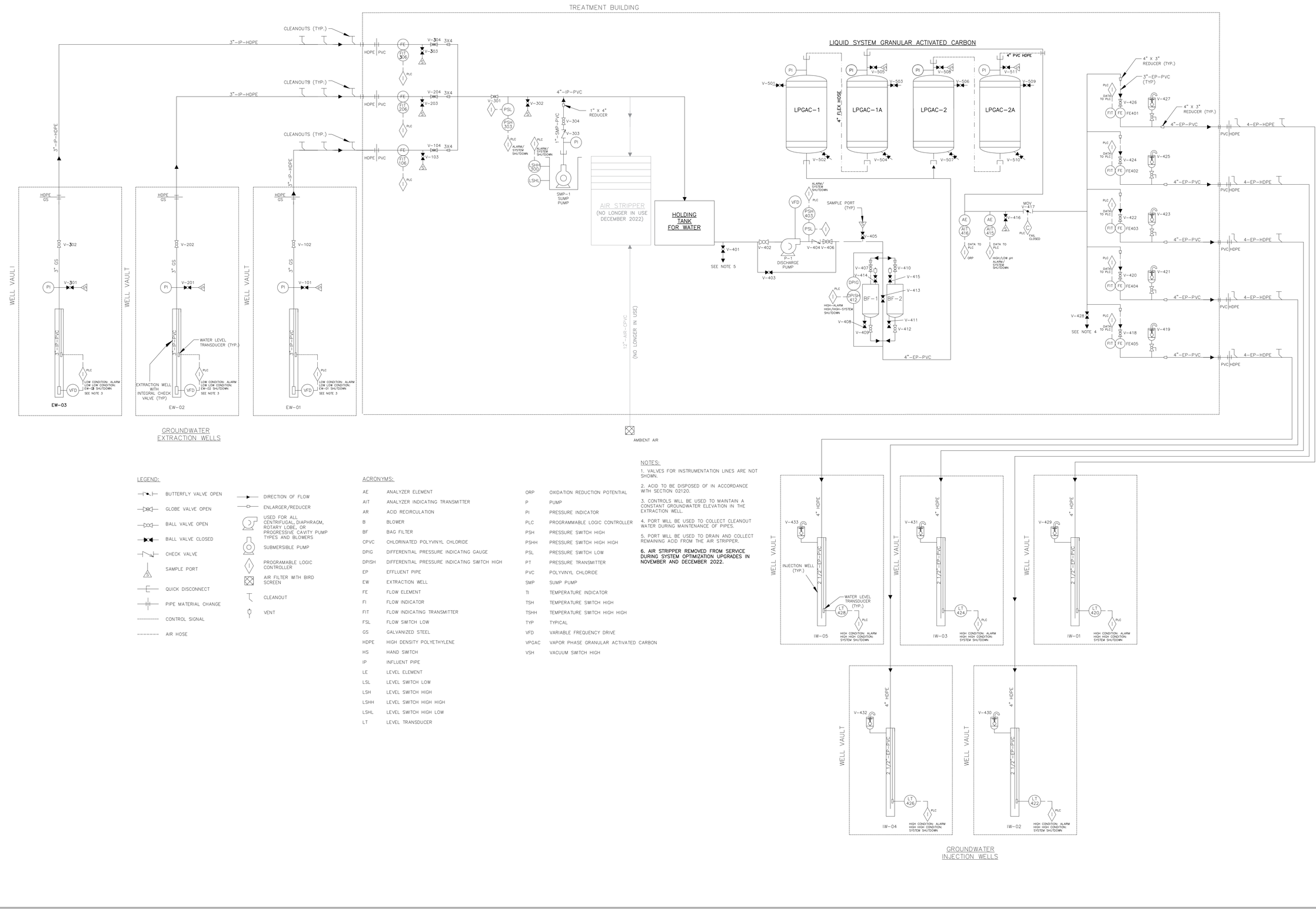
PORT JEFFERSON STATION, NEW YORK

REVISED TREATMENT BUILDING LAYOUT

SHEET NO.

Figure 3

DRAWING NAME: G:\Data\2023\NYDEC - NYSDEC\DRAWINGS\PROJECT FILES\JEFFERSON STATION, NY 11776\JEC1027OM\GA\Revised Treatment Building Layout.dwg LAYOUT: 24 x 36 - BOTTOM TITLE PLOT DATE: Aug 11, 2023 - 10:08am OPERATOR: BOB



LEGEND:

- BUTTERFLY VALVE OPEN
- GLOBE VALVE OPEN
- BALL VALVE OPEN
- BALL VALVE CLOSED
- CHECK VALVE
- SAMPLE PORT
- QUICK DISCONNECT
- PIPE MATERIAL CHANGE
- CONTROL SIGNAL
- AIR HOSE
- DIRECTION OF FLOW
- ENLARGER/REDUCER
- USED FOR ALL CENTRIFUGAL, DIAPHRAGM, ROTARY LOBE, OR PROGRESSIVE CAVITY PUMP TYPES AND BLOWERS
- SUBMERSIBLE PUMP
- PROGRAMABLE LOGIC CONTROLLER
- AIR FILTER WITH BIRD SCREEN
- CLEANOUT
- VENT

ACRONYMS:

AE	ANALYZER ELEMENT
AIT	ANALYZER INDICATING TRANSMITTER
AR	ACID RECIRCULATION
B	BLOWER
BF	BAG FILTER
CPVC	CHLORINATED POLYVINYL CHLORIDE
DPIG	DIFFERENTIAL PRESSURE INDICATING GAUGE
DPISH	DIFFERENTIAL PRESSURE INDICATING SWITCH HIGH
EP	EFFLUENT PIPE
EW	EXTRACTION WELL
FE	FLOW ELEMENT
FI	FLOW INDICATOR
FIT	FLOW INDICATING TRANSMITTER
FSL	FLOW SWITCH LOW
GS	GALVANIZED STEEL
HDPE	HIGH DENSITY POLYETHYLENE
HS	HAND SWITCH
IP	INFLUENT PIPE
LE	LEVEL ELEMENT
LSL	LEVEL SWITCH LOW
LSH	LEVEL SWITCH HIGH
LSHH	LEVEL SWITCH HIGH HIGH
LSHL	LEVEL SWITCH HIGH LOW
LT	LEVEL TRANSDUCER
ORP	OXIDATION REDUCTION POTENTIAL
P	PUMP
PI	PRESSURE INDICATOR
PLC	PROGRAMMABLE LOGIC CONTROLLER
PSH	PRESSURE SWITCH HIGH
PSHH	PRESSURE SWITCH HIGH HIGH
PSL	PRESSURE SWITCH LOW
PT	PRESSURE TRANSMITTER
PVC	POLYVINYL CHLORIDE
SMP	SUMP PUMP
TI	TEMPERATURE INDICATOR
TSH	TEMPERATURE SWITCH HIGH
TSHH	TEMPERATURE SWITCH HIGH HIGH
TYP	TYPICAL
VFD	VARIABLE FREQUENCY DRIVE
VPGAC	VAPOR PHASE GRANULAR ACTIVATED CARBON
VSH	VACUUM SWITCH HIGH

NOTES:

1. VALVES FOR INSTRUMENTATION LINES ARE NOT SHOWN.
2. ACID TO BE DISPOSED OF IN ACCORDANCE WITH SECTION 02120.
3. CONTROLS WILL BE USED TO MAINTAIN A CONSTANT GROUNDWATER ELEVATION IN THE EXTRACTION WELL.
4. PORT WILL BE USED TO COLLECT CLEANOUT WATER DURING MAINTENANCE OF PIPES.
5. PORT WILL BE USED TO DRAIN AND COLLECT REMAINING ACID FROM THE AIR STRIPPER.
6. **AIR STRIPPER REMOVED FROM SERVICE DURING SYSTEM OPTIMIZATION UPGRADES IN NOVEMBER AND DECEMBER 2022.**

HRP
MOVE YOUR ENVIRONMENT FORWARD
197 SCOTT SWAMP ROAD
FARMINGTON, CT 06032
(860) 674-9570
HRPASSOCIATES.COM

REVISIONS

NO.	DATE	DESCRIPTION

DESIGNED:	DCZ
DRAWN:	DCZ
REVIEWED:	JK
APPROVED:	JK
SCALE:	NO SCALE
ISSUE DATE:	1/17/2023
PROJECT NUMBER:	DEC1027OM
SHEET SIZE:	24"x36"

P.E. SEAL

LAWRENCE AVIATION INDUSTRIES
GROUNDWATER TREATMENT SYSTEM
100 SHEEP PASTURE RD
PORT JEFFERSON STATION, NEW YORK

Process Flow Diagram

FIGURE NO.
4

DRAWING NAME: S:\Data\NY\NY0X\C - NYS\WC\BROOKHAVEN\SHEEP PASTURE RAMD, PORT JEFFERSON STATION, NY 11776\1DEC1027OM\CAD\Process Flow Diagram.dwg - LAYOUT: 24 x 36 - SSM - PLOT DATE: 1-18-23 - 12:33pm - OPERATOR: BOB

APPENDIX A
LAI Treatment System As Builts

US EPA
Region II
New York, New York

As-Built Drawings for Groundwater Remediation at the Lawrence Aviation Industries Superfund Site Port Jefferson Station, New York

Prepared For:

CDM Federal Programs Corporation
New York, New York

Prepared By:
Arrowhead Contracting, Inc.
10981 Eicher Road
Lenexa, Kansas
(913) 814-9994

October 2010

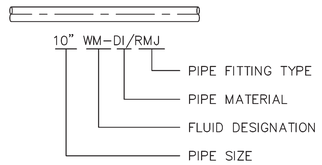
PROCESS LINE ABBREVIATIONS

AIR	AIR, ATMOSPHERIC PRESSURE
BW	BACKWASH
CA	COMPRESSED AIR
CCA	CHLORINE CONTAMINATED AIR
CGW	CONTAMINATED GROUNDWATER
D	DRAIN
EFF	EFFLUENT
EXH	EXHAUST
FLT	FILTRATE
FTW	FILTER-TO-WASTE
NPW	NON-POTABLE WATER
OZE	OZONE GAS
P	PRODUCT
PW	POTABLE WATER
RW	RAW WATER
S	SANITARY
SL	SLUDGE
SN	SUPERNATANT
SP	SAMPLE PORT
SS	STORM SEWER
TF	TOTAL FLUIDS
TW	TREATED WATER
V	VENT
VAP	VAPOR

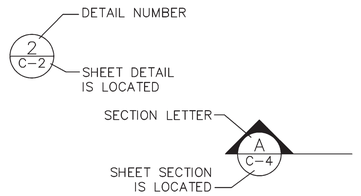
PIPING MATERIAL IDENTIFICATION

CPVC	CHLORINATED POLYVINYL CHLORIDE
CSP	CARBON STEEL PIPE
COP	COPPER
CMP	CORRUGATED METAL PIPE
CIP	CAST IRON PIPE
DIP	DUCTILE IRON PIPE
FRP	FIBERGLASS REINFORCED PIPE
GSP	GALVANIZED STEEL PIPE
HDPE	HIGH DESITY POLYETHYLENE PIPE
PE	POLYETHYLENE PIPE
PP	POLYPROPYLENE PIPE
PVC	POLYVINYL CHLORIDE PIPE
RCP	REINFORCED CONCRETE PIPE
RUB	RUBBER
SS	STAINLESS STEEL PIPE
VCP	VITRIFIED CLAY PIPE

PIPING DESIGNATION



DETAIL & SECTION DESIGNATION

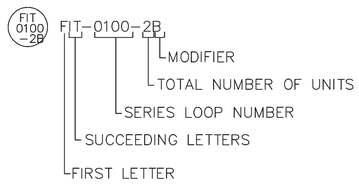


SHEET NUMBER	TITLE
G-01	DRAWING INDEX AND LEGEND
G-02	LEGEND
C-01	PROJECT SITE PLAN
C-02	GWTF SITE PLAN
C-03	CONVEYANCE PIPE TRENCH DETAILS
C-04	CONTROL WIRING PULLBOX DETAIL
C-05	FENCE DETAILS
C-06	FENCE DETAILS
C-07	CIVIL DETAILS
C-08	SITE PLAN
C-09	SANITARY PLAN
C-10	WATER SERVICE PLAN
A-01	BUILDING PLAN
A-02	BUILDING ELEVATIONS VIEW
A-03	DOOR SCHEDULE AND FINISH SCHEDULE
A-04	CONTROL ROOM/BATHROOM PARTITION WALL CONSTRUCTION DETAILS
A-05	RESERVED
S-01	STRUCTURAL SPECIFICATIONS
S-02	STRUCTURAL FOUNDATION PLAN AND DETAILS
S-03	SUB SLAB VENTING SYSTEM DETAILS
M-01	TREATMENT EQUIPMENT MECHANICAL PLAN
M-02	TREATMENT EQUIPMENT MECHANICAL CROSS-SECTION
M-03	TREATMENT SYSTEM HEADER DETAILS
M-04	MECHANICAL DETAILS
M-05	MECHANICAL DETAILS
M-06	EXTRACTION WELLHEAD DETAIL
M-07	INJECTION WELLHEAD DETAIL
P-01	POTABLE WATER AND SANITARY SEWER PIPING PLAN
E-01	ELECTRICAL SITE PLAN
E-02	ONE-LINE DIAGRAM
E-03	POWER PLAN
E-04	LIGHTING PLAN
E-05	CONTROL WIRING PLAN
H-01	HVAC PLAN
I-01	PROCESS AND INSTRUMENTATION DIAGRAM

EQUIPMENT NOTATION ABBREVIATIONS

AC	AIR COMPRESSOR
AN	ANNUBAR
ARV	AIR RELIEF VALVE
B	BLOWER
BFP	BELT FILTER PRESS
BP	BOOSTER PUMP
BPD	BACKFLOW PREVENTION DEVICE
C	CATALYST
CA	COLLECTOR ARM
CC	CALIBRATION COLUMN (LG)
CL	CHLORINATOR
CV	CHECK VALVE
CY	CYCLONE
D	DIFFUSERS
E	EDUCTOR
FC	FILTER CELL
FM	FLOW METER
FV	FLOW VALVE
GC	GRIT CLASSIFIER
GS	GAS SENSOR
GT	GRAVITY THICKENER
H	HYDROCYCLONE
HP	HOPPER
HV	HAND VALVE
IN	INJECTOR
L	LAUNDER
MX	MIXER
OP	ORIFICE PLATE
P	PUMP
PB	POLYMER AIRLOCK
PCV	PRESSURE CONTROL VALVE
PD	PULSATION DAMPENER
PW	PRESSURE WASHER
PWC	PRE WETTING CON
RA	ROTARY AIRLOCK
RM	ROTOMETER
S	STORAGE
SB	STORAGE BIN
SC	SCALE
SIL	SILENCER
SM	STATIC MIXER
SP	SAMPLE PUMP
SV	SOLENOID VALVE
SW	STILLING WELL
T	TANK
V	VIBRATOR
VR	AUTOMATIC SWITCHOVER VACUUM REGULATOR
WP	ADJUSTABLE WEIR PLATE
WW	WETWELL

INSTRUMENT IDENTIFICATION



FUNCTION ABBREVIATIONS

A	ANALOG
AIT	ANALOG INDICATING TRANSMITTER
ALT	ALTERNATE
BFC	BALLASTED FLOCCULATION / CLARIFICATION
CL_2	CHLORINE RESIDUAL
CS	CONTROL STATION
D	DIGITAL
dP	DIFFERENTIAL PRESSURE
DO	DISSOLVED OXYGEN
?	INTERNAL INDICATOR
FC	FAIL CLOSED
FI	FAIL INDETERMINATE
FL	FAIL LOCKED
FO	FAIL OPEN
HMI	HUMAN MACHINE INTERFACE
HOA	HAND-OFF-AUTOMATIC
HS	HAND SWITCH
IAS	INTERNAL AIR SUPPLY
I/I	CURRENT-TO-CURRENT
I/P	CURRENT-TO-PNEUMATIC
LEL	LOWER EXPLOSIVE LIMIT
L	LENGTH
LCP	LOCAL CONTROL PANEL
LOS	LOCK OUT SERVICE
L/R	LOCAL-REMOTE
NO	NORMALLY OPEN
NC	NORMALLY CLOSED
O_3	OZONE GAS
OAC	OPEN-AUTO-CLOSE
OC	OPEN-CLOSE
OO	ON-OFF....MAINTAINED
ORP	OXIDATION REDUCTION POTENTIAL
OSC	OPEN-STOP-CLOSE....MOMENTARY
SEQ	SEQUENCE OPERATION
SP	SET POINT
S/S	START-STOP....MOMENTARY
TOAE	TIME-TO-OPEN AFTER ENERGIZED
TURB	TURBIDITY
UCP	UNIT CONTROL PANEL
VGAC	VAPOR-PHASE GRANULAR ACTIVATED CARBON
>	HIGH SELECT
<	LOW SELECT

REV #	Revisions	Date	Approved
	AS-BUILT	10/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

ARROWHEAD CONTRACTING INC.
10981 Eicher Drive
Lenexa, Kansas 66219
(913) 814-9994

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

Designed by:	DLR
Drawn by:	DLR
Checked by:	GWW
Reviewed by:	SFS
Submitted by:	GWW

LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
LEGEND

Scale: AS SHOWN		Sheet reference number: G-01	Date: January 27, 2010
Spec. No.: -			Drawing Code: -
Contract No. -			

SEND TO / PHONE
LOC / PROJ.
PROJ. # / TASK #
DRAWER / DATE
FILE # / SCALE

PUMP AND COMPRESSOR SYMBOLS

- RECIPROCATING COMPRESSOR
- CENTRIFUGAL PUMP
- CENTRIFUGAL BLOWER
- REGENERATIVE BLOWER
- ROTARY VANE COMPRESSOR
- ROTARY LOBE BLOWER
- CLAW ROTARY LOBE BLOWER
- PROGRESSIVE CAVITY PUMP
- AIR/AIR OR AIR/WATER HEAT EXCHANGER
- SUBMERSIBLE SUMP PUMP
- ROTARY SCREW COMPRESSOR
- DIAPHRAGM METERING PUMP
- DOUBLE DIAPHRAGM PNEUMATIC PUMP

VALVE SYMBOLS

- GATE VALVE
- BALL VALVE
- GLOBE VALVE
- BUTTERFLY VALVE
- DIAPHRAGM VALVE
- CHECK VALVE
- S SOLENOID VALVE
- PRESSURE RELIEF VALVE
- VACUUM RELIEF VALVE
- SP SAMPLE PORT
- SP SAMPLE PORT
- PRESSURE REGULATOR
- P PNEUMATIC DIAPHRAGM VALVE
- PRESSURE SUSTAINING VALVE

PIPING SYMBOLS

- WYE STRAINER
- QUICK DISCONNECT HOSE CONNECTION
- UNION PIPE CONNECTION
- FLEXIBLE JOINT OR CONNECTOR
- BUCKET TRAP OR SEPARATOR
- AIR FILTER ELEMENT
- SILENCER
- SITE GLASS

PRIMARY ELEMENT SYMBOLS

- FE 101 — ROTAMETER (VARIABLE AREA FLOW METER)
- FE 100 — VENTURI FLOW ELEMENT
- FE 100 — PITOT TUBE FLOW ELEMENT
- FE 100 — POSITIVE DISPLACEMENT FLOW ELEMENT
- PT 100 — SUBMERSIBLE PRESSURE TRANSMITTER ELEMENT
- FE 100 — MAGENTIC FLOW METER ELEMENT
- FE 100 — PADDLE WHEEL FLOW ELEMENT
- FE 100 — TURBINE FLOW ELEMENT
- FE 100 — VARIABLE AREA VANE FLOW ELEMENT

PIPE AND FITTING SYMBOLS

- WELDED JOINT
- FLANGED JOINT
- MECHANICAL JOINT
- RESTRAINED MECHANICAL JOINT
- PUSH ON JOINT
- RESTRAINED PUSH ON JOINT
- BALL JOINT
- DIRECTION OF FLOW
- PLAIN END x PLAIN END PIPE COUPLING
- PLAIN END x PLAIN END RESTRAINED PIPE COUPLING
- FLANGED ADAPTER COUPLING
- FLEXIBLE COUPLING OR EXPANSION JOINT (SLEEVE TYPE)
- FLEXIBLE COUPLING OR EXPANSION JOINT (BELLOWS TYPE)
- GROUVED END JOINT COUPLING (F) FLEXIBLE (R) RIGID
- FLANGE GUARD
- FILLER FLANGE
- UNION
- QUICK CONNECT COUPLING
- HOSE COUPLING
- CAP

PIPE AND FITTING SYMBOLS

- 90° ELBOW
- 90° ELBOW ROTATED UP
- 90° ELBOW ROTATED DOWN
- TEE
- TEE ROTATED UP
- TEE ROTATED DOWN
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER

INSTRUMENT SYMBOL LEGEND

ALARM LIGHT: LAH 104

INSTRUMENT: PSHH 100

FIRST	SECOND	THIRD	FOURTH
C – CONDUCTIVITY	A – ALARM	C – COMMON	H – HIGH
dP – DIFFERENTIAL PRESSURE	E– ELEMENT	H – HIGH	L – LOW
F – FLOW	I – INDICATOR	L – LOW	
H – HAND	P – PROBE	T – TRANSMITTER	
L – LEVEL	S – SWITCH		
P – PRESSURE	T – TRANSMITTER		
T – TEMPERATURE			
V – VACUUM			

LINE THRU INSTRUMENT SIGNIFIES PANEL MOUNTED INSTRUMENT (NO LINE INDICATES FIELD MOUNTED INSTRUMENT)

INDICATES INSTRUMENT TAG NUMBER

REV #	Revisions	Date	Approved
	AS-BUILT	10/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

ARROWHEAD CONTRACTING INC.
10981 Eicher Drive
Lenexa, Kansas 66219
(913) 814-9994

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
LEGEND

Designed by: DLR	Scale: AS SHOWN	Sheet reference number: G-02	Date: JANUARY 27, 2010
Drawn by: DLR	Spec. No.: -		Drawing Code: -
Checked by: GWW	Contract No.: -		
Reviewed by: SFS			
Submitted by: GWW			

SEND TO / PHONE
LOC / PROJ
PROJ # / TASK #
UPPER / DATE
FILE # / SCALE

NOTES:

1. PIPE INSTALLATION WITH LIMITS OF STATE RIGHT OF WAY TO BE BURIED MINIMUM 120" BELOW GRADE. REFER TO DETAIL 5, SHEET C-03.
2. RESTORATION WITHIN NYDOT RIGHT OF WAY TO BE COMPLETED IN ACCORDANCE WITH NYDOT STANDARD SPECIFICATION SECTION 107-08.

GENERAL NOTES

COORDINATES BASED ON HORIZONTAL SYSTEM NAD '83, SPC (3104 NY L).

ELEVATIONS BASED ON VERTICAL DATUM NAVD '88.

FOR WELLS EW1, EW2, IW-01, IW-02, IW-03, IW-04 AND IW-05 THE ELEVATIONS ARE TAKEN ON THE EDGE OF HOLE ON THE INSIDE OF THE FLANGE.

ALL OTHER ELEVATIONS TAKEN ON THE NOTCH ON THE NORTH SIDE OF THE CASING.

NEW POWER POLE AND PRIMARY SERVICE DROP
NEW WATER METER
NEW RPZ
NEW POTABLE WATER SERVICE LINE
MW-05
NEW UNDERGROUND PRIMARY ELECTRICAL SERVICE LINE, RPZ HOTBOX POWER FEED, AND TELEPHONE SERVICE
PZ-07
ABANDONED CONCRETE FOUNDATION TO FORMER MOTOR POOL
PILE
1 C-01C-03
3 PHASE 13 KV ELECTRIC
CESSPOOLS
CESSPOOL
PZ-01
EXTRACTION WELL, REFER TO DRAWING M-06
INFLUENT WATER LINE
2 C-01C-03
FLOOR DRAIN
TRENCH DRAIN
FLOOR DRAIN
SITE DRAINAGE
3" WATER LINE
LAB.
BUILDING 10
BUILDING G
SBD-10-W
SBD-PD-19
BUILDING F
PZ-06
EXTRACTION WELL, REFER TO DRAWING M-06
IW-ISCO-13
IW-ISCO-10
IW-ISCO-9
IW-ISCO-8
MW-ISCO-3
IW-ISCO-7
IW-ISCO-3
ISCO-SB-1
PZ-04
EXTRACTION WELL, REFER TO DRAWING M-06
MPW-02
PZ-PD-02
PZ-PD-03
PZ-PD-01
SBD-08-W
MW-ISCO-2
IW-ISCO-12
IW-ISCO-2
ISCO-SB-2
MW-ISCO-1
IW-ISCO-6
IW-ISCO-5
ISCO-SB-3
IW-ISCO-11
MW-ISCO-4
IW-ISCO-4
IW-ISCO-1
BUILDING 10X CHEM MILL
BUILDING G
SEPTIC TANK
ABANDONED CESSPOOLS
SITE DRAINAGE
ACID PUMP HOUSE
ABANDONED ACID HOLDING TANK
3 C-01C-03
7 C-01C-03
3 PHASE 13 KV ELECTRIC
SBD-PD-17
4" PVC ACID LINE
ACID DRAINAGE LINE
PZ-03
INFLUENT WATER LINE
BUILDING 30 CHEM MILL
H.F. ACID TANK
6" CLAY PIPE (ABANDONED)
ACID HOLDING TANK
CLEAN OUTS
RECYCLED CRUSHED CONCRETE SURFACE
ABANDONED ACID LINE
SBD-PD-16
PZ-02
SBD-PD-18
NITRIC ACID TANK
MIDWEST GRINDER BLDG
ROOF DRAIN
FIRE LINE
PVC CONDUIT
FLOOR DRAIN
6" TRANSITE
JUNCTION BOX
4" PVC ACID LINE
NEW YORK STATE RIGHT OF WAY
BOLLARD POST, REFER TO DETAIL 4, SHEET C-07 (TYP.)
6 C-07C-03
IW-02
IW-03
IW-04
NEW GWTF BUILDING
1 STY. MAS. BLDG. #3 20.4
CLEAN OUTS
ELECTRO MELT FACILITY
INDUSTRIAL WASTE STORAGE BUILDING
SEE DETAIL 2, SHEET C-07 FOR CLEAN OUT DETAIL (TYP)
CHAIN LINK FENCE
SEPTIC TANK LEACHING POOL
PZ-05
IW-01
IW-05
CLEAN OUTS
PLACE RIP-RAP ALONG FACE OF SLOPE
4 C-01C-03
ABANDONED CESSPOOL
CLEAN OUTS
SEE NOTE 1
5 C-01C-03
REFER TO SHEET C-04 FOR CONTROL WIRING HANDHOLE DETAILS (TYP)
INJECTION WELL, REFER TO DRAWING M-07
EFFLUENT LINES

60 30 0 60 120
SCALE: 1" = 60'

REV #	Revisions	Date	Approved
2	AS-BUILT REVISIONS	11/15/21	
	AS-BUILT	12/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

HGL HydroGeoLogic, Inc

CDM FEDERAL PROGRAMS NEW YORK, NEW YORK

LAWRENCE AVIATION SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
PROJECT SITE PLAN

Designed by: DLR	Scale: AS SHOWN	Sheet reference number: C-01	Date: JANUARY 27, 2010
Drawn by: DLR	Spec. No.: -		Drawing Code: -
Checked by: GWW	Contract No. -		
Reviewed by: SFS			
Submitted by: GWW			

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

SEND TO | PHONE | LOC. | PROJ. | PROJ. # | TASK # | DRPER. | DATE | FILE # | SCALE

NOTES:

1. SURFACE SOIL IN THE AREA SURROUNDING THE GWTF BUILDING HAVE BEEN REMEDIATED BY OTHERS TO REMOVE PCB AND LEAD CONTAMINATED SOIL. TO THE BEST OF ARROWHEADS KNOWLEDGE NO SURFICIAL SOIL CONTAMINATION REMAINS. DURING SOIL CHARACTERIZATION OF THE YARD PIPING TRENCHES ADDITIONAL SOIL SAMPLES WILL BE COLLECTED IN THE LOCATION OF THE GWTF BUILDING TO CONFIRM THAT CONTAMINATED SOIL WITH THE LIMITS OF EXCAVATION (I.E. FOUNDATIONS) IS NOT PRESENT. REFER TO THE PROJECT WORK PLAN FOR SAMPLING REQUIREMENTS AND SPECIFIC SOIL HANDLING REQUIREMENTS IF CONTAMINATED SOIL IS PRESENT.
2. PREVIOUS REMEDIAL ACTIVITIES IN THE GWTF AREA HAVE RESULTED IN A SMOOTH LEVEL SURFACE. CLEARING AND GRUBBING ACTIVITIES CONDUCTED AS PART OF THIS WORK WILL BE PERFORMED SUCH THAT FINAL GRADING MATCHES THE SURROUNDING TOPOGRAPHY.
3. MINIMAL SITE GRADING WILL BE REQUIRED TO ACCOMMODATE THE GWTF BUILDING. THE FINISH FLOOR ELEVATION WILL BE CONSTRUCTED TO MATCH THE TOP OF CONCRETE PAD ELEVATION AT LOCATION "A". FINAL GRADING OF THE AREA SURROUNDING THE GWTF WILL BE COMPLETED TO PROMOTE DRAINAGE AWAY FROM THE BUILDING.

RECYCLED CRUSHED CONCRETE SURFACE. SEE DETAIL 3, SHEET C-07

FIRE LINE

PVC CONDUIT

LOCATION "A" EL. 230.1'

1 STY. MAS. BLDG.

42.8

25.4

12'

20'

ARMOR EXISTING SLOPE WITH GEOTEXTILE FABRIC AND RIP-RAP. SEE DETAIL SHEET C-10

NEW GWTF BUILDING

CHAIN LINK FENCE, REFER TO DRAWINGS C-5 AND C-6 FOR CONSTRUCTION DETAILS

NEW PAD-MOUNTED ELECTRICAL TRANSFORMER

SEPTIC TANK

LEACHING POOL

PZ-05

10 5 0 10 20

SCALE:1" = 10'

REV #	Revisions	Date	Approved
2	AS-BUILT REVISIONS	11/15/21	
	AS-BUILT	12/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

HGL HydroGeoLogic, Inc

CDM FEDERAL PROGRAMS NEW YORK, NEW YORK

LAWRENCE AVIATION SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

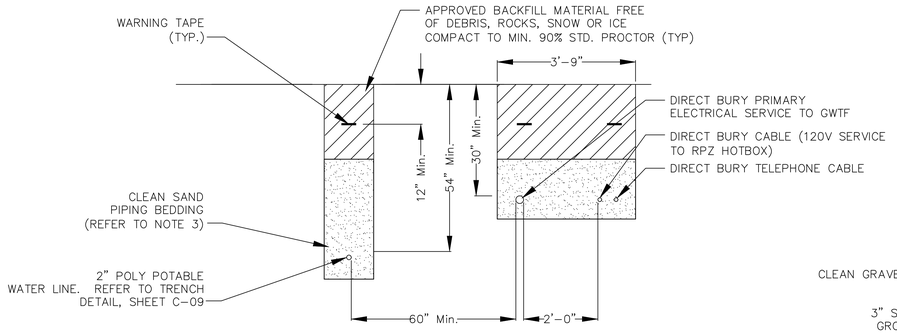
GROUNDWATER TREATMENT PLANT
GWTF SITE PLAN

Designed by: DLR
Drawn by: DLR
Checked by: GWW
Reviewed by: SFS
Submitted by: GWW

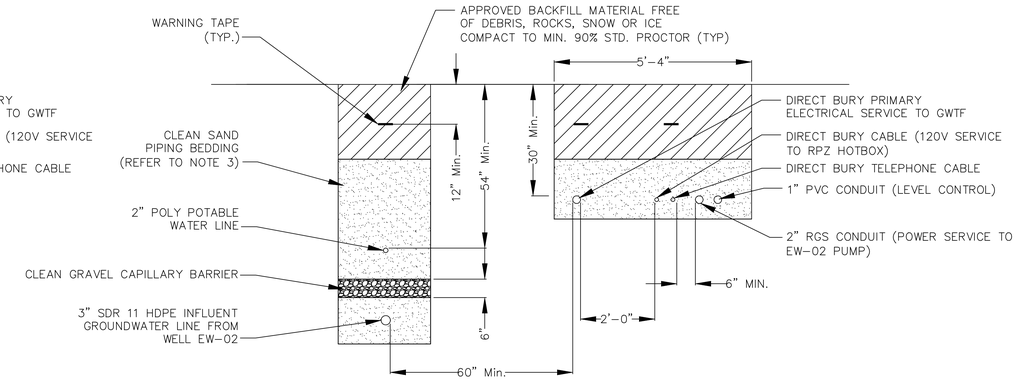
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

Scale: AS SHOWN
Spec. No.: -
Contract No. -
Sheet reference number: C-02
Date: JANUARY 27, 2010
Drawing Code: -

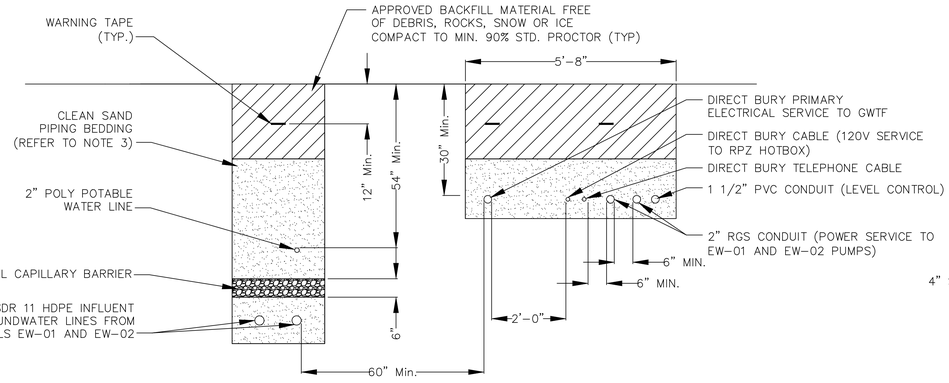
SEND TO PHONE
LDC PROJ.
PROJ. # TASK #
DPPER. DATE
FILE # SCALE



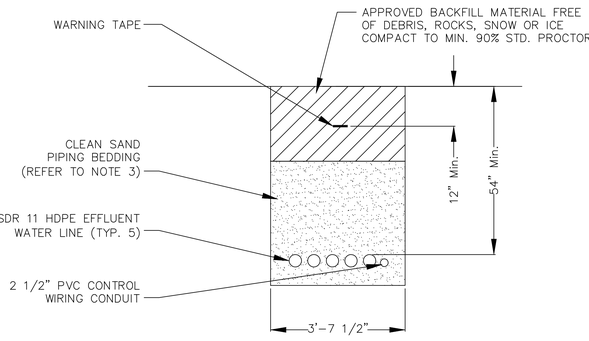
1 C-01 C-03 TRENCH SECTION
NOT TO SCALE



2 C-01 C-03 TRENCH SECTION
NOT TO SCALE



3 C-01 C-03 TRENCH SECTION
NOT TO SCALE

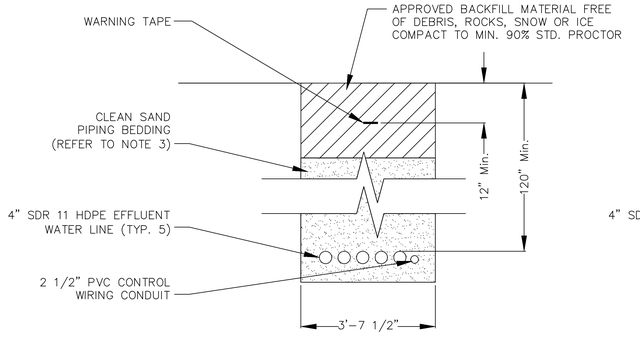


4 C-01 C-03 TRENCH SECTION
NOT TO SCALE

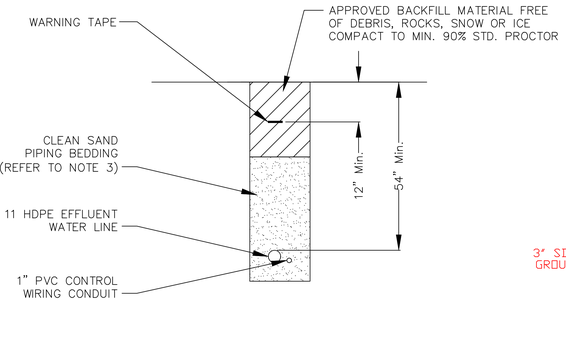
NOTES:

1. PROVIDE MINIMUM 6" CLEARANCE BETWEEN EACH PIPE TRENCH WALLS AND 2" BETWEEN EACH PIPE, TYPICAL ALL PIPING.
2. ALL PIPING LOCATED WITHIN STATE RIGHT OF WAY TO BE BURIED MINIMUM OF 120" TO TOP OF HIGHEST PIPE.
3. EXCAVATED MATERIAL USED FOR PIPE BEDDING.

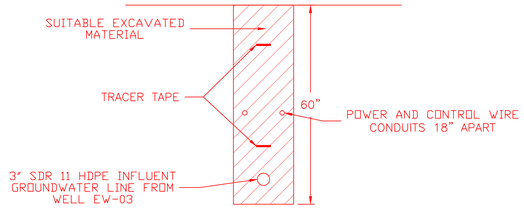
   REFER TO DRAWING E-01 FOR ADDITIONAL
4. DETAIL OF ELECTRICAL CABLE AND CONDUIT BURIAL AND SEPARATION REQUIREMENTS.



5 C-01 C-03 TRENCH SECTION
NOT TO SCALE



6 C-01 C-03 TRENCH SECTION
NOT TO SCALE



7 C-01 C-03 TRENCH SECTION
NOT TO SCALE

REV #	Revisions	Date	Approved
2	AS-BUILT REVISIONS	11/15/21	
	AS-BUILT	10/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

HGL HydroGeoLogic, Inc

CDM FEDERAL PROGRAMS NEW YORK, NEW YORK

Designed by:
Drawn by:
Checked by:
Reviewed by:
Submitted by: DLR

LAWRENCE AVIATION SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT

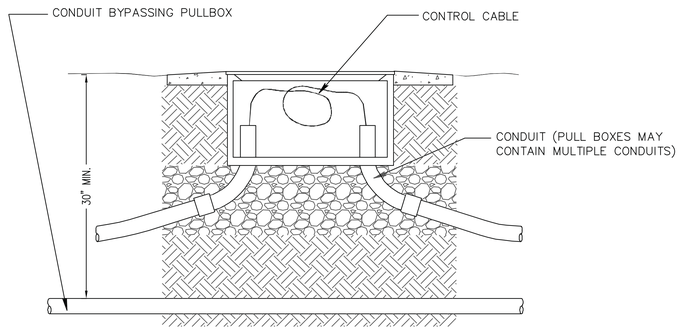
CONVEYANCE PIPE TRENCH DETAILS

Scale: AS SHOWN
Spec. No.: -
Contract No. -
Sheet reference number: C-03
Date: JANUARY 27, 2010
Drawing Code: -

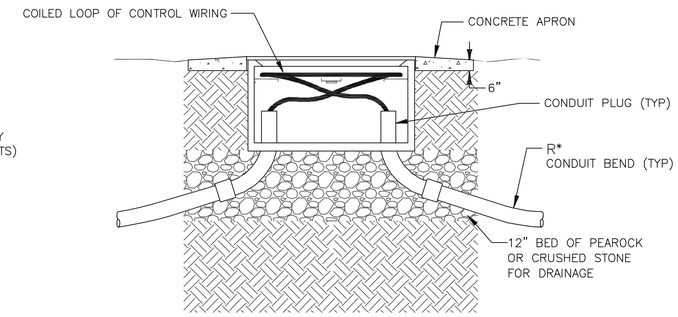
SEND TO
PHONE
LOC
PROJ
PROJ #
TASK #
DIPER
DATE
FILE #
SCALE

NOTES:

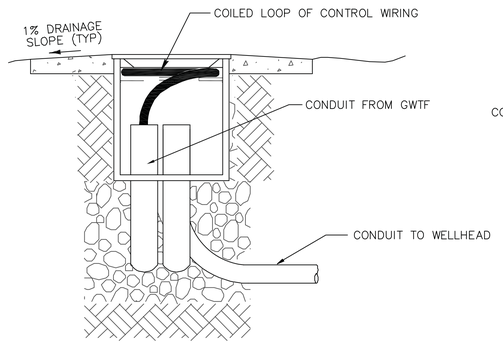
1. CONDUITS DEPICTED ON THIS SHEET ARE REPRESENTATIVE ONLY. EXACT NUMBER OF CONDUITS INSTALLED AND CONDUIT SIZE SHALL BE AS SHOWN ON DRAWING C-03.
2. CONDUIT CENTERLINE SHALL BE ALIGNED WITHIN THE PULL BOX TO FACILITATE CABLE PULLING.
3. CONDUIT PLUGS SHALL BE INSTALLED IN ALL CONDUITS, BOTH WITH OR WITHOUT CABLE.
4. TRACER WIRE AND PULL ROPE TO BE INSTALLED AS FOLLOWS:
   IF INSTALLATION INCLUDED MULTIPLE RUNS OF CONDUIT, PULL ROPE SHALL BE INSTALLED IN EACH INDIVIDUAL CONDUIT. TRACER WIRE WILL BE INSTALLED IN ONLY ONE CONDUIT.
   IF INSTALLATION INCLUDES ONLY ONE CONDUIT, PULL ROPE AND TRACER WIRE WILL BE INSTALLED IN CONDUIT.
5. PULL BOXES SHALL HAVE 12" WIDE x 6" THICK CONCRETE APRON SLOPED AWAY FROM PULLBOX.
6. PULL BOX CONSTRUCTED OF POLYETHYLENE, PLACE BOLLARD POSTS AT EACH LOCATION TO PREVENT DAMAGE.

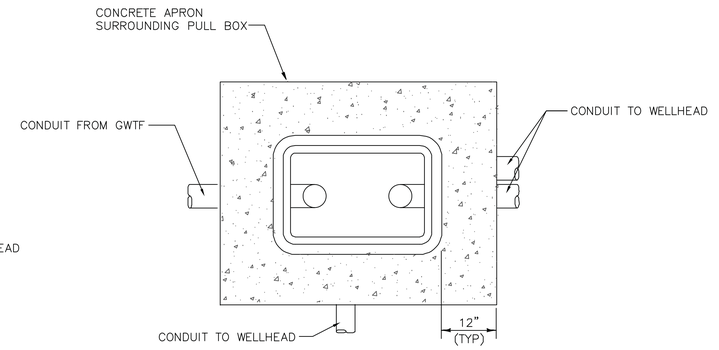


CONDUIT BYPASS DETAIL



* CONDUIT BEND NOTES:
1. MINIMUM RADIUS "R" MUST NOT BE LESS THAN 12"
2. MINIMUM SWEEP MUST NOT BE GREATER THAN 90 DEGREES





PULL BOX INSTALLATION

REV #	Revisions	Date	Approved
	AS-BUILT	10/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

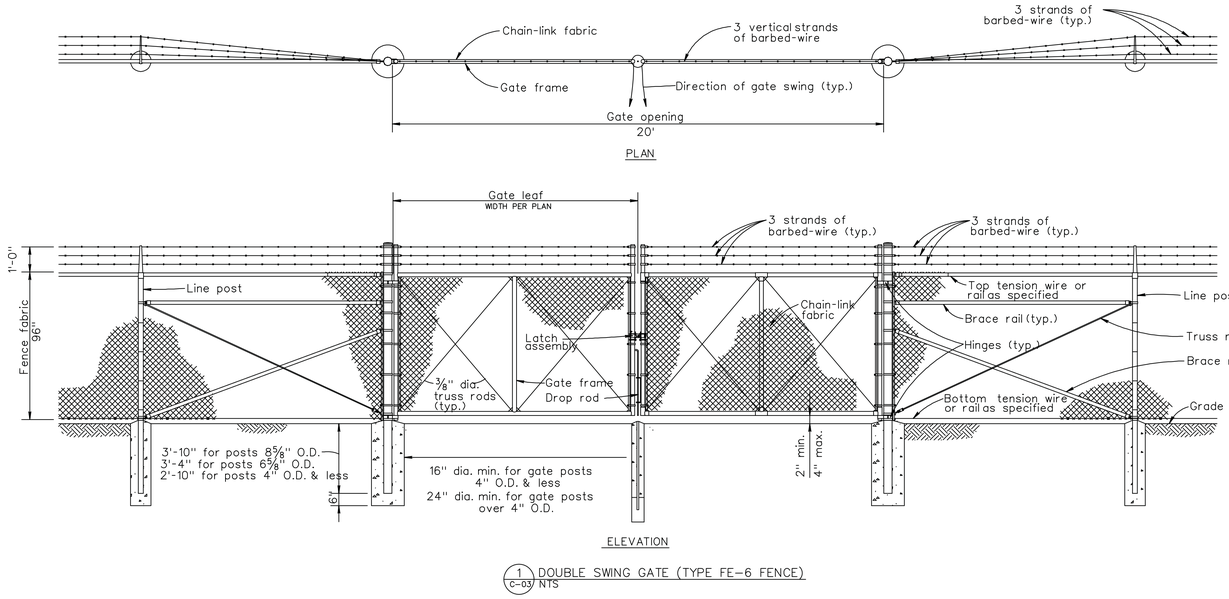
ARROWHEAD CONTRACTING INC.
10981 Eicher Drive
Lenexa, Kansas 66219
(913) 814-9994

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

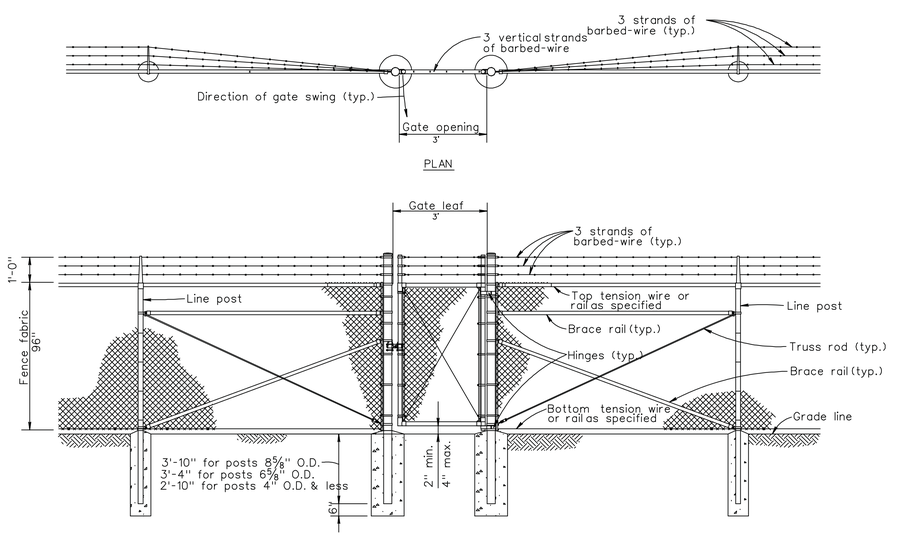
Designed by: DLR	LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE PORT JEFFERSON STATION, NEW YORK
Drawn by: DLR	GROUNDWATER TREATMENT PLANT CONTROL WIRING PULLBOX DETAIL
Checked by: GWW	
Reviewed by: SFS	Scale: AS SHOWN
Submitted by: GWW	Spec. No.: -
	Contract No.: -
	Sheet reference number: C-04
	Date: JANUARY 27, 2010
	Drawing Code: -

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

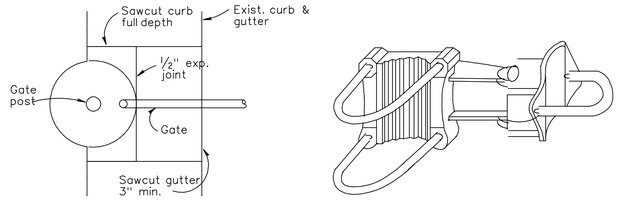
SEND TO
PHONE
LOC
PROJ.
PROJ. #
TASK #
UPPER
DATE
FILE #
SCALE



1 C-03 DOUBLE SWING GATE (TYPE FE-6 FENCE)
NTS

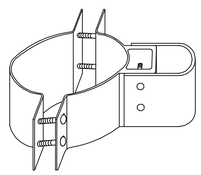


2 C-03 SINGL SWING GATE (TYPE FE-6 FENCE)
NTS



PLAN

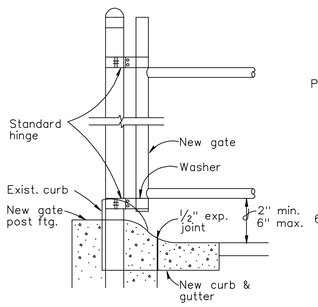
OFFSET HINGE



STANDARD HINGE

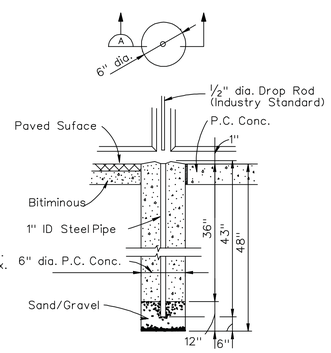
GATE POST SCHEDULE	
GATE LEAF WIDTH (NOMINAL)	OUTSIDE DIMENSION (NOMINAL)
6' or less	2.875" OD 2.5" SQ
More than 6' to 13'	4.0" OD
More than 13' to 18'	6.625" OD
More than 18'	8.625" OD

NOTES:
1. Details shown are to clarify requirements and are not intended to limit other type of fence sections and methods of installation.
2. Swing Gates shall be constructed with drop rods, padlocks, latch assembly and gate keepers except as noted.
3. All gate frames shall be a minimum 1.90" nominal (round) or 2.00" nominal (square). Gate frames shall be of welded construction or shall be assembled using heavy fittings. At Contractor's option a welded horizontal brace may be used in lieu of truss rods to brace all welded gate frames. The Contractor shall be responsible for the proper rigid construction of all gates supplied.

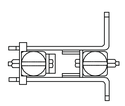


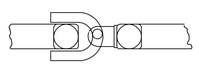
SECTION

GATE POST DETAIL AT CURB AND GUTTER
NO SCALE

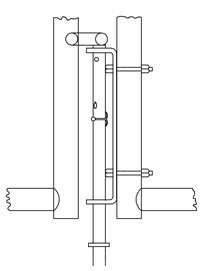


DROP ROD FOUNDATION





LATCH ASSEMBLY



DROP ROD ASSEMBLY

3 MISC. FENCE DETAILS
C-03 NTS

REV #	Revisions	Date	Approved
	AS-BUILT	10/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

ARROWHEAD CONTRACTING INC.
10981 Eicher Drive
Lenexa, Kansas 66219
(913) 814-9994

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

Designed by: DLR
Drawn by: DLR
Checked by: GWW
Reviewed by: SFS
Submitted by: GWW

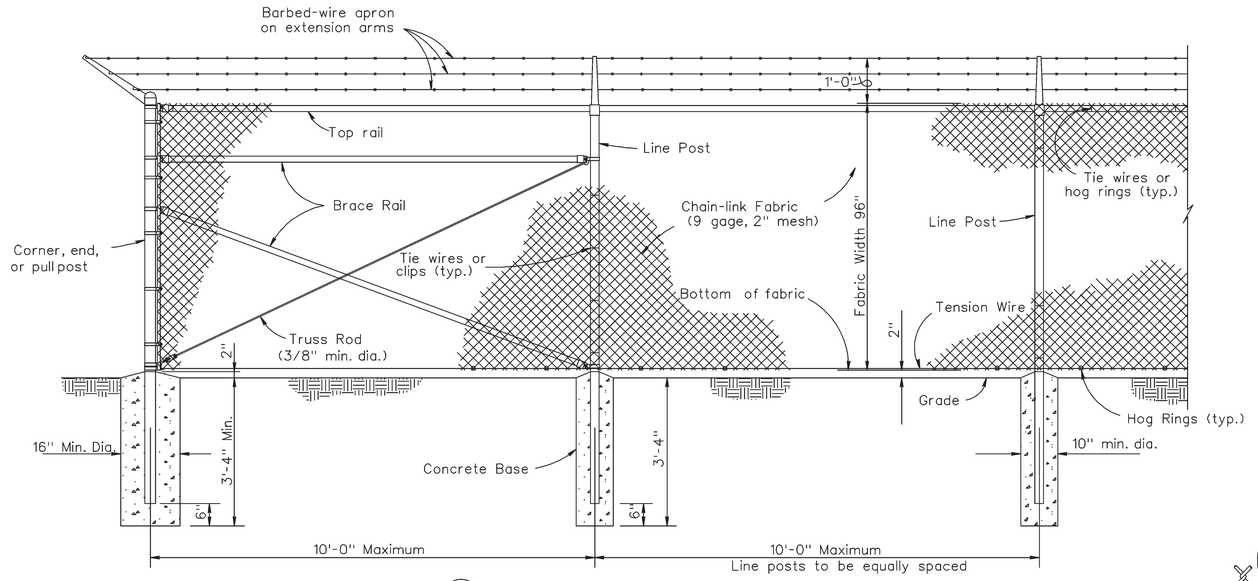
LAWRENCE AVIATION SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
FENCE DETAILS

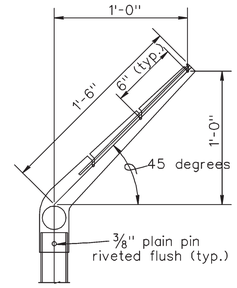
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

Scale: AS SHOWN
Spec. No.: -
Contract No.: -
Sheet reference number: C-05
Date: JANUARY 27, 2010
Drawing Code: -

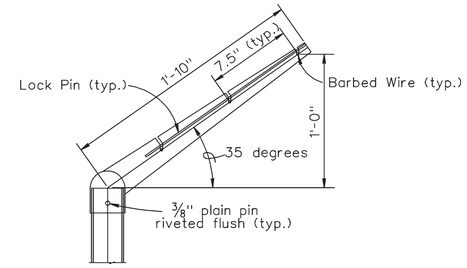
SEND TO PHONE
LOC. PROJ.
PROJ. # TASK #
DPPER. DATE
FILE # SCALE



1 C-02 CHAIN-LINK SECURITY FENCE DETAIL
NTS



LINE POST



CORNER POST

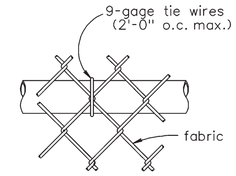
2 C-02 CHAIN-LINK SECURITY FENCE DETAIL
NTS

STEEL POST SCHEDULE			
USE AND SECTION	MINIMUM OUTSIDE DIMENSIONS (NOMINAL)		
	FABRIC LESS THAN 72"	FABRIC 72" TO 96"	FABRIC OVER 96"
Corner, End & Pull Posts			
Tubular - Round	2.375" O.D.	2.875" O.D.	4.00" O.D.
Tubular - Square	2.00" SQ.	2.50" SQ.	3.00" SQ.
C-Section (Roll-Formed)	3.50" x 3.50"	3.50" x 3.50"	———
Line Posts			
Tubular - Round	1.90" O.D.	2.375" O.D.	2.875" O.D.
H-Section	2.25" x 1.70"	2.25" x 1.70"	2.25" x 1.70"
C-Section (Roll-Formed)	1.875" x 1.625"	2.25" x 1.70"	———
Top, Bottom & Brace Rails			
Tubular - Round	1.66" O.D.		
Tubular - Square	1.50" O.D.		
H-Section	1.625" x 1.50"		
C-Section (Roll-Formed)	1.625" x 1.25"		

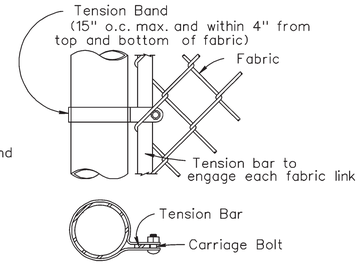
NOTES:
1. Details shown are to clarify requirements and are not intended to limit other types of fence sections and methods of installation.
2. Wire ties, rails, posts, and braces shall be constructed on the secure side of the fence alignment. Chain-link fabric shall be placed on the opposite side of the secure area.
3. Unless specifically shown or specified, all FE6 fence shall have apron extended outward from the area being protected.
4. C-section posts shall be installed so that the void inside the post is completely filled with concrete up to the top of the foundation.
5. Fences shall be type FE6-TR-96

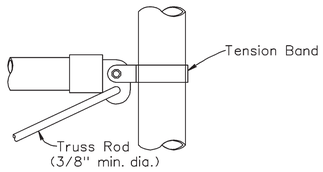
FENCE LEGEND:
Type FE5 - Chain-Link Fence Without barbed-wire apron
Type FE6 - Chain-Link Fence w/barbed-wire on single outrigger
Type FE7 - Chain-Link Fence w/barbed wire on double outrigger
Type FE8 - Chain-Link Fence w/barbed-wire and barbed-tape on double outrigger
TR - Fence with top rail and tension wire at bottom
TBR - Fence with top and bottom rails
TWB - Tension wire top and bottom
TWBR - Fence with top tension wire and bottom rail
Final number is fabric width in inches.

Examples:
FE6-TR-72 - Chain-Link security fence with barbed-wire on single outrigger, top rail, and 72 inch fabric width.
FE5-TWB-48 - Chain-Link security fence with no apron, top and bottom tension wire, and 48 inch fabric width.



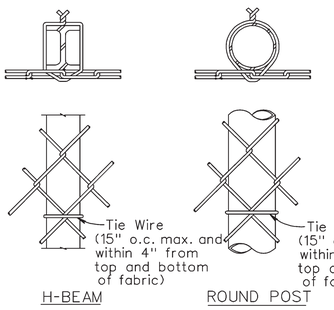
TOP OR BRACE RAIL ATTACHMENT





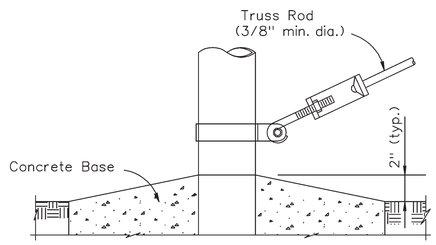
ROUND POST

END OR GATE POST DETAIL

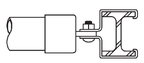


H-BEAM ROUND POST

LINE POST ATTACHMENTS

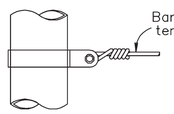


TRUSS ROD AND BAND



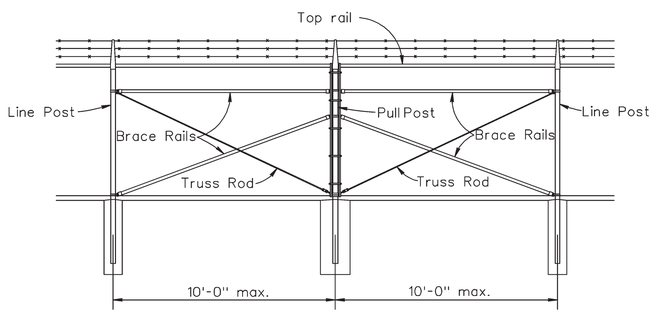
H-BEAM

BRACE RAIL CLAMP DETAILS



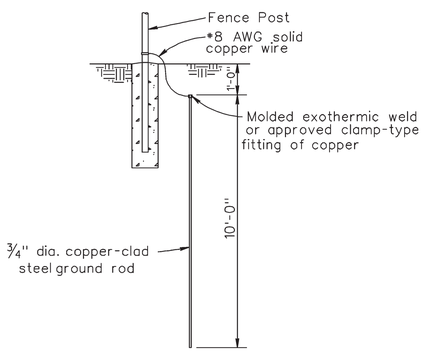
TENSION BAND DETAIL

FASTENING DETAILS
NO SCALE



BRACE PANEL DETAIL
NO SCALE

NOTE:
Provide brace panel whenever straight runs exceed 500 feet.



GROUNDING DETAIL
NO SCALE

3 C-02 MISC. FENCE DETAILS
NTS

REV #	Revisions	Date	Approved
	AS-BUILT	10/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

ARROWHEAD CONTRACTING INC.
10981 Eicher Drive
Lenexa, Kansas 66219
(913) 814-9994

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

Designed by: DLR
Drawn by: DLR
Checked by: GWW
Reviewed by: SFS
Submitted by: GWW

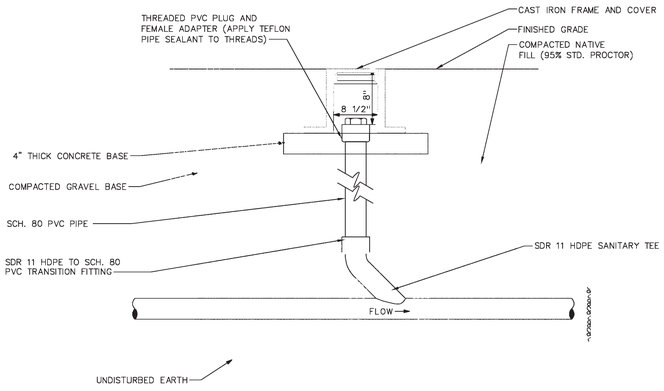
LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
FENCE DETAILS

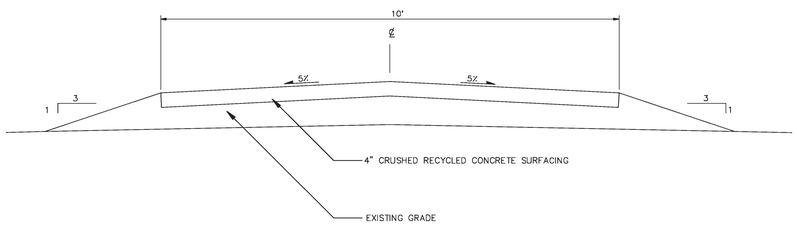
Scale: AS SHOWN
Spec. No.: –
Contract No. –
Sheet reference number: C-06
Date: JANUARY 27, 2010
Drawing Code: –

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

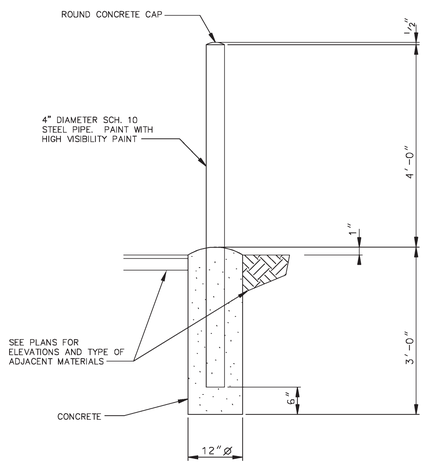
SEND TO PHONE
LOC PROJ.
PROJ. # TASK #
UPPER DATE
FILE # SCALE



2 C-01 C-07 CLEAN-OUT DETAIL
NOT TO SCALE



3 C-01 C-07 ACCESS ROAD DETAIL
NOT TO SCALE



4 A-01 C-07 BOLLARD POST DETAIL
NOT TO SCALE

REV #	Revisions	Date	Approved
	AS-BUILT	10/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

ARROWHEAD CONTRACTING INC.
10981 Eicher Drive
Lenexa, Kansas 66219
(913) 814-9994

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

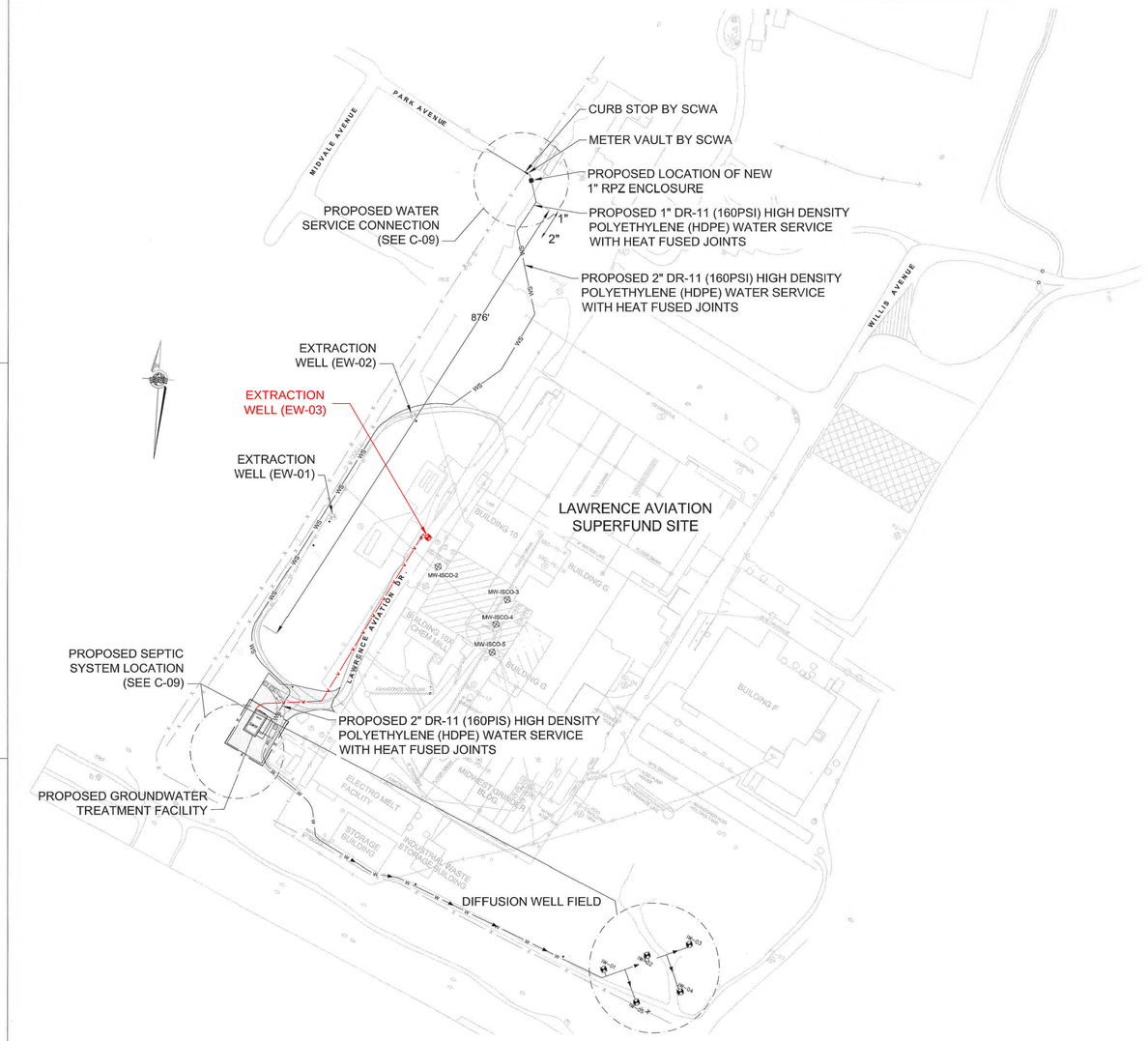
LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
CIVIL DETAILS

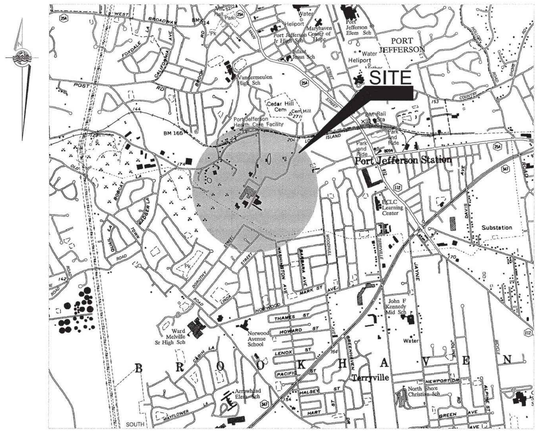
Designed by: DLR	Scale: AS SHOWN	Sheet reference number: C-07	Date: JANUARY 27, 2010
Drawn by: DLR	Spec. No.: -		Drawing Code: -
Checked by: GWW	Contract No. -		
Reviewed by: SFS			
Submitted by: GWW			

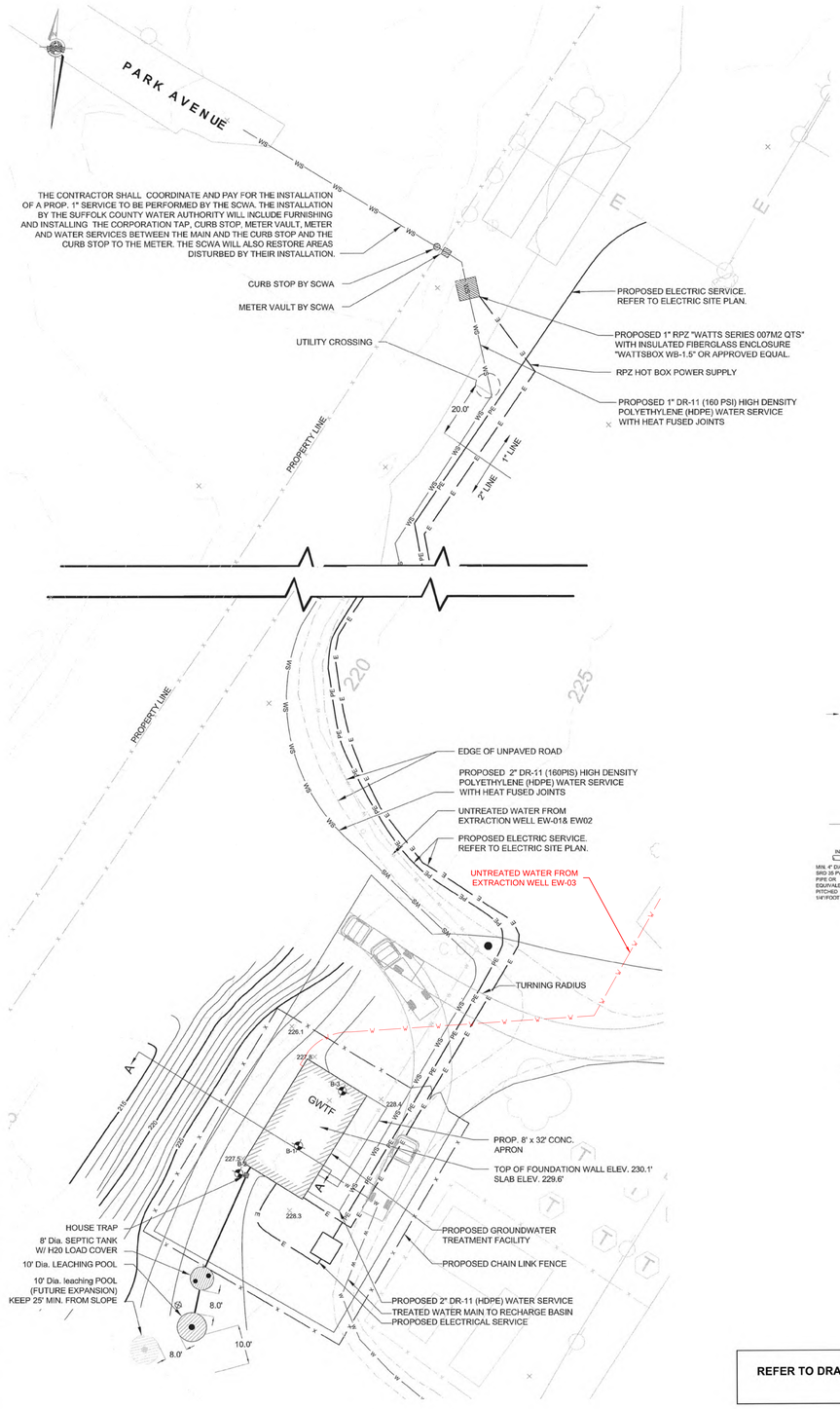
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

SEND TO PHONE
LOC PROJ
PROJ # TASK #
DPPER DATE
FILE # SCALE



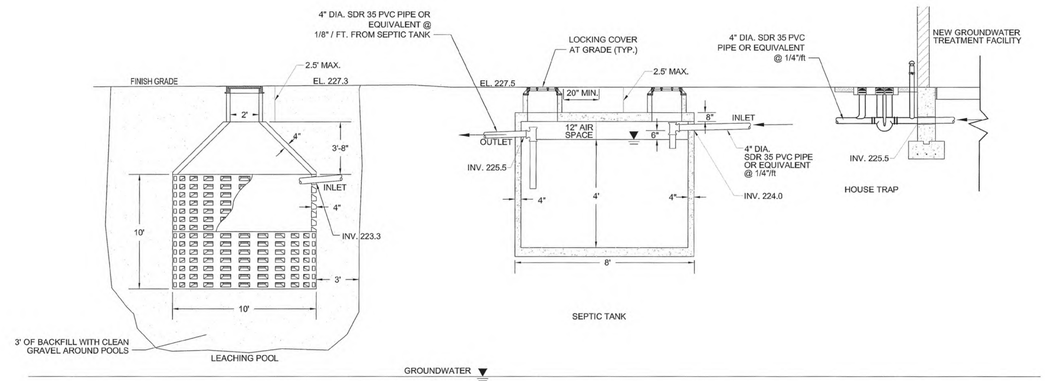
SITE PLAN
SCALE: 1" = 100'


SITE
PORT JEFFERSON
Port Jefferson Station
Terryville
BROOKHAVEN
Substation
Heliport
Cedar Hill Cem.
Ward Melville Sr High Sch
Johnsonville Elem Sch
Port Jefferson Country Club
Port Jefferson Golf Course
Port Jefferson Fire Dept
Port Jefferson Ambulance Corp
Port Jefferson Transfer Station
Recycling Facility
Comsewogue Sch
Comsewogue Public Library
Comsewogue Fire Dept
Comsewogue Ambulance Corp
Comsewogue Cem
Comsewogue Golf Course
Comsewogue Elementary Sch
Comsewogue Water Dist
Comsewogue Sch Dist



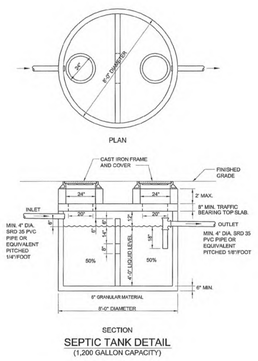
SANITARY PLAN

SCALE: 1" = 10'



SANITARY PROFILE

SCALE: NOT TO SCALE

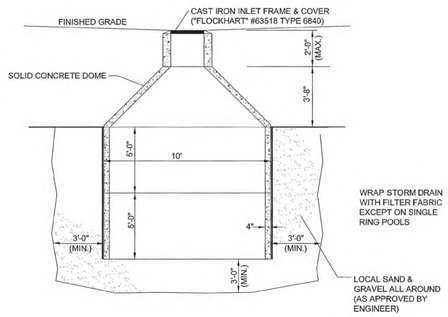


SEPTIC TANK DETAIL

(1,200 GALLON CAPACITY)

1,200 GAL. SEPTIC TANK

SCALE: NOT TO SCALE



LEACHING POOL DETAIL

SCALE: NOT TO SCALE

NOTES:

1. THERE ARE NO PRIVATE OR PUBLIC POTABLE WATER SUPPLY WELLS WITHIN 200' OF THE PROPOSED SANITARY SYSTEM.
2. ALL MANHOLE COVERS SHALL BE INSECT-PROOF, INSTALLED TO FLUSH WITH GRADE, AND SHALL BE DESIGNED FOR AASHTO H-20 LOADING.
3. ALL PRE-CAST STRUCTURES TO MEET SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES STANDARDS.
4. USE (1) 1,200 GAL. REINFORCED PRE-CAST CONCRETE SEPTIC TANK.
5. USE (1) 10 FT DIAMETER, 10 FT HIGH AND PRE-CAST CONCRETE LEACHING POOLS.
6. USE 4 INCH DIAMETER, APPROVED SEWER PIPE THROUGHOUT.
7. BACKFILL MATERIAL SHALL BE COARSE SAND AND GRAVEL.
8. BOTTOM OF LEACHING POOL SHALL BE A MINIMUM OF 3 FEET ABOVE HIGH SEASONAL GROUNDWATER.
9. SANITARY LINE CLEANOUTS TO BE PLACED AT EACH 45° BEND AND NO GREATER THAN 100' APART.
10. SEPTIC SYSTEM TO BE PLACED 25' MINIMUM AWAY FROM SLOPE.
11. ALL PRE-CAST CONCRETE STRUCTURES TO BE 4,000 PSI @ 28 DAYS, AND SHALL BE DESIGNED FOR AASHTO H-20 LOADING.

REFER TO DRAWING C-01 FOR AS-BUILT SITE PLAN

SCDHS APPROVAL STAMP

REV #	Revisions	Date	Approved
1	ISSUED FOR CONSTRUCTION	05/19/10	
2	AS-BUILT REVISIONS	11/15/21	
	AS-BUILT	10/10	

P.W. GROSSER CONSULTING ENGINEER AND HYDROGEOLOGIST, P.C.
630 JOHNSON AVE. • SUITE 7
BOHEMIA • NY • 11716-2618
PH: (631)589-6353 • FX: (631)589-8705
E-MAIL: INFO@PWGROSSER.COM

HydroGeoLogic, Inc

CDM FEDERAL PROGRAMS NEW YORK, NEW YORK

LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
UTILITY PLAN

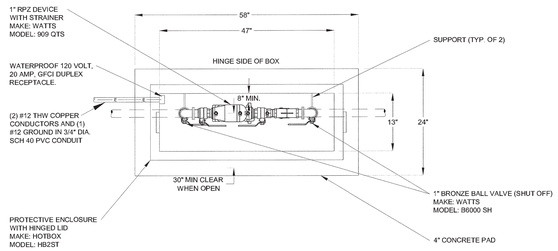
Designed by: PR	Scale: AS SHOWN	Sheet reference number: C-09	Date: JANUARY 26, 2010
Drawn by: PR	Spec. No.: –		Drawing Code: –
Checked by: RJZ	Contract No. –		
Reviewed by: RJZ			
Submitted by: RJZ			

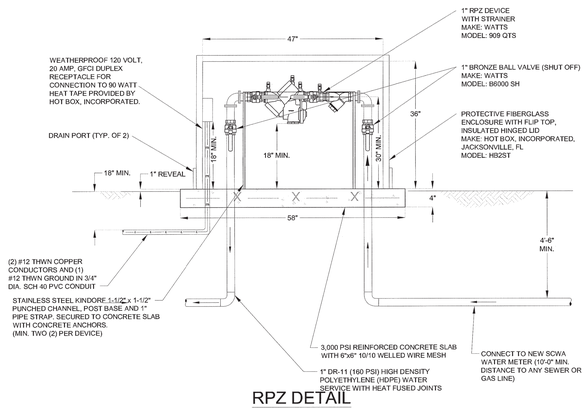
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DRAWING AND RELATED DOCUMENTS IS A VIOLATION OF SEC. 7209 OF THE N.Y.S. EDUCATION LAW

SEND TO: PRIME
LOC: PROJ:
FILE #:
SCALE:

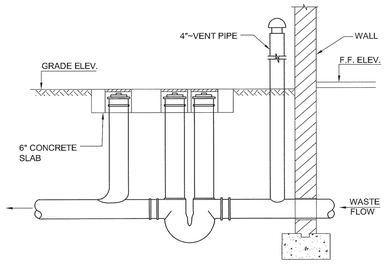
J:\Projects A-D\AC\100\CAD\CIVIL DESIGN\SAN+WATER SERV PLAN.dwg





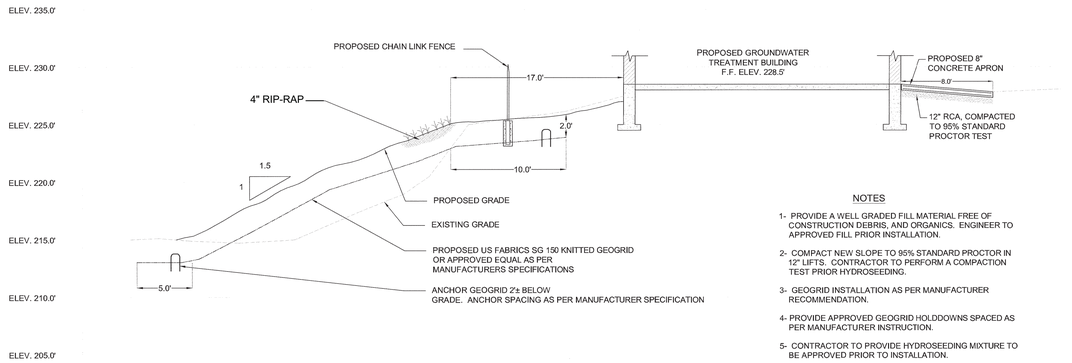
RPZ DETAIL

SCALE: NOT TO SCALE



HOUSE TRAP DETAIL

NOT TO SCALE



SLOPE STABILIZATION PROFILE (SECTION A-A)

NOT TO SCALE

NOTES

1- PROVIDE A WELL GRADED FILL MATERIAL FREE OF CONSTRUCTION DEBRIS, AND ORGANICS. ENGINEER TO APPROVED FILL PRIOR INSTALLATION.

2- COMPACT NEW SLOPE TO 95% STANDARD PROCTOR IN 12" LIFTS. CONTRACTOR TO PERFORM A COMPACTION TEST PRIOR HYDROSEEDING.

3- GEOGRID INSTALLATION AS PER MANUFACTURER RECOMMENDATION.

4- PROVIDE APPROVED GEOGRID HOLDDOWNS SPACED AS PER MANUFACTURER INSTRUCTION.

5- CONTRACTOR TO PROVIDE HYDROSEEDING MIXTURE TO BE APPROVED PRIOR TO INSTALLATION.

6- CONCRETE APRON TO BE 3,500 PSI CLASS A CONCRETE.

7- PROVIDE 6 x 6 W10/W10 AT TOP AND BOTTOM OF APRON. (2" MIN. COVER)

8- PROVIDE 1" EXPANTION JOINT BETWEEN CONC. APRON AND BLDG. FOUNDATION.

NOTES:
1. ALL PIPING WITHIN ENCLOSURE TO BE 1" DIAMETER TYPE K COPPER PIPING WITH BRASS SOLDERED FITTINGS.
2. EXPOSED RPZ, COPPER PIPING AND FITTINGS IN PROTECTIVE ENCLOSURE WRAPPED WITH 90 WATT HEAT TRACE TAPE PROVIDED BY HOT BOX, INCORPORATED.
3. SURROUNDING GRADE SHALL BE SLOPED AWAY FROM THE NEW CONCRETE SLAB.

SCDHS APPROVAL STAMP

REV #	Revisions	Date	Approved
1	ISSUED FOR CONSTRUCTION	05/19/10	
	AS-BUILT	10/10	

P.W. GROSSER CONSULTING
ENGINEER
AND
HYDROGEOLOGIST, P.C.
630 JOHNSON AVE. • SUITE 7
BOHEMIA • NY • 11716-2618
PH: (631)589-6353 • FX: (631)589-8705
E-MAIL: INFO@PWGROSSER.COM

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DRAWING AND RELATED DOCUMENTS IS A VIOLATION OF SEC. 7209 OF THE N.Y.S. EDUCATION LAW

ARROWHEAD CONTRACTING INC.
10981 Eicher Drive
Lenexa, Kansas 66219
(913) 814-9994

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

Designed by:	PR
Drawn by:	PR
Checked by:	RJZ
Reviewed by:	RJZ
Submitted by:	RJZ

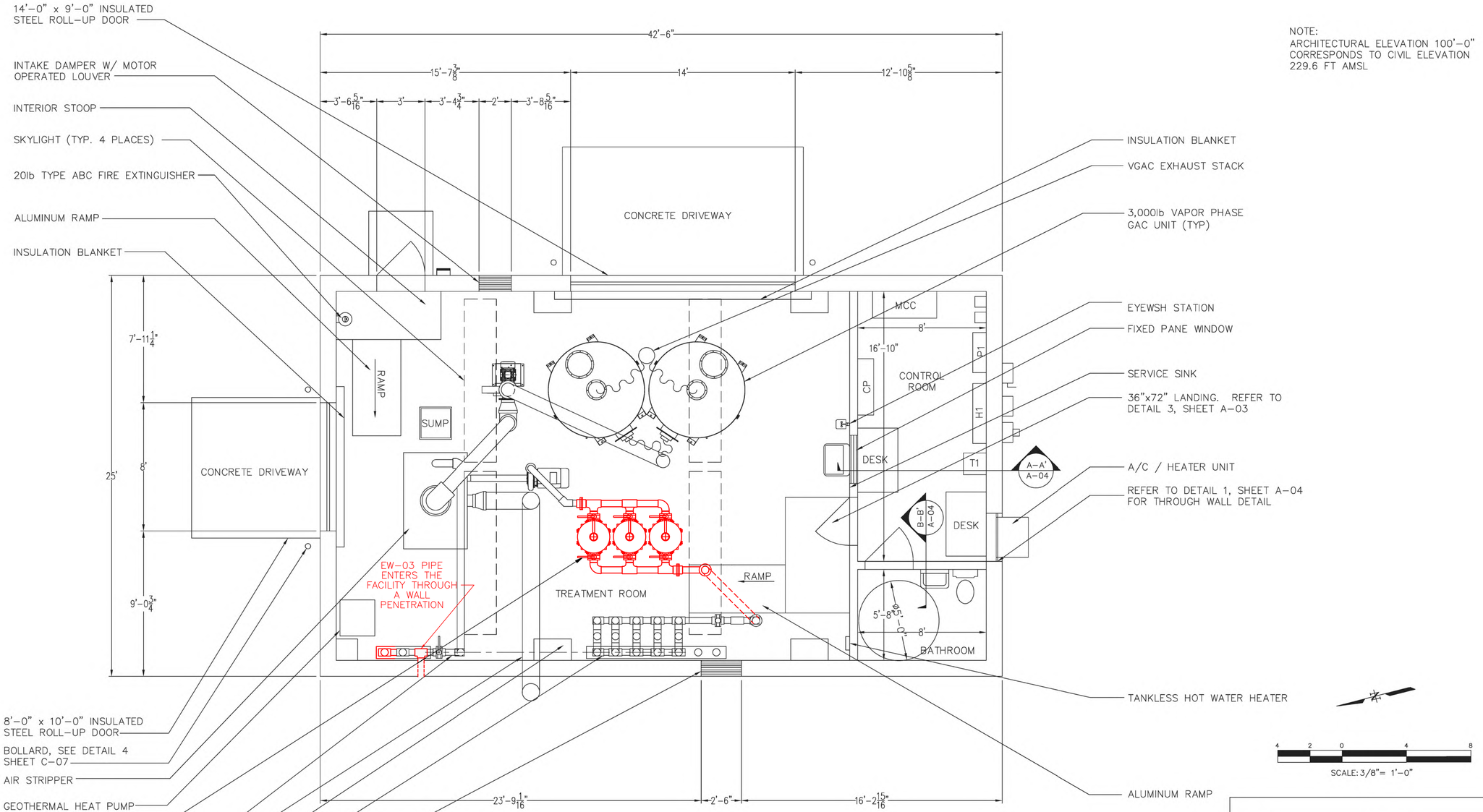
LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
SITE DETAILS

Scale:	AS SHOWN	Sheet reference number:	Date: JANUARY 26, 2010
Spec. No.:	-	C-10	Drawing Code: -
Contract No.	-		

SEND TO
PHONE
LOC.
PROJ.
FILE #
SCALE

J:\Projects A-D\AC\11001\CAD\CIVIL DESIGN\SAN-WATER SERV PLAN.dwg



NOTE:
ARCHITECTURAL ELEVATION 100'-0" CORRESPONDS TO CIVIL ELEVATION 229.6 FT AMSL

4 2 0 4 8

SCALE: 3/8"= 1'-0"

FLOOR PLAN

REV #	Revisions	Date	Approved
3	AS-BUILT REVISONS	11/15/21	
	AS-BUILT	10/10	
2	REVISED INTERIOR WALL PLACEMENT	7/28/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

HGL HydroGeoLogic, Inc

CDM FEDERAL PROGRAMS NEW YORK, NEW YORK

Designed by: DLR
Drawn by: DLR
Checked by: GWW
Reviewed by: SFS
Submitted by: GWW

LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

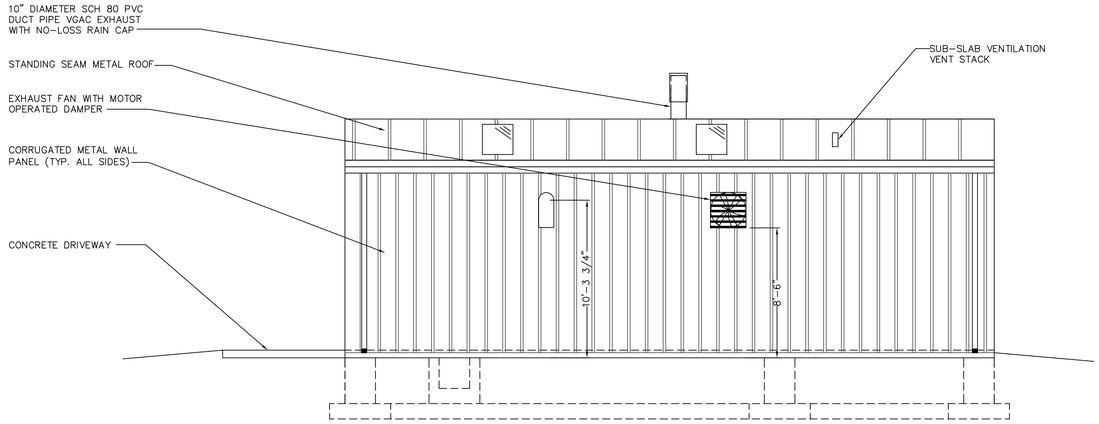
GROUNDWATER TREATMENT PLANT
BUILDING PLAN

Scale: AS SHOWN
Spec. No.: -
Contract No.: -
Sheet reference number: A-01
Date: JANUARY 27, 2010
Drawing Code: -

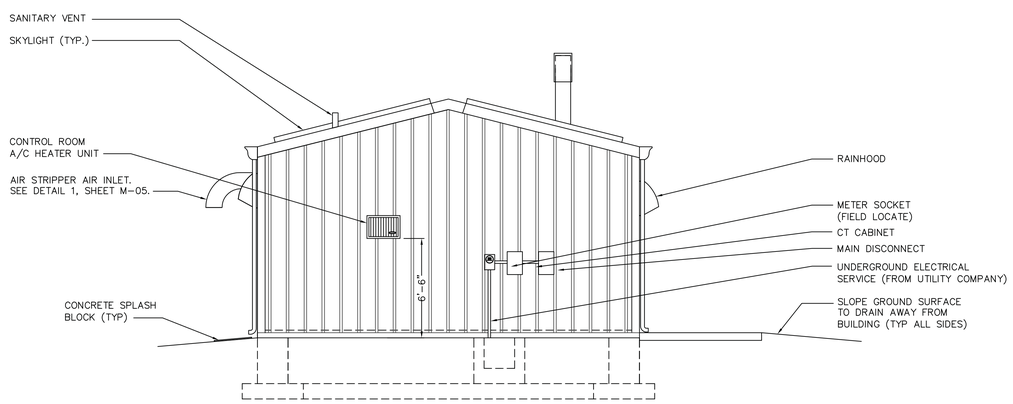
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

SEND TO | PHONE
LOC. | PROJ.
PROJ. # | TASK #
UPPER | DATE
FILE # | SCALE

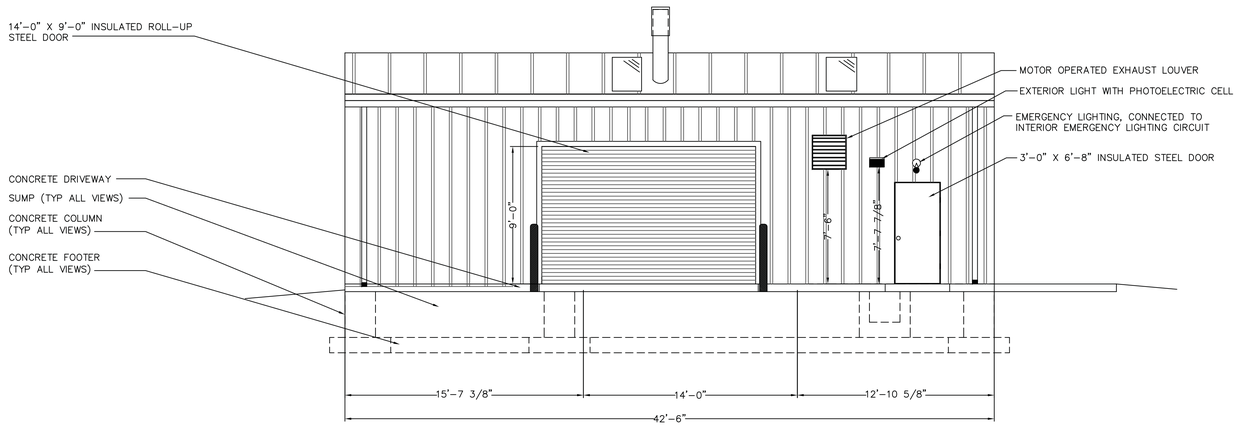
NOTE:
ARCHITECTURAL ELEVATION 100'-0"
CORRESPONDS TO CIVIL ELEVATION
229.6 FT AMSL



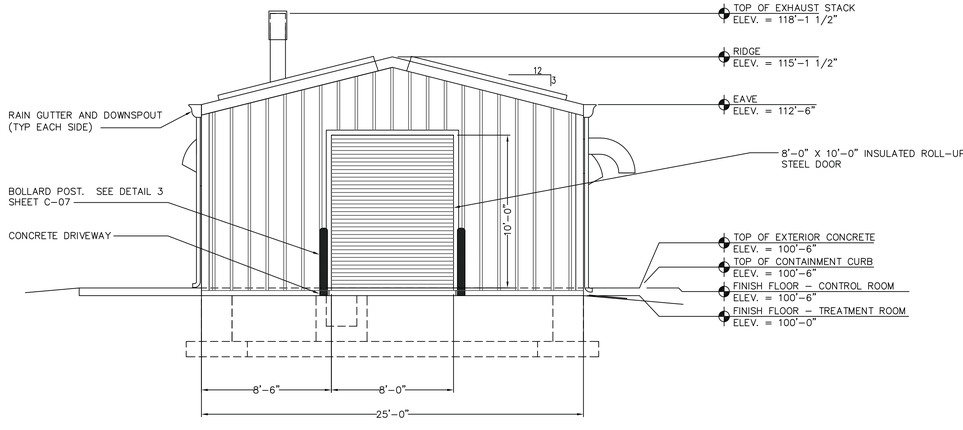
1 A-02 WEST ELEVATION



2 A-02 SOUTH ELEVATION



3 A-02 EAST ELEVATION



4 A-02 NORTH ELEVATION

4 2 0 4 8

SCALE: 1/4"= 1'-0"

REV #	Revisions	Date	Approved
	AS-BUILT	10/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

ARROWHEAD CONTRACTING INC.
10981 Eicher Drive
Lenexa, Kansas 66219
(913) 814-9994

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

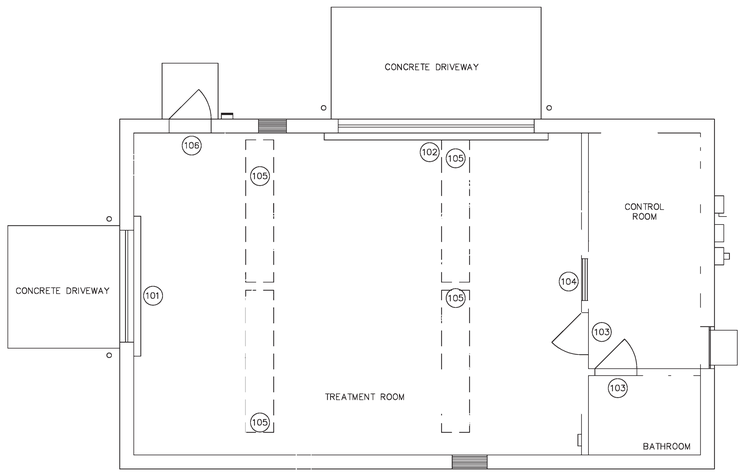
LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
BUILDING ELEVATION VIEW

Designed by:	DLR
Drawn by:	DLR
Checked by:	GWW
Reviewed by:	SFS
Submitted by:	GWW
Scale:	AS SHOWN
Spec. No.:	-
Contract No.	-
Sheet reference number:	A-02
Date:	JANUARY 27, 2010
Drawing Code:	-

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

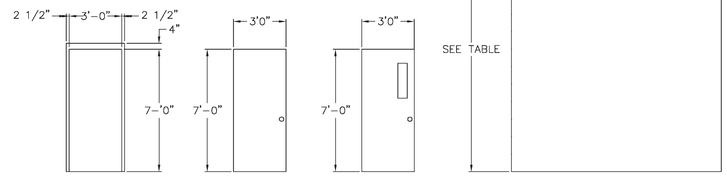
SEND TO PHONE
LOC. PROJ.
PROJ. # TASK #
DPPER: DATE:
FILE # SCALE



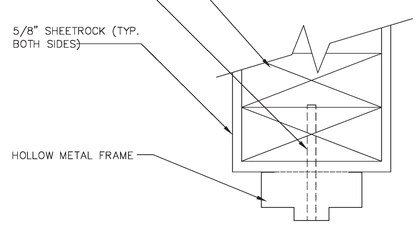
FLOOR PLAN
NTS

DOOR AND WINDOW SCHEDULE										
NO.	DOOR/WINDOW				FRAME			DOOR FIRE RATING	DETAILS	REMARKS
	SIZE	MATERIAL	FINISH	TYPE	MATERIAL	FINISH	TYPE			
101	8'-0"x 10'-0""	ST	PAINT	C	ST	PAINT	–	–	MANUFACTURERS STD. DETAIL	ROLL-UP, INSULATED
102	14'-0" x 9'-0"	ST	PAINT	C	ST	PAINT	–	–	MANUFACTURERS STD. DETAIL	ROLL-UP, INSULATED
103	3'-0"x 7'-0"	HM	PAINT	A	HM	PAINT	A	–	MANUFACTURERS STD. DETAIL	INSULATED
104	3'-0"x 2'-6"	–	–	–	HM	PAINT	–	–	FIXED SINGLE PANE GLASS	
105	2'-0"x 10'-6"	–	–	–	–	–	–	–		
106	3'-0"x 7'-0"	HM	PAINT	B	HM	PAINT	A	–	MANUFACTURERS STD. DETAIL	INSULATED W/ SIDELIGHT

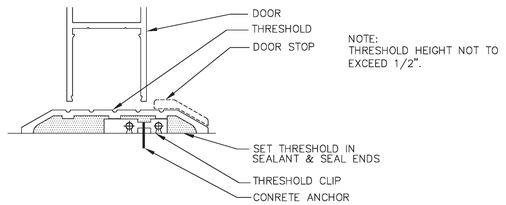
FINISH SCHEDULE					
ROOM		TYPE	FINISH	COLOR	REMARKS
EXTERIOR TREATMENT BUILDING	WALLS	METAL	PAINT	LIGHT STONE	METAL PANELS TO BE FACTORY PAINTED
	ROOF	METAL	PAINT	TAUPE SAND	METAL PANELS TO BE FACTORY PAINTED
	TRIM/GUTTER	METAL	PAINT	LIGHT STONE	METAL PANELS TO BE FACTORY PAINTED
TREATMENT ROOM	WALLS	METAL	PAINT	POLAR WHITE	METAL PANELS TO BE FACTORY PAINTED
	FLOOR	CONCRETE	NONE		
CONTROL ROOM	WALLS	DRYWALL	PAINT	LIGHT GRAY	
	FLOOR	CONCRETE	PAINT	GRAY	
	CEILING	DRYWALL	PAINT	LIGHT GRAY	
BATHROOM	WALLS	DRYWALL	PAINT	LIGHT GRAY	
	FLOOR	CONCRETE	PAINT	GRAY	
	CEILING	DRYWALL	PAINT	LIGHT GRAY	
BOLLARD POSTS	–	STEEL	PAINT	SAFETY YELLOW	



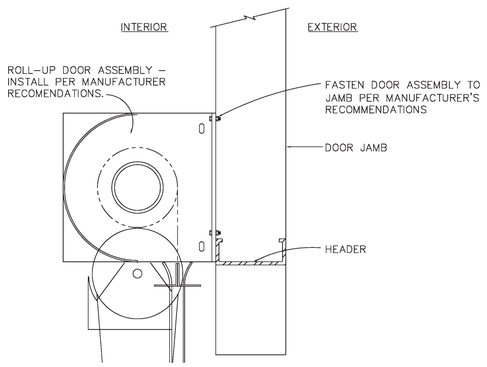
FRAME TYPE "A" DOOR TYPE "A" DOOR TYPE "B" DOOR TYPE "C"



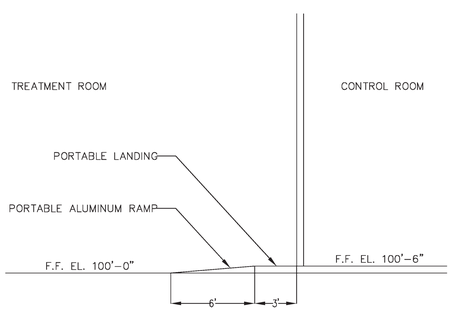
1 A-03 WOOD FRAMED WALL DOOR/WINDOW JAMB
NTS



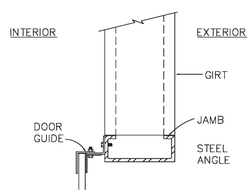
2 A-03 ENTRY DOOR TRESHOLD
NTS



HEAD



3 A-03 PORTABLE INTERIOR LANDING DETAIL
NTS



JAMB

4 A-03 STEEL OVERHEAD DOOR
NTS

REV #	Revisions	Date	Approved
	AS-BUILT	10/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

ARROWHEAD CONTRACTING INC.
10981 Eicher Drive
Lenexa, Kansas 66219
(913) 814-9994

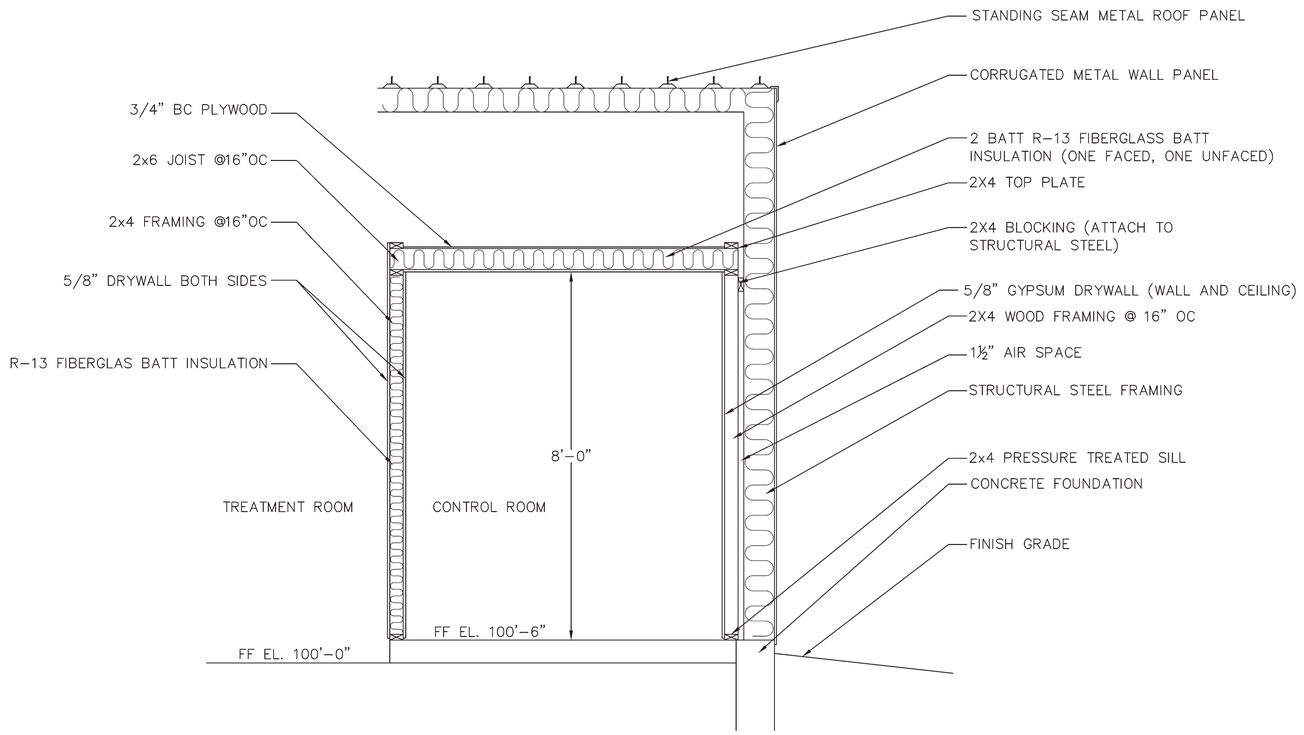
CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

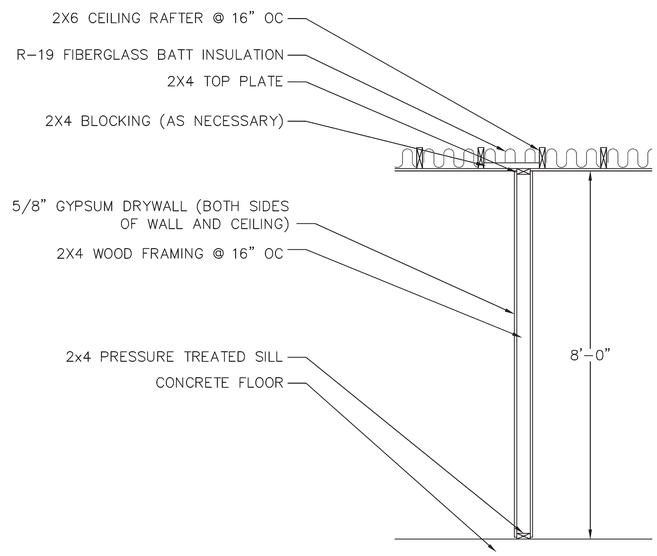
GROUNDWATER TREATMENT PLANT
DOOR SCHEDULE AND
FINISH SCHEDULE

Designed by: DLR	Scale: AS SHOWN	Sheet reference number: A-03	Date: JANUARY 27, 2010
Drawn by: DLR	Spec. No.: –		Drawing Code: –
Checked by: GWW	Contract No. –		
Reviewed by: SFS			
Submitted by: GWW			

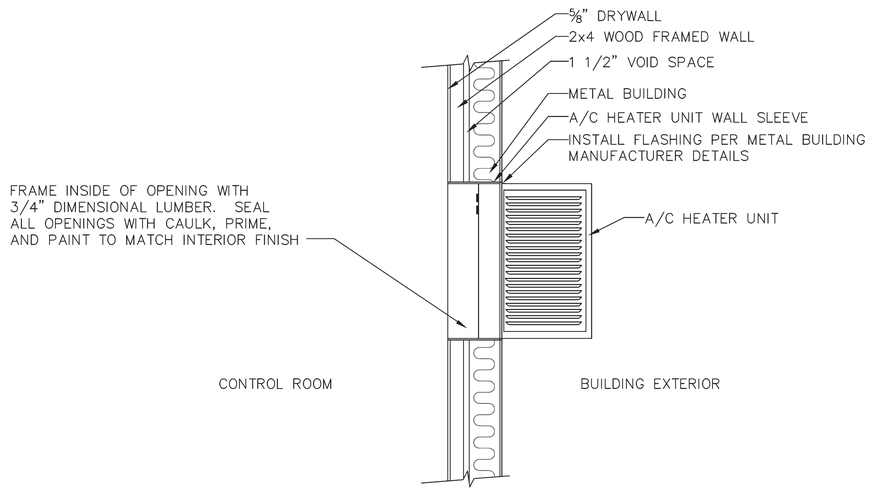
SEND TO PHENC
LOC PROJ.
PROJ. # TASK #
DPPER. DATE
FILE # SCALE



A-A' / A-01 | A-04 CONTROL ROOM/BATHROOM EXTERIOR WALL CONSTRUCTION DETAIL
NTS



B-B' / A-01 | A-04 CONTROL ROOM/OFFICE INTERIOR WALL CONSTRUCTION DETAIL
NTS



1 / A-01 | A-04 EXTERIOR FRAMED OPENING DETAIL
NTS

REV #	Revisions	Date	Approved
	AS-BUILT	10/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

ARROWHEAD CONTRACTING INC.
10981 Eicher Drive
Lenexa, Kansas 66219
(913) 814-9994

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

Designed by: DLR
Drawn by: DLR
Checked by: GWW
Reviewed by: SFS
Submitted by: GWW

LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
CONTROL ROOM/BATHROOM PARTITION
WALL CONSTRUCTION DETAILS

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

Scale: AS SHOWN
Spec. No.: -
Contract No. -
Sheet reference number: A-04
Date: JANUARY 27, 2010
Drawing Code: -

SEND TO
PHONE
LOC.
PROJ.
PROJ. #
TASK #
DPER.
DATE
FILE #
SCALE

STRUCTURAL SPECIFICATIONS

I. CODES AND STANDARDS

A. ALL WORK SHALL CONFORM TO THE REQUIREMENTS OF THE "NEW YORK STATE BUILDING CODE", LATEST EDITION, WITH THE SPECIFICATION, AND WITH THE REGULATIONS OF ALL GOVERNMENTAL AGENCIES HAVING JURISDICTION.

B. WHERE MORE STRINGENT, THE LATEST EDITION OF THE FOLLOWING CODES SHALL APPLY TO WORK:

1. "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE", ACI 318.
2. "STANDARD PRACTICE FOR SELECTING PROPORTIONS FOR NORMAL, HEAVYWEIGHT AND MASS CONCRETE", ACI 211.1.
3. "RECOMMENDED PRACTICE FOR EVALUATION OF STRENGTH TEST RESULTS OF CONCRETE", ACI 214.
4. "SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDING", ACI 301.
5. "RECOMMENDED PRACTICE FOR MEASURING, MIXING, TRANSPORTING AND PLACING CONCRETE", ACI 304.
6. "PLACING CONCRETE BY PUMPING METHODS", ACI 304.2R.
7. "HOT WEATHER CONCRETING", ACI 305R.
8. "COLD WEATHER CONCRETING", ACI 306R.
9. "STANDARD PRACTICE FOR CURING CONCRETE", ACI 308.
10. "STANDARD PRACTICE FOR CONSOLIDATION OF CONCRETE", ACI 309.
11. "CONCRETE SANITARY ENGINEERING STRUCTURES", ACI 350R.
12. "BUILDING CODE REQUIREMENTS FOR CONCRETE MASONRY STRUCTURES", ACI 530.

C. REFERENCE DOCUMENTS:

1. "ACI DETAILING MANUAL - 1988", SP-66 (INCLUDES ACI 315-80 AND ACI 315R-80).
2. "MANUAL OF STANDARD PRACTICE", CONCRETE REINFORCING STEEL INSTITUTE.
3. "STANDARD TOLERANCES FOR CONCRETE CONSTRUCTION AND MATERIALS", ACI 117.
4. "RECOMMENDED PRACTICE FOR CONCRETE FORMWORK", ACI 347 WITH THE SPECIFIC DELETION OF REFERENCE TO TOLERANCES WHERE IN CONFLICT WITH THIS SPECIFICATION. TOLERANCES GIVEN IN ACI 117 SHALL APPLY TO THE WORK.
5. "NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION", NATIONAL FOREST PRODUCTS ASSOCIATION.

II. GENERAL

A. THIS PROJECT HAS BEEN DESIGNED FOR THE WEIGHTS OF MATERIALS INDICATED IN THE DESIGN DATA. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE ALLOWABLE CONSTRUCTION LOADS AND TO PROVIDE PROPER DESIGN AND CONSTRUCTION OF FALSEWORK, FORMWORK, STAGING, BRACING, SHEETING, SHORING, ETC.

B. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL VERIFY STRUCTURAL ELEVATIONS AND DIMENSIONS WITH EXISTING CONDITIONS AND WITH OTHER DRAWINGS; COORDINATE LOCATION OF SLEEVES AND OPENINGS THROUGH THE STRUCTURE, SLAB DEPRESSIONS, FLOOR DRAINS, INSERTS, AND OTHER RELATED ITEMS.

C. CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR THE CORRECTNESS OF DIMENSIONS OR QUANTITIES AND FOR THE FITTING TO OTHER WORK; FOR WORK TO BE CONFIRMED AND CORRELATED AT THE SITE; FOR INFORMATION PERTAINING TO THE FABRICATION PROCEDURE OR TO THE MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES OF CONSTRUCTION; AND FOR THE COORDINATION OF STRUCTURAL WORK WITH THE WORK OF ALL OTHER TRADES. THE VERIFICATION OF THE PHYSICAL INTERRELATIONSHIPS OF ELEMENTS OF THE WORK FROM PLANS AND SPECIFICATIONS AND IN THE FIELD IS THE CONTRACTOR'S SOLE RESPONSIBILITY. REVIEW OF CONTRACTOR'S SUBMISSIONS DOES NOT RELIEVE CONTRACTOR FROM THESE RESPONSIBILITIES.

D. SEE ARCHITECTURAL DRAWINGS FOR DETAILS AND LOCATION OF OPENINGS OR RECESSES IN WALLS AND SLABS AND OTHER DIMENSIONS NOT SHOWN IN STRUCTURAL DRAWINGS.

SEE ARCHITECTURAL MECHANICAL AND ELECTRICAL DRAWINGS FOR INFORMATION REGARDING SIZE AND LOCATION OF OPENINGS FOR DUCTS, PIPES, CONDUITS, MACHINE PADS, ETC.

PROPOSED OPENINGS OR RECESSES IN THE STRUCTURE WHICH ARE NOT SHOWN IN THE STRUCTURAL DRAWINGS, EITHER DIRECTLY OR BY TYPICAL DETAIL, SHALL BE SUBMITTED FOR ACCEPTANCE.

III. REINFORCED CONCRETE

A. UNLESS OTHERWISE NOTED:

1. ALL REINFORCING STEEL SHALL BE DEFORMED BARS CONFORMING TO ASTM A615, GRADE 60.
2. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A185.

B. CONCRETE MIX DESIGNS REQUIRED ARE LISTED BELOW. ALL CONCRETE MIXES SHALL CONFORM TO THE PROVISIONS FOR CONCRETE QUALITY CONTAINED IN CHAPTER 5, ACI 318. COMPRESSIVE STRENGTH, F'c, IS MEASURED AT 28 DAYS AGE, EXCEPT IF HIGH STRENGTH CEMENT IS USED. F'C IS MEASURED AT 7 DAYS AGE.

f'c (PSI)*	MINIMUM CEMENT (LBS. PER C.Y.)	MAXIMUM SLUMP (IN.)	MAXIMUM WATER CEMENT RATIO
3,500 NORMAL WEIGHT (SUPER PLASTICIZED)	700	3**	0.38
3,500	610	5	0.46

* f'c SHALL BE 28 DAY STRENGTH.
** PRIOR TO ADDITION OF HRWR ADMIXTURE.

C. PROVIDE CONCRETE WITH THE FOLLOWING PROPERTIES IN THE LOCATIONS INDICATED:

F'c	COARSE AGGREGATE	LOCATIONS
4,000 PSI	NORMAL WEIGHT (SUPER PLASTICIZED)	FOUNDATION WALLS, FOOTINGS AND BASE SLAB
4,000 PSI	NORMAL WEIGHT	ALL CONCRETE UNLESS SPECIFICALLY SHOWN OTHERWISE

D. WATER REDUCING ADMIXTURE SHALL BE INCORPORATED INTO ALL CONCRETE AT A MINIMUM DOSAGE AS RECOMMENDED BY THE MANUFACTURER. ALL CONCRETE OTHER THAN FOR FOOTINGS SHALL BE AIR-ENTRAINED TO 4 TO 6 PERCENT. EXTERIOR CONCRETE SHALL BE AIR ENTRAINED TO 5 TO 7 PERCENT. CALCIUM CHLORIDE IS NOT PERMITTED FOR USE IN CONCRETE.

E. SPLICING OF REINFORCEMENT IS PERMITTED ONLY AT LOCATIONS SHOWN IN THE CONTRACT DRAWINGS OR AS ACCEPTED BY THE ENGINEER. UNLESS OTHERWISE SHOWN OR NOTED REINFORCING STEEL SHALL BE SPLICED TO DEVELOP ITS FULL TENSILE CAPACITY IN ACCORDANCE WITH ACI 318.

F. REINFORCING BAR DEVELOPMENT LENGTHS SHALL BE IN ACCORDANCE WITH ACI-318 UNLESS NOTED OTHERWISE.

G. DETAILING OF REINFORCING STEEL SHALL CONFORM TO "ACI MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES" (ACI 315).

H. MINIMUM CONCRETE COVER FOR REINFORCEMENT (SUBJECT TO TOLERANCES PERMITTED BY CODE) SHALL BE AS GIVEN IN PARAGRAPH 7.7.1 OF ACI 318, UNLESS OTHERWISE INDICATED.

I. ALL WALL AND FLOOR SLAB CONSTRUCTION SHALL BE CAST MONOLITHICALLY WITHOUT HORIZONTAL CONSTRUCTION JOINTS, UNLESS SHOWN IN THE CONTRACT DRAWINGS.

J. SUPERPLASTICIZED CONCRETE: PREPARE WITH A HIGH-RANGE, WATER-REDUCING ADMIXTURE (HRWR). CONTRACTOR'S MIX DESIGN SHALL INCLUDE ALSO WRITTEN DESCRIPTIONS OF CONTRACTOR'S METHODS FOR MIXING, PLACING AND CONVEYING SUCH CONCRETE. HRWR MIXES SHALL BE PREPARED TO PROVIDE CONCRETE WITH 9 INCH MAXIMUM SLUMP WHILE ADHERING TO THE WATER CEMENT RATIO MAXIMUM SPECIFIED. HRWR MIXES SHALL ARRIVE AT THE JOB SITE AT 3" MINIMUM SLUMP, BE VERIFIED, THEN HIGH RANGE WATER REDUCING ADMIXTURE ADDED TO INCREASE SLUMP TO AN ACCEPTABLE LEVEL.

K. LOCATION OF ALL CONSTRUCTION JOINTS ARE SUBJECT TO THE REQUIREMENTS OF THE CONTRACT DOCUMENTS, CONFORMANCE WITH ACI 318, AND ACCEPTANCE OF THE ENGINEER.

L. SPLICES OF WWF, AT ALL SPLICED EDGES, SHALL BE SUCH THAT THE OVERLAP MEASURED BETWEEN OUTERMOST CROSS WIRES OF EACH FABRIC SHEET IS NOT LESS THAN THE SPACING OF THE CROSS WIRE PLUS 2 INCHES, NOR LESS THAN 8", AND IN ACCORDANCE WITH PARAGRAPH 12.18 OF ACI-318.

M. WELDING OF REINFORCING BARS IS PROHIBITED.

N. BAR SUPPORTS SHALL BE ALL-GALVANIZED METAL WITH PLASTIC TIPS.

O. ALL REINFORCEMENT SHALL BE SECURELY TIED IN PLACE TO PREVENT DISPLACEMENT BY CONSTRUCTION TRAFFIC OR CONCRETE. TIE WIRE SHALL BE 16 GAUGE CONFORMING TO ASTM A82.

P. REINFORCING STEEL SUPPORTED ON THE GROUND SHALL BE PLACED ON PRECAST BLOCKS PRODUCED SPECIFICALLY FOR THE INTENDED PURPOSE.

Q. SLAB-ON-GROUND:

1. CAST OVER A MINIMUM OF 12 INCHES OF FREE DRAINING GRAVEL FILL.
2. PROVIDE VAPOR BARRIER OVER GRAVEL FILL AS BOTTOM FORM FOR SLAB ON GROUND. OVERLAP JOINTS AND BOND TOGETHER IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. PROVIDE MOISTOP GRADE 395 BY FORTIFIBER CORP. OR OTHER ACCEPTED BY ENGINEER.

IV. FOUNDATIONS

A. ALL FOOTINGS ARE DESIGNED TO BEAR ON UNDISTURBED SOIL WITH A MINIMUM BEARING CAPACITY OF 0.5 TONS PER SQUARE FOOT. ALL EXISTING LOOSE FILL AND UNSATISFACTORY BEARING MATERIAL SHALL BE REMOVED FROM THE SITE.

B. DEWATERING SHALL BE PROVIDED AS REQUIRED SO THAT EXCAVATION, CONCRETE WORK AND BACKFILLING ARE PERFORMED IN THE DRY.

C. TEMPORARY BRACING, SHEETING AND SHORING, ETC. SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR, AND SHALL BE DESIGNED, FABRICATED AND INSTALLED IN ACCORDANCE WITH ACCEPTED DRAWINGS PREPARED AND SEALED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF NEW YORK.

D. CONTRACTOR SHALL NOT POUR CONCRETE UNTIL FIELD BORINGS HAS BEEN PERFORMED AND CHECKED BY THE ENGINEER

V. MISCELLANEOUS MATERIAL

A. JOINT FILLER - PREFORMED, NON-EXTRUDING, RESILIENT TYPE, NON-ASPHALTIC CONFORMING TO ASTM D1752.

B. DRILLED-IN ANCHORS INTO WORK SHALL BE EXPANSION TYPE UNLESS NOTED OTHERWISE. ACCEPTABLE ANCHORS: KWIK BOLT II BY HILTI FASTENING SYSTEMS, TULSA, OKLAHOMA; RED HEAD WEDGE ANCHORS BY ITT PHILLIPS DRILL DIVISION, OR OTHER ACCEPTED BY ENGINEER.

VI. SUBMITTALS

A. GENERAL: SUBMIT SAMPLES, SHOP DRAWINGS, PRODUCT DATA, TEST REPORTS AND DATA, MANUFACTURER'S NAMES, CERTIFICATIONS AND PROCEDURES FOR ALL SPECIFIED ITEMS AND AS REQUESTED. SHOP DRAWINGS SHALL CONFORM TO THE BEST STANDARDS OF THE CONSTRUCTION INDUSTRY, AND SHALL BE PREPARED BY AND UNDER THE SUPERVISION OF COMPETENT ENGINEERING PERSONNEL.

B. REINFORCED CONCRETE:

1. SUBMIT REINFORCING STEEL SHOP DRAWINGS INCLUDING APPLICABLE BAR LISTS AND BENDING SCHEDULES. INDICATE ALL LAP LENGTHS AND LOCATIONS AND CLEAR COVER ON REINFORCING STEEL IN THE PLACING PLANS.
2. SUBMIT CERTIFIED MILL TEST REPORTS FOR CEMENT AND STEEL REINFORCING UPON REQUEST.
3. SUBMIT CONCRETE MIX DESIGN.
4. SUBMIT CATALOG CUTS FOR TIES, WATERSTOPS, VAPOR BARRIER, AND EXPANSION ANCHORS.

VII. CONTROLLED INSPECTION

A. PROVIDE CONTROLLED INSPECTION FOR INSTALLATION OF:

1. FOUNDATION BEARING SURFACES.
2. CAST-IN-PLACE CONCRETE.
3. SUB-GRADE BELOW SLAB ON GROUND.

B. ALL CONTROLLED INSPECTION SHALL BE DONE UNDER THE SUPERVISION OF A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NEW YORK. REPORTS SHALL BE SUBMITTED TO THE OWNER AND ENGINEER FOR REVIEW.

VIII. SCHEDULE

A. THE CONRTRACTOR SHALL NOTIFY THE ENGINEER 48 HOURS PRIOR TO POURING CONCRETE.

REV #	Revisions	Date	Approved
		10/10	
2	AS-BUILT	04/30/10	
1	REVISED FOUNDATION PER SOIL BORINGS	03/22/10	
	CDM COMMENTS		

P.W. GROSSER CONSULTING ENGINEER AND HYDROGEOLOGIST, P.C.
630 JOHNSON AVE. • SUITE 7
BOHEMIA • NY • 11716-2618
PH: (631)589-6353 • FX: (631)589-8705
E-MAIL: INFO@PWGROSSER.COM

ARROWHEAD CONTRACTING INC.
10981 Eicher Drive
Lenexa, Kansas 66219
(913) 814-9994

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DRAWING AND RELATED DOCUMENTS IS A VIOLATION OF SEC. 7209 OF THE N.Y.S. EDUCATION LAW

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

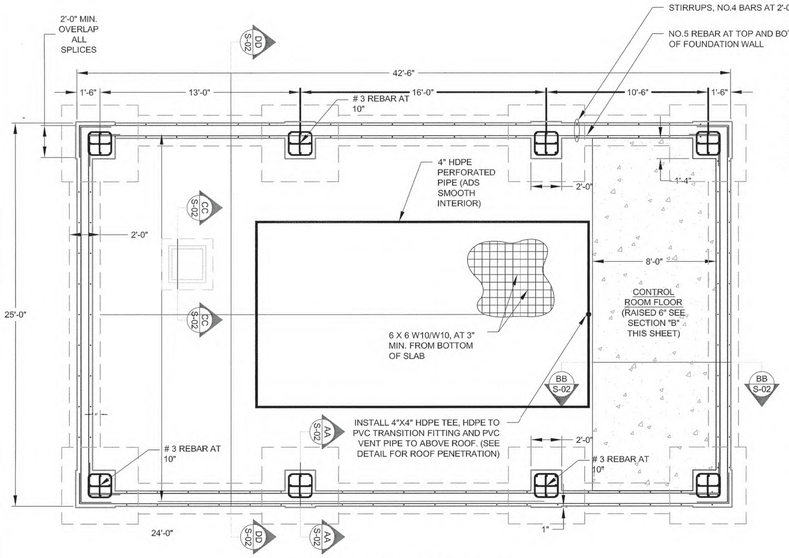
Designed by:	GR
Drawn by:	PL
Checked by:	PWG
Reviewed by:	PWG
Submitted by:	PWG

LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
STRUCTURAL SPECIFICATIONS

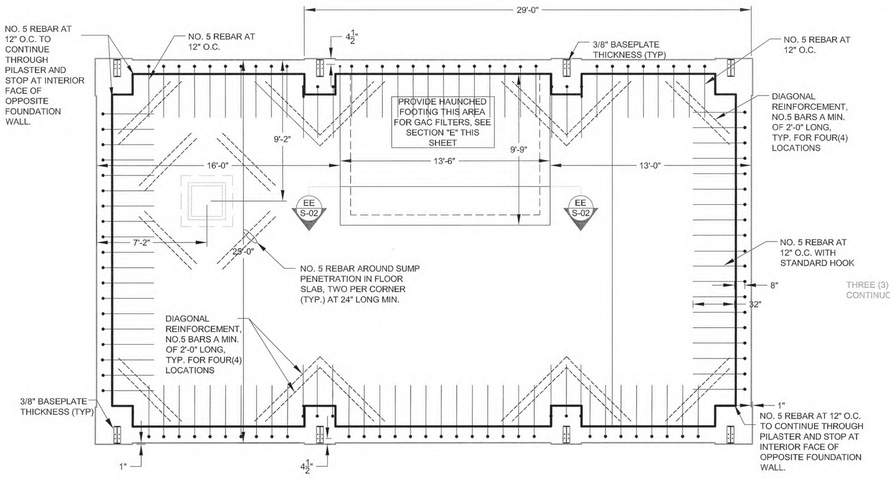
Scale:	AS SHOWN	Sheet reference number:	Date: JANUARY 26, 2010
Spec. No.:	-	S-01	Drawing Code: -
Contract No.	-		

SEND TO / PHONE
LOC / PROJ.
PROJ. # / TASK #
UPPER / DATE
FILE # / SCALE



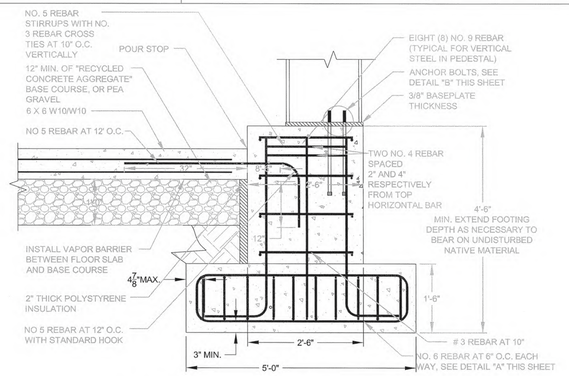
FOUNDATION: PLAN VIEW

SCALE: 1/4" = 1'-0"



FOUNDATION: FLOOR PLAN

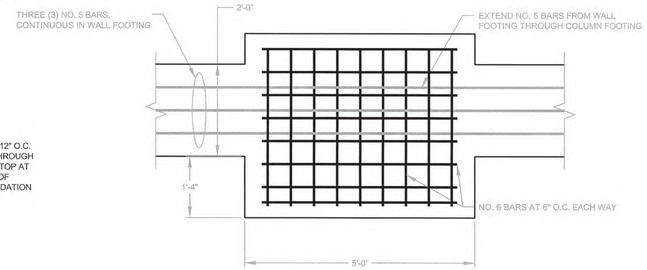
SCALE: 1/4" = 1'-0"



FOUNDATION PILASTER: SECTION VIEW

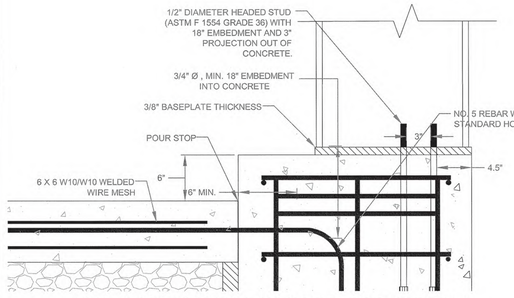
A-A S-02

SCALE: 3/4" = 1'-0"



DETAIL "A": FOUNDATION PILASTER FOOTING

SCALE: 3/4" = 1'-0"

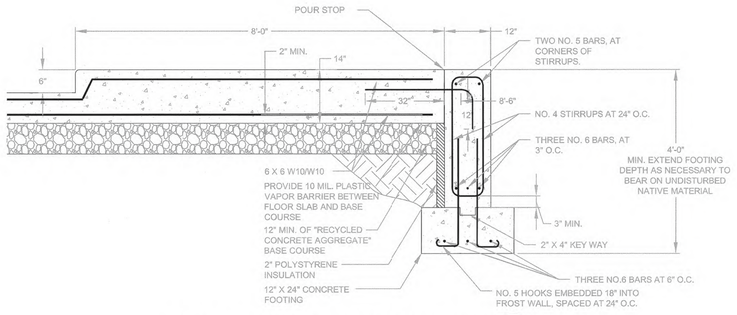


DETAIL "B": ANCHOR BOLT EMBEDMENT DETAIL

SCALE: 1-1/2" = 1'-0"

NOTE:

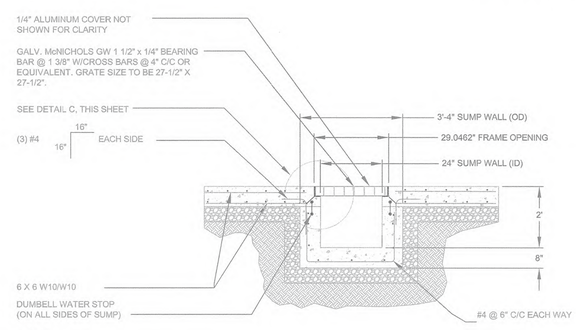
1. ALL CONCRETE TO BE A MINIMUM OF 4,000 PSI, SEE SPECIFICATIONS ON SHEET S-01.
2. CONTRACTOR TO COORDINATE INSTALLATION OF ANCHOR BOLTS WITH BUILDING MANUFACTURER. CONTRACTOR TO SUBMIT SHOP DRAWING OF ANCHOR BOLT PLACEMENT PRIOR TO INSTALLATION FOR ENGINEER'S REVIEW.
3. REFER TO MANUFACTURER'S SPECIFICATIONS FOR ANCHOR BOLT PLACEMENT, PROJECTION FROM CONCRETE, DIAMETER AND QUANTITY.
4. COORDINATE LOCATION OF ANCHOR BOLTS AT ALL OPENINGS WITH THE MANUFACTURER.



FOUNDATION WALL: SECTION VIEW

B-B S-02

SCALE: 3/4" = 1'-0"



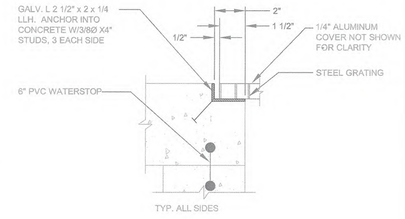
NOTES:

1. GRATING TO BE 1 1/2"x3/16" CROSS BAR @4" C/C (SPAN EAST TO WEST)
2. ALL DIMENSIONS ARE CENTER OF BAR TO CENTER OF BEARING BAR.
3. PROVIDE SOLID 1/4" ALUMINUM PLATE TO COVER OPENING.
4. PROVIDE BANDING ON ALL SIDES.
5. CONTRACTOR TO PROVIDE SHOP DRAWING OF GRATING AND FRAME FOR ENGINEER'S REVIEW PRIOR TO CONSTRUCTION.

SUMP: SECTION VIEW

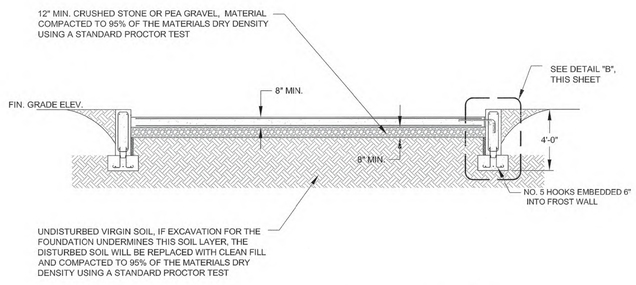
C-C S-02

SCALE: 1/2" = 1'-0"



DETAIL "C": GRATING ANCHOR ANGLE

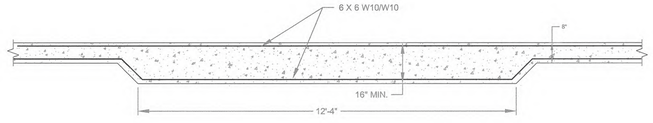
SCALE: 1/2" = 1'-0"



FOUNDATION: SECTION VIEW

D-D S-02

SCALE: 1/4" = 1'-0"



HAUNCH FOOTING: SECTION VIEW

E-E S-02

SCALE: 1/2" = 1'-0"

REV #	Revisions	Date	Approved
	AS-BUILT	10/10	
4	REVISED SLAB TIED INTO FOUNDATION WALL	06/17/10	
3	REVISED FOUNDATION AND ANCHOR BOLTS	06/09/10	
2	REVISED FOUNDATION PER SOIL BORINGS	04/30/10	
1	CDM COMMENTS	03/22/10	

P.W. GROSSER CONSULTING ENGINEER AND HYDROGEOLOGIST, P.C.
630 JOHNSON AVE. - SUITE 7
BOHEMIA - NY - 11716-2618
PH: (631)589-6353 - FX: (631)589-8705
E-MAIL: INFO@PWGROSSER.COM

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DRAWING AND RELATED DOCUMENTS IS A VIOLATION OF SEC. 7209 OF THE N.Y.S. EDUCATION LAW

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

ARROWHEAD CONTRACTING INC.
10981 Eicher Drive
Lenexa, Kansas 66219
(913) 814-9994

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

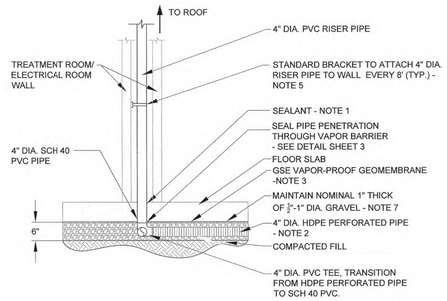
Designed by:	GR
Drawn by:	PL
Checked by:	PWG
Reviewed by:	PWG
Submitted by:	PWG

LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
STRUCTURAL: FOUNDATION PLAN AND DETAILS

Scale: AS SHOWN	Sheet reference number: S-02	Date: JANUARY 26, 2010	
Spec. No.: -		Drawing Code: -	
Contract No. -			

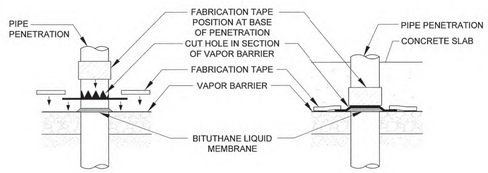
SEND TO: PHONE
LOC: PROJ
PROJ. # TASK #
UPPER: DATE
FILE # SCALE



CROSS SECTIONAL DETAIL

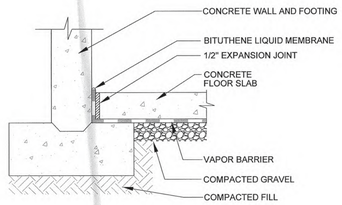
SCALE: NOT TO SCALE

NOTES:
1. SEAL OPENING WITH ELASTOMERIC JOINT SEALANT AS DEFINED IN ASTM C920.
2. HIGH DENSITY POLYETHYLENE CORRUGATED PERFORATED PIPE WITH SMOOTH INTERIOR WATERWAY. ADS N-12 OR APPROVED EQUAL.
3. 15 MIL GSE HDE 015A000 HIGH DENSITY POLYETHYLENE VAPOR-PROOF GEOMEMBRANE OR APPROVED EQUAL. FOR USE BELOW SLAB. VAPOR BARRIER TO BE INSTALLED AS PER MANUFACTURER'S INSTRUCTIONS. VAPOR BARRIER SHALL HAVE A PERMEANCE RATING OF 0.1 PERMS OR LESS.
5. FINAL LOCATION OF VERTICAL RISER PIPE TO BE DETERMINED WITH ARCHITECT AND GENERAL CONTRACTOR.
6. GRAVEL LAYER TO BE CONSISTENT AND UNIFORM BENEATH ENTIRE SLAB.
7. SURFACE SEALING MATERIAL TO BE NON-VOC EMITTING CEMENT OR CEMENT-BENTONITE.
8. THE VAPOR BARRIER PENETRATION DETAIL PROVIDES VISUAL INSTRUCTIONS TO INSTALL AND SEAL THE VAPOR BARRIER AROUND ROUND PENETRATIONS SUCH AS PIPES AND CONDUITS. INSTALL VAPOR BARRIER AS PER MANUFACTURER'S INSTRUCTIONS.



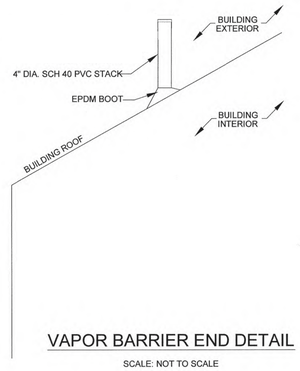
VAPOR BARRIER PENETRATION DETAIL

SCALE: NOT TO SCALE



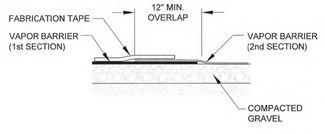
VAPOR BARRIER END DETAIL

SCALE: NOT TO SCALE



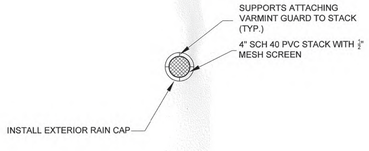
VAPOR BARRIER END DETAIL

SCALE: NOT TO SCALE



VAPOR BARRIER OVERLAP DETAIL

SCALE: NOT TO SCALE



VAPOR BARRIER END DETAIL

SCALE: NOT TO SCALE

NO. :

TUE

REV #	Revisions	Date	Approved
	AS-BUILT	10/10	
2	REVISED FOUNDATION PER SOIL BORINGS	04/30/10	
1	CDM COMMENTS	03/22/10	

P.W. GROSSER CONSULTING ENGINEER AND HYDROGEOLOGIST, P.C.
630 JOHNSON AVE. • SUITE 7
BOHEMIA • NY • 11716-2618
PH: (631)589-6353 • FX: (631)589-8705
E-MAIL: INFO@PWGROSSER.COM

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DRAWING AND RELATED DOCUMENTS IS A VIOLATION OF SEC. 7209 OF THE N.Y.S. EDUCATION LAW

ARROWHEAD CONTRACTING INC.
10981 Eicher Drive
Lenexa, Kansas 66219
(913) 814-9994

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

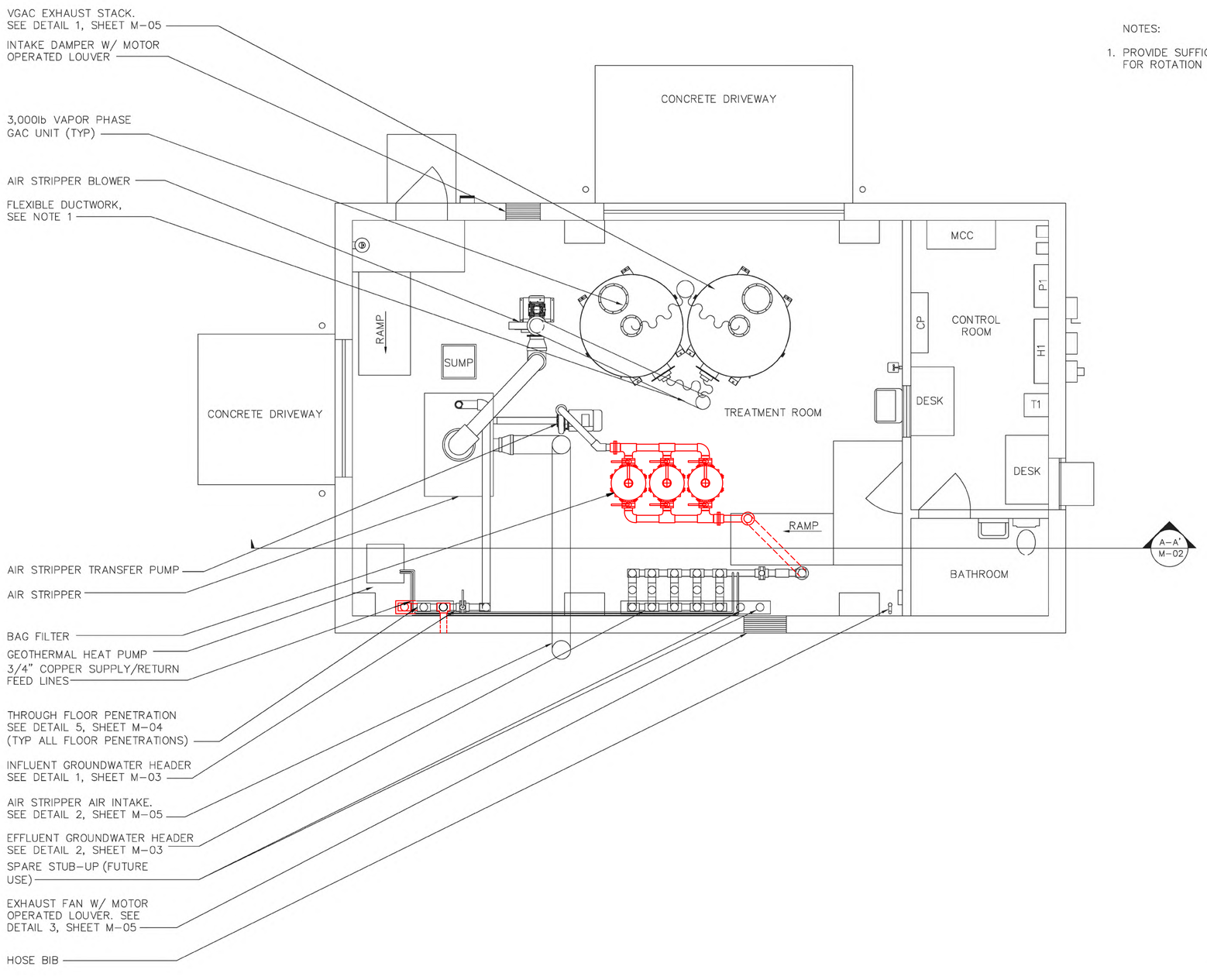
LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
SUB SLAB VENTING SYSTEM DETAILS

Designed by:	GR
Drawn by:	PL
Checked by:	PWG
Reviewed by:	PWG
Submitted by:	PWG
Scale:	AS SHOWN
Spec. No.:	-
Contract No.	-
Sheet reference number:	S-03
Date:	JANUARY 26, 2010
Drawing Code:	-

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

SEND TO
PHONE
LOC
PROJ.
PROJ. #
TASK #
UPPER
DATE
FILE #
SCALE



NOTES:

1. PROVIDE SUFFICIENT LENGTH OF FLEXIBLE DUCT TO ALLOW FOR ROTATION IN OPERATION OF VAPOR GAC UNITS.

4 2 0 4 8

SCALE: 3/8"= 1'-0"

REV #	Revisions	Date	Approved
2	AS-BUILT REVISIONS	11/15/21	
	AS-BUILT	10/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

HGL HydroGeoLogic, Inc

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

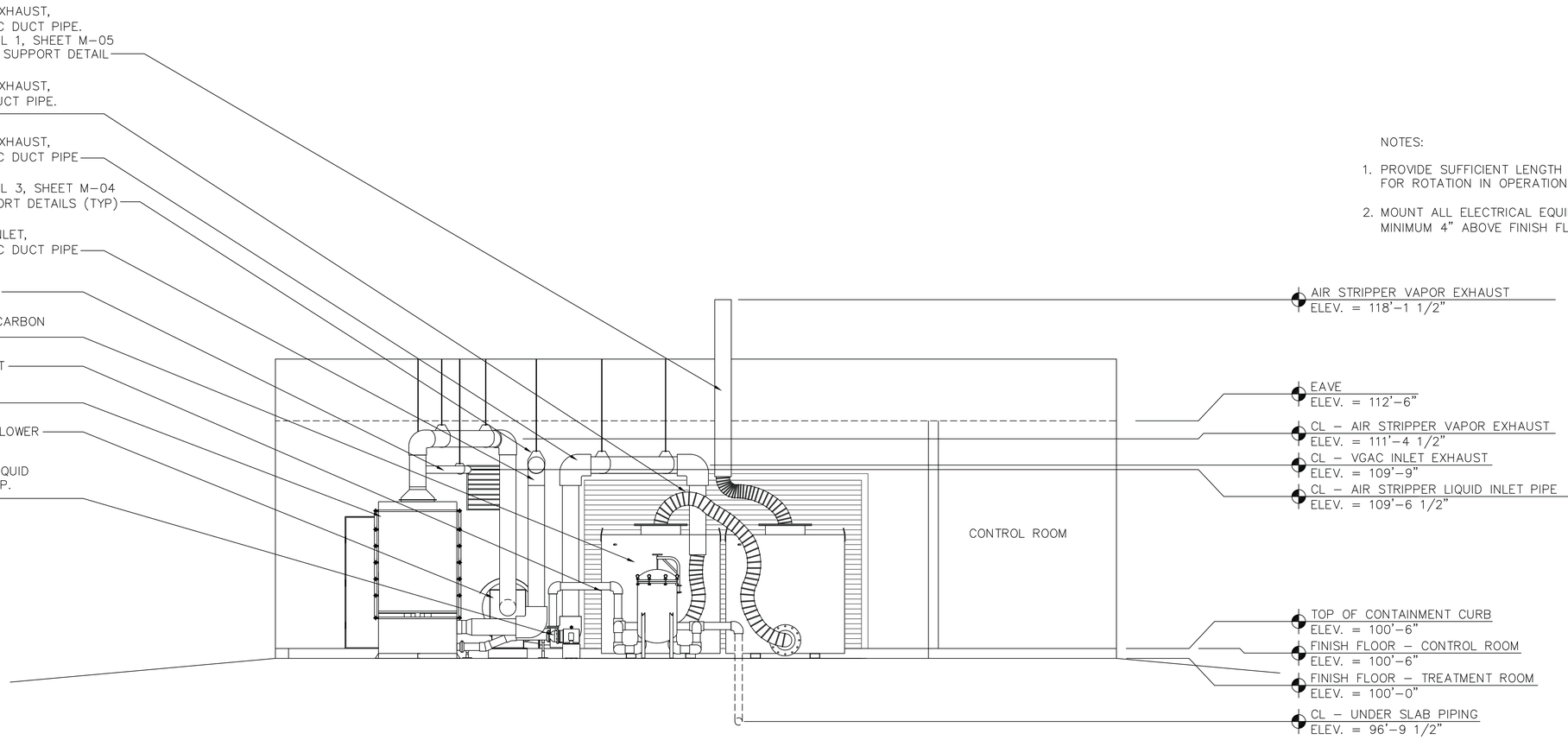
LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
TREATMENT EQUIPMENT
MECHANICAL PLAN

Designed by:	DLR
Drawn by:	DLR
Checked by:	GWW
Reviewed by:	SFS
Submitted by:	GWW
Scale:	AS SHOWN
Spec. No.:	-
Contract No.	-
Sheet reference number:	M-01
Date:	JANUARY 27, 2010
Drawing Code:	-

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

SEND TO
PHONE
LOC.
PREL.
PREL. #
TASK #
UPPER
DATE
FILE #
SCALE



A-A' / M-01 CROSS-SECTION

NOTES:

1. PROVIDE SUFFICIENT LENGTH OF FLEXIBLE DUCT TO ALLOW FOR ROTATION IN OPERATION OF VAPOR GAC UNITS.
2. MOUNT ALL ELECTRICAL EQUIPMENT (MOTORS, SWITCHES, ETC.) MINIMUM 4" ABOVE FINISH FLOOR.

4 2 0 4 8

SCALE: 3/8"= 1'-0"

REV #	Revisions	Date	Approved
	AS-BUILT	10/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

ARROWHEAD CONTRACTING INC.
10981 Eicher Drive
Lenexa, Kansas 66219
(913) 814-6994

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

Designed by: DLR
Drawn by: DLR
Checked by: GWW
Reviewed by: SFS
Submitted by: GWW

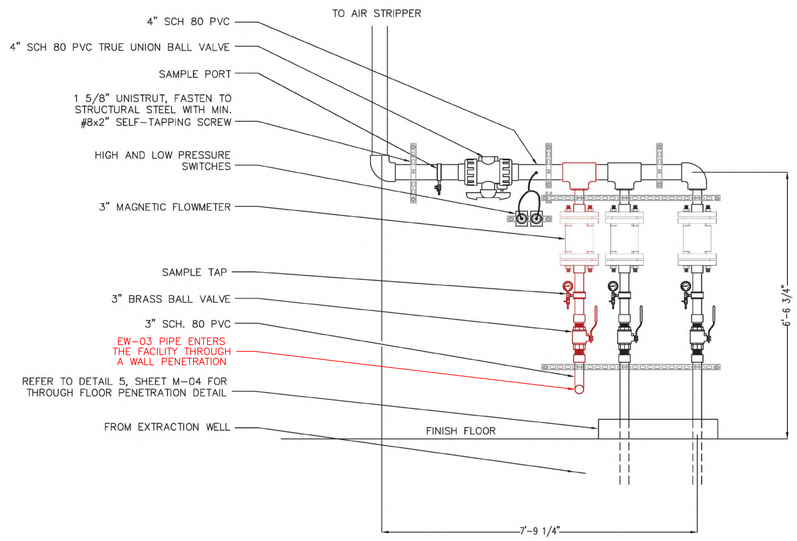
LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
TREATMENT EQUIPMENT
MECHANICAL CROSS-SECTION

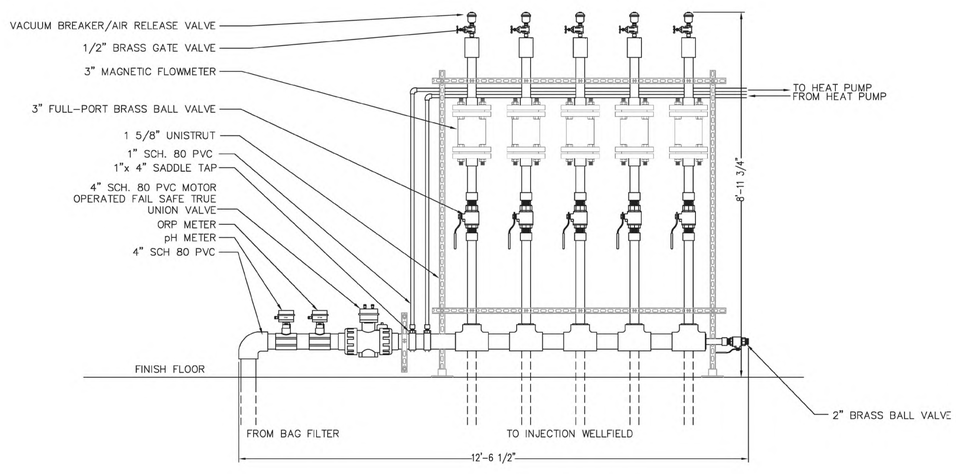
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

Scale: AS SHOWN
Spec. No.: -
Contract No.: -
Sheet reference number: M-02
Date: JANUARY 27, 2010
Drawing Code: -

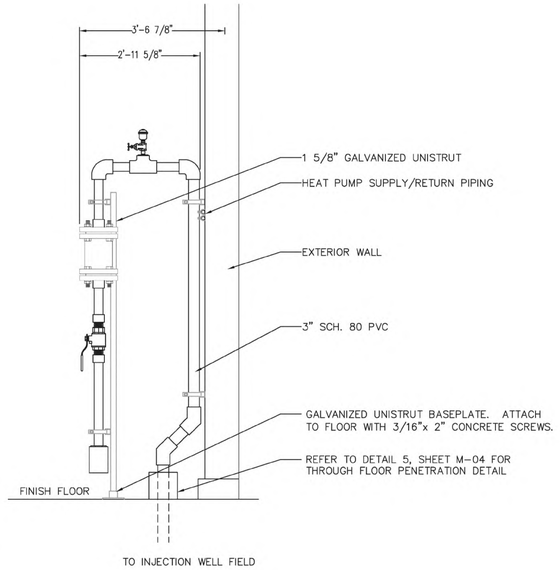
SEND TO PHONE
LDC PROJ
PROJ. # TASK #
DPPER. DATE
FILE # SCALE



1 M-01 | M-03 INFLUENT HEADER DETAIL
NOT TO SCALE



ELEVATION VIEW



SIDE VIEW

2 M-01 | M-03 EFFLUENT HEADER DETAIL
NOT TO SCALE

REV #	Revisions	Date	Approved
2	AS-BUILT REVISONS	11/15/21	
	AS-BUILT	10/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

HGL HydroGeoLogic, Inc

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

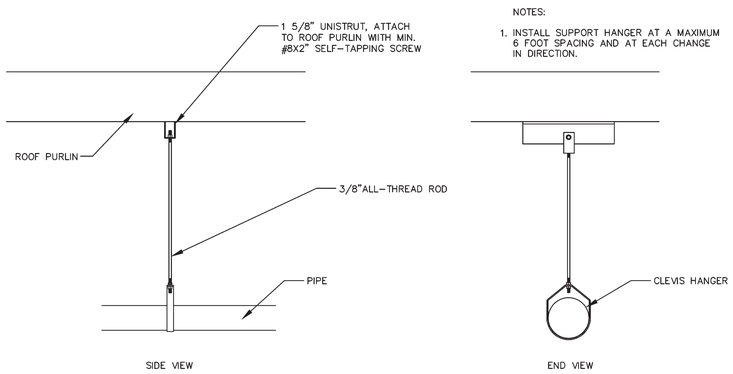
LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
TREATMENT SYSTEM HEADER DETAILS

Designed by: DLR	Scale: AS SHOWN	Sheet reference number: M-03	Date: JANUARY 27, 2010
Drawn by: DLR	Spec. No.: -		Drawing Code: -
Checked by: GWW	Contract No. -		
Reviewed by: SFS			
Submitted by: GWW			

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

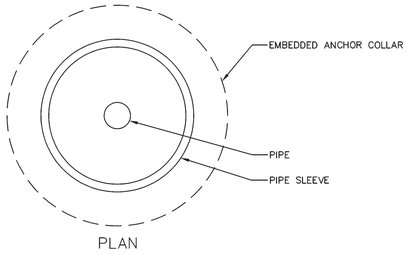
SEND TO
PHONE
LOC.
PROJ.
PROJ. #
TASK #
DPPER
DATE
FILE #
SCALE



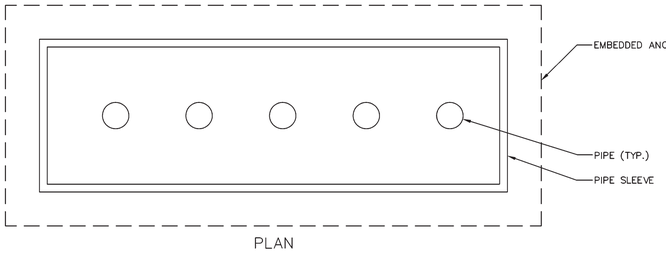
NOTES:

1. INSTALL SUPPORT HANGER AT A MAXIMUM 6 FOOT SPACING AND AT EACH CHANGE IN DIRECTION.

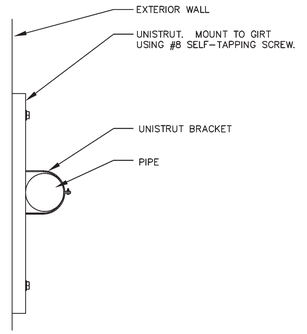
3 M-02 | M-04 CEILING MOUNTED PIPE HANGER DETAIL
NOT TO SCALE



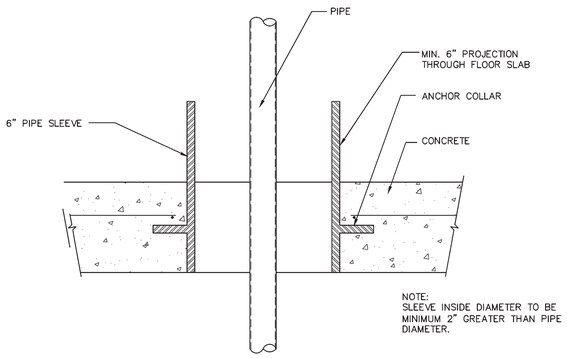
PLAN



PLAN



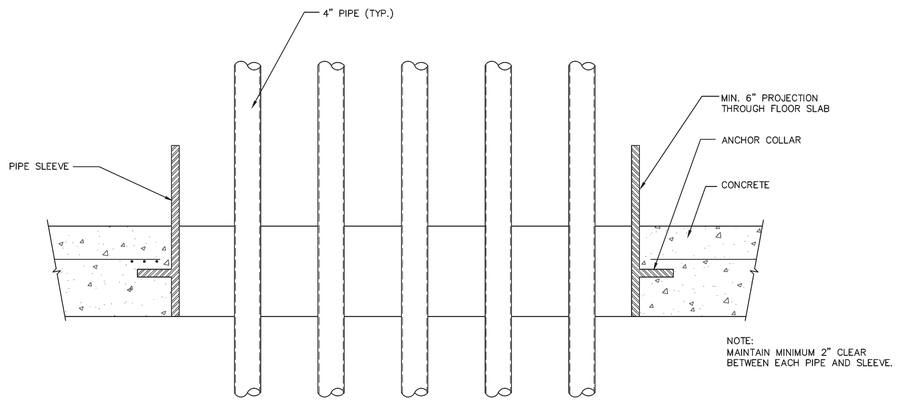
4 M-02 | M-04 WALL-MOUNTED PIPE HANGER DETAIL
NOT TO SCALE



NOTE:
SLEEVE INSIDE DIAMETER TO BE MINIMUM 2" GREATER THAN PIPE DIAMETER.

SECTION

SINGLE PIPE



NOTE:
MAINTAIN MINIMUM 2" CLEAR BETWEEN EACH PIPE AND SLEEVE.

SECTION

MULTIPLE PIPE

5 M-01 | M-04 PIPE SLEEVE DETAIL
NOT TO SCALE

REV #	Revisions	Date	Approved
	AS-BUILT	10/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

ARROWHEAD CONTRACTING INC.
10981 Eicher Drive
Lenexa, Kansas 66219
(913) 814-9994

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

Designed by: DLR
Drawn by: DLR
Checked by: GWW
Reviewed by: SFS
Submitted by: GWW

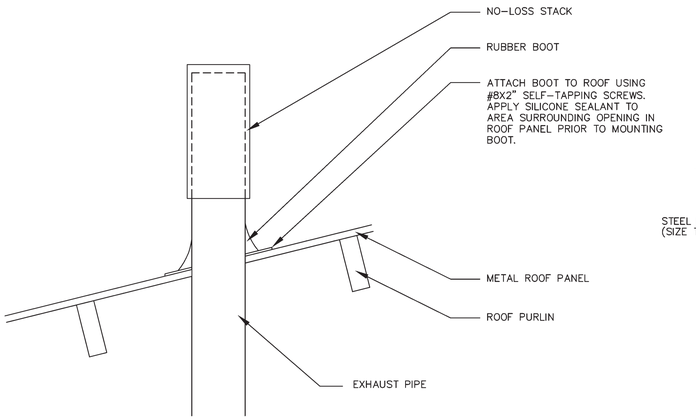
LAWRENCE AVIATION SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
MECHANICAL DETAILS

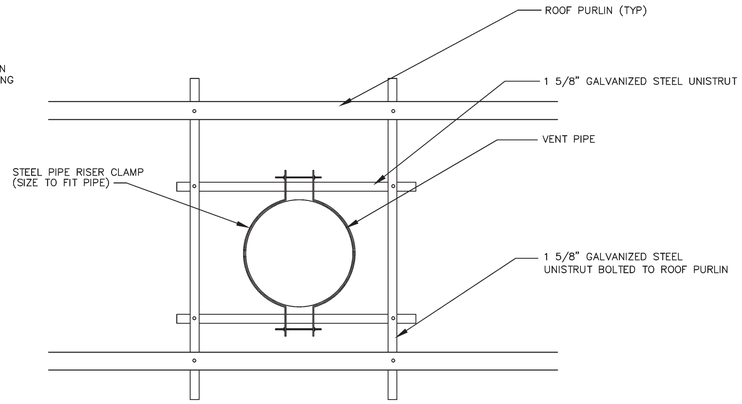
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

Scale: AS SHOWN
Spec. No.: -
Contract No.: -
Sheet reference number: M-04
Date: JANUARY 27, 2010
Drawing Code: -

SEND TO: PHENIC
LOC: PROJ.
PROJ. # TASK #
UPPER: DATE
FILE # SCALE

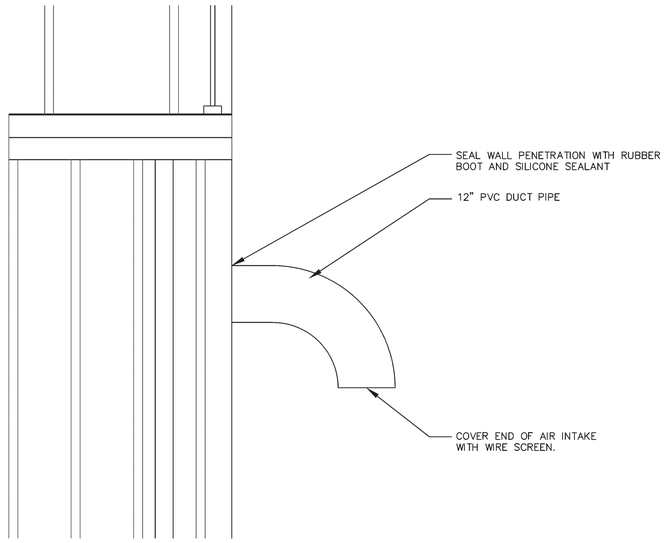


SECTION

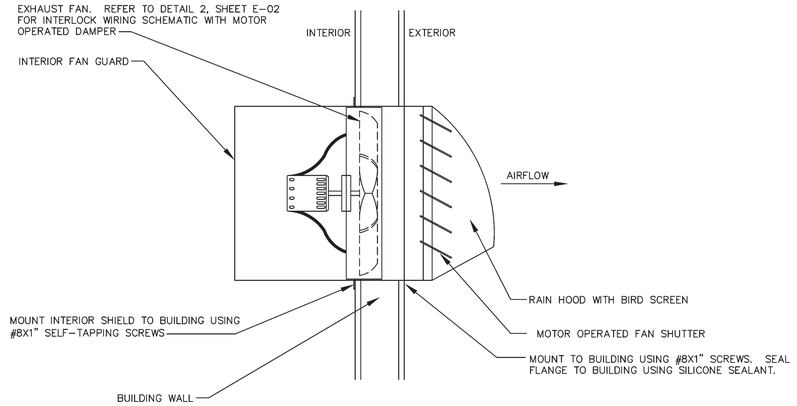


PLAN VIEW

1 / M-01 | M-05 EXHAUST PIPE THROUGH ROOF DETAIL
NOT TO SCALE



2 / M-01 | M-05 AIR STRIPPER AIR INTAKE DETAIL
NOT TO SCALE



3 / M-01 | M-05 EXHAUST FAN MOUNTING DETAIL
NOT TO SCALE

REV #	Revisions	Date	Approved
	AS-BUILT	10/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

ARROWHEAD CONTRACTING INC.
10981 Eicher Drive
Lenexa, Kansas 66219
(913) 814-9994

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

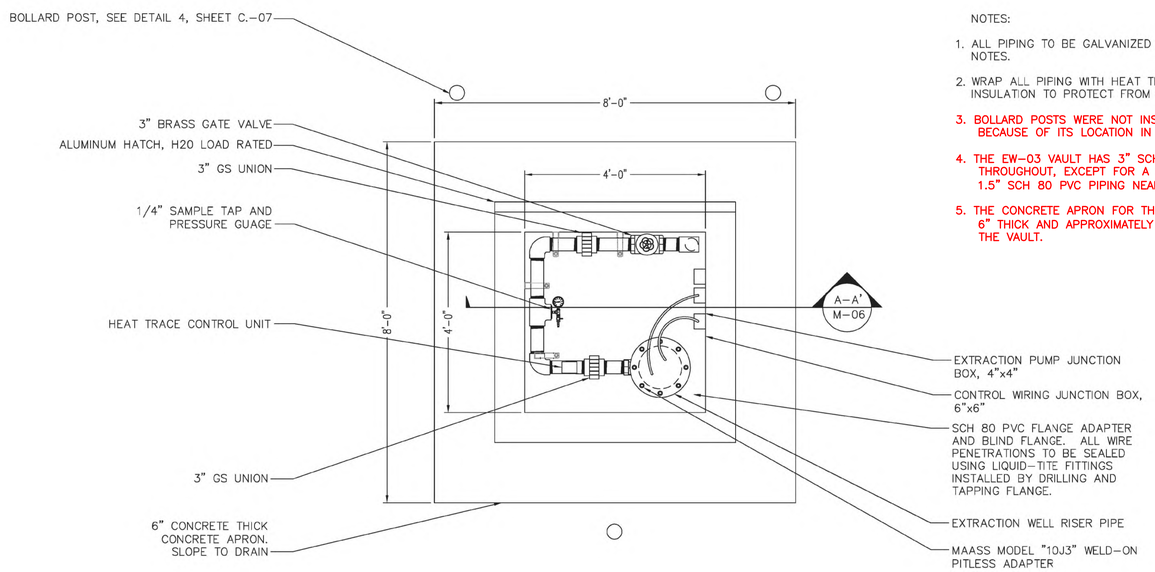
LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
MECHANICAL DETAILS

Designed by: DLR	Scale: AS SHOWN	Sheet reference number: M-05	Date: JANUARY 27, 2010
Drawn by: DLR	Spec. No.: -		Drawing Code: -
Checked by: GWW	Contract No. -		
Reviewed by: SFS			
Submitted by: GWW			

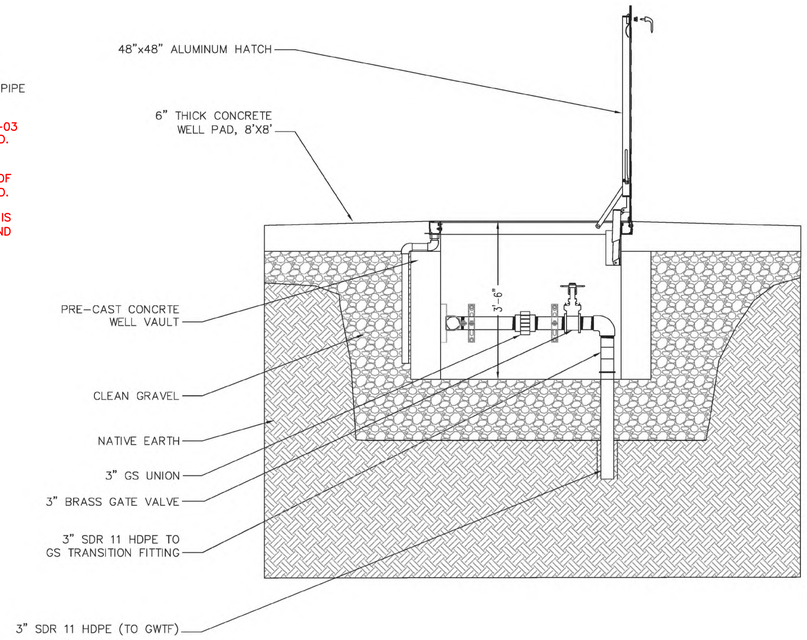
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

SEND TO PHONE
LOC PROJ
PROJ # TASK #
DPPER: DATE
FILE # SCALE



NOTES:

1. ALL PIPING TO BE GALVANIZED STEEL UNLESS NOTES.
2. WRAP ALL PIPING WITH HEAT TRACE TAPE AND PIPE INSULATION TO PROTECT FROM FREEZING.
3. BOLLARD POSTS WERE NOT INSTALLED FOR EW-03 BECAUSE OF ITS LOCATION IN AN ACCESS ROAD.
4. THE EW-03 VAULT HAS 3" SCH 80 PVC PIPE THROUGHOUT, EXCEPT FOR A SMALL SECTION OF 1.5" SCH 80 PVC PIPING NEAR THE WELL HEAD.
5. THE CONCRETE APRON FOR THE EW-03 VAULT IS 6" THICK AND APPROXIMATELY 12" WIDE AROUND THE VAULT.



1 / C-01 | M-06 EXTRACTION WELLHEAD DETAIL
NOT TO SCALE

A-A' / M-06 EXTRACTION WELLHEAD CROSS-SECTION
NOT TO SCALE

REV #	Revisions	Date	Approved
2	AS-BUILT REVISIONS	11/15/21	
	AS-BUILT	10/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

HGL HydroGeoLogic, Inc

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

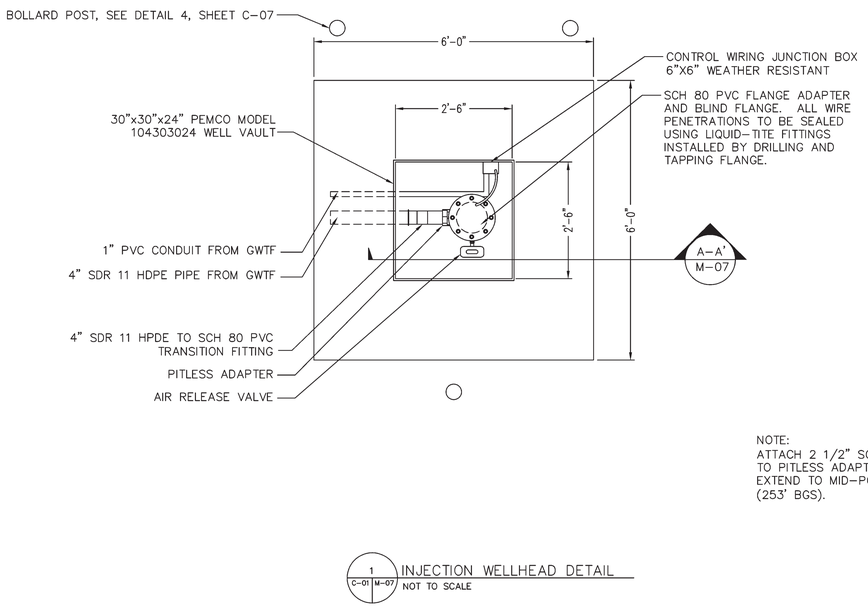
LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
EXTRACTION WELLHEAD DETAIL

Designed by:	DLR
Drawn by:	DLR
Checked by:	GWW
Reviewed by:	SFS
Submitted by:	GWW
Scale:	AS SHOWN
Spec. No.:	-
Contract No.	-
Sheet reference number:	M-06
Date:	JANUARY 27, 2010
Drawing Code:	-

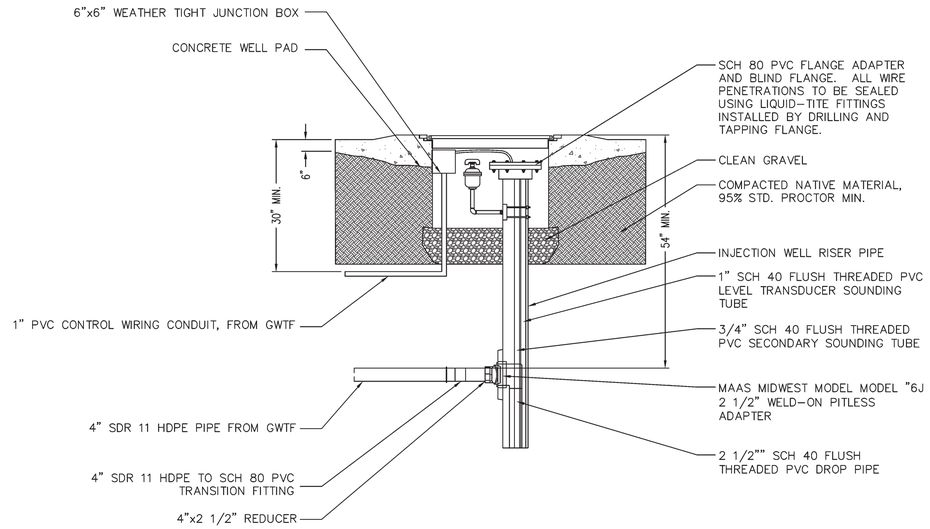
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

SEND TO | PHONE | LOC. | PROJ. | PROJ. # | TASK # | DPPER | DATE | FILE # | SCALE



NOTE:
ATTACH 2 1/2" SCH 40 PVC DROP PIPE TO PITLESS ADAPTER. DROP PIPE TO EXTEND TO MID-POINT OF WELL SUMP (253' BGS).

1 / C-01 / M-07 INJECTION WELLHEAD DETAIL
NOT TO SCALE



A-A' / M-07 INJECTION WELLHEAD CROSS-SECTION
NOT TO SCALE

REV #	Revisions	Date	Approved
	AS-BUILT	10/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

ARROWHEAD CONTRACTING INC.
10981 Eicher Drive
Lenexa, Kansas 66219
(913) 814-9994

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

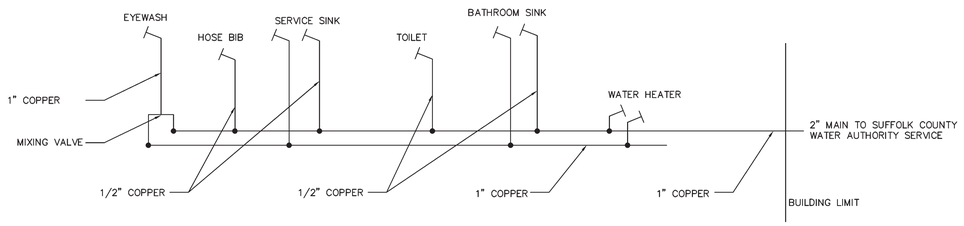
LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
INJECTION WELLHEAD DETAIL

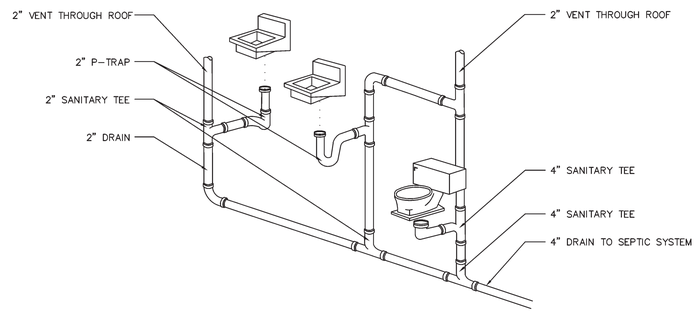
Designed by:	DLR
Drawn by:	DLR
Checked by:	GWW
Reviewed by:	SFS
Submitted by:	GWW
Scale:	AS SHOWN
Spec. No.:	-
Contract No.	-
Sheet reference number:	M-07
Date:	JANUARY 27, 2010
Drawing Code:	-

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWNG
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

SEND TO
PHONE
LOC.
PROJ.
PROJ. #
TASK #
UPPER
DATE
FILE #
SCALE



1 A-01 P-01 POTABLE WATER SERVICE RISER
NOT TO SCALE



2 A-01 P-01 SANITARY DRAIN RISER PLAN
NOT TO SCALE

REV #	Revisions	Date	Approved
	AS-BUILT	10/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

ARROWHEAD CONTRACTING INC.
10981 Eicher Drive
Lenexa, Kansas 66219
(913) 814-9994

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
PLUMBING PLAN

Designed by: DLR
Drawn by: DLR
Checked by: GWW
Reviewed by: SFS
Submitted by: GWW

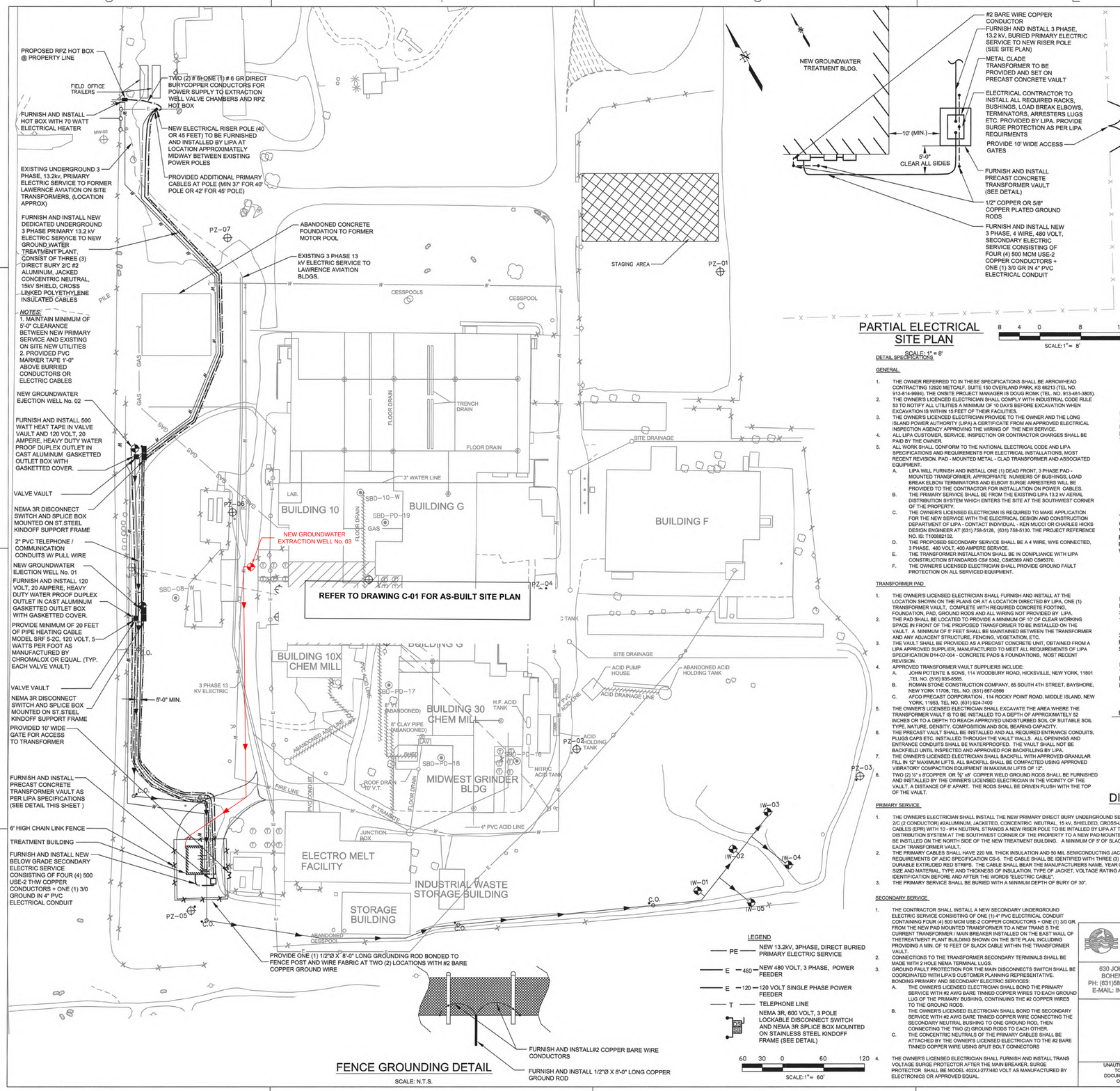
Scale: AS SHOWN
Spec. No.: -
Contract No.: -

Sheet reference number: P-01

Date: JANUARY 27, 2010
Drawing Code: -

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

SEND TO
PHONE
LOC
PROJ
PROJ #
TASK #
DPPER:
DATE
FILE #
SCALE



PARTIAL ELECTRICAL SITE PLAN

SCALE: 1" = 8'

8 4 0 8 16

SCALE: 1"= 8'

DETAIL SPECIFICATIONS:

GENERAL

1. THE OWNER REFERRED TO IN THESE SPECIFICATIONS SHALL BE ARROWHEAD CONTRACTING 12920 METCALF, SUITE 150 OVERLAND PARK, KS 66213 (TEL. NO. 913-814-9994). THE ONSITE PROJECT MANAGER IS DOUG RONK (TEL. NO. 913-461-3805).
2. THE OWNER'S LICENCED ELECTRICIAN SHALL COMPLY WITH INDUSTRIAL CODE RULE 53 TO NOTIFY ALL UTILITIES A MINIMUM OF 10 DAYS BEFORE EXCAVATION WHEN EXCAVATION IS WITHIN 15 FEET OF THEIR FACILITIES.
3. THE OWNER'S LICENCED ELECTRICIAN PROVIDE TO THE OWNER AND THE LONG ISLAND POWER AUTHORITY (LIPA) A CERTIFICATE FROM AN APPROVED ELECTRICAL INSPECTION AGENCY APPROVING THE WIRING OF THE NEW SERVICE.
4. ALL LIPA CUSTOMER, SERVICE, INSPECTION OR CONTRACTOR CHARGES SHALL BE PAID BY THE OWNER.
5. ALL WORK SHALL CONFORM TO THE NATIONAL ELECTRICAL CODE AND LIPA SPECIFICATIONS AND REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, MOST RECENT REVISION. PAD - MOUNTED METAL - CLAD TRANSFORMER AND ASSOCIATED EQUIPMENT.
   A. LIPA WILL FURNISH AND INSTALL ONE (1) DEAD FRONT, 3 PHASE PAD - MOUNTED TRANSFORMER, APPROPRIATE NUMBERS OF BUSHINGS, LOAD BREAK ELBOW TERMINATORS AND ELBOW SURGE ARRESTERS WILL BE PROVIDED TO THE CONTRACTOR FOR INSTALLATION ON POWER CABLES.
   B. THE PRIMARY SERVICE SHALL BE FROM THE EXISTING LIPA 13.2 kV AERIAL DISTRIBUTION SYSTEM WHICH ENTERS THE SITE AT THE SOUTHWEST CORNER OF THE PROPERTY.
   C. THE OWNER'S LICENSED ELECTRICIAN IS REQUIRED TO MAKE APPLICATION FOR THE NEW SERVICE WITH THE ELECTRICAL DESIGN AND CONSTRUCTION DEPARTMENT OF LIPA - CONTACT INDIVIDUAL - KEN MUCCI OR CHARLES HICKS DESIGN ENGINEER AT (631) 758-5128, (631) 758-5130. THE PROJECT REFERENCE NO. IS: T100882102.
   D. THE PROPOSED SECONDARY SERVICE SHALL BE A 4 WIRE, WYE CONNECTED, 3 PHASE, 480 VOLT, 400 AMPERE SERVICE.
   E. THE TRANSFORMER INSTALLATION SHALL BE IN COMPLIANCE WITH LIPA CONSTRUCTION STANDARDS CS# 5362, CS#5369 AND CS#5370.
   F. THE OWNER'S LICENSED ELECTRICIAN SHALL PROVIDE GROUND FAULT PROTECTION ON ALL SERVICED EQUIPMENT.

TRANSFORMER PAD

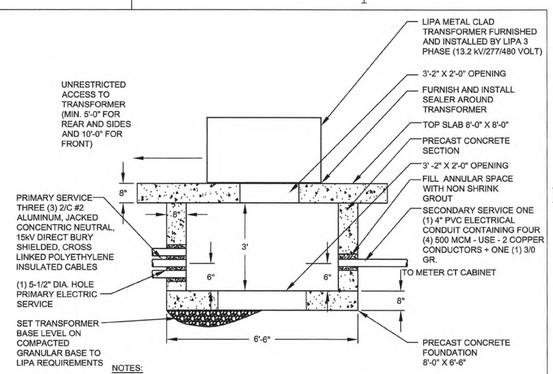
1. THE OWNER'S LICENSED ELECTRICIAN SHALL FURNISH AND INSTALL AT THE LOCATION SHOWN ON THE PLANS OR AT A LOCATION DIRECTED BY LIPA, ONE (1) TRANSFORMER VAULT, COMPLETE WITH REQUIRED CONCRETE FOOTING, FOUNDATION, PAD, GROUND RODS AND ALL WIRING NOT PROVIDED BY LIPA.
2. THE PAD SHALL BE LOCATED TO PROVIDE A MINIMUM OF 10' OF CLEAR WORKING SPACE IN FRONT OF THE PROPOSED TRANSFORMER TO BE INSTALLED ON THE VAULT. A MINIMUM OF 5' FEET SHALL BE MAINTAINED BETWEEN THE TRANSFORMER AND ANY ADJACENT STRUCTURE, FENCING, VEGETATION, ETC.
3. THE VAULT SHALL BE PROVIDED AS A PRECAST CONCRETE UNIT, OBTAINED FROM A LIPA APPROVED SUPPLIER, MANUFACTURED TO MEET ALL REQUIREMENTS OF LIPA SPECIFICATION D14-07-004 - CONCRETE PADS & FOUNDATIONS, MOST RECENT REVISION.
4. APPROVED TRANSFORMER VAULT SUPPLIERS INCLUDE:
   A. JOHN POTENTE & SONS, 114 WOODBURY ROAD, HICKSVILLE, NEW YORK, 11801 ,TEL NO. (516) 935-8585.
   B. ROMAN STONE CONSTRUCTION COMPANY, 85 SOUTH 4TH STREET, BAYSHORE, NEW YORK 11706, TEL. NO. (631) 667-0566
   C. AFCO PRECAST CORPORATION , 114 ROCKY POINT ROAD, MIDDLE ISLAND, NEW YORK, 11953, TEL NO. (631) 924-7400
5. THE OWNER'S LICENSED ELECTRICIAN SHALL EXCAVATE THE AREA WHERE THE TRANSFORMER VAULT IS TO BE INSTALLED TO A DEPTH OF APPROXIMATELY 52 INCHES OR TO A DEPTH TO REACH APPROVED UNDISTURBED SOIL OF SUITABLE SOIL TYPE, NATURE, DENSITY, COMPOSITION AND SOIL BEARING CAPACITY.
6. THE PRECAST VAULT SHALL BE INSTALLED AND ALL REQUIRED ENTRANCE CONDUITS, PLUGS CAPS ETC. INSTALLED THROUGH THE VAULT WALLS. ALL OPENINGS AND ENTRANCE CONDUITS SHALL BE WATERPROOFED. THE VAULT SHALL NOT BE BACKFIELD UNTIL INSPECTED AND APPROVED FOR BACKFILLING BY LIPA.
7. THE OWNER'S LICENSED ELECTRICIAN SHALL BACKFILL WITH APPROVED GRANULAR FILL IN 12" MAXIMUM LIFTS. ALL BACKFILL SHALL BE COMPACTED USING APPROVED VIBRATORY COMPACTION EQUIPMENT IN MAXIMUM LIFTS OF 12".
8. TWO (2) ¾" x 8'COPPER OR ⅝" x 8' COPPER WELD GROUND RODS SHALL BE FURNISHED AND INSTALLED BY THE OWNER'S LICENSED ELECTRICIAN IN THE VICINITY OF THE VAULT, A DISTANCE OF 6' APART. THE RODS SHALL BE DRIVEN FLUSH WITH THE TOP OF THE VAULT.

PRIMARY SERVICE

1. THE OWNER'S ELECTRICIAN SHALL INSTALL THE NEW PRIMARY DIRECT BURY UNDERGROUND SERVICE CONSISTING OF THREE (3) 2/C (2 CONDUCTOR) #2ALUMINUM, JACKETED, CONCENTRIC NEUTRAL, 15 kV, SHIELDED, CROSS-LINKED POLYETHYLENE INSULATED CABLES (EPR) WITH 10 - #14 NEUTRAL STRANDS A NEW RISER POLE TO BE INTALLED BY LIPA AT THE AERIAL ELECTRICAL DISTRIBUTION SYSTEM AT THE SOUTHWEST CORNER OF THE PROPERTY TO A NEW PAD MOUNTED METAL CLAD TRANSFORMER TO BE INSTILLED ON THE NORTH SIDE OF THE NEW TREATMENT BUILDING. A MINIMUM OF 5' OF SLACK SHALL BE PROVIDED INSIDE EACH TRANSFORMER VAULT.
2. THE PRIMARY CABLES SHALL HAVE 220 MIL THICK INSULATION AND 50 MIL SEMICONDUCTING JACKET AND SHALL MEET ALL REQUIREMENTS OF AEIC SPECIFICATION CS-5. THE CABLE SHALL BE IDENTIFIED WITH THREE (3) 225 MIL WIDE BY 6 MILS THICK DURABLE EXTRUDED RED STRIPS. THE CABLE SHALL BEAR THE MANUFACTURERS NAME, YEAR OF MANUFACTURE, CONDUCTOR SIZE AND MATERIAL, TYPE AND THICKNESS OF INSULATION, TYPE OF JACKET, VOLTAGE RATING AND THE NESC "LIGHTNING BOLT" IDENTIFICATION BEFORE AND AFTER THE WORDS "ELECTRIC CABLE".
3. THE PRIMARY SERVICE SHALL BE BURIED WITH A MINIMUM DEPTH OF BURY OF 30".

SECONDARY SERVICE

1. THE CONTRACTOR SHALL INSTALL A NEW SECONDARY UNDERGROUND ELECTRIC SERVICE CONSISTING OF ONE (1) 4" PVC ELECTRICAL CONDUIT CONTAINING FOUR (4) 500 MCM USE-2 COPPER CONDUCTORS + ONE (1) 3/0 GR FROM THE NEW PAD MOUNTED TRANSFORMER TO A NEW TRANS S THE CURRENT TRANSFORMER / MAIN BREAKER INSTALLED ON THE EAST WALL OF THETREATMENT PLANT BUILDING SHOWN ON THE SITE PLAN, INCLUDING PROVIDING A MIN. OF 10 FEET OF SLACK CABLE WITHIN THE TRANSFORMER VAULT.
2. CONNECTIONS TO THE TRANSFORMER SECONDARY TERMINALS SHALL BE MADE WITH 2 HOLE NEMA TERMINAL LUGS.
3. GROUND FAULT PROTECTION FOR THE MAIN DISCONNECTS SWITCH SHALL BE COORDINATED WITH LIPA'S CUSTOMER PLANNING REPRESENTATIVE. BONDING PRIMARY AND SECONDARY ELECTRIC SERVICES:
   A. THE OWNER'S LICENSED ELECTRICIAN SHALL BOND THE PRIMARY SERVICE WITH #2 AWG BARE TINNED COPPER WIRES TO EACH GROUND LUG OF THE PRIMARY BUSHING, CONTINUING THE #2 COPPER WIRES TO THE GROUND RODS.
   B. THE OWNER'S LICENSED ELECTRICIAN SHALL BOND THE SECONDARY SERVICE WITH #2 AWG BARE TINNED COPPER WIRE CONNECTING THE SECONDARY NEUTRAL BUSHING TO ONE GROUND ROD, THEN CONNECTING THE TWO (2) GROUND RODS TO EACH OTHER.
   C. THE CONCENTRIC NEUTRALS OF THE PRIMARY CABLES SHALL BE ATTACHED BY THE OWNER'S LICENSED ELECTRICIAN TO THE #2 BARE TINNED COPPER WIRE USING SPLIT BOLT CONNECTORS
4. THE OWNER'S LICENSED ELECTRICIAN SHALL FURNISH AND INSTALL TRANS VOLTAGE SURGE PROTECTOR AFTER THE MAIN BREAKER. SURGE PROTECTOR SHALL BE MODEL 402XJ-277/480 VOLT AS MANUFACTURED BY ELECTRONICS OR APPROVED EQUAL.

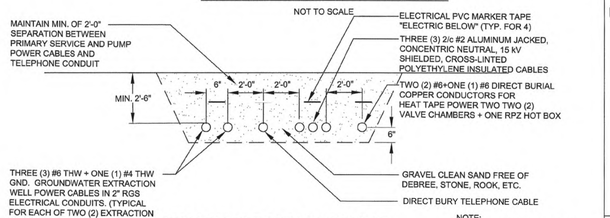


NOTES:

1. CONTRACTOR TO FURNISH AND INSTALL A NEW 400 AMPERE, PRIMARY AND SECONDARY ELECTRIC SERVICE, COMPLETE WITH NEMA 3R METER / CURRENT TRANSFORMER, TRANS S CABINET. AS PER LIPA REQUIREMENTS AT LOCATION SHOWN ON THE SITE PLAN.
2. THE CURRENT TRANSFORMER SECTION TO BE PROVIDED WITH LIPA APPROVED METER SOCKET AND TEST SWITCH.
3. METER AND CURRENT TRANSFORMERS TO BE FURNISHED AND INSTALLED BY LIPA.
4. DIMENSIONS SHOWN ARE APPROXIMATE. LARGER DIMENSIONS MAY BE REQUIRED TO MEET CODE AND LIPA REQUIREMENTS.
5. THE NEW MAIN BREAKER SECTION TO BE PROVIDED WITH A 600 VOLT, 3 PHASE, 600 AMPERE (SET AT 400 AMPS) MAIN BREAKER.
6. SURGE PROTECTION TO BE PROVIDED AS PER LIPA REQUIREMENTS.

TRANSFORMER VAULT DETAIL

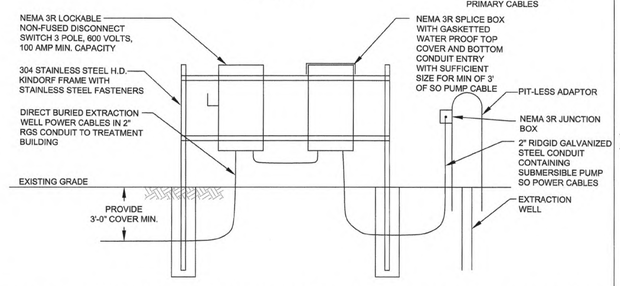
NOT TO SCALE



PRIMARY ELECTRIC SERVICE TRENCH DETAIL

NOT TO SCALE

NOTE:
WELL POWER CABLE MUST BE IN RIGID GALVANIZED STEEL ELECTRICAL CONDUIT WITH A MIN. OF 2'-0" SEPARATION FROM HIGH VOLTAGE PRIMARY CABLES

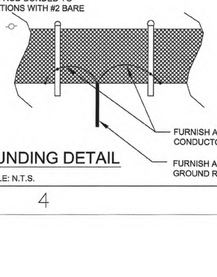


DISCONNECT SWITCH / SPLICE BOX DETAIL (TYP. FOR TWO(2) LOCATIONS

NOT TO SCALE

FENCE GROUNDING DETAIL

SCALE: N.T.S.



LEGEND

- PE — NEW 13.2kV, 3PHASE, DIRECT BURIED PRIMARY ELECTRIC SERVICE
- E — 480 — NEW 480 VOLT, 3 PHASE, POWER FEEDER
- E — 120 — 120 VOLT SINGLE PHASE POWER FEEDER
- T — TELEPHONE LINE
- NEMA 3R, 600 VOLT, 3 POLE LOCKABLE DISCONNECT SWITCH AND NEMA 3R SPLICE BOX MOUNTED ON STAINLESS STEEL KINDOFF FRAME (SEE DETAIL)

60 30 0 60 120

SCALE:1"= 60'

REV #	Revisions	Date	Approved
2	AS-BUILT REVISIONS	11/15/21	
	AS-BUILT	10/10	

P.W. GROSSER CONSULTING ENGINEER AND HYDROGEOLOGIST, P.C.
630 JOHNSON AVE. - SUITE 7
BOHEMIA - NY - 11716-2618
PH: (631)589-6353 - FX: (631)589-8705
E-MAIL: INFO@PWGROSSER.COM

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DRAWING AND RELATED DOCUMENTS IS A VIOLATION OF SEC. 7209 OF THE N.Y.S. EDUCATION LAW

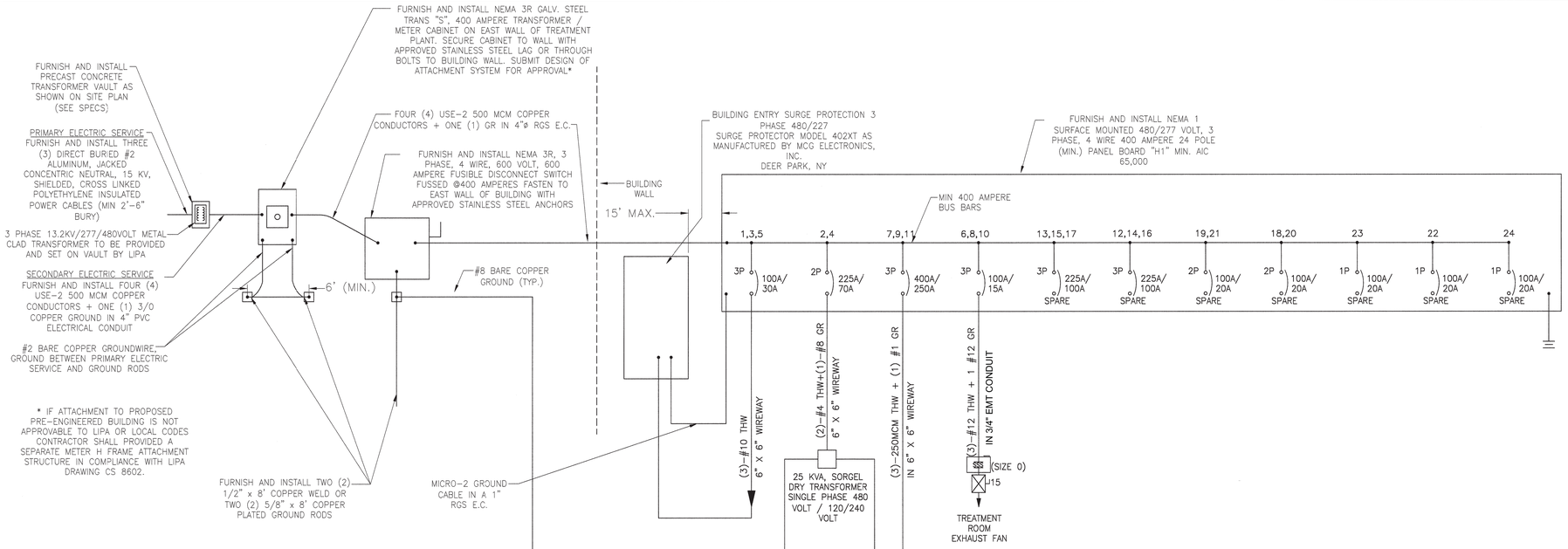
HydroGeoLogic, Inc

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

Designed by:	DLR
Drawn by:	DLR
Checked by:	GWW
Reviewed by:	SFS
Submitted by:	GWW
Scale:	AS SHOWN
Spec. No.:	-
Contract No.:	-
Sheet reference number:	E-1
Date:	AUGUST 15, 2009
Drawing Code:	-

LAWRENCE AVIATION SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT ELECTRICAL SITE PLAN



NOTES:

1) CONTRACTOR TO PROVIDE OUT PUT REACTORS AND POWER WIRING IN RMC. IF REQUIRED BY VFD MANUFACTURER ALL POWER WIRING SHALL BE SHIELDED.
2) CIRCUIT POWER FEEDER SIZES FOR EXTRACTION WELLS DETERMINED BY VOLTAGE DROP REQUIREMENTS OF LESS THAN 3% (14.4 VOLTS)

LEGEND

VFD –	480 VOLT, 3 PHASE VARIABLE FREQUENCY DRIVE, MOUNTED IN SELF STANDING MOTOR CONTROL CENTER
SSS –	480 VOLT, 3 PHASE SOLID STATE, ACROSS THE LINE MAGNETIC STARTER
50A/25A –	HMCP 600 VOLT CIRCUIT BREAKER CAPACITY 50 AMPS SET @ 25 AMPERES
GR –	COPPER GROUND MIN 50% OF POWER CIRCUIT CAPACITY
1P –	SINGLE POLE, 600/240 VOLT CIRCUIT BREAKER
2P –	TWO POLE, 600/240 VOLT CIRCUIT BREAKER
3P –	THREE POLE 600 VOLT CIRCUIT BREAKER
2P –	TWO POLE, 240 VOLT CIRCUIT BREAKER
SB	NEMA 3R SPLICE BOX WITH REMOVABLE GASKETED WATER PROOF GASKET
	NEW FUSIBLE 3 POLE DISCONNECT SWITCH
RGS	RIGID GALVANIZED STEEL ELECTRICAL CONDUIT

REV #	Revisions	Date	Approved
	AS-BUILT	10/10	
1	ISSUED FOR CONSTRUCTION	5-19-10	

P.W. GROSSER CONSULTING ENGINEER AND HYDROGEOLOGIST, P.C.
630 JOHNSON AVE. • SUITE 7
BOHEMIA • NY • 11716-2618
PH: (631)589-6353 • FX: (631)589-8705
E-MAIL: INFO@PWGROSSER.COM

ARROWHEAD CONTRACTING INC.
10981 Eicher Drive
Lenexa, Kansas 66219
(913) 814-9994

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DRAWING AND RELATED DOCUMENTS IS A VIOLATION OF SEC. 7209 OF THE N.Y.S. EDUCATION LAW

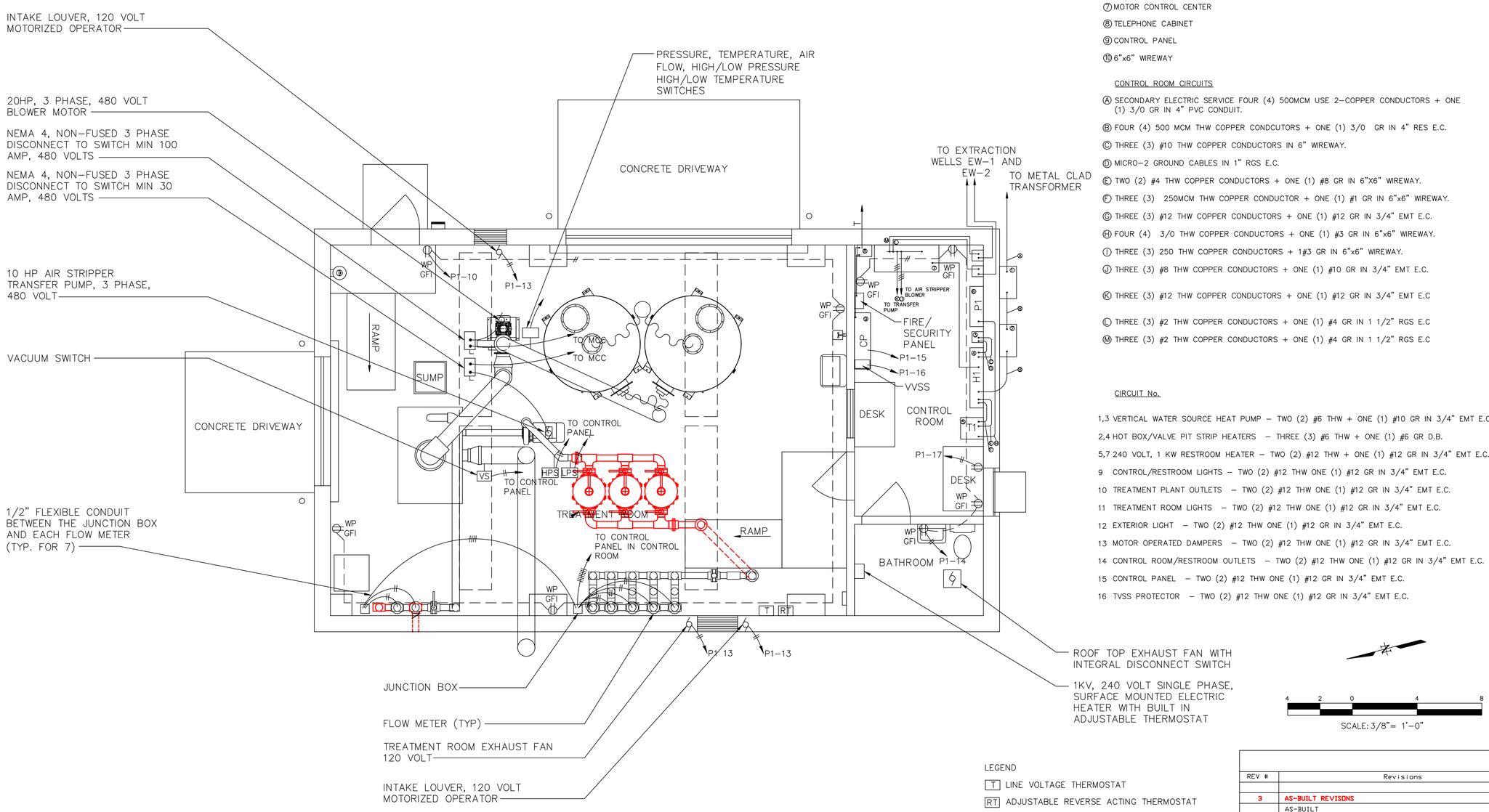
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
ONE-LINE DIAGRAM

Designed by: DLR
Drawn by: DLR
Checked by: GWW
Reviewed by: SFS
Submitted by: GWW
Scale: AS SHOWN
Sheet reference number: E-02
Date: AUGUST 15, 2009
Spec. No.: -
Contract No. -
Drawing Code: -

SEND TO | PHONE
LOC. | PROJ.
UPPER: | PROJ. # | TASK #
DATE:
FILE #
SCALE



POWER PLAN

CONTROL ROOM PANELS

① TRANS S CT CABINET
② MAIN SWITCH
③ BUILDING ENTRY SURGE PROTECTOR
④ POWER PANELBOARD H-1 3 PHASE, 480 VOLT
⑤ 25kvA TRANSFORMER
⑥ POWER PANELBOARD P-1 SINGLE PHASE 120/240 VOLT
⑦ MOTOR CONTROL CENTER
⑧ TELEPHONE CABINET
⑨ CONTROL PANEL
⑩ 6"x6" WIREWAY

CONTROL ROOM CIRCUITS

Ⓐ SECONDARY ELECTRIC SERVICE FOUR (4) 500MCM USE 2-COPPER CONDUCTORS + ONE (1) 3/0 GR IN 4" PVC CONDUIT.
Ⓑ FOUR (4) 500 MCM THW COPPER CONDCUTORS + ONE (1) 3/0 GR IN 4" RES E.C.
Ⓒ THREE (3) #10 THW COPPER CONDUCTORS IN 6" WIREWAY.
Ⓓ MICRO-2 GROUND CABLES IN 1" RGS E.C.
Ⓔ TWO (2) #4 THW COPPER CONDUCTORS + ONE (1) #8 GR IN 6"X6" WIREWAY.
Ⓕ THREE (3) 250MCM THW COPPER CONDUCTOR + ONE (1) #1 GR IN 6"x6" WIREWAY.
Ⓖ THREE (3) #12 THW COPPER CONDUCTORS + ONE (1) #12 GR IN 3/4" EMT E.C.
Ⓗ FOUR (4) 3/0 THW COPPER CONDUCTORS + ONE (1) #3 GR IN 6"x6" WIREWAY.
Ⓘ THREE (3) 250 THW COPPER CONDUCTORS + 1#3 GR IN 6"x6" WIREWAY.
Ⓙ THREE (3) #8 THW COPPER CONDUCTORS + ONE (1) #10 GR IN 3/4" EMT E.C.
Ⓚ THREE (3) #12 THW COPPER CONDUCTORS + ONE (1) #12 GR IN 3/4" EMT E.C
Ⓛ THREE (3) #2 THW COPPER CONDUCTORS + ONE (1) #4 GR IN 1 1/2" RGS E.C
Ⓜ THREE (3) #2 THW COPPER CONDUCTORS + ONE (1) #4 GR IN 1 1/2" RGS E.C

CIRCUIT No.

1,3 VERTICAL WATER SOURCE HEAT PUMP - TWO (2) #6 THW + ONE (1) #10 GR IN 3/4" EMT E.C.
2,4 HOT BOX/VALVE PIT STRIP HEATERS - THREE (3) #6 THW + ONE (1) #6 GR D.B.
5,7 240 VOLT, 1 KW RESTROOM HEATER - TWO (2) #12 THW + ONE (1) #12 GR IN 3/4" EMT E.C.
9 CONTROL/RESTROOM LIGHTS - TWO (2) #12 THW ONE (1) #12 GR IN 3/4" EMT E.C.
10 TREATMENT PLANT OUTLETS - TWO (2) #12 THW ONE (1) #12 GR IN 3/4" EMT E.C.
11 TREATMENT ROOM LIGHTS - TWO (2) #12 THW ONE (1) #12 GR IN 3/4" EMT E.C.
12 EXTERIOR LIGHT - TWO (2) #12 THW ONE (1) #12 GR IN 3/4" EMT E.C.
13 MOTOR OPERATED DAMPERS - TWO (2) #12 THW ONE (1) #12 GR IN 3/4" EMT E.C.
14 CONTROL ROOM/RESTROOM OUTLETS - TWO (2) #12 THW ONE (1) #12 GR IN 3/4" EMT E.C.
15 CONTROL PANEL - TWO (2) #12 THW ONE (1) #12 GR IN 3/4" EMT E.C.
16 TVSS PROTECTOR - TWO (2) #12 THW ONE (1) #12 GR IN 3/4" EMT E.C.

4 2 0 4 8
SCALE: 3/8"= 1'-0"

LEGEND

T LINE VOLTAGE THERMOSTAT
RT ADJUSTABLE REVERSE ACTING THERMOSTAT
CONDUIT HOME RUN TO PANELBOARD OR DEVICE CONTAINING TWO (2) #12 + ONE (1) #12 GND. IN ¾" CONDUIT
WP GFI 240 VOLT 20 AMPERE, GFI WATERPROOF OUTLET WITH WATERPROOF CAST ALUMINUM OUTBOX AND GASKET COVER PLATE
RGS RIGID GALVANIZED STEEL
EMT ELECTRICAL METALLIC TUBING

REV #	Revisions	Date	Approved
3	AS-BUILT REVISIONS	11/15/21	
	AS-BUILT	10/10	
2	REVISED INTERIOR WALL PLACEMENT	7/28/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

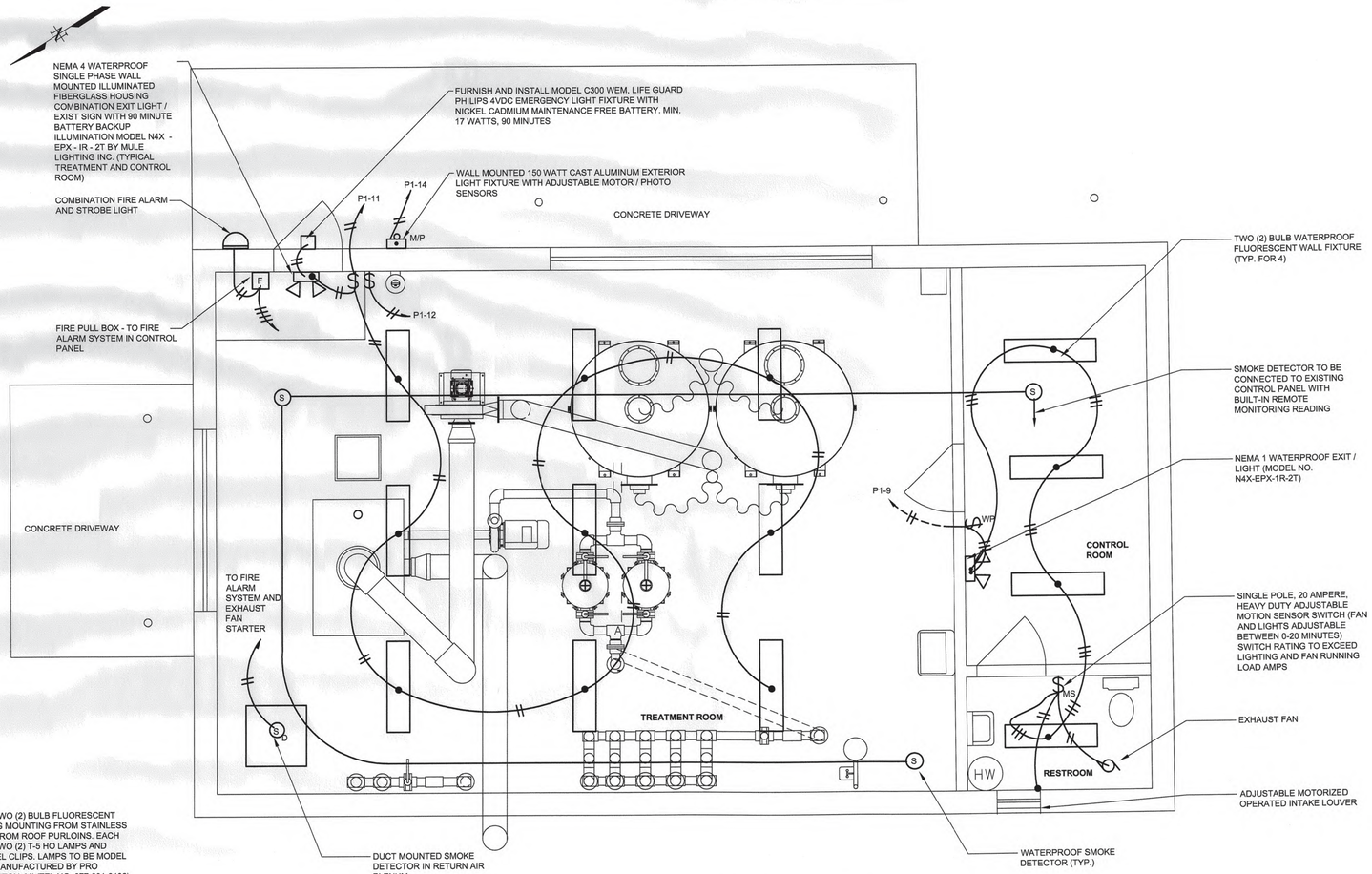
HGL HydroGeoLogic, Inc

CDM FEDERAL PROGRAMS NEW YORK, NEW YORK

Designed by: DLR	LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE PORT JEFFERSON STATION, NEW YORK
Drawn by: DLR	GROUNDWATER TREATMENT PLANT POWER PLAN
Checked by: GWW	
Reviewed by: SFS	Scale: AS SHOWN
Submitted by: GWW	Spec. No.: -
	Contract No. -
	Sheet reference number: E-03
	Date: JANUARY 27, 2010
	Drawing Code: -

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

SEND TO PHONE
LOC PROJ
PROJ # TASK #
DRPPR DATE
FILE # SCALE



LIGHTING FLOOR PLAN

SCALE 3/8" = 1'-0"

LEGEND

- VAPOR TIGHT, TWO (2) BULB FLUORESCENT FIXTURE CEILING MOUNTING FROM STAINLESS STEEL CHAINS FROM ROOF PURLOINS. EACH FIXTURE WITH TWO (2) T-5 HO LAMPS AND STAINLESS STEEL CLIPS. LAMPS TO BE MODEL WT-2T5-UH AS MANUFACTURED BY PRO LIGHTING, BRIGHTON, MI (TEL NO. 877-801-8406)
- EMERGENCY LIGHTING FIXTURE 120 VOLT POWER SUPPLY - MIN. 30 MIN BATTERY BACKUP
- $WP — HEAVY DUTY, 240 VOLT, 20 AMPERE WATER PROOF SWITCH WITH CAS ALUMINUM GASKET OUTLET BOX AND GASKET COVER PLATES (NEMA 3R)
- MS MP — EXTERIOR CAST ALUMINUM WATERPROOF LIGHT WITH MOTION SENSOR, PHOTO CELL ADJUSTABLE TIMER
- $WP — 20 AMP, 120 VOLT WATERPROOF ADJUSTABLE MOTION SENSOR SWITCH
- (S) — MOISTURE PROOF SURFACE MOUNTED SMOKE DETECTOR
- (S)D — DUCT MOUNTED SMOKE DETECTOR

NOTE:
SMOKE DETECTORS AND FIRE PULL STATION TO BE CONNECTED TO EXHAUST FAN CONTROL TO DE-ENERGIZE THE EXHAUST FAN WHEN A FIRE ALARM CONDITION EXISTS.

REFER TO DRAWING M-01 FOR TREATMENT PLANT EQUIPMENT LAYOUT

REV #	Revisions	Date	Approved
	AS-BUILT	10/10	
1	ISSUED FOR CONSTRUCTION	5-19-10	

P.W. GROSSER CONSULTING ENGINEER AND HYDROGEOLOGIST, P.C.
630 JOHNSON AVE. • SUITE 7
BOHEMIA • NY • 11716-2618
PH: (631)589-6353 • FX: (631)589-8705
E-MAIL: INFO@PWGROSSER.COM

ARROWHEAD CONTRACTING INC.
10981 Eicher Drive
Lenexa, Kansas 66219
(913) 814-9994

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DRAWING AND RELATED DOCUMENTS IS A VIOLATION OF SEC. 7209 OF THE N.Y.S. EDUCATION LAW

Designed by: DLR
Drawn by: DLR
Checked by: GWW
Reviewed by: SFS
Submitted by: GWW

LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
LIGHTING PLAN

Scale: AS SHOWN
Spec. No.: –
Contract No.: –
Sheet reference number: E-04
Date: AUGUST 15, 2009
Drawing Code: –

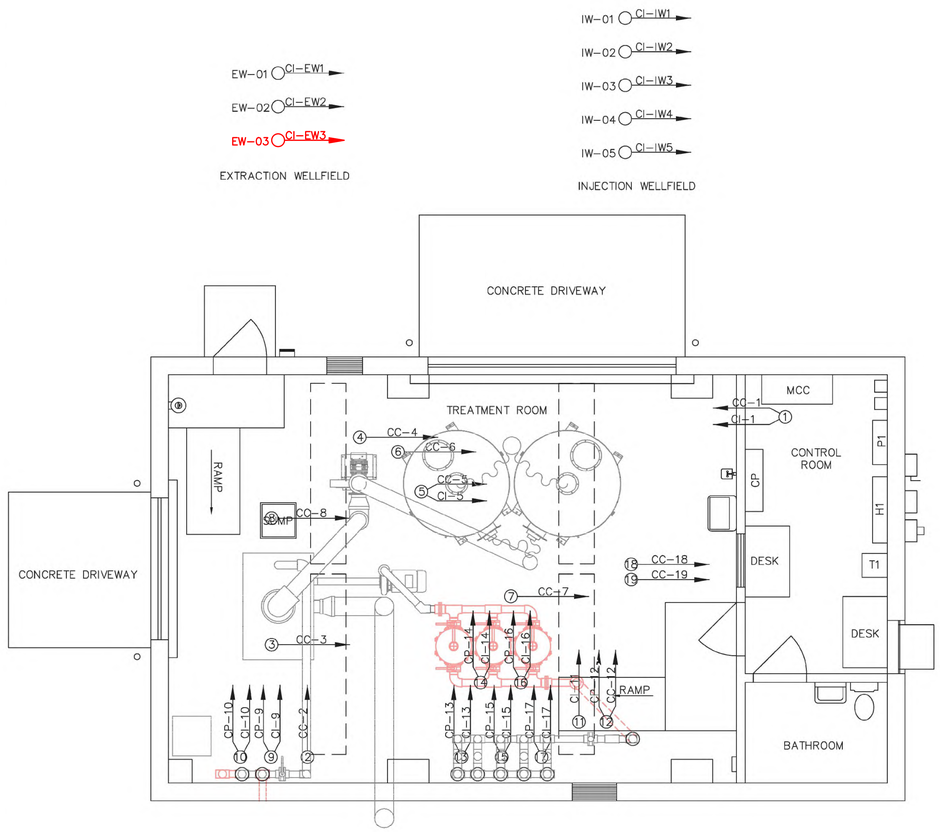
SCND 'D' PHONE
LDC PROJ.
PROJ. # TASK #
UPPER DATE
FILE # SCALE

FIELD WIRING SCHEDULE

LOCATION NUMBER	P&ID TAG	DESCRIPTION	NUMBER OF CONDUCTORS			CONDUIT DESIGNATIONS			NOTES
			P	C	I	CP	CC	CI	
1	B-1	BLOWER MOTOR STARTER AUX CONTACTS		2			1		MOTOR STARTER IN MCC TO MCP
1	B-1	BLOWER HOA SWITCH AUTO POSITION		2			1		HOA SWITCH IN MCC TO MCP
1	P-1	DISCHARGE PUMP VFD RUNNING		2			1		VFD IN MCC TO MCP
1	P-1	DISCHARGE PUMP VFD AUTO MODE		2			1		VFD IN MCC TO MCP
1	P-1	DISCHARGE PUMP VFD GENERAL FUALT		2			1		VFD IN MCC TO MCP
1	EW-1	EW-1 PUMP VFD RUNNING		2			1		VFD IN MCC TO MCP
1	EW-1	EW-1 PUMP VFD AUTO MODE		2			1		VFD IN MCC TO MCP
1	EW-1	EW-1 PUMP VFD GENERAL FAULT		2			1		VFD IN MCC TO MCP
1	EW-1	EW-1 PUMP VFD DRY RUN FAULT		2			1		VFD IN MCC TO MCP
1	EW-2	EW-2 PUMP VFD RUNNING		2			1		VFD IN MCC TO MCP
1	EW-2	EW-2 PUMP VFD AUTO MODE		2			1		VFD IN MCC TO MCP
1	EW-2	EW-2 PUMP VFD GENERAL FAULT		2			1		VFD IN MCC TO MCP
1	EW-2	EW-2 PUMP VFD DRY RUN FAULT		2			1		VFD IN MCC TO MCP
2	PSL-303	GW INFLUENT LOW PRESSURE SWITCH		2			2		SWITCH ON INFLUENT PIPE TO MCP
2	PSH-303	GW INFLUENT HIGH PRESSURE SWITCH		2			2		SWITCH ON INFLUENT PIPE TO MCP
3	LSL-400	AIR STRIPPER SUMP LOW-LOW LEVEL SWITCH		2			3		SWITCH ON AIR STRIPPER SUMP TO MCP
3	LSH-400	AIR STRIPPER SUMP HIGH-HIGH LEVEL SWITCH		2			3		SWITCH ON AIR STRIPPER SUMP TO MCP
4	VSH-500	BLOWER HIGH VACUUM SWITCH		2			4		SWITCH ON BLOWER SUCTION PIPE TO MCP
5	PSH-502	BLOWER HIGH PRESSURE SWITCH		2			5		SWITCH ON BLOWER DISCHARGE PIPE TO MCP
5	PSHH-502	BLOWER HIGH-HIGH PRESSURE SWITCH		2			5		SWITCH ON BLOWER DISCHARGE PIPE TO MCP
5	TSH-502	BLOWER HIGH TEMPERATURE SWITCH		2			5		SWITCH ON BLOWER DISCHARGE PIPE TO MCP
5	TSHH-502	BLOWER HIGH-HIGH TEMPERATURE SWITCH		2			5		SWITCH ON BLOWER DISCHARGE PIPE TO MCP
5	FSL-502	BLOWER LOW FLOW SWITCH		2			5		SWITCH ON BLOWER DISCHARGE PIPE TO MCP
6	PSL-403	DISCHARGE PUMP LOW PRESSURE SWITCH		2			6		SWITCH ON PUMP DISCHARGE PIPE TO MCP
6	PSH-403	DISCHARGE PUMP HIGH PRESSURE SWITCH		2			6		SWITCH ON PUMP DISCHARGE PIPE TO MCP
7	DPSH-412	BAG FILTER DIFFERENTIAL PRESSURE SWITCH		2			7		SWITCH ON BAG FILTER TO MCP
8	LSHH-300	BUILDING SUMP HIGH-HIGH LEVEL PROBES		2			8		TWO PROBES IN BUILDING SUMP TO MCP. ONE CONDUCTOR PER PROBE.
1	NOT SHOWN	PHASE LOSS MONITOR		2			1		PHASE LOSS MONITOR IN MCC TO MCP
12	MOV-415	EFFLUENT SHUT-OFF VALVE OPEN LIMIT SWITCH		2			12		MOTORIZED VALVE TO MCP
12	MOV-415	EFFLUENT SHUT-OFF VALVE CLOSED LIMIT SWITCH		2			12		MOTORIZED VALVE TO MCP
1	B-1	BLOWER RUN COMMAND TO MOTOR STARTER		2					MCP TO MOTOR STARTER IN MCC
1	P-1	DISCHARGE PUMP RUN COMMAND TO VFD		2					MCP TO VFD IN MCC
1	EW-1	EW-1 RUN COMMAND TO VFD		2					MCP TO VFD IN MCC
1	EW-2	EW-2 RUN COMMAND TO VFD		2					MCP TO VFD IN MCC
12	MOV-415	EFFLUENT SHUT-OFF VALVE OPEN COMMAND	2	2		12	12		120V POWER FROM LIGHTING PANEL. OPEN AND CLOSE COMMANDS FROM MCP.
12	MOV-415	EFFLUENT SHUT-OFF VALVE CLOSE COMMAND		2			12		120V POWER FROM LIGHTING PANEL. OPEN AND CLOSE COMMANDS FROM MCP.
3	LIT-400	AIR STRIPPER SUMP LEVEL TRANSMITTER			2			3	TRANSMITTER AT AIR STRIPPER SUMP TO MCC
EW-1	LT-100	EW-1 LEVEL TRANSMITTER			2			EW-1	TRANSMITTER IN EW-1 TO MCP
9	FIT-106	EW-1 FLOW TRANSMITTER	2		2			9	TRANSMITTER ON EW-1 INFLUENT PIPE TO MCP
EW-2	LT-200	EW-2 LEVEL TRANSMITTER			2			EW-2	TRANSMITTER IN EW-2 TO MCP
10	FIT-206	EW-2 FLOW TRANSMITTER	2		2	10		10	TRANSMITTER ON EW-2 INFLUENT PIPE TO MCP
11	AIT-415	EFFLUENT pH TRANSMITTER			2			11	TRANSMITTER ON EFFLUENT PIPE TO MCP
IW-1	LT-420	IW-1 LEVEL TRANSMITTER			2			IW-1	TRANSMITTER IN IW-1 TO MCP
13	FIT-420	IW-1 FLOW TRANSMITTER	2		2			13	TRANSMITTER ON IW-1 EFFLUENT PIPE TO MCP
IW-2	LT-422	IW-2 LEVEL TRANSMITTER			2			IW-2	TRANSMITTER IN IW-2 TO MCP
14	FIT-422	IW-2 FLOW TRANSMITTER	2		2			14	TRANSMITTER ON IW-2 EFFLUENT PIPE TO MCP
IW-3	LT-424	IW-3 LEVEL TRANSMITTER			2			IW-3	TRANSMITTER IN IW-3 TO MCP
15	FIT-424	IW-3 FLOW TRANSMITTER	2		2			15	TRANSMITTER ON IW-3 EFFLUENT PIPE TO MCP
IW-4	LT-426	IW-4 LEVEL TRANSMITTER			2			IW-4	TRANSMITTER IN IW-4 TO MCP
16	FIT-426	IW-4 FLOW TRANSMITTER	2		2			16	TRANSMITTER ON IW-4 EFFLUENT PIPE TO MCP
IW-5	LT-428	IW-5 LEVEL TRANSMITTER			2			IW-5	TRANSMITTER IN IW-5 TO MCP
17	FIT-428	IW-5 FLOW TRANSMITTER	2		2			17	TRANSMITTER ON IW-5 EFFLUENT PIPE TO MCP
5	FIT-502	AIR STRIPPER BLOWER FLOW TRANSMITTER	2		2			5	TRANSMITTER ON BLOWER DISCHARGE PIPE TO MCP. 24VDC TRANSMITTER POWER ALLOWED IN INSTRUMENTATION CONDUIT.
5	PIT-502	AIR STRIPPER BLOWER PRESSURE TRANSMITTER			2			5	TRANSMITTER ON BLOWER DISCHARGE PIPE TO MCP
1	P-1	4-20 mA SPEED SIGNAL TO P-1 VFD			2			1	MCP TO VFD IN MCC
1	EW-1	4-20 mA SPEED SIGNAL TO EW-1 VFD			2			1	MCP TO VFD IN MCC
1	EW-2	4-20 mA SPEED SIGNAL TO EW-2 VFD			2			1	MCP TO VFD IN MCC
18	NOT SHOWN	FIRE ALARM		2			2		ALARM SWITCH TO MCP; POWER OBTAINED FROM BUILDING LIGHTING CIRCUIT
19	NOT SHOWN	SECURITY ALARM		2			2		ALARM SWITCH TO MCP; POWER OBTAINED FROM BUILDING LIGHTING CIRCUIT

Field Wiring and Conduit Notes:

1. P=Power , THHN/THWN, min 14 AWG, stranded. C=Control, THHN/THWN, min 14 AWG, stranded. I=Instrumentation, twisted, shielded pair w/drain wire, min 16 AWG, stranded.
2. CP=Power conduit; CC=Control conduit; CI=Instrumentation conduit; MCC=Motor Control Center; Panel=PLC Control Panel.
3. Conduit designations are only suggestions on combining circuits into a common conduit. Under no circumstances shall Instrumentation wire be placed in Power or Control conduits.
4. Conductor wire counts are for instrumentation and control conduit wiring only and include power required for field control devices, if needed. Conductor counts do not include ground wires for powered devices. Refer to Specficiations for wiring materials and methods. Refer to DWG E-01 for motor power wiring schedule.
5. Conduit sizes to be determined by Electrical Contractor in accordanc with NFPA 70.



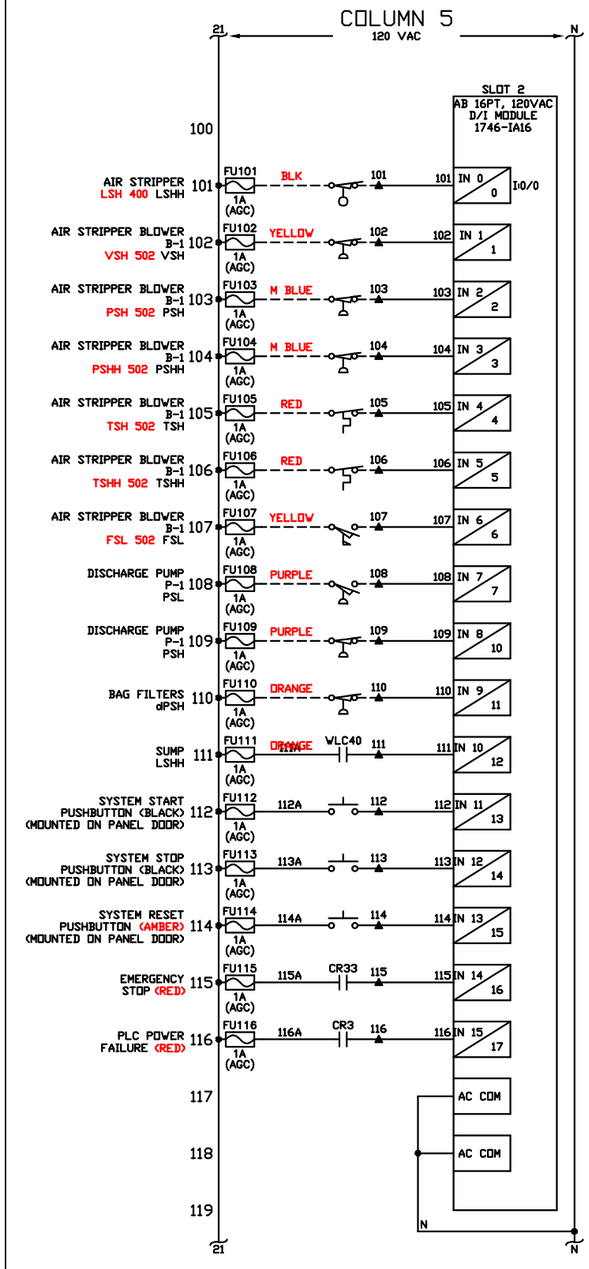
REV #	Revisions	Date	Approved
2	AS-BUILT REVISONS	11/15/21	
	AS-BUILT	10/10	
	ISSUED FOR CONSTRUCTION	5/19/10	

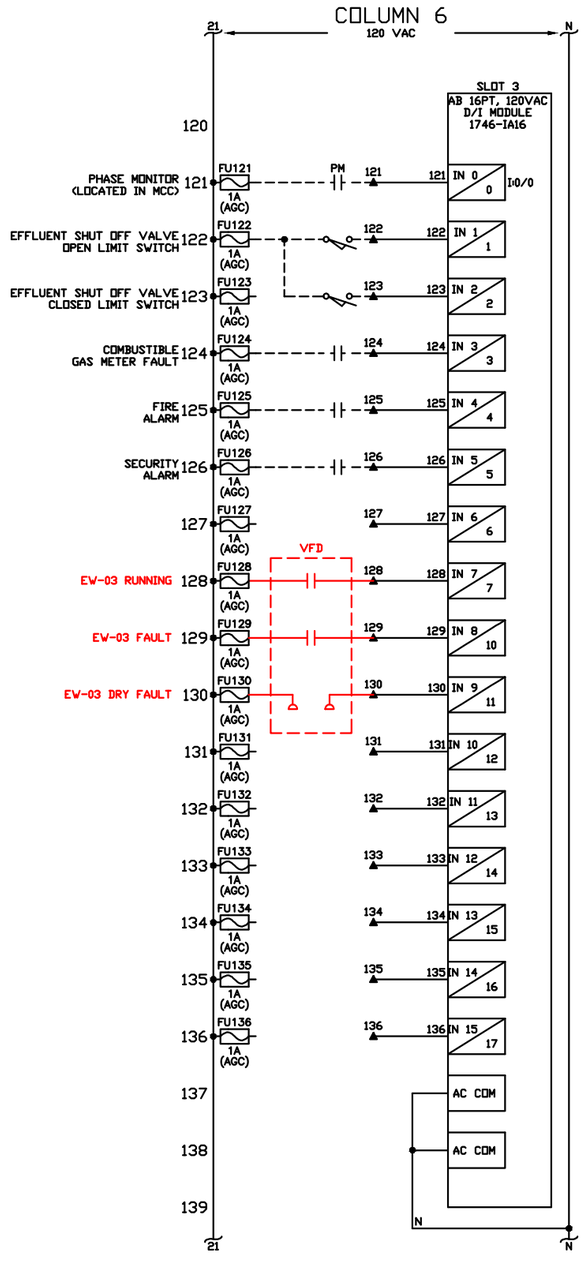
HGL HydroGeoLogic, Inc

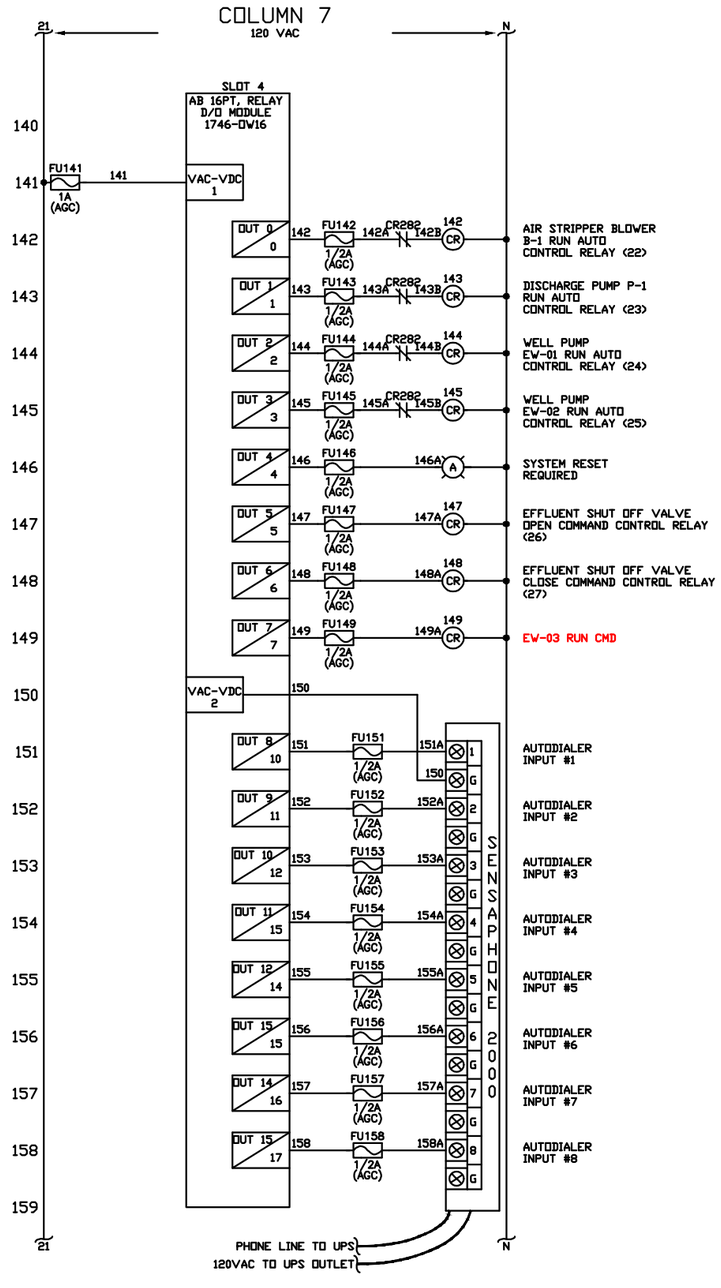
CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

Designed by: BSL	LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE PORT JEFFERSON STATION, NEW YORK
Drawn by: DLR	GROUNDWATER TREATMENT PLANT CONTROL WIRING PLAN
Checked by: GWW	
Reviewed by: SFS	Scale: AS SHOWN; Spec. No.: -; Contract No.: -
Submitted by: GWW	Sheet reference number: E-05
	Date: MARCH 19, 2010
	Drawing Code: -

SEND TO / PHONE
LOC. / PROJ.
PROJ. # / TASK #
UPPER / DATE
FILE # / SCALE







REVISIONS			
REV	DESCRIPTION	DATE	DWN
A	RELEASE FOR SUBMITTAL	02/01/10	RC
B	RELEASE FOR RE-SUBMITTAL	03/10/10	RC
C	RELEASE FOR PRODUCTION	06/22/10	RC
D	AS BUILT	08/17/10	RC
E	STARTUP REVISIONS	10/14/10	RC
F	AS-BUILT REVISIONS	11/15/21	TB

UNLESS SPECIFIED OTHERWISE
* DIMENSIONS ARE IN INCHES
* DO NOT SCALE DRAWING

DRAWN BY: RC
DESIGNED BY: RC
PROJECT MANAGER: MK
DATE: 01/11/10
PROJECT NO.: 2933

THESE MATERIALS ARE PROPRIETARY AND SHALL REMAIN THE PROPERTY OF H2K TECHNOLOGIES, INC. BUYER SHALL HAVE THE USE OF MATERIALS AND INFORMATION FOR THE LIMITED PURPOSE OF INSTALLING AND MAINTAINING THE EQUIPMENT SOLD BY H2K TECHNOLOGIES, INC. NOT TO BE REPRODUCED WITHOUT WRITTEN PERMISSION.

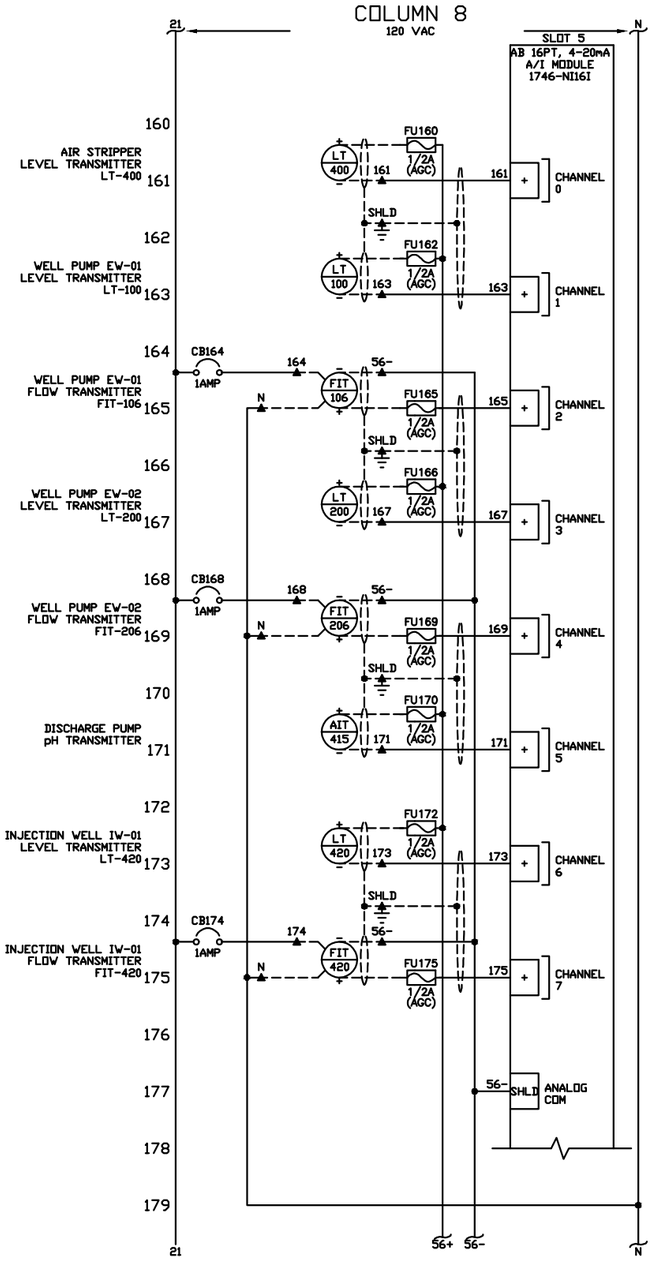
HGL HydroGeoLogic, Inc

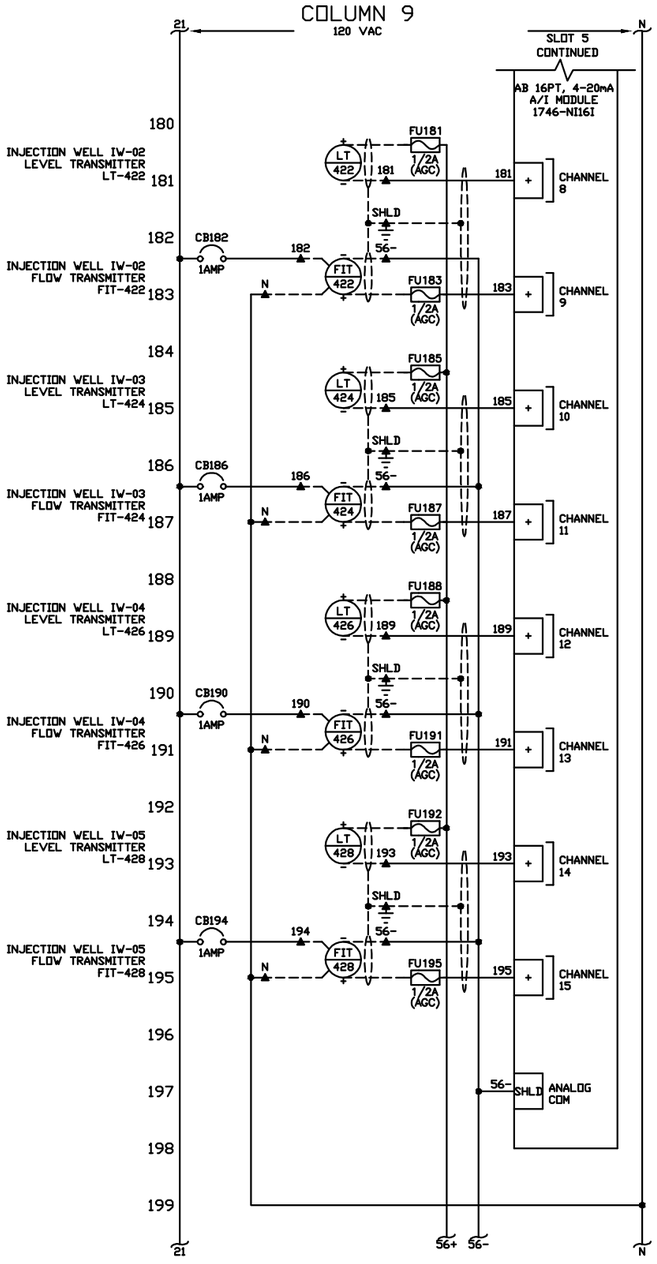
PROJECT TITLE:
ARROWHEAD–
LAWRENCE AVIATION
PORT JEFFERSON,
NY

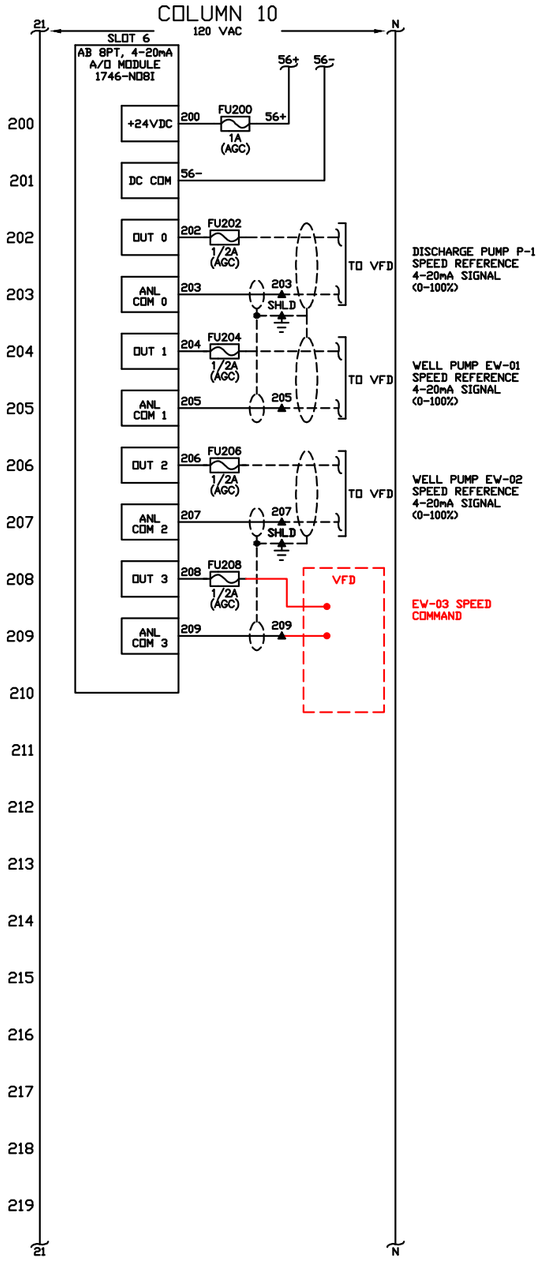
DRAWING TITLE:
E–6
SCHEMATIC CONTROL PANEL

SHEET 4 OF 10

DRAWING NO.:
2933–23







REVISIONS

REV	DESCRIPTION	DATE	DWN
A	RELEASE FOR SUBMITTAL	02/01/10	RC
B	RELEASE FOR RE-SUBMITTAL	03/10/10	RC
C	RELEASE FOR PRODUCTION	06/22/10	RC
D	AS BUILT	08/17/10	RC
E	STARTUP REVISIONS	10/14/10	RC
F	AS-BUILT REVISIONS	11/17/21	TB

UNLESS SPECIFIED OTHERWISE
* DIMENSIONS ARE IN INCHES
* DO NOT SCALE DRAWING

DRAWN BY: RC
DESIGNED BY: RC
PROJECT MANAGER: MH
DATE: 01/11/10
PROJECT NO.: 2933

THESE MATERIALS ARE PROPRIETARY AND SHALL REMAIN THE PROPERTY OF H2K TECHNOLOGIES, INC. BUYER SHALL HAVE THE USE OF MATERIALS AND INFORMATION FOR THE LIMITED PURPOSE OF INSTALLING AND MAINTAINING THE EQUIPMENT SOLD BY H2K TECHNOLOGIES, INC. NOT TO BE REPRODUCED WITHOUT WRITTEN PERMISSION.

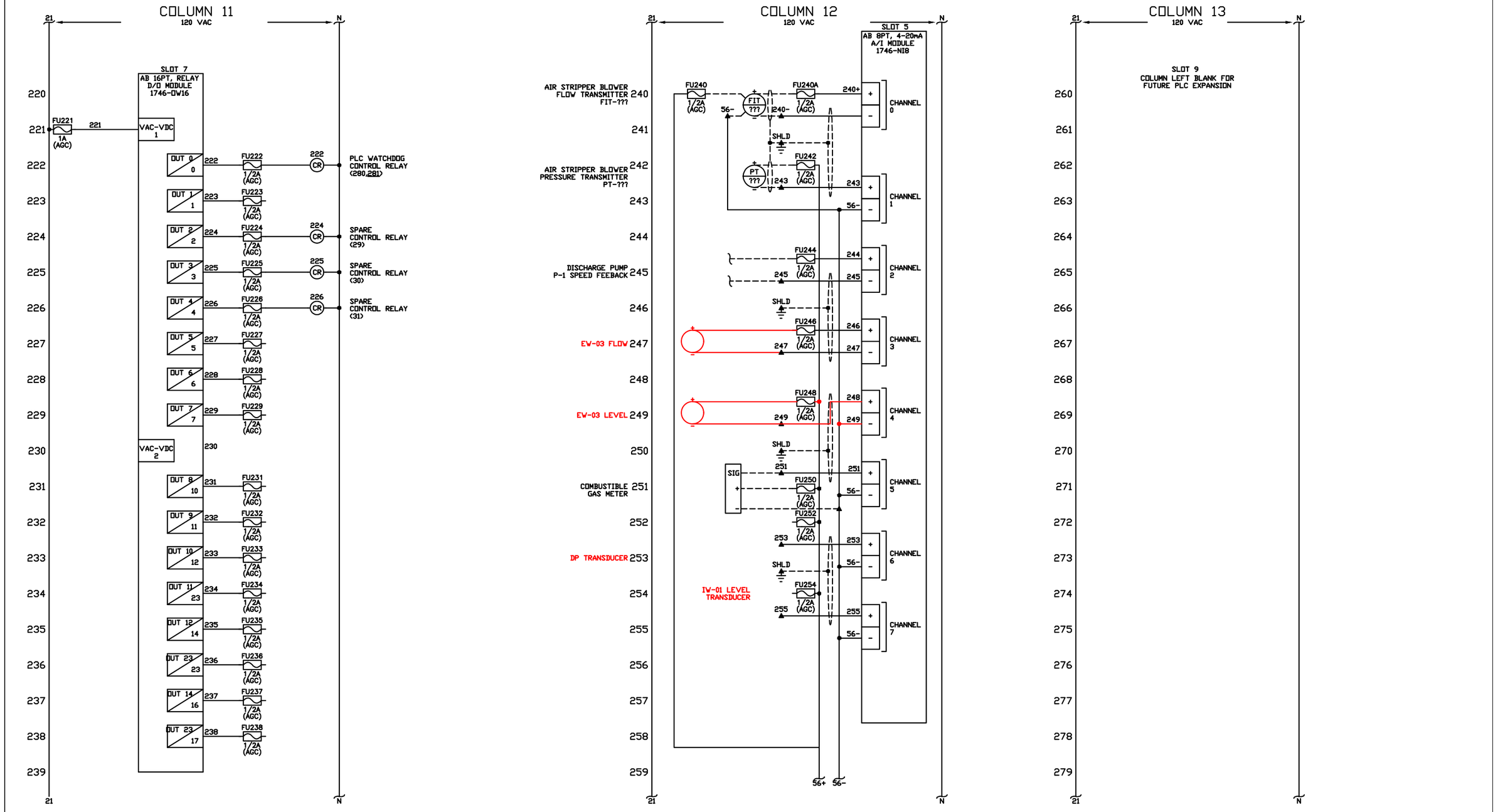
HydroGeoLogic, Inc

PROJECT TITLE:
ARROWHEAD-
LAWRENCE AVIATION
PORT JEFFERSON,
NY

DRAWING TITLE:
E-7
SCHEMATIC CONTROL PANEL

SHEET 5 OF 10

DRAWING NO.:
2933-24



REVISIONS			
REV	DESCRIPTION	DATE	DWN
A	RELEASE FOR SUBMITTAL	02/01/10	RC
B	RELEASE FOR RE-SUBMITTAL	03/10/10	RC
C	RELEASE FOR PRODUCTION	06/22/10	RC
D	AS BUILT	08/17/10	RC
E	STARTUP REVISIONS	10/14/10	RC
F	AS-BUILT REVISIONS	11/15/21	TB

UNLESS SPECIFIED OTHERWISE
* DIMENSIONS ARE IN INCHES
* DO NOT SCALE DRAWING

DRAWN BY: RC
DESIGNED BY: RC
PROJECT MANAGER: MH
PROJECT NO.: 2933
DATE: 01/11/10

THESE MATERIALS ARE PROPRIETARY AND SHALL REMAIN THE PROPERTY OF H2K TECHNOLOGIES, INC. BUYER SHALL HAVE THE USE OF MATERIALS AND INFORMATION FOR THE LIMITED PURPOSE OF INSTALLING AND MAINTAINING THE EQUIPMENT SOLD BY H2K TECHNOLOGIES, INC. NOT TO BE REPRODUCED WITHOUT WRITTEN PERMISSION.

HGL HydroGeoLogic, Inc

PROJECT TITLE:
ARROWHEAD-LAWRENCE AVIATION
PORT JEFFERSON, NY

DRAWING TITLE:
E-8
SCHEMATIC CONTROL PANEL

SHEET 6 OF 10

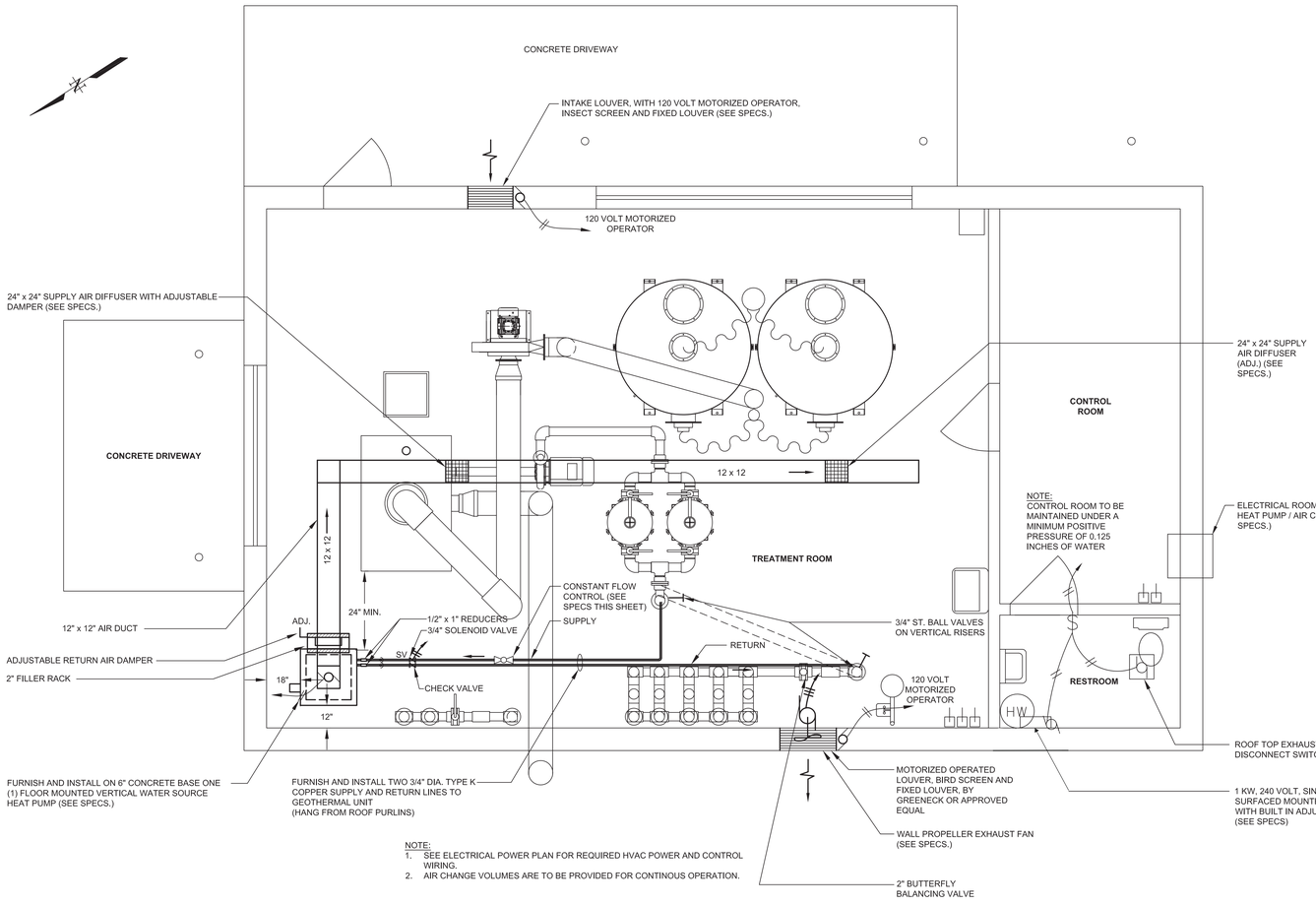
DRAWING NO.:
2933-25

HEAT LOSS CALCULATIONS DIFFERENTIAL TEMPERATURE (5 DEGREES FARENHEIT OUTSIDE, 65 DEGREES FARENHEIT INSIDE)

LOCATION	HEAT LOSS FLOOR	HEAT LOSS EXTERNAL WALLS	ROOF	DOOR / WINDOWS	INFILTRATION	TOTAL
TREATMENT ROOM	33' x 25' x 25 x 0.25 = 5,156 BTU/HR	9'-4" x 91'-0" x 60 x 1/11 = 4,641 BTU/HR	33' x 26' - 6" x 60 x 1/19 = 2,762 BTU/HR	1-6' x 9' = 72 SF 1-14' x 9' = 126 SF 1-3' x 7' = 21 SF 219 x 60 x 1.20 = 15,336 BTU/HR	93 LF x 2 CFM/LF x 60 x 1.08 = 12, 052 BTU/HR	39,947 BTU/HR
CONTROL ROOM	18'-6" x 9'-0" x 25 x 0.25 = 1,041 BTU/HR	9'-4" x 27'- 6" x 60 x 1/11 = 1401 BTU/ HR	19'-6" x 9'-0" x 60 x 1/19 = 554 BTU/HR	None	None	2,996 BTU/HR
RESTROOM	9'- 0" x 6'-0" x 25 x 0.25 = 333 BTU/HR	9'-4" x 15'-0" x 60 x 1/11 = 764 BTU/HR	9'-0" x 6'-0" x 60 x 1/19 = 171 BTU/HR	None	4 LF x 2 CFM/LF x 60 x 1.08 = 864 BTU/ HR	2, 766 BTU/HR

HEAT GAIN CALCULATIONS DIFFERENTIAL TEMPERATURE (95 DEGREES FARENHEIT OUTSIDE, 75 DEGREES FARENHEIT INSIDE)

LOCATION	HEAT GAIN FLOOR	HEAT GAIN EXTERNAL WALLS	ROOF	DOOR/WINDOWS	INFILTRATION	LIGHTING	EQUIPMENT	TOTAL
TREATMENT ROOM	33' x 25' x 16 x 0.25 = (-) 3,300 BTU/ HR	9'-4" x 91'-0" x 20 x 1/11 = 1,545 BTU/HR	33' x 26'-6" x 20 x 1/19 = 920 BTU/HR	213 FT x 20 x 1.20 = 5,112 BTU/HR	93 LF x 2 CFM/LF x 20 x 1.08 = 4,010 BTU/HR	33' x 25" x 2 watts/SF x 1.34= 2,211 BTU/HR	27,000 KW x 10 % x 1.34 = 3,618 BTU/HR	14,124 BTU/HR
CONTROL ROOM	18'-6" x 9'-0" x 16 x 0.25 = (-) 666 BTU/HR	9'-4" x 27'-6" x 20 x 1/11 = 467 BTU/HR	19'-6" x 8'-0" x 20 x 1/19 = 164 BTU/HR	None	None	18'-9" x 9'-0" x 2.0 watts/ SF x 1.34= 452 BTU/HR	64,00 watts x 10% x 1.34 = 8,576 BTU/HR	8,933 BTU/HR
RESTROOM	9'-0" x 6'-0" x 16 x 0.25 = (-) 216 BTU/HR	9'-4" x 15'-0" x 20 x 1/11 = 255 BTU/HR	9'-0" x 6'-0" x 20 x 1/19 = 57 BTU/HR	None	4 LF x 2 CFM/LF x 20 x 1.08 = 173 BTU/HR	9'-0" x 6'-0" x 2.0 watts/ SF x 1.34 = 145 BTU/HR	None	411 BTU/HR

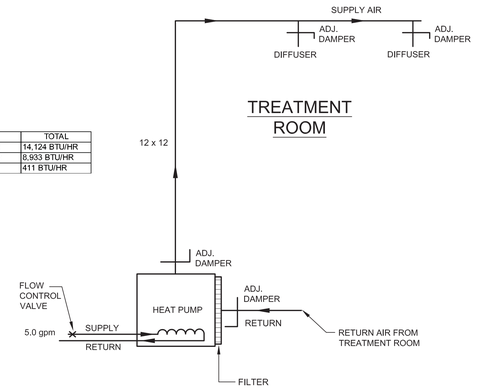


NOTE:
1. SEE ELECTRICAL POWER PLAN FOR REQUIRED HVAC POWER AND CONTROL WIRING.
2. AIR CHANGE VOLUMES ARE TO BE PROVIDED FOR CONTINOUS OPERATION.

HVAC FLOOR PLAN

NOT TO SCALE

REFER TO DRAWING M-01 FOR TREATMENT PLANT EQUIPMENT LAYOUT



PID DRAWING HVAC SYSTEM

NOT TO SCALE

HEATING VENTILATION AND AIR CONDITIONING SPECIFICATIONS

1. TREATMENT ROOM VERTICAL WATER SOURSE HEAT PUMP

FURNISH AND INSTALL ONE (1) FLOOR MOUNTED VERTICAL WATER SOURCE HEAT PUMP ENFINITY MODEL VFC-019 4.8 GPM, 19,200 BTU/HR MINIMUM CAPACITY, 600 CFM MINIMUM SUPPLY AIR FAN CAPACITY, MINIMUM EFFICIENCY 15.2 AS MANUFACTURED BY McQUAY, SINGE PHASE, 240 VOLT POWER SOURSE WITH FILTER RACK AND RETURN AIR COLLAR, WITH 10 KW BACK UP AUXILIARY/EMERGENCY ELECTRIC HEAT COIL - SINGLE POINT POWER TO OPERATE IN EMERGENCY SITUATIONS WHERE THE COMPRESSOR NO LONGER FUNCTIONS (THE INTEGRAL ELECTRIC HEAT COIL CAN PROVIDE TEMPORARY HEATING UNTIL THE COMPRESSOR IS REPLACED), R-410A NON OZONE DEPLETING REFRIGANT, ECM HIGH EFFICIENC FAN MO TOR TO MAINTAIN CONSTANT AIRFLOW OVER VARYING STATIC PRESSURE, 2-WAY MOTORIZED VALVES (NO OR NC) WHEN THERE ISN'T A CALL FOR UNIT OPERATION, THE VALVE CLOSES, REDUCING THE FLOW REQUIREMENTS THROUGH THE CONDENSER WATER LOOP, COMPRESSOR SOUND BLANKET, AND PAINTED CABINET SUITABLE FOR HIGH HUMITY ENVIROMENT.

MINIMUM PERFORMANCE SCHEDULE

Unit Size	Capacity (BTUH)	EER - Water Loop		EER - Ground Loop		EER - Ground Source		Nominal Airflow (CFM)
		PSC	ECM	PSC	ECM	PSC	ECM	
VFC019	19,200	15.2	16.6	17.3	19.0	23.5	26.1	600

2. TREATMENT ROOM EXHAUST FAN/INTAKE LOUVER VENTILATION SYSTEM - (DESIGNED FOR CONTINOUS AND EMERGENCY OPERATION)

FURNISH AND INSTALL ONE (1) COMPLETE TREATMENT ROOM VENTILATION SYSTEM CONSISTING OF ONE (1) 36" X 36" WALL INTAKE LOUVER, ONE (1) WALL EXHAUST FAN, ONE (1) VENTILATION CONTROL PANEL CONTAINING ONE (1) REVERSE ACTING THERMONTROSTATE AND ONE H-O-A OPERATION SWITCH. THE SYSTEM SHALL BE INSTALLED TO PROVIDE A MINIMUM OF 12 AIR CHANGES/HOUR OR 2,258 CFM. THE INTAKE LOUVER SHALL BE PROVIDED WITH ANODIZED ALUMINIUM FIXED WHEATERPROOF LOUVER, A MOTORIZED OPERATING SHUTTER, 120-VOLT MOTOR OPERATOR AND INSECT/BIRD SCREEN. THE EXHAUST FAN SHALL BE PROVIDED WITH A ANODIZED ALUMINIUM FIXED LOUVER, MOTORIZED OPERATED SHUTTER, 120VOLT MOTOR OPERATOR AND BIRD SCREEN. THE VENTILATION CONTROL PANEL SHALL BE A NEMA 12 PANEL CONTAINING A HOMEYWELL 120 VOLT PROGRAMABLE REVERSE ACTING THERMOSTATE, AND A HAND-OFF-AUTOMATIC SWITCH TO PROVIDE FOR MANUAL OPERATION OF THE SYSTEM VIA THE HAND POSITION OF THE SWITCH AND AUTOMATIC OPERATION THROUGH THE REVERSE ACTING THERMOSTAT AND AUTOMATIC POSITION OF THE SWITCH. THE FAN SHALL BE A SIDEWALL DIRECT DRIVE LEVEL 2 PROPELLER FAN MODEL NUMBER SE-2/SS2-16-423-A3, SINGLE PHASE, 120/208 VOLTS, 1/3 HORSE POWER, 1750 RPM, RATED AT A MINIMUM CAPACITY OF 2,, 854 CFM @ 0.125 INCHES OF WATER AS MANUFACTURED BY GREENHECK FAN CORPORATION PO BOX 410 SCHOFIELD, WI 54476 715.359.6171.

3. TREATMENT ROOM AIR DIFFUSERS

FURNISH AND INSTALL 24" X 24" ADJUSTIBLE 316 STAINLES STEEL HORIZONTIAL AIR PATTERN DIFFUSERS, SURFACE MOUNTED MODEL SSE-1, 10 " DIAMETER NECK, MINIMUM AIR FLOW VOLUME 435 CFM @ 800 FEET/MINUTE NECK VELOCITY AND 0.04 INCHES OF WATER PRESSURE DROP, AS MANUFACTURED BY ANEMUSTAT AIR DISTRIBUTION, 1220 WATSON CENTER ROAD, CARSON, CALIFORNIA 90745, LOCAL DISTRUBER ALBERT WEISS A/C PRODUCTS INC., 270 MADSON AVENUE, NEW YORK CITY, NEW YORK 10016, TELEPHONE NUMBER 212-679-8550.

4. CONTROL ROOM THROUGH THE WALL HEAT PUMP AIR CONDITIONER

FURNISH AND INSTALL UAL.ONE (1) THROUGH THE WALL HEAT PUMP AIR CONDITIONER WITH WALL SLEEVE/CASE, MODEL NUMBER GE AIHS10DCC, MINIMUM COOLING CAPACITY 10,000 BTU/HOUR, MINIMUM HEATING CAPACITY 11,600 BTU/HOUR (ELECTRIC) AND 9,700 BTU/HOUR (REVERSE ACTING CYCLE), DEHUMIDIFICATION CAPACITY OF 2.9 PINTS/HOUR, MINIMUM SUPPLY AIR FLOW (OUT DOOR AIR) 304 CFM, WITH OUTDOOR VENT/EXHAUST, 2 SPEED FAN, SINGLE PASE, 208/240 VOLT, 16 AMPERS, 3,680 WATTS, AS MAUFACTURED BY GENERAL ELECTRIC CORPORTATION OR SPECIFICALLY APPROVED EQUAL

5. RESTROOM EXHAUST FAN/INTAKE LOUVER VENTILATION SYSTEM - (DESIGNED FOR CONTINOUS AND EMERGENCY OPERATION)

FURNISH AND INSTALL ONE (1) COMPLETE RESTROOM VENTILATION SYSTEM CONSISTING OF ONE (1) ROOFTOP DOWN BLAST EXHAUST VENTILATOR, ONE (1) ADJUSTABLE MONTION SENSOR CONTROL SWITCH AND ONE REVERSE ACTING THERMONTROSTATE. THE SYSTEM SHALL BE INSTALLED TO REMOVE RESTROOM AIR DURING AND AFTER USE AND TO PROVIDE TEMPERATURE VENTILATION OF THE RESTROOM VIA AN ADJUSTABLE REVERSE ACTING THERMOSTATE. THE SYSTEM SHALL BE INSTALLED TO PROVIDE A MINIMUM OF 6 AIR CHANGES/HOUR AND/OR 125 CFM.

THE EXHAUST FAN SHALL BE PROVIDED WITH A ANODIZED ALUMINIUM FIXED LOUVER, MOTORIZED OPERATED SHUTTER, 120VOLT MOTOR OPERATOR AND BIRD SCREEN. THE VENTILATION CONTROLS SHALL CONSIST OF A HOMEYWELL 120 VOLT PROGRAMABLE REVERSE ACTING THERMOSTATE, AND A ADJUSTIBLE MOTION SENSOR SWITCH FOR AUTOMATIC OPERATION OF THE SYSTEM VIA THE MOTION SENSOR AND THE REVERSE ACTING THERMOSTAT. THE FAN SHALL BE A ROOFTOP DIRECT DRIVE LEVEL 2 PROPELLER FAN MODEL NUMBER SE-2/8S2-16-423-A3, SINGLE PHASE, 120/208 VOLTS, 1/3 HORSE, 1750 RPM, RATED AT A MINIMUM CAPACITY OF 2., 854 CFM @ 0.125 INCHES OF WATER AS MANUFACTURED BY GREENHECK FAN CORPORATION PO BOX 410 SCHOFIELD, WI 54476 715.359.6171.

6. RESTROOM HEATING SYSTEM- (DESIGNED FOR CONTINOUS AND EMERGENCY OPERATION)

FURNISH AND INSTALL ONE (1) COMPLETE RESTROOM HEATING SYSTEM CONSISTING OF ONE WALL MOUNTED SURFACE MOUNTED ELECTRIC HEATER. THE HEATER SHALL BE PROVIDED WITH A FACTORY WIRED BUILT-IN THERMOSTAT. THE HEATER SHALL HAVE DUAL PROTECTION IS IN THE FORM OF A THERMAL CUTOUT WITH INDICATOR LIGHT AND A ONETIME THERMAL FUSE. THE UNIT SHALL BE UL AND CUL LISTED. IT SHALL BE SURFACE MOUNTED ON THE RESTROOM WALL. THE UNIT SHALL HAVE A FAST RESPONSE COIL ELEMENT DESIGNED FOR QUICK HEAT AND LOW MAINTENANCE. IT SHALL HAVE THREE PIECE CONSTRUCTION AND AN ELEGANT NORTHERN WHITE FINISH. THE UNIT SHALL BE Q-MARK CRA1512T2 ELECTRIC WALL HEATER. THE UNIT SHALL HAVE THE FOLLOWING CHARACTERISTICS:

VOLTS: 120
WATTS: 1500
AMPS: 12.5
BTU/HR: 5118
HEAT RANGE: 40-85 DEGREES
BUILT-IN THERMOSTAT
FAST-RESPONSE COIL ELEMENT
THREE PIECE CONSTRUCTION
EUROPEAN STYLING
DUAL PROTECTION: THERMAL CUTOUT WITH INDICATOR LIGHT AND ONE TIME THERMAL FUSE
NORTHERN WHITE FINISH

MINIMUM OUTDOOR AIR VENTILATION REQUIREMENTS FOR CONTINOUS AND EMERGANCY OPERATION.

1. TREATMENT ROOM
   - A. VOLUME = 33'-0" L X 25'-0"W X (AVERAGE EVE HEIGHT) 13'-8" = 11,286 CUBIC FEET
   - B. AIR CHANGES PER HOUR = 12
   - C. REQUIRED FAN CAPACITY = 11,286 CUBIC FEET X 12 CHANGES PER HOUR / 60 MINUTES PER HOUR = 2,258 CFM.
2. CONTROL ROOM
   - A. VOLUME = 18'-6" X 9'-0"W X (AVERAGE EVE HEIGHT) 13'-8" = 2,276 CUBIC FEET
   - B. AIR CHANGES PER HOUR = 12
   - C. REQUIRED FAN CAPACITY = 2,276 CUBIC FEET X 12 CHANGES PER HOUR / 60 MINUTES PER HOUR = 456 CFM.
3. RESTROOM
   - A. VOLUME = 9'-0"L X 6'-0" W X 9'-6" H = 513 CUBIC FEET
   - B AIR CHANGES PER HOUR = 6
   - C. MINIMUM REQUIRED FAN CAPACITY = 513 CUBIC FEET X 6 CHANGES PER HOUR / 60 MINUTES PER HOUR = 51.3 CFM.

REV #	Revisions	Date	Approved
	AS-BUILT	10/10	
1	ISSUED FOR CONSTRUCTION	5-19-10	

P.W. GROSSER CONSULTING ENGINEER AND HYDROGEOLOGIST, P.C.
630 JOHNSON AVE. • SUITE 7
BOHEMIA • NY • 11716-2618
PH: (631)589-6353 • FX: (631)589-8705
E-MAIL: INFO@PWGROSSER.COM

ARROWHEAD CONTRACTING INC.
10981 Eicher Drive
Lenexa, Kansas 66219
(913) 814-9994

CDM FEDERAL PROGRAMS
NEW YORK, NEW YORK

LAWRENCE AVIATION IDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

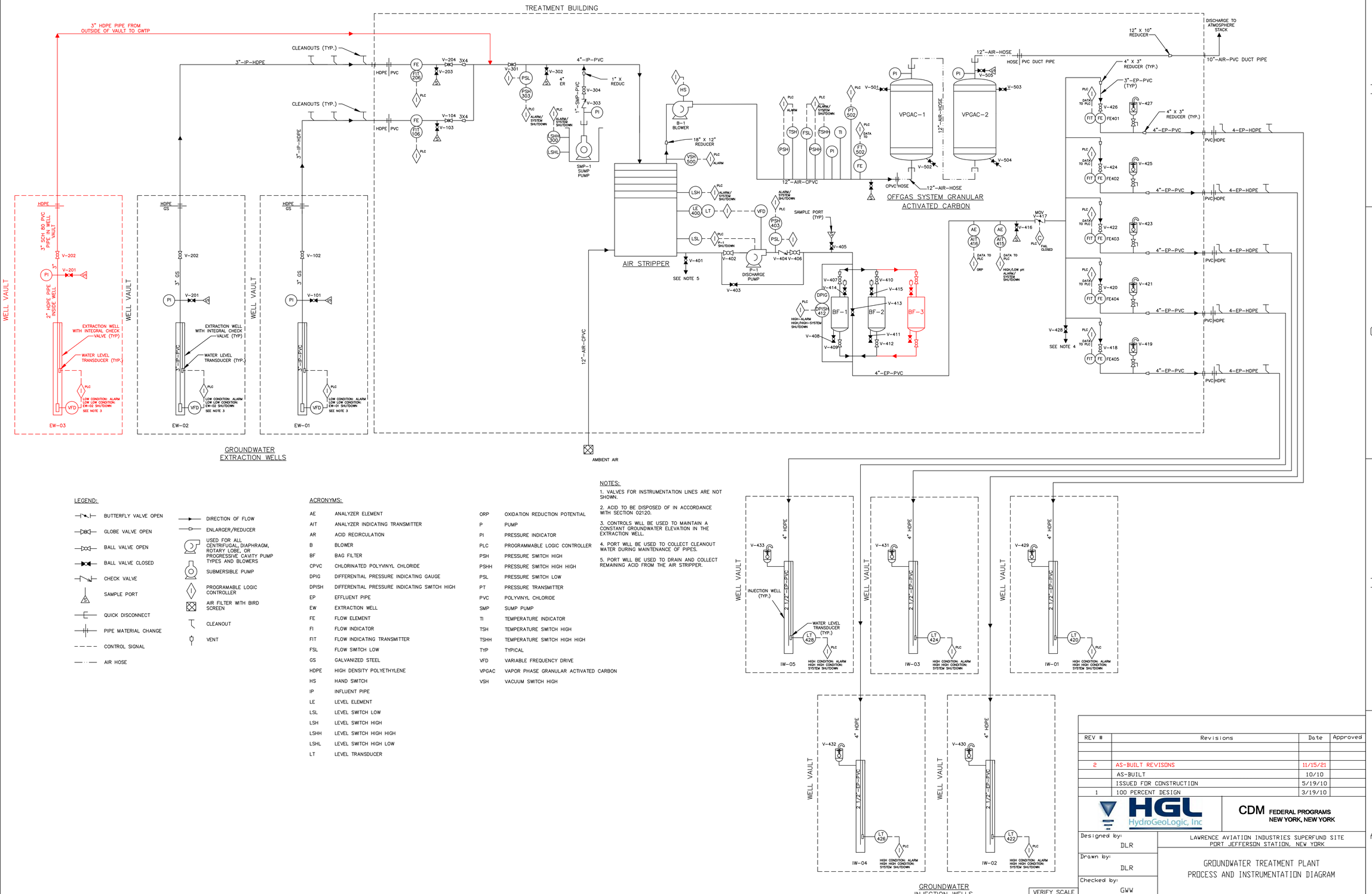
GROUNDWATER TREATMENT PLANT
HVAC PLAN

Designed by:	DLR
Drawn by:	DLR
Checked by:	GWW
Reviewed by:	SFS
Submitted by:	GWW
Scale:	NTS
Spec. No.:	-
Contract No.	-
Sheet reference number:	H-01
Date:	JANUARY 26, 2010
Drawing Code:	-

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DRAWING AND RELATED DOCUMENTS IS A VIOLATION OF SEC. 7209 OF THE N.Y.S. EDUCATION LAW

SEND TO / PHONE
LOC. / PROJ.
PROJ. # / TASK #
DPPER. / DATE
FILE # / SCALE


TREATMENT BUILDING
3" HDPE PIPE FROM OUTSIDE OF VAULT TO GWTP
CLEANOUTS (TYP.)
3"-IP-HDPE
HDPE | PVC
FE FIT 206 V-204 3X4 V-203
FE FIT 106 V-104 3X4 V-103
V-301 PSL PSH 303 V-302 4" ER 4"-IP-PVC
1" X REDUC
1"-SMP-PVC V-304 V-303 PI
SHH 300 SHL
SMP-1 SUMP PUMP
HS B-1 BLOWER
18" X 12" REDUCER
VSH 500
12"-AIR-CPVC
LSH LE 400 LT LSL
AIR STRIPPER
V-401
SEE NOTE 5
VFD P-1 DISCHARGE PUMP
V-402 V-403 V-404 V-406
PSH 403 PSL
SAMPLE PORT (TYP)
V-405
V-407 V-411 DPIC DPISH 412 BF-1
V-408 V-409
V-410 V-415 V-413 BF-2 V-411 V-412 BF-3
4"-EP-PVC
PT 502 V-501
TSH FSL TSHH TI PSH PSHH PI FT 502 FE
12"-AIR-CPVC
CPVC HOSE
12"-AIR-HOSE
VPGAC-1
V-502
VPGAC-2
V-503 V-504 V-505
OFFGAS SYSTEM GRANULAR ACTIVATED CARBON
MOV V-417
AE AIT 416 DATA TO PLC ORP
AE AIT 415 DATA TO PLC HIGH/LOW pH ALARM/ SYSTEM SHUTDOWN
V-416
C PLC CAL CLOSED
12" X 10" REDUCER
DISCHARGE TO ATMOSPHERE STACK
12"-AIR-HOSE
HOSE PVC DUCT PIPE
10"-AIR-PVC DUCT PIPE
4" X 3" REDUCER (TYP.)
3"-EP-PVC (TYP.)
V-426 V-427 FIT FE401
V-424 V-425 FIT FE402
V-422 V-423 FIT FE403
V-420 V-421 FIT FE404
V-418 V-419 FIT FE405
V-428
SEE NOTE 4
4"-EP-PVC
4"-EP-HDPE
PVC | HDPE
WELL VAULT
HDPE
3" SCH 80 PVC PIPE IN WELL VAULT
3"
V-202 V-201 PI
3" HDPE PIPE INSIDE WELL
EXTRACTION WELL WITH INTEGRAL CHECK VALVE (TYP)
WATER LEVEL TRANSDUCER (TYP.)
PLC
VFD
LOW CONDITION: ALARM LOW LOW CONDITION: EW-02 SHUTDOWN
SEE NOTE 3
EW-03
GS
3" GS
V-202 V-201 PI
3"-IP-PVC
LOW CONDITION: ALARM LOW LOW CONDITION: EW-02 SHUTDOWN
SEE NOTE 3
EW-02
V-102 V-101 PI
LOW CONDITION: ALARM LOW LOW CONDITION: EW-01 SHUTDOWN
SEE NOTE 3
EW-01
GROUNDWATER EXTRACTION WELLS
AMBIENT AIR
NOTES:
1. VALVES FOR INSTRUMENTATION LINES ARE NOT SHOWN.
2. ACID TO BE DISPOSED OF IN ACCORDANCE WITH SECTION 02120.
3. CONTROLS WILL BE USED TO MAINTAIN A CONSTANT GROUNDWATER ELEVATION IN THE EXTRACTION WELL.
4. PORT WILL BE USED TO COLLECT CLEANOUT WATER DURING MAINTENANCE OF PIPES.
5. PORT WILL BE USED TO DRAIN AND COLLECT REMAINING ACID FROM THE AIR STRIPPER.
LEGEND:
BUTTERFLY VALVE OPEN
GLOBE VALVE OPEN
BALL VALVE OPEN
BALL VALVE CLOSED
CHECK VALVE
SAMPLE PORT
QUICK DISCONNECT
PIPE MATERIAL CHANGE
CONTROL SIGNAL
AIR HOSE
DIRECTION OF FLOW
ENLARGER/REDUCER
USED FOR ALL CENTRIFUGAL, DIAPHRAGM, ROTARY LOBE, OR PROGRESSIVE CAVITY PUMP TYPES AND BLOWERS
SUBMERSIBLE PUMP
PROGRAMABLE LOGIC CONTROLLER
AIR FILTER WITH BIRD SCREEN
CLEANOUT
VENT
ACRONYMS:
AE ANALYZER ELEMENT
AIT ANALYZER INDICATING TRANSMITTER
AR ACID RECIRCULATION
B BLOWER
BF BAG FILTER
CPVC CHLORINATED POLYVINYL CHLORIDE
DPIG DIFFERENTIAL PRESSURE INDICATING GAUGE
DPISH DIFFERENTIAL PRESSURE INDICATING SWITCH HIGH
EP EFFLUENT PIPE
EW EXTRACTION WELL
FE FLOW ELEMENT
FI FLOW INDICATOR
FIT FLOW INDICATING TRANSMITTER
FSL FLOW SWITCH LOW
GS GALVANIZED STEEL
HDPE HIGH DENSITY POLYETHYLENE
HS HAND SWITCH
IP INFLUENT PIPE
LE LEVEL ELEMENT
LSL LEVEL SWITCH LOW
LSH LEVEL SWITCH HIGH
LSHH LEVEL SWITCH HIGH HIGH
LSHL LEVEL SWITCH HIGH LOW
LT LEVEL TRANSDUCER
ORP OXIDATION REDUCTION POTENTIAL
P PUMP
PI PRESSURE INDICATOR
PLC PROGRAMMABLE LOGIC CONTROLLER
PSH PRESSURE SWITCH HIGH
PSHH PRESSURE SWITCH HIGH HIGH
PSL PRESSURE SWITCH LOW
PT PRESSURE TRANSMITTER
PVC POLYVINYL CHLORIDE
SMP SUMP PUMP
TI TEMPERATURE INDICATOR
TSH TEMPERATURE SWITCH HIGH
TSHH TEMPERATURE SWITCH HIGH HIGH
TYP TYPICAL
VFD VARIABLE FREQUENCY DRIVE
VPGAC VAPOR PHASE GRANULAR ACTIVATED CARBON
VSH VACUUM SWITCH HIGH
V-433 4" HDPE INJECTION WELL (TYP.) 2 1/2"-EP-PVC WATER LEVEL TRANSDUCER (TYP.) LT 428 PLC IW-05 HIGH CONDITION: ALARM HIGH HIGH CONDITION: SYSTEM SHUTDOWN
V-431 LT 424 IW-03
V-429 LT 420 IW-01
V-432 LT 426 IW-04
V-430 LT 422 IW-02
GROUNDWATER INJECTION WELLS
REV # | Revisions | Date | Approved
2 | AS-BUILT REVISONS | 11/15/21
AS-BUILT | 10/10
ISSUED FOR CONSTRUCTION | 5/19/10
1 | 100 PERCENT DESIGN | 3/19/10
HGL HydroGeoLogic, Inc
CDM FEDERAL PROGRAMS NEW YORK, NEW YORK
Designed by: DLR
Drawn by: DLR
Checked by: GWW
Reviewed by: SFS
Submitted by: GWW
LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE PORT JEFFERSON STATION, NEW YORK
GROUNDWATER TREATMENT PLANT PROCESS AND INSTRUMENTATION DIAGRAM
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.
Scale: AS SHOWN
Spec. No.: -
Contract No. -
Sheet reference number: I-01
Date: JANUARY 27, 2010
Drawing Code: -
SEND TO PHONE
LOC PROJ
PROJ. # TASK #
DRPR. DATE
FILE # SCALE

APPENDIX B

NYSDEC State Pollutant Discharge Elimination System Permit Equivalent

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Division of Water, Bureau of Water Permits
625 Broadway, Albany, New York 12233
www.dec.ny.gov

M E M O R A N D U M
SPDES Permit Equivalent

TO: Steven Scharf, DER

FROM: Gwendolyn Temple, Bureau of Water Permits, DOW

SUBJECT: SPDES Permit Equivalent: Lawrence Aviation Industries On-Site (LAI) Groundwater Treatment System, DER Site ID# 1-52-016

DRAINAGE BASIN: 17

DATE: June 14, 2021

In response to your request dated March 2, 2021, attached please find the effluent limitations and monitoring requirements for the above noted remediation discharge. This is a renewal of an existing SPDES permit equivalent.

The discharge consists of treated water from groundwater collected on-site at the Lawrence Aviation Industries (LAI) Superfund site. The treatment system consists of two groundwater extraction wells, a low-profile air stripper, two particle filtration units, and two vapor carbon units. Treated water is discharged to five injection wells located upgradient from the extraction wells and treatment system.

The DOW does not have any regulatory authority over a discharge from a State, PRP, or Federal Superfund Site. DER will be responsible for ensuring compliance with the attached effluent limitations and monitoring requirements, and approval of all engineering submissions. The additional conditions identifies the appropriate DER contact person who will receive all effluent results, engineering submissions, and modification requests. The Regional Water Engineer should be kept appraised of the status of this discharge and, in accordance with the attached criteria, receive a copy of the effluent results for informational purposes.

If you have any questions, please call Gwendolyn Temple at 518-402-8194.

Attachment (Effluent Limitations and Monitoring Requirements)

cc: Region 1 Regional Water Engineer (via email, w/attach)
BWP Section Chief, DOW (via email, w/attach)

EFFLUENT LIMITATIONS & MONITORING REQUIREMENTS

OUTFALL	DISCHARGE TYPE	LATITUDE/ LONGITUDE	RECEIVING WATER and CLASS	EFFECTIVE	EXPIRING
001	Treated Remediation Wastewater	**IW-01** 40° 55' 35" N 73° 4' 6" W **IW-02** 40° 55' 35" N 73° 4' 5" W **IW-03** 40° 55' 35" N 73° 4' 4" W **IW-04** 40° 55' 35" N 73° 4' 4" W **IW-05** 40° 55' 34" N 73° 4' 5" W	Groundwater, Class GA	6/14/2021	6/13/2026

The discharges from the treatment facility shall be limited and monitored by the operator as specified below:

Outfall and Parameters **Outfall 001**	**CAS No.**	**Monthly Avg. Limits**	**Daily Max Limits**	**Units**	**Minimum Monitoring Requirements**		**FN**
					Measurement Frequency	**Sample Type**	
Flow	NA	Monitor	200	GPM	Continuous	Recorder	
Flow	NA	Monitor	Monitor	GPD	Continuous	Recorder	
pH	NA	5.1 - 8.5		SU	Weekly	Grab	1
1,1-Dichloroethane	75-34-3	Monitor	5	ug/L	Monthly	Grab	1
cis-1,2-Dichloroethylene	156-59-2	Monitor	5	ug/L	Monthly	Grab	1
Tetrachloroethene	127-18-4	Monitor	5	ug/L	Monthly	Grab	1
1,1,1-Trichloroethane	71-55-6	Monitor	5	ug/L	Monthly	Grab	1
Trichloroethene	79-01-6	Monitor	5	ug/L	Monthly	Grab	1
Aluminum	7439-90-5	Monitor	2	mg/L	Monthly	Grab	1
Chromium, Total	7440-47-3	Monitor	100	ug/L	Monthly	Grab	1
Fluoride	16984-48-8	Monitor	3	mg/L	Monthly	Grab	1
Iron	7439-89-6	Monitor	600	ug/L	Monthly	Grab	1
Lead, Total	7439-92-1	Monitor	50	ug/L	Monthly	Grab	1
Manganese	7439-96-5	Monitor	600	ug/L	Monthly	Grab	1
Nickel, Total	7440-02-0	Monitor	200	ug/L	Monthly	Grab	1
Sum of Iron and Manganese	NA	Monitor	1	mg/L	Monthly	Grab	1

Additional Conditions:

1. Discharge is not authorized until such time as an engineering submission showing the method of treatment is approved by the Department. The discharge rate may not exceed the effective or design treatment system capacity. All monitoring data, engineering submissions and modification requests must be submitted to:

   Steven Scharf
   Division of Environmental Remediation
   NYSDEC, 625 Broadway, Albany, New York 12233- 7015,
   Tel: 518-402- 9620

   With a copy sent to:

   Regional Water Engineer, Region 1
   50 Circle Road, Stony Brook, New York, 11790-3409 Phone: (631) 444-0405

2. Samples and measurements, to comply with the monitoring requirements specified above, must be taken from the effluent side of the final treatment unit prior to discharge to the receiving water body unless otherwise noted above.

3. Only site generated wastewater is authorized for treatment and discharge.

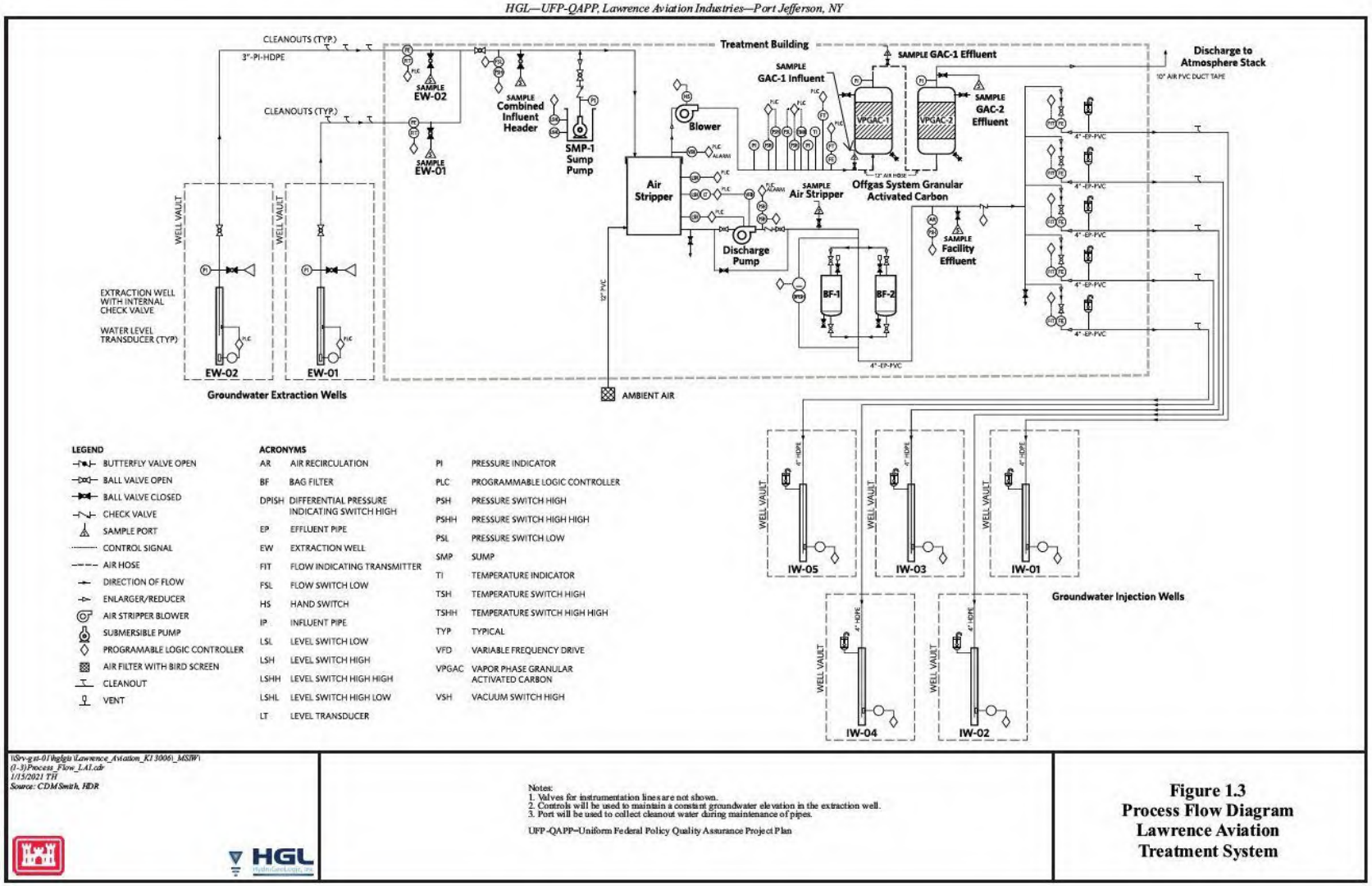
4. Authorization to discharge is valid only for the period noted above but may be renewed if appropriate. A request for renewal must be received 6 months prior to the expiration date to allow for a review of monitoring data and reassessment of monitoring requirements.

5. Both concentration (mg/l or µg/l) and mass loadings (lbs/day) must be reported to the Department for all parameters except flow and pH.

6. Any use of corrosion/scale inhibitors, biocidal-type compounds, or other water treatment chemicals used in the treatment process must be approved by the department prior to use.

7. This discharge and administration of this discharge must comply with the substantive requirements of 6NYCRR Part 750.

MONITORING LOCATIONS



APPENDIX C
Equipment Manuals

Page numbers refer to page in "Appendix G O&M Manual, from pdf of HGL O&M manual
We are missing the manuals (in electronic form) for C27 - Bag filter unit, and C-28, Replacement PLC and HMI

APPENDIX C

EQUIPMENT OPERATION AND MAINTENANCE MANUALS

between C-5 and C-6 are the following sections:
Differential Pressure transmitter (Dwyer Magnehelic pressure gauge), pg 767
Warrick Conductivity Probe - Pg 772
and
A/S sump level transmitter, page 774
not sure if any of these are still active

C-1 H2K Operation and Maintenance Manual pg 551
C-2 pH Probe/Pre-Amplifier/Transmitter pg 669
C-3 Magnetic Flowmeters pg 698
C-4 Motor-Operated Fail-Safe Valve pg 755
C-5 Air Velocity Transmitter pg 762
C-6 Discharge Pump pg 861
C-7 Motor Control Center pg 916
C-8 Variable Frequency Drive Installation Manual pg 1109
C-9 Variable Frequency Drive User Manual pg 1162
C-10 25kVA Transformer pg 1353
C-11 Extraction Well Line Filter pg 1378
C-12 Electrical Distribution Panels pg 1417
C-13 Motorized Damper pg 1522
C-14 Control Room Air Conditioner/Heater pg 1537
C-15 Uninterruptible Power Supply pg 1594
C-16 Water Heater pg 1713
C-17 Pre-Engineered Metal Building Maintenance Guide pg 1716
C-18 RPZ Valve pg 1734
C-19 Security/Fire Alarm System Operation Guide pg 1739
C-20 Eye-Wash Station Mixing Valve pg 1820
C-21 Geothermal Heat Pump pg 1849
C-22 Control Panel Wiring Schematics pg 1901
C-23 Pump SMP-1 pg 1951
C-24 Pumps EW-01, EW-02, and EW-03 pg 1962
C-25 O&M Forms pg 1981
C-26 Example Electrical Preventative Maintenance Program pg 1985
C-27 Bag Filter Unit Drawing, 6-Filter Unit Missing
C-28 Replacement PLC and HMI Missing

Due to the overly large size of the electronic version of the Equipment Manual file, it has been omitted from this version of the O&M Manual. The Equipment Manual can be found on the HGL Client Portal and also on a compact disc of the entire O&M Manual that will be delivered to the GWTP after the O&M Manual is finalized.

Please read and save this Repair Parts Manual. Read this manual and the General Operating Instructions carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. The Safety Instructions are contained in the General Operating Instructions. Failure to comply with the safety instructions accompanying this product could result in personal injury and/or property damage! Retain instructions for future reference. AMT reserves the right to discontinue any model or change specifications at any time without incurring any obligation.
©2022 AMT Pump Company, A Subsidiary of The Gorman-Rupp Company, All Rights Reserved.

Periodic maintenance and inspection is required on all pumps to ensure proper operation. Unit must be clear of debris and sediment. Inspect for leaks and loose bolts. Failure to do so voids warranty.

CENTRIFUGAL PUMPS

Refer to pump manual 1808-634-00 for General Operating and Safety Instructions.

AMT® A Gorman-Rupp Company

DESCRIPTION

AMT Heavy Duty Solids Handling Centrifugal pumps are suited for liquid and chemical transfer, recirculation, booster service, dirty water and other industrial applications. Stainless steel units are especially effective in applications where rust and/ or corrosion can develop in systems. Pumps are designed to handle liquids with solids content or dissolved solids and debris. Semi-open impeller features self-cleaning ability that makes the unit useful in applications involving up to 1/4” diameter solids and muddy or dirty liquids

A mechanical seal (comprised of carbon, ceramic and stainless steel components) isolates motor shaft from liquid being pumped. Discharge port on pump casing can be rotated in 90° increments with vent and drain plugs for all positions. Buna seals handle liquids from 40° to 180° F (4° to 82° C).Viton® seals handle liquids from 40º to 200º F(4º to 90º C) Maximum ambient temperature 104° F (40° C). Casing working pressure to 100 psi (689 kPa). These are manual units, no controls are supplied. For use with nonflammable, non-abrasive liquids compatible with pump component materials.

INSTALLATION

Flooded Suction: Net Positive Suction Head Required (NPSHR). Curve with NPSHR available at www.amtpump.com.

1. Problems will arise in operation of this pump unless the recommended NPSHR is supplied to the pump (See “Troubleshooting”chart in 1808-634- 00 manual).
2. Salt Water Usage: Because of crystallization and erosive material on the shaft seal (Ref. Nos. 9, 10), we recommend installation of seal-wash hose (Ref. No. 21). Using a wrench, remove the pipe plug (Ref. No. 20) from adapter (Ref. No. 18) and pipe plug (Ref. No. 15) from casing (Ref. No. 14) (remove pipe plug on the 3 o’clock position). Install optional seal wash hose.

NOTE: Applicable only with pumps having (A220-90) seal wash and hose installed or by ordering casing (Ref. #18) with optional seal wash and hose installation (A220-90).

MAINTENANCE

⚠ WARNING

Make certain that unit is disconnected from power source before attempting to service or remove any component.

REMOVAL OF OLD SEAL

Refer to Figure 1 for seal location.

IMPORTANT: Always replace both seal seat (Ref. No. 9) and seal head (Ref. No. 10) to ensure proper mating of components!

1. Remove fasteners (Ref. No. 6) that connect adapter (Ref. No. 3) to casing (Ref. No. 14).
2. Remove casing and 0-ring (Ref. No. 8).

⚠ CAUTION

Care should be taken not to pinch or “shave” o-ring between adapter and casing.

3. Using a wrench, remove impeller fastener, impeller seal (where applicable) and impeller (Ref. No. 12).

IMPORTANT: Care should be taken to ensure that the same number of shim washers (Ref. No. 11) are replaced behind impeller as were removed. These shim washers are located directly behind impeller. These washers as well as impeller key (Ref. No. 19) (where applicable) become loose as impeller is removed.

4. Seal head and shaft sleeve (Ref. No. 17) (where applicable) can now be pulled from shaft.
5. Pry seal seat from adapter.
6. Push seal head from shaft sleeve (where applicable).

INSTALLATION OF NEW SEAL

⚠ CAUTION

The precision lapped faces on shaft seal are easily damaged. Handle your replacement seal carefully.

1. Thoroughly clean all surfaces of seal seat cavity.
2. Using a clean cloth, wipe shaft and shaft sleeve (where applicable) and make certain that they are perfectly clean.
3. Wet rubber portion of new seal seat with a light coating of soapy water. While wearing clean gloves or using a clean light rag, press seal seat squarely into adapter recess. Avoid scratching white ceramic surface. If seat will not position properly, place a cardboard washer over polished surface and use a piece of pipe to press in firmly, but gently
4. Dispose of cardboard washer. Check again to see that polished surface is free of dirt and all other foreign particles and that it has not been scratched or damaged.

Centrifugal Pumps

5. Wet inside rubber portion of new seal head with a light coating of soapy water. Slide head onto shaft/shaft sleeve. Slide shaft sleeve with seal head onto motor shaft (where applicable). Seal head and seal seat will meet. Reinstall any shims that have been removed (See “Shim Adjustment” section).

IMPORTANT: Before installing new shaft sleeve, apply a bead of non-hardening, pliable sealant (such as Permatex® Form-A-Gasket® No. 2) to motor shaft shoulder.

6. Replace impeller key (where applicable) and impeller. Replace impeller seal (where applicable) before screwing impeller fastener in place.
7. Reassemble pump.
8. A short “run-in” period may be necessary to provide completely leak free seal operation.

SHIM ADJUSTMENT

When installing a replacement impeller (Ref. No. 12) or motor (Ref. No. 1), it may be necessary to adjust the number of shims (Ref. No. 11) to ensure proper running clearance between impeller and casing (Ref. No. 14).

Proceed as follows:

NOTE: A proper running clearance is less than 0.010”.

1. For impeller replacement, add one 0.010” shim in addition to those removed originally.
2. For motor replacement, add two 0.010” shims in addition to shims removed during disassembly.
3. Reassemble pump as described in steps 6 and 7. (See “Installation of New Seal” section).

IMPORTANT: Ensure that casing is snugly in place and check shaft to make sure it is turning freely (rotate impeller by impeller fastener, Ref. No. 13 with a wrench). If it turns freely, check to ensure that adapter (Ref. No. 3) and casing are fitted metal-to-metal where they meet on outside. If they are not metal-to-metal, tighten fasteners (Ref. No. 6) and recheck shaft for free turning. Tighten carefully, turning shaft while tightening so that motor bearings are not damaged in the event that too many shims were installed. If shaft seizes before fasteners are completely tight, disassemble pump and remove one shim and repeat reassembly.

Centrifugal Pumps

For Repair Parts contact dealer where pump was purchased.

Please provide following information:
-Model Number
-Serial Number (if any)

Part description and number as shown in parts list

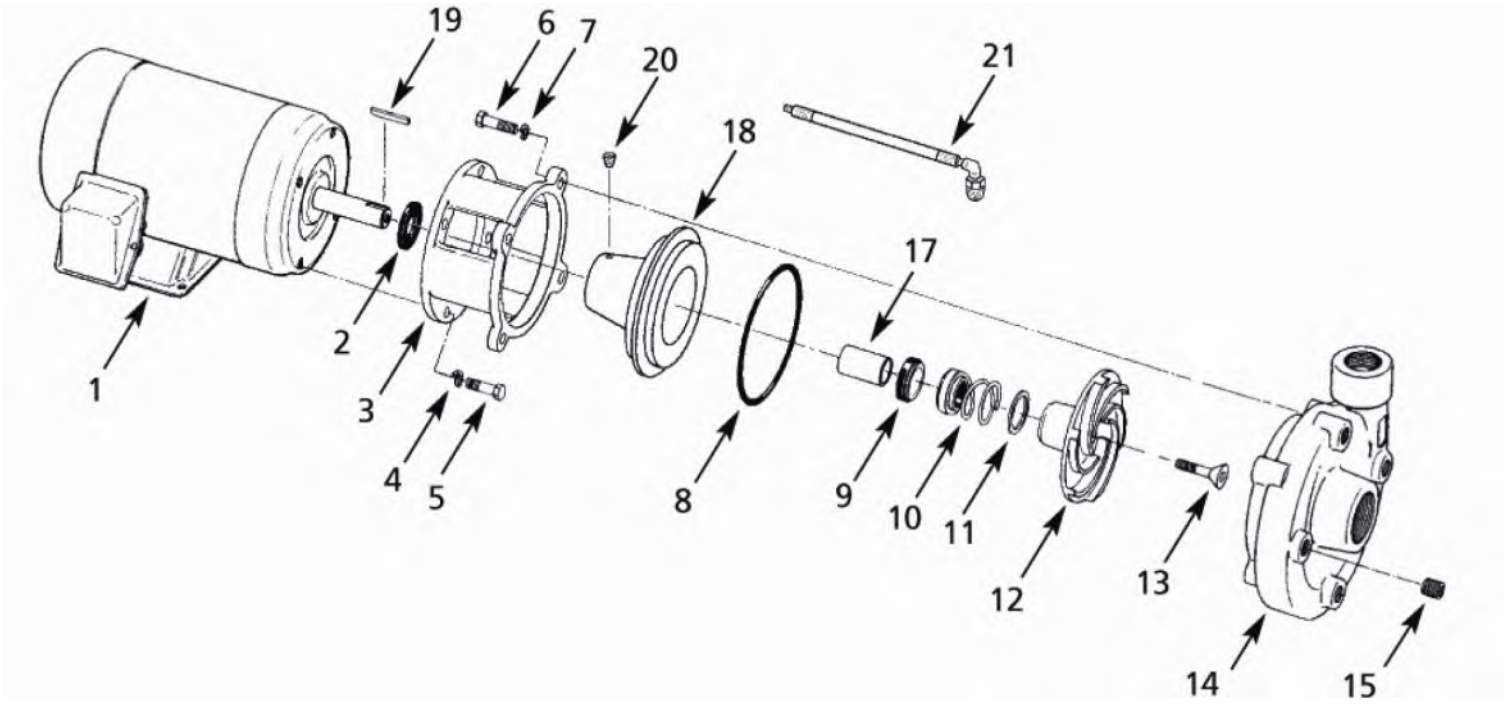


Figure 1 - Repair Parts Illustrations

Repair Parts List

Ref. No.	Description	Part Number for Models: 3156 3157 2HP	315A 315B 3HP	3150 2HP	3151 3HP	315E 3152 5HP	Qty.
1	Motor - 1 Phase TEFC	1626-305-00	1626-306-00	-	-	1626-078-00	1
	Motor - 3 Phase TEFC	1627-311-00	1627-312-00	1627-350-00	1627-351-00	1627-352-00	
2	Slinger Washer	N/A	N/A	1470-093-00	1470-093-00	1470-093-00	1
3	Adapter - Cast Iron	4890-030-01	4890-030-01	3150-033-00	3150-033-00	3150-033-00	1
	Adapter - Stainless Steel	4890-031-98	4890-031-98	3150-033-00	3150-033-00	3150-033-00	
4	Washer	*	*	*	*	*	4
5	Fastener	*	*	*	*	*	4
6	Fastener	Incl. w/ Ref 14	Incl. w/ Ref 14	Incl. w/ Ref 14	Incl. w/ Ref 14	Incl. w/ Ref 14	4
7	Washer	Incl. w/ Ref 14	Incl. w/ Ref 14	Incl. w/ Ref 14	Incl. w/ Ref 14	Incl. w/ Ref 14	4
8	O-Ring	Incl. w/ Ref KIT	Incl. w/ Ref KIT	Incl. w/ Ref KIT	Incl. w/ Ref KIT	Incl. w/ Ref KIT	1
9,10	Shaft Seal Assembly	Incl. w/ Ref KIT	Incl. w/ Ref KIT	Incl. w/ Ref KIT	Incl. w/ Ref KIT	Incl. w/ Ref KIT	1
11	Impeller Shim Kit	1806-044-90	1806-044-90	1664-000-90	1664-000-90	1664-000-90	1
12	Impeller	3156-011-00	3156-010-00	3150-013-00	3151-013-00	3152-013-00	1
13	Impeller Fastener	1784-001-00	1784-001-00	1759-003-00	1759-003-00	1759-003-00	1
14	Casing - Cast Iron	3156-001-95	3156-001-95	3150-001-95	3150-001-95	3150-001-95	1
	Casing - Stainless Steel (includes Ref. Nos. 6, 7 14 and 15)	3156-001-98	3156-001-98	3150-003-98	3150-003-98	3150-003-98	
15	Pipe Plug	Incl. w/ Ref 14	Incl. w/ Ref 14	Incl. w/ Ref 14	Incl. w/ Ref 14	Incl. w/ Ref 14	4
17	Shaft Sleeve	-	-	1555-142-00	1555-142-00	1555-142-00	1
18	Casing Cover - Cast Iron	-	-	3150-025-09	3150-025-09	3150-025-09	1
	Casing Cover - Stainless Steel	-	-	3150-023-09	3150-023-09	3150-023-09	
19	Impeller Key	-	-	1471-030-00	1471-030-00	1471-030-00	1
20	Pipe Plug (optional for seal wash)	*	*	*	*	*	1
21	Hose (optional for pumps w/ seal wash)	4261-170-00	4261-170-00	4261-170-00	4261-170-00	4261-170-00	1
KIT	Seal Kit - Buna N (standard Cast Iron)	3156-300-94	3156-300-94	3150-300-94	3150-300-94	3150-300-94	1
	Seal Kit - Buna N & Sil. Carb. (optional)	3156-300-93	3156-300-93	3150-300-93	3150-300-93	3150-300-93	1
	Seal Kit - Viton (standard Stainless Steel)	3156-300-91	3156-300-91	3150-300-91	3150-300-91	3150-300-91	1
	Seal Kit - Viton & Sil. Carb. (optional)	3156-300-92	3156-300-92	3150-300-92	3150-300-92	3150-300-92	1
	Seal Kit - EPR-EPDM (optional) (includes Ref. Nos. 8, 9 and 10)	-	-	3150-300-96	3150-300-96	3150-300-96	1

(*) Standard hardware item, available locally.

Repair Parts List

Ref. No.	Description	Part Number for Models: 4264 4260 7.5HP	4242 4240 7.5HP	4265 4261 10HP	4253 4250 10HP	4251 15HP	Qty.
1	Motor - 1 Phase TEFC	1626-079-00	1626-079-00	1626-080-00	1626-080-00	-	1
	Motor - 3 Phase TEFC	1627-353-00	1627-353-00	1627-354-00	1627-354-00	1627-355-00	
2	Slinger Washer	1470-093-00	1470-093-00	1470-093-00	1470-093-00	1470-093-00	1
3	Adapter	3150-033-00	4252-033-00	3150-033-00	4252-033-00	4252-033-00	1
4	Washer	*	*	*	*	*	4
5	Fastener	*	*	*	*	*	4
6	Fastener	Incl. w/ Ref 14	Incl. w/ Ref 14	Incl. w/ Ref 14	Incl. w/ Ref 14	Incl. w/ Ref 14	4
7	Washer	Incl. w/ Ref 14	Incl. w/ Ref 14	Incl. w/ Ref 14	Incl. w/ Ref 14	Incl. w/ Ref 14	4
8	O-Ring	Incl. w/ Ref KIT	Incl. w/ Ref KIT	Incl. w/ Ref KIT	Incl. w/ Ref KIT	Incl. w/ Ref KIT	1
9,10	Shaft Seal Assembly	Incl. w/ Ref KIT	Incl. w/ Ref KIT	Incl. w/ Ref KIT	Incl. w/ Ref KIT	Incl. w/ Ref KIT	1
11	Impeller Shim Kit	1664-000-90	1664-000-90	1664-000-90	1664-000-90	1664-000-90	1
12	Impeller	4260-013-00	4240-013-00	4261-013-00	4250-013-00	4251-013-00	1
13	Impeller Fastener	1761-002-00	1759-003-00	1761-002-00	1759-003-00	1757-005-00	1
14	Casing - Cast Iron	4260-001-95	4240-001-95	4260-001-95	4250-001-95	4250-001-95	1
	Casing - Stainless Steel (includes Ref. Nos. 6, 7 14 and 15)	4260-003-98	4240-003-98	4260-003-98	4250-003-98	4250-003-98	
15	Pipe Plug	Incl. w/ Ref 14	Incl. w/ Ref 14	Incl. w/ Ref 14	Incl. w/ Ref 14	Incl. w/ Ref 14	4
17	Shaft Sleeve	1555-142-00	1555-142-00	1555-142-00	1555-142-00	1555-142-00	1
18	Casing Cover - Cast Iron	3150-025-09	4240-025-00	3150-025-09	4240-025-00	4240-025-00	1
	Casing Cover - Stainless Steel	3150-023-09	4240-023-00	3150-023-09	4240-023-00	4240-023-00	
19	Impeller Key	1471-030-00	1471-030-00	1471-030-00	1471-030-00	1471-030-00	1
20	Pipe Plug (optional for seal wash)	*	*	*	*	*	1
21	Hose (optional for pumps w/ seal wash)	4261-170-00	4261-170-00	4261-170-00	4261-170-00	4261-170-00	1
KIT	Seal Kit - Buna N (standard Cast Iron)	3150-300-94	4240-300-94	3150-300-94	4240-300-94	4240-300-94	1
	Seal Kit - Buna N & Sil. Carb. (optional)	3150-300-93	4240-300-93	3150-300-93	4240-300-93	4240-300-93	1
	Seal Kit - Viton (standard Stainless Steel)	3150-300-91	4240-300-91	3150-300-91	4240-300-91	4240-300-91	1
	Seal Kit - Viton & Sil. Carb. (optional)	3150-300-92	4240-300-92	3150-300-92	4240-300-92	4240-300-92	1
	Seal Kit - EPR-EPDM (optional) (includes Ref. Nos. 8, 9 and 10)	3150-300-96	-	3150-300-96	-	-	1

(*) Standard hardware item, available locally.

NOTES:

A Gorman-Rupp Company

AMT Pump Company
(herein "AMT")
400 Spring Street
Royersford, PA 19468
Phone: (610) 948-3800
Fax: (610) 948-5300
www.amtpump.com

IPT PUMPS BY GORMAN-RUPP

General Information

SALES POLICY: AMT products are sold through our established Distributors. We do not sell direct to the consumer or organization not entitled to trade recognition. Therefore, possession of our catalogs and/or price list(s) does not infer an offer to sell.

MINIMUM ORDER: We appreciate your order, however, all orders are subject to a minimum $35.00 net invoice charge (excluding freight). This applies to all pump and parts purchase orders.

PRICES: Prices are subject to change without notice. All orders accepted are subject to prices in effect at time of shipment.

PAYMENT TERMS: Terms, upon establishment of credit, are Net 30 days. Past due accounts may be subject to a service charge of 1.5% per month. Domestic or assignable letter of credit is required for all export trade.

PAST DUE ACCOUNTS: AMT reserves the right to withhold open account shipments on any past due account. Invoices are considered past due after thirty (30) days. In the interest of sound business, all orders are subject to approval of the Credit Department.

SHIPPING INSTRUCTIONS: All shipments will be made F.O.B. the factory. Where instructions for shipment do not appear on the order, the shipment will be made according to our best judgment. Full risk of loss (including transportation delays and losses) shall pass to the customer upon delivery of the products to the carrier at the F.O.B. point. When loss or delay occurs, primary responsibility for tracing rests with the customer. When there is LOSS or APPARENT VISIBLE DAMAGE to a shipment, when tendered for delivery, *DO NOT* give the carrier a clear receipt. Note such damage on the carrier's delivery receipt and *HAVE THE DRIVER SIGN THE RECEIPT.*

PRODUCT REVISIONS: AMT reserves the right to discontinue, change or improve its products or any portions thereof without being obligated to provide such a change or improvement for units sold and/or shipped prior to such a change or improvement.

LEAD TIME: Products designated "Quick Ship Product", also referred to as "QSP" will normally be shipped within 24 hours of receipt of a non-cancellable purchase order. Only limited quantities of "QSP" pumps are available.

STANDARD LEAD TIME: Lead time is two weeks for all non "QSP" product. AMT reserves the right to revise lead times as required due to availability of materials and all other causes beyond our control.

VIP SHIPMENT: Select AMT and IPT branded pumps are available for next day shipment for non-QSP (Quick Ship Products) items and subjected to a specific model surcharge per unit noted in the respective price book. Requires calling for availability, confirmation and a non-cancellable purchase order or credit card payment prior to shipment. The expedited shipping charges are an additional cost added separately from the VIP charges per item. AMT reserves the right to revise lead times as required due to availability of materials and all other causes beyond our control. QSP quantities are limited as determined by AMT.

ALL purchase orders must be submitted via hard copy sent to AMT customer service department by fax, EDI or e-mail.

RETURN GOODS POLICY: Goods shall not be returned without a return goods authorization number (RGA) issued by AMT customer service. The RGA number must be listed on the packing list. Only current model and part numbers with a valid date code may be returned (within one year from date of purchase). **A 20% restocking and packaging charge will apply to all returns. All shipping charges must be pre-paid. No exceptions.**

ORDER CHANGES BY CUSTOMER: Orders in process may not be changed except with written consent and may be subject to special charges.

12 Month Limited Warranty

EXTENT AND DURATION OF LIMITED WARRANTY

Coverage: AMT Pump Company (herein "AMT") or IPT Pumps by Gorman-Rupp (herein "IPT") or Gorman-Rupp Industries Division of the The Gorman-Rupp Company, Patterson, or the Gorman-Rupp Company (herein referred to as "G-R Unit) each individually warrants that its products and parts shall be free from defects in material and workmanship for twelve (12) months from the date of purchase by the original end user when installation is made and maintenance is performed in accordance with G-R Unit's recommendations. Wear and tear resulting from use and items normally consumed in use are not covered.

EXCEPTIONS

(A) This Limited Warranty shall not apply to mechanical seals in AMT or IPT pumps and the following products and parts: engines, motors, trade accessories and all other products, components, parts and materials not manufactured by the G-R Units. These items may, however, be covered by the warranties of their respective manufacturers. (B) This warranty does not extend to or apply to any unit which has been repaired or altered at any place other than by a G-R Unit, or by persons not expressly approved by a G-R Unit to make repairs or alterations, nor to any unit the serial number, model number or identification of which has been removed, defaced or altered. (C) This warranty does not extend to any product manufactured by a G-R Unit, which has been subjected to mis-use, neglect, accident, improper installation, or use in violation of instructions furnished by a G-R Unit. (D) Pump Kits: This warranty does not extend to any product sold by a G-R Unit unassembled as a Pump Kit. Pump Kits are warranted against defects in material and workmanship for 60 days from the date of shipment from a G-R Unit. Any Pump Kit parts deemed defective by a G-R Unit will be replaced free of charge within 60 days of shipment. Pump Kits are not returnable for credit.

LIMITATIONS

THE G-R UNITS' SOLE AND EXCLUSIVE WARRANTY WITH RESPECT TO THEIR PRODUCTS AND PARTS IS THIS LIMITED WARRANTY. THIS LIMITED WARRANTY IS IN LIEU OF ALL OTHER EXPRESS AND/OR IMPLIED WARRANTIES, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE.

EXCLUSIVE REMEDY AND DAMAGES

The sole and exclusive remedy for breach of this Warranty by a G-R Unit and the entire extent of its liability for such breach or for damages arising from the use of the products and parts covered under this Limited Warranty, shall be as follows:

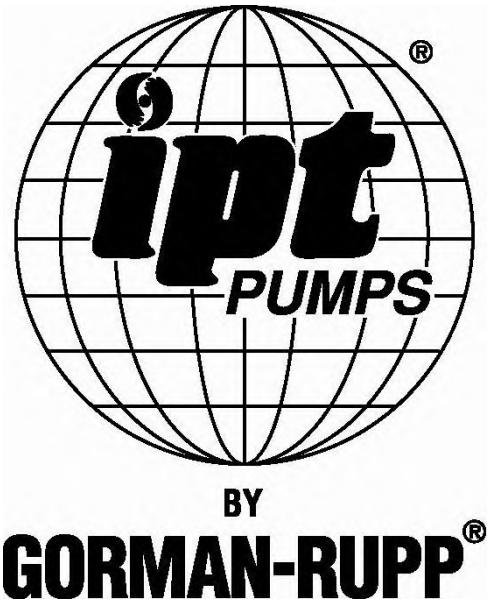
1. **Repair or Replacement:** If inspection shows that any G-R Unit product or part covered under this Limited Warranty is defective in materials or workmanship, the G-R Unit shall repair or replace the defective or non-conforming product or part without charge, whichever the G-R Unit chooses. You must have properly maintained and used the product or part claimed to be defective in accordance with the maintenance schedule or manual, which comes with the product. No allowance will be made for labor, installation, removal, transportation or other charges incurred by you in connection with such repair or replacement.
2. To obtain the above remedy:
   - A. Immediately notify the G-R Unit upon discovery of the claimed defect in materials or workmanship and provide the serial number or date code of the product and/or part(s) or provide the G-R Unit with the invoice or bill of sale referencing the product by no later than the expiration date of the warranty period.
   - B. The G-R Unit will advise whether inspection will be necessary and how whether repair or replacement will be made. If inspection by the G-R Unit is necessary, the pump or defective part must be sent freight pre-paid to the G-R Unit. Return shipment will be F.O.B. the G-R Unit's plant.
   - C. **Return Goods Authorization Requirement:** No product will be accepted for return or replacement without the prior written authorization of the G-R Unit. Upon such authorization, and in accordance with instructions from the G-R Unit, the product will be returned to the G-R Unit, shipping charges prepaid by the Buyer.

3. **Damages:** The G-R Unit's liability for damages for breach of this Limited Warranty shall not exceed the amount of the purchase price of the product or part(s) in respect to which Such damages are claimed. **IN NO EVENT SHALL THE G-R UNITS BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES FOR BREACH OF THIS LIMITED WARRANTY.**

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This Limited Warranty gives you specific legal rights, and you may also have other rights, which vary from state to state.



A Gorman-Rupp Company



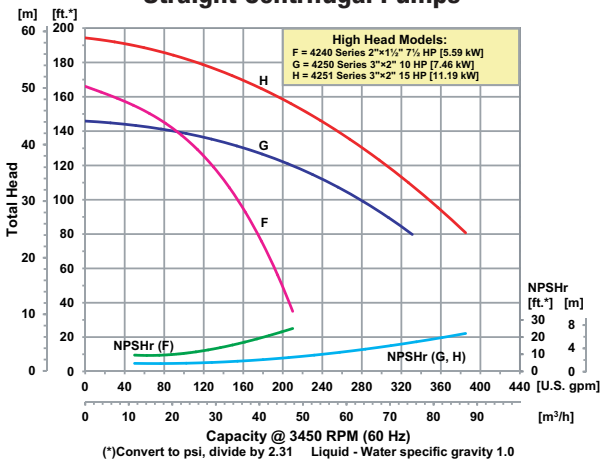
www.amtpump.com

Heavy Duty Centrifugal Pumps

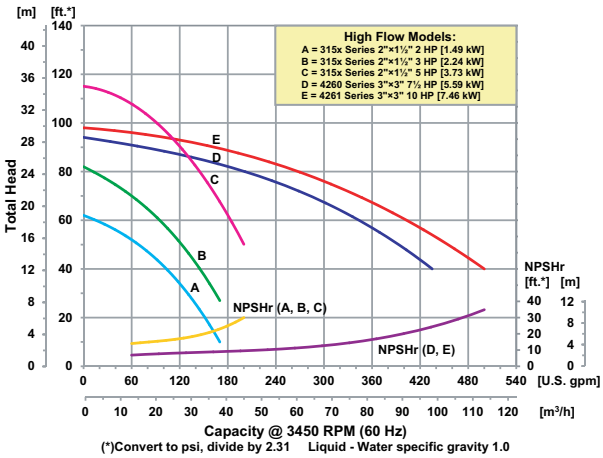


- **Available in: 300 Series Investment Cast Stainless Steel, Cast Bronze and Cast Iron Construction with Stainless Steel Impeller**
- **Buna-N Mechanical Seal and O-Ring on Cast Iron Models**
- **Viton® Mechanical Seal and O-Ring on Stainless Steel and Bronze Models**
- **Optional Silicon Carbide Seals Available**
- **Front Drain Plugs Located 90° Apart**
- **Maximum Head 194 Feet (84 PSI)**
- **Maximum Flow 500 GPM**
- **2 HP to 15 HP NEMA Motors, Single and Three Phase**
- **Optional Mounting Base Available**
- **Solids Handling and Dirty Water Design**

Performance of Heavy Duty Straight Centrifugal Pumps



(*)Convert to psi, divide by 2.31 Liquid - Water specific gravity 1.0



(*)Convert to psi, divide by 2.31 Liquid - Water specific gravity 1.0

AMT Heavy Duty Solids Handling Centrifugal pumps are suited for liquid and chemical transfer, recirculation, booster service, dirty water and other industrial applications. Stainless steel units are especially effective in applications where rust and/or corrosion can develop in systems. Pumps are designed to handle liquids with solids content or dissolved solids and debris. Semi-open impeller features self-cleaning ability that makes the unit useful in applications involving up to 1/4" diameter solids and muddy or dirty liquids. Discharge position can be adjusted in 90° increments with vent and drain plugs for all positions. Type 21 mechanical seal and O-ring casing seal. **Pumps are not self-priming and require flooded suction.**

AMT
A Gorman-Rupp Company

400 Spring Street • Royersford, PA 19468 USA

www.amtpump.com • 888-amt-pump (268-7867)

For use with nonflammable liquids compatible with pump component materials. Viton® and Teflon® are registered trademarks of E. I. Dupont.

Heavy Duty Centrifugal Pumps

Pump Dimensional & Specification Data

Model ‡	Curve	HP	PH	Frame	ENC	Voltage @ 60 Hz +	Full Load Amps	SUC*	DIS*	A**	B**	C**	D**	E	F**	G	J**	K	L**	W**	H	‡ Ship Wt. (Lbs.)
3156			1	56J		115/230	22/11			5.4 [13.8]	5.0 [12.7]	8.5 [21.8]	3.5 [8.9]	2.5 [6.4]	4.0 [10.2]	4.3 [11.0]	2.4 [6.2]	1.3 [3.5]	17.4 [44.2]	10.6 [26.9]	9.6 [24.4]	78
3150	A	2	3	145JM	TEFC	230/460	6/3	2	1½	6.1 [15.5]	3.5 [8.9]	10.7 [27.1]	3.5 [8.9]	2.5 [6.4]	4.0 [10.2]	4.4 [11.3]	2.7 [7.0]	1.3 [3.5]	19.2 [48.7]	11.4 [28.9]	9.6 [24.4]	84
3157			3	56J		230/460	6/3			5.4 [13.8]	3.6 [9.1]	8.5 [21.8]	3.5 [8.9]	2.5 [6.4]	4.0 [10.2]	4.3 [11.0]	2.4 [6.2]	1.3 [3.5]	16.9 [42.9]	10.6 [26.9]	9.6 [24.4]	71
315A			1	56J		230	12			5.4 [13.8]	5.0 [12.7]	8.6 [21.8]	3.5 [8.9]	2.5 [6.4]	4.0 [10.2]	4.3 [11.0]	2.4 [6.2]	1.3 [3.5]	17.9 [45.4]	10.6 [26.9]	9.6 [24.4]	87
3151	B	3	3	182JM	TEFC	230/460	8/4	2	1½	7.1 [18.0]	6.6 [16.8]	10.9 [27.6]	4.5 [11.4]	2.5 [6.4]	4.0 [10.2]	4.4 [11.3]	3.7 [9.5]	0.3 [0.9]	20.0 [50.8]	12.8 [32.5]	9.6 [24.4]	137
315B			3	56J		230/460	8/4			5.4 [13.8]	3.6 [9.1]	8.5 [21.8]	3.5 [8.9]	2.5 [6.4]	4.0 [10.2]	4.3 [11.0]	2.4 [6.2]	1.3 [3.5]	17.4 [44.2]	10.6 [26.9]	9.6 [24.4]	75
315E	C	5	1	184JM	TEFC	230	16	2	1½	7.8 [19.9]	6.6 [16.8]	10.8 [27.6]	4.5 [11.4]	2.5 [6.4]	4.0 [10.2]	4.4 [11.3]	3.7 [9.5]	0.3 [0.9]	24.2 [61.4]	13.9 [35.3]	9.6 [24.4]	143
3152			3	184JM		230/460	17/9			7.1 [18.0]	6.6 [16.8]	10.8 [27.6]	4.5 [11.4]	2.5 [6.4]	4.0 [10.2]	4.4 [11.3]	3.7 [9.5]	0.3 [0.9]	21.7 [55.1]	12.8 [32.5]	9.6 [24.4]	145
4264	D	7½	1	213JM	TEFC	230	32	3	3	9.0 [22.9]	7.3 [18.7]	12.3 [31.4]	5.2 [13.3]	2.7 [7.0]	4.5 [11.4]	4.7 [12.1]	4.2 [10.8]	0.2 [0.7]	27.0 [68.6]	16.2 [41.1]	12.0 [30.4]	205
4260			3	184JM		230/460	22/11			7.0 [18.0]	6.6 [16.8]	11.6 [29.5]	4.5 [11.4]	2.7 [7.0]	4.5 [11.4]	4.7 [12.1]	3.7 [9.5]	1.0 [2.6]	22.5 [57.1]	14.3 [36.3]	12.0 [30.4]	172
4265	E	10	1	215JM	TEFC	230	40	3	3	9.0 [22.9]	6.2 [15.7]	12.3 [31.4]	5.2 [13.3]	2.7 [7.0]	4.5 [11.4]	4.7 [12.1]	4.2 [10.8]	0.2 [0.7]	27.0 [68.5]	16.2 [41.1]	12.0 [30.4]	213
4261			3	215JM		230/460	26/13			8.1 [20.7]	7.3 [18.7]	12.3 [31.4]	5.2 [13.3]	2.7 [7.0]	4.5 [11.4]	4.7 [12.1]	4.2 [10.8]	0.2 [0.7]	26.0 [66.0]	15.0 [38.1]	12.0 [30.4]	204
4242	F	7½	1	213JM	TEFC	230	32	2	1½	9.0 [22.9]	7.3 [18.7]	11.3 [28.9]	5.2 [13.3]	2.4 [6.2]	3.8 [9.7]	4.4 [11.3]	4.2 [10.8]	N/A	26.0 [66.0]	14.6 [37.1]	11.1 [28.1]	196
4240			3	184JM		230/460	22/11			7.1 [18.0]	6.6 [16.8]	10.6 [27.0]	4.5 [11.4]	2.4 [6.2]	4.5 [11.4]	4.5 [11.4]	3.7 [9.5]	0.1 [0.3]	21.5 [54.6]	12.6 [32.0]	10.5 [30.6]	163
4253	G	10	1	215JM	TEFC	230	40	3	2	9.0 [22.9]	5.5 [14.2]	11.5 [29.3]	5.2 [13.3]	2.7 [7.1]	4.7 [12.1]	5.0 [12.9]	4.2 [10.8]	0.3 [0.9]	26.1 [66.3]	15.9 [40.4]	10.6 [26.9]	217
4250			3	215JM		230/460	26/13			8.1 [20.7]	7.3 [18.7]	11.5 [29.3]	5.2 [13.3]	2.7 [7.1]	4.7 [12.1]	5.0 [12.9]	4.2 [10.8]	0.3 [0.9]	25.2 [64.0]	14.7 [37.3]	10.6 [26.9]	208
4251	H	15	3	215JM	TEFC	230/460	47/24	3	2	8.1 [20.7]	7.3 [18.7]	11.5 [29.3]	5.2 [13.3]	2.7 [7.1]	4.7 [12.1]	5.0 [12.9]	4.2 [10.8]	0.3 [0.9]	25.2 [64.0]	14.7 [37.3]	10.6 [26.9]	218

(*) Standard NPT (Female) pipe thread.
(**) This dimension may vary due to motor manufacturer's specifications.
(+) 3-Phase motors can also operate on 50 Hz. (This will change full load amps, service factor and RPM)
NOTE: Dimensions are in inches (centimeters) and have a tolerance of ± 1/4".
NOTE: Electric supply for **ALL** motors must be within ±10% of nameplate voltage rating (e.g. 230V ±10%= 207 to 253).

NOTE: Check Price Book for Specific Pump Construction/Material Availability.
Maximum Solids Handling Capacity: 1/4" Diameter

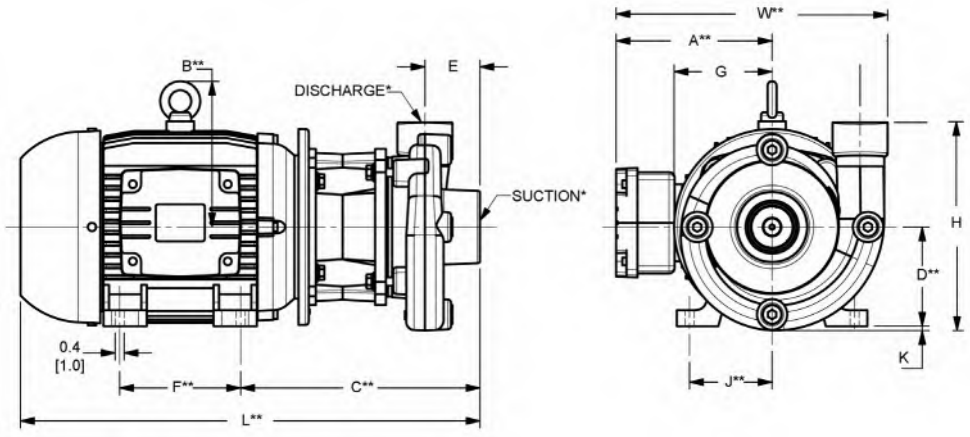
‡ When Ordering, Add the Correct (-9X) Suffix to Model Number Indicating Material Selection (Ex. 315A-95)

XCI (-95) Cast Iron Construction with Buna-N Seals

XB (-94) Cast Bronze Construction with Viton® Seals

XSS (-98) Cast Stainless Steel Construction with Viton® Seals

(All Models Come Standard with Stainless Steel Impeller)



Standard Features

- Stainless Steel, Bronze and Cast Iron Construction
- Buna-N or Viton® Mechanical Seal and O-ring, Depending on Model
- Optional Silicon Carbide Mechanical Seals Available
- Stainless Steel Motor Shaft and Hardware
- NEMA TEFC Single and Three Phase Motors, Depending on Model
- Optional Mounting Base Available for 182/184/215 JM Frames
- Self-cleaning Stainless Steel Impeller
- Maximum Working Pressure 150 PSI
- Maximum Temperature
  - Viton® 200° F
  - Buna-N 180° F
- Optional Seal Wash Port and Hose Available on All Models
- Pedestal Version Models Available for Frame Models 145/182/184JM
- QSP – Quick Ship Pump for Many Models
- Solids Handling Design

Hazardous Duty/Xplosion Proof motors available from stock ranging from 1 to 10 HP; *CALL FOR QUOTATION & LEAD TIME!*

A Gorman-Rupp Company

Manufacturer of AMT & IPT Pumps
400 Spring Street • Royersford, PA 19468 USA
www.amtpump.com • 888-amt-pump (268-7867)

The Gorman-Rupp Company reserves the right to discontinue any model or change specifications at any time without incurring any obligation.
©2012 American Machine and Tool Company. All rights reserved.

IPT PUMPS BY GORMAN-RUPP®

0220

Lawrence Aviation Industries
Superfund Site

Port Jefferson, NY

Groundwater Treatment Plant
PLC Upgrade

PLC & HMI Hardware

Submittal

Contractor:
AWT Environmental Services, Inc
P.O. Box 128
Sayreville, NJ 08857
Phone: 732-613-1660

CIS provided by:
Uptime Automation
132 Lewis Street, Unit B3
Eatontown, NJ 07724
Phone: 732-389-0300



www.uptimeauto.com

Project:	Lawrence Aviation Industries Superfund Site Groundwater Treatment System Port Jefferson, NY Contract No.: NA
Contractor:	AWT Environmental Services
Spec Section:	na
Submittal:	PLC & HMI Hardware

REVISION HISTORY

REV. NO.	REVISION DESCRIPTION	REVISED BY	DATE
1	INITIAL SUBMITTAL	AG	05/06/2021
2	N/A		

Project:	Lawrence Aviation Industries Superfund Site Groundwater Treatment System Port Jefferson, NY Contract No.: NA
Contractor:	AWT Environmental Services
Spec Section:	na
Submittal:	PLC & HMI Hardware

TABLE OF CONTENTS

HMI **4**

PLC **13**

Project:	Lawrence Aviation Industries Superfund Site Groundwater Treatment System Port Jefferson, NY Contract No.: NA
Contractor:	AWT Environmental Services
Spec Section:	na
Submittal:	PLC & HMI Hardware

PLC

QTY	MANUFACTURER	PART NO.	DESCRIPTION
1	ALLEN BRADLEY	5069-L320ER	Controller, CompactLogix 5380, 2 MB User Memory, 16 I/Os, 24 EtherNet/IP Devices
1	ALLEN BRADLEY	5069-RTB64-SCREW	5069 Compact I/O Power terminal RTB kit for both 4 and 6 pin Screw type
3	ALLEN BRADLEY	5069-IA16	5069 Compact I/O 16 Channel 120VAC Input Module
2	ALLEN BRADLEY	5069-OA16	5069 Compact I/O 16 channels high current 2A discrete output.
3	ALLEN BRADLEY	5069-IF8	5069 Compact I/O Analog 8 channels Current/Voltage Input Module
1	ALLEN BRADLEY	5069-OF4	5069 Compact I/O Analog 4 channels Current/Voltage Output Module
9	ALLEN BRADLEY	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit in a pack of 1 pcs

CompactLogix 5380 Controllers

CompactLogix™ 5380 controllers are part of the Logix 5000™ family of controllers. The controllers provide a scalable controller solution to address a wide variety of applications. The applications range from standalone systems to more complex systems with devices that are connected to the controller via an EtherNet/IP™ network.

The controllers are mounted on a DIN rail. They can monitor and control local and remote I/O modules, and other devices connected to an EtherNet/IP network. The CompactLogix 5380 controllers support this functionality:

- Use of Compact 5000™ I/O module as local I/O and remote I/O modules.
- Use Compact 5000 I/O modules, and other I/O modules, as remote I/O modules.
- Support for Integrated Motion over an EtherNet/IP network (not all controllers).
- Use of Dual-IP mode or Linear/DLR mode.
- Use of two Ethernet ports that let the controller connect to EtherNet/IP device-level and enterprise-level networks.
- Use of 1784-SD1, 1784-SD2, 1784-SDHC8, 1784-SDHC32, 9509-CMSDCD4 Secure Digital (SD) card for nonvolatile memory.
- USB programming port for temporary connection.

Features - CompactLogix 5380 Controllers

Feature	5069-L306ER, 5069-L306ERM	5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM	5069-L320ER, 5069-L320ERM, 5069-L320ERMK	5069-L330ER, 5069-L330ERM, 5069-L330ERMK	5069-L340ER, 5069-L340ERM	5069-L350ERM, 5069-L350ERMK	5069-L380ERM	5069-L3100ERM
Controller tasks Continuous Periodic Event	32 tasks 1000 programs/task All event triggers							
Built-in communication ports	1 - USB port 2 - Ethernet ports **IMPORTANT**: Consider the following: When the controller operates in Dual-IP mode, each Ethernet port requires a unique IP address. When the controller operates in Linear/DLR mode, the controller uses only one IP address.							
USB port communication	USB 2.0, Type B Full speed (12 Mbps) Programming, configuration, firmware update, and online edits only							
Ethernet performance	10 Mbps, 100 Mbps, 1 Gbps Full-duplex only							
EtherNet/IP modes supported	Dual-IP mode (Available with the Studio 5000 Logix Designer® application, version 29.00.00 or later) Linear/DLR mode							
EtherNet/IP network topologies supported	DLR Star Linear							
EtherNet/IP nodes supported, max(1)	16	24	40	60	90	120	150	180
Socket interfaces supported, max	32							
Integrated motion(2)								
Number of axes supported, max(3)	256							
Number of CIP™ Drive axes (Position loop-configured) supported, max(4)	5069-L306ERM: 2	5069-L310ERM: 4	5069-L320ERM, 5069-L320ERMK: 8	5069-L330ERM, 5069-L330ERMK: 16	5069-L340ERM: 20	24	28	32
Programming languages	Ladder Diagram (LD) Structured Text (ST) Function Block Diagram (FBD) Sequential Function Chart (SFC)							

(1) The maximum number of nodes that are listed represents when the controller is used with the Logix Designer application, version 31 or later. Some controllers can be used with earlier Logix Designer application versions. The maximum number of nodes that a controller supports can be fewer in Logix Designer application, versions 30 or earlier.

(2) Only controllers that have an M in their catalog number support Integrated Motion on EtherNet/IP networks.

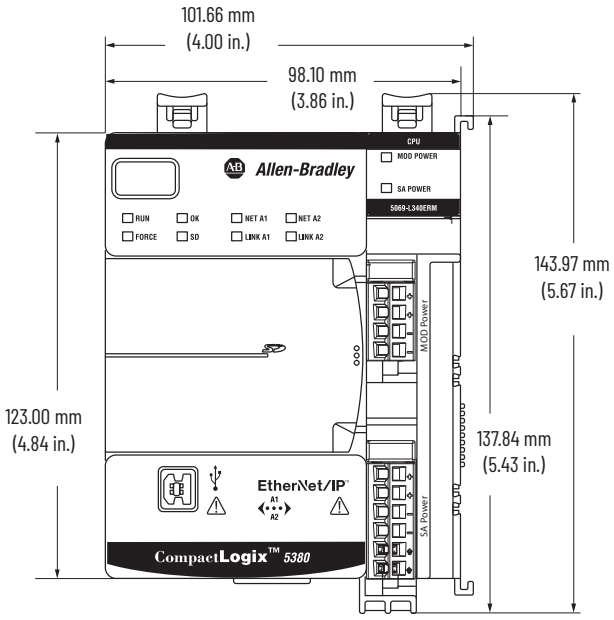
(3) Any combination of CIP Drive, Virtual, Consumed, Regenerative AC/DC Converter and Non-Regenerative AC/DC Converter axis types.

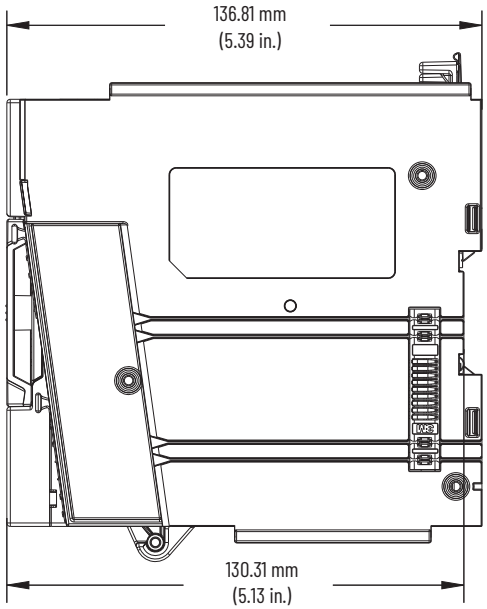
(4) The maximum number of CIP Drive axes (configured for Position Loop) that can be included in the total integrated motion axes count for a controller.

Technical Specifications - CompactLogix 5380 Controllers

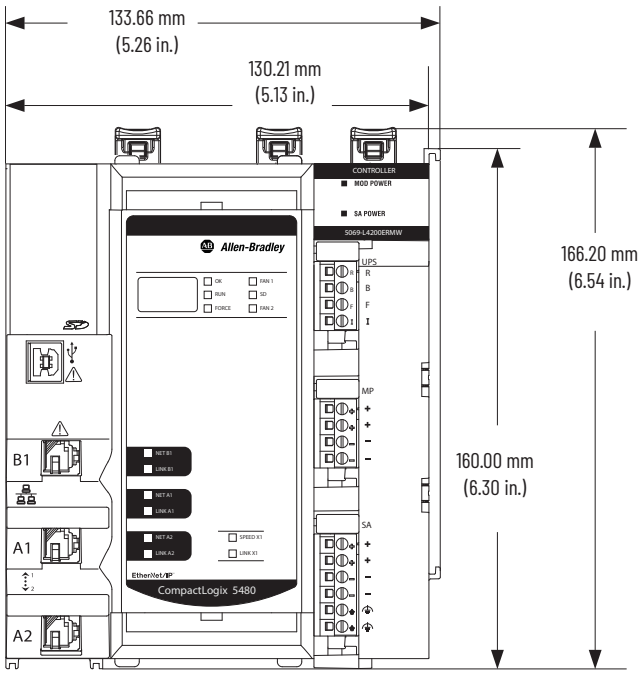
Attribute	5069-L306ER, 5069-L306ERM	5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM	5069-L320ER, 5069-L320ERM, 5069-L320ERMK	5069-L330ER, 5069-L330ERM, 5069-L330ERMK	5069-L340ER, 5069-L340ERM	5069-L350ERM, 5069-L350ERMK	5069-L380ERM	5069-L3100ERM
User memory	0.6 MB	1 MB	2 MB	3 MB	4 MB	5 MB	8 MB	10 MB
Optional nonvolatile memory	• 1784-SD1 (1 GB) • 1784-SD2 (2 GB), ships with controller • 1784-SDHC8 (8 GB) • 1784-SDHC32 (32 GB) • 9509-CMSDCD4 (4 GB) CodeMeter CmCard card							
Local I/O modules, max	8	8	16	31[1]	31	31	31	31
MOD Power voltage range	18...32V DC							
MOD Power current, max	450 mA							
MOD Power inrush	850 mA for 125 ms							
MOD Power passthrough[2]	9.55 A @ 18...32V DC							
MOD Power current rating, max	10 A Do not exceed 10 A current draw at the MOD Power RTB.							
SA Power voltage ranges[3]	0...32V DC 0...240V AC, 47...63 Hz ATEX/IECEX, 125V AC max							
SA Power current, max[3]	10 mA (DC power) 25 mA (AC power)							
SA Power passthrough[3], [4]	9.95 A @ 0...32V DC 9.975 A @ 0...240V AC, 47...63 Hz ATEX/IECEX, 125V AC max							
SA Power current rating, max [3]	10 A (AC or DC power) Do not exceed 10 A current draw at the SA Power RTB.							
Power dissipation, max	8.5 W							
Thermal dissipation, max	29 BTU/hr							
Isolation voltage	300V (continuous), Basic Insulation Type, SA, and MOD Power to Backplane 300V (continuous), Basic Insulation Type, SA to MOD Power 300V (continuous), Basic Insulation Type, Ethernet to Backplane 300V (continuous), Double Insulation Type, Ethernet to MOD Power 300V (continuous), Double Insulation Type, Ethernet to SA Power 50V (continuous), Functional Insulation Type, Ethernet to USB 300V (continuous), Basic Insulation Type, USB to Backplane 300V (continuous), Double Insulation Type, USB to MOD Power 300V (continuous), Double Insulation Type, USB to SA Power No isolation between Ethernet ports Type tested at 1500V AC for 60 s							
Weight, approx	0.768 kg (1.693 lb)							
Dimensions (HxWxD), approx	143.97 x 98.10 x 136.81 mm (5.67 x 3.86 x 5.39 in.)							
Location	DIN rail mount (horizontal mount only)							
DIN rail	Compatible zinc-plated, chromate steel DIN rail. EN50022 - 35 x 7.5 mm (1.38 x 0.30 in.)							
Removable terminal block	RTBs are available in separately ordered 5069 RTB kits. The MOD power connection uses a 4-point RTB, and the SA power connection uses a 6-point RTB. The following kits are available: • Kit catalog number 5069-RTB64-SCREW contains RTB catalog numbers 5069-RTB6-SCREW and 5069-RTB4-SCREW. • Kit catalog number 5069-RTB64-SPRING contains RTB catalog numbers 5069-RTB6-SPRING and 5069-RTB4-SPRING.							
Terminal block torque	5069-RTB4-SCREW & 5069-RTB6-SCREW: 0.4 N•m (3.5 lb•in) 5069-RTB4-SPRING & 5069-RTB6-SPRING: Torque does not apply							
Wire size	5069-RTB4-SCREW, 5069-RTB6-SCREW connections: 0.5...1.5 mm^2 (22...16 AWG) solid or stranded copper wire that is rated at 105 °C (221 °F), or greater, 3.5 mm (0.14 in.) max diameter including insulation, single wire connection only 5069-RTB4-SPRING, 5069-RTB6-SPRING connections: 0.5...1.5 mm^2 (22...16 AWG) solid or stranded copper wire that is rated at 105 °C (221 °F), or greater, 2.9 mm (0.11 in.) max diameter including insulation, single wire connection only Ethernet connections: Ethernet Cabling and Installation according to IEC 61918 and IEC 61784-5-2							
Insulation stripping length	5069-RTB4-SCREW, 5069-RTB6-SCREW connections: 12 mm (0.47 in.) 5069-RTB4-SPRING, 5069-RTB6-SPRING connections: 10 mm (0.39 in.)							
Wire category[5]	3 - on USB port 1 - on power ports 2 - on Ethernet ports							

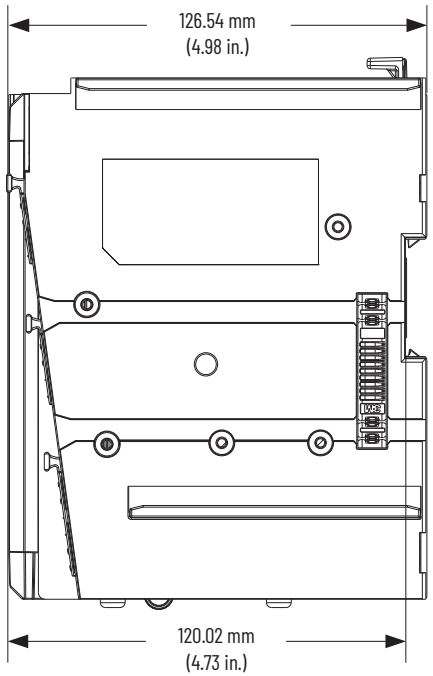
CompactLogix 5380





CompactLogix 5480





Environmental Specifications - 1784-SD1, 1784-SD2, 1784-SDHC8, 1784-SDHC32

Attribute	1784-SD1, 1784-SD2
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	-40...+85 °C (-13...+185 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-65...+150 °C (-85...+302 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5...95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	15 g peak to peak
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	IEC 61000-6-4
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz

Certifications - 1784-SD1, 1784-SD2, 1784-SDHC8, 1784-SDHC32

Certification(1)	1784-SD1, 1784-SD2
CE	European Union 2014/30/EU EMC Directive, compliant with: • EN 61000-6-4; Industrial Emissions • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B)
RCM	Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Emissions
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: • Article 58-2 of Radio Waves Act, Clause 3

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Removable Terminal Kits

You can order RTBs to connect MOD power and SA power to CompactLogix 5380 and Compact GuardLogix 5380 controllers. The RTBs are used to connect wiring to the controllers. The MOD power connection uses a 4-point RTB, and the SA power connection uses a 6-point RTB.

CompactLogix 5380 and Compact GuardLogix Controllers - RTBs

Cat. No.	Description
5069-RTB64-SCREW	Contains the following: • 5069-RTB6-SCREW - 6-point RTB that uses screw-type terminals • 5069-RTB4-SCREW - 4-point RTB that uses screw-type terminals
5069-RTB64-SPRING	Contains the following: • 5069-RTB6-SPRING - 6-point RTB that uses spring-type terminals to connect SA power to the controller. • 5069-RTB4-SPRING - 4-point RTB that uses spring-type terminals to connect MOD power to the controller.

5069-IA16 Digital 16-point 120/240V AC Input Module

The following figure shows a wiring diagram for the 5069-IA16 module.

5069-IA16 Wiring Diagram

Channel Connections

The diagram shows devices that are connected to channels 0, 2, 4, 6, 8, and 10. You are not restricted to using only those channels.
You can connect devices to any channel or combination of channels as needed.

SA Power

Connections to an external power supply that provides SA Power via the SA Power RTB on one of the following:

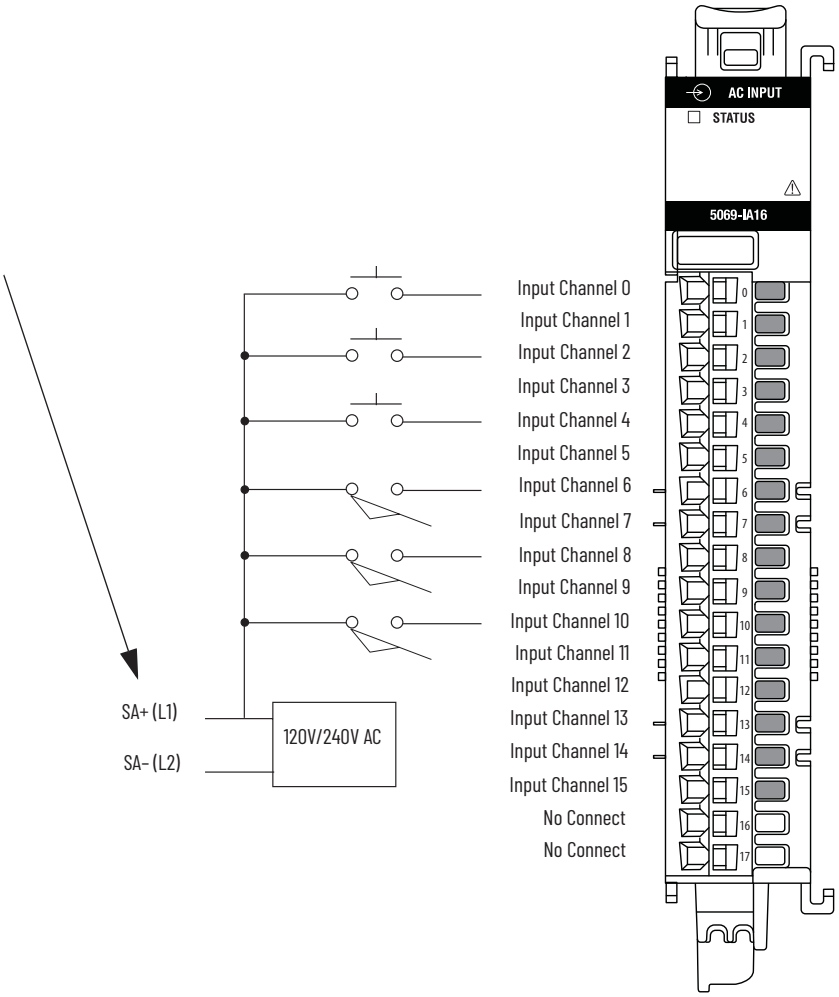
- CompactLogix 5380 controller
- CompactLogix 5480 controller
- 5069-AENTR or 5069-AEN2TR EtherNet/IP™ adapter
- 5069-FPD field potential distributor

IMPORTANT: Remember the following:

- The 5069-IA16 module uses AC SA power. You must connect AC power to the component, that is, CompactLogix 5380 controller, adapter, or field potential distributor, that provides SA Power to the module.
- If you install a **5069-IA16 module as a local I/O module in a Compact GuardLogix 5380 controller system**, you must install a field potential distributor that has AC power that is connected to it and install the 5069-IA16 module next to the field potential distributor.

You cannot install modules that draw AC SA power next to a Compact GuardLogix 5380 controller. Compact GuardLogix 5380 controllers do not support AC power on their SA Power RTBs.

- The 5069-IA16 module inputs use a shared common. The inputs have a return through internal module circuitry to the SA (–) terminal on the SA Power RTB.
- If you install modules in a system that use AC SA power and DC SA power, you must install them on separate SA Power buses.
- You use a 5069-FPD field potential distributor to establish a new SA Power bus in a system. SA Power buses are isolated from each other. To keep the modules on separate SA Power buses, complete these steps.
  1. Install the modules that use one type of SA power, for example DC, to the right of the adapter or controller, that is, the first SA Power bus.
  2. Install the 5069-FPD field potential distributor to establish a second SA Power bus.
  3. Install the modules that use the other type of SA power, for example AC, on the second SA Power bus.



5069-OA16 Digital 16-point 120/240V AC Output Module

The following figure shows a wiring diagram for the 5069-OA16 module.

5069-OA16 Wiring Diagram

Channel Connections

The diagram shows devices that are connected to channels 0, 4, 8, and 12. You are not restricted to using only those channels.

You can connect devices to any channel or combination of channels as needed.

SA Power

Connections to an external power supply that provides SA Power via the SA Power RTB on one of the following:

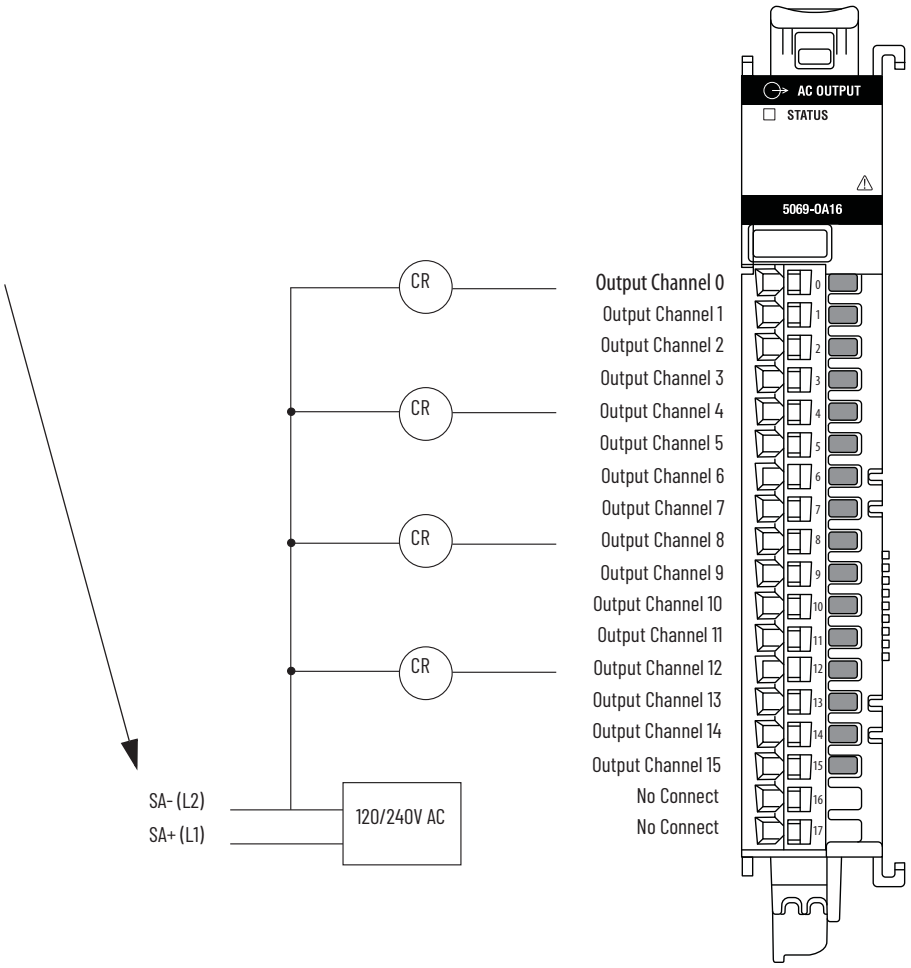
- CompactLogix 5380 controller
- CompactLogix 5480 controller
- 5069-AENTR or 5069-AEN2TR EtherNet/IP adapter
- 5069-FPD field potential distributor

IMPORTANT: Remember the following:

- The 5069-OA16 module uses AC SA power. You must connect AC power to the component, that is, CompactLogix 5380 controller, adapter, or field potential distributor, that provides SA Power to the module.

If you install a **5069-OA16 module as a local I/O module in a Compact GuardLogix 5380 controller system**, you must install a field potential distributor that has AC power that is connected to it and install the 5069-OA16 module next to it. You cannot install modules that draw AC SA power next to a Compact GuardLogix 5380 controller. Compact GuardLogix 5380 controllers do not support AC power on their SA Power RTBs.

- The 5069-OA16 module outputs use a shared common. The outputs have a return through internal module circuitry to the SA (–) terminal on the SA Power RTB.
- If you install modules in a system that use AC SA power and DC SA power, you must install them on separate SA Power buses.
- You use the 5069-FPD field potential distributor to establish a new SA Power bus in a system. SA Power buses are isolated from each other. To keep the modules on separate SA Power buses, complete these steps.
  1. Install the modules that use one type of SA power, for example DC, to the right of the adapter or controller, that is, the first SA Power bus.
  2. Install the 5069-FPD field potential distributor to establish a second SA Power bus.
  3. Install the modules that use the other type of SA power, for example AC, on the second SA Power bus.



The following figure shows a wiring diagram for the 5069-IF8 module with channels configured for current mode.

5069-IF8 Wiring Diagram - Current Mode

Channel Connections

The diagram shows devices that are connected to channels 0, 2, 5, and 7. You are not restricted to using only this channel. You can connect devices to any channel or combination of channels as needed.

IMPORTANT

- Place additional loop devices, for example, strip chart recorders, at either **A** location in the current loop.
- Use separate external power supplies to provide SA power to the system and to power external devices that are connected to the module.
- This module has only two shield terminals. Compact 5000 I/O module RTBs only support one wire per terminal.

If you connect more than two devices to the module, you can ground two devices at the shield terminals.
You must ground the remaining devices somewhere else, such as, to the DIN rail via a terminal strip. In this case, use the same power supply to power the additional devices. If separate power supplies are used to power the additional devices, ground the power supplies at the same ground location.

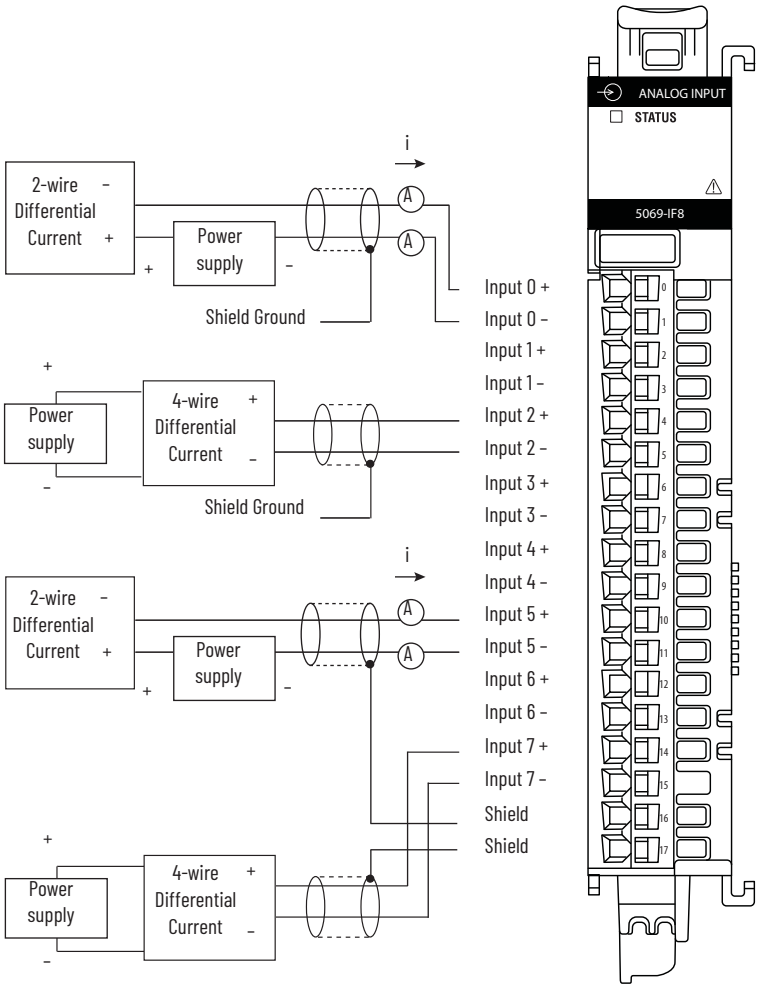
SA Power

Connections to an external power supply that provides SA power are made via the SA Power RTB on one of the following:

- CompactLogix 5380 controller
- Compact GuardLogix 5380 controller
- CompactLogix 5480 controller
- 5069-AENTR or 5069-AEN2TR EtherNet/IP Adapter
- 5069-FPD field potential distributor

IMPORTANT: Remember the following:

- The 5069-IF8 module uses DC SA power. You must connect DC power to the component, that is, controller, adapter, or field potential distributor, that provides SA Power to the modules.
- If you install modules in a system that use AC SA power and DC SA power, you must install them on separate SA power buses.
- You use a 5069-FPD field potential distributor to establish a new SA Power bus in a system. SA Power buses are isolated from each other. To keep the modules on separate SA Power buses, complete these steps.
  1. Install the modules that use one type of SA power, for example DC, to the right of the adapter or controller, that is, the first SA Power bus.
  2. Install the 5069-FPD field potential distributor to establish a second SA Power bus.
  3. Install the modules that use the other type of SA power, for example AC, on the second SA Power bus.



5069-OF4, 5069-OF4K, and 5069-OF8 Analog Current/Voltage Output Modules

The following figure shows a wiring diagram for the 5069-OF4 and 5069-OF4K modules when used in current mode.

5069-OF4 and 5069-OF4K Wiring Diagram - Current Mode

Channel Connections

The diagram shows a device that is connected to channels 0, 2, and 3. You are not restricted to using only these channels. You can connect devices to any channel or combination of channels as needed.

IMPORTANT:

- Place more loop devices, for example, strip chart recorders, at either **A** location in the current loop.
- This module has only two shield terminals. Compact 5000 I/O module RTBs only support one wire per terminal.

If you connect more than two devices to the module, you can ground two devices at the shield terminals. You must ground the remaining devices somewhere else, such as, to the DIN rail via a terminal strip

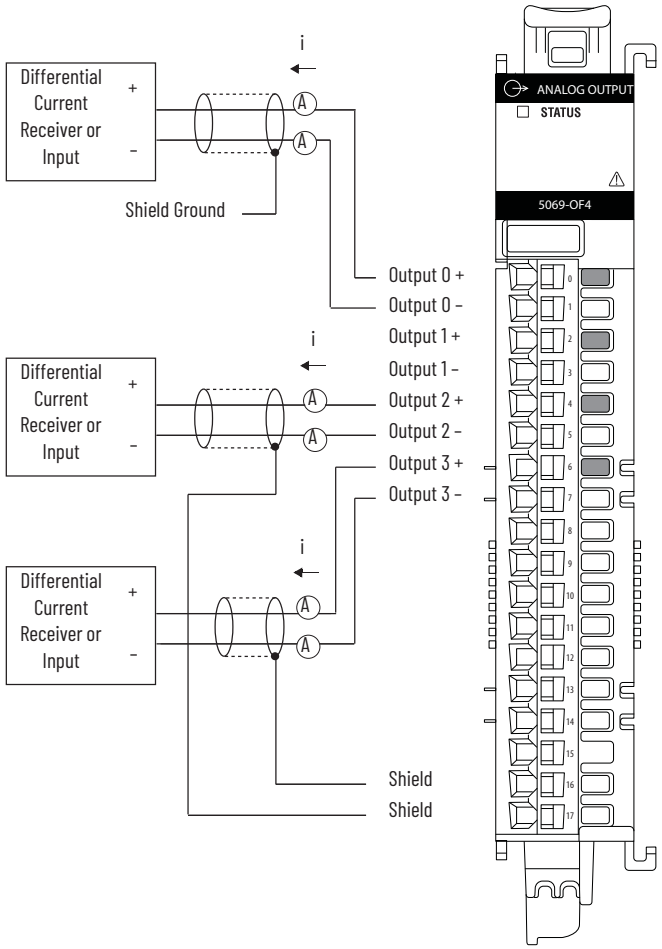
SA Power

Connections to an external power supply that provides SA power are made via the SA Power RTB on one of the following:

- CompactLogix 5380 controller
- Compact GuardLogix 5380 controller
- CompactLogix 5480 controller
- 5069-AENTR or 5069-AEN2TR EtherNet/IP Adapter
- 5069-FPD field potential distributor

IMPORTANT: Remember the following:

- The 5069-OF4 module uses DC SA power. You must connect DC power to the component, that is, controller, adapter, or field potential distributor, that provides SA Power to the modules.
- If you install modules in a system that use AC SA power and DC SA power, you must install them on separate SA power buses.
- You use a 5069-FPD field potential distributor to establish a new SA Power bus in a system. SA Power buses are isolated from each other. To keep the modules on separate SA Power buses, complete these steps.
  1. Install the modules that use one type of SA power, for example DC, to the right of the adapter or controller, that is, the first SA Power bus.
  2. Install the 5069-FPD field potential distributor to establish a second SA Power bus.
  3. Install the modules that use the other type of SA power, for example AC, on the second SA Power bus.



Project:	Lawrence Aviation Industries Superfund Site Groundwater Treatment System Port Jefferson, NY Contract No.: NA
Contractor:	AWT Environmental Services
Spec Section:	na
Submittal:	PLC & HMI Hardware

HMI

QTY	MANUFACTURER	PART NO.	DESCRIPTION
1	C-MORE	EA9-T15CL-R	C-more EA9 series touch screen HMI, 15in color TFT LCD, 1024 x 768 pixel, XGA, LED backlight, supports (1) serial, (1) Ethernet and (2) USB ports and (2) memory card slots.

Note 1: A metal Bezel will be provided to panel mount the new HMI to the existing cutout.

C-more Selection Guide & Specifications

Specification \ Model	12" TFT color w/ full features	15" TFT color w/ base features	15" TFT color w/ full features
Part Number	EA9-T12CL	EA9-T15CL-R	EA9-T15CL
Display Actual Size and Type	12.1" TFT color	15.0" TFT color	
Display Viewing Area	9.69" x 7.26" [246.0 mm x 184.5 mm]	11.97" x 8.98" [304.1 mm x 228.0 mm]	
Weight	4.89 lb [2200g]	6.46 lb (2930g)	6.50 lb [2950g]
Screen Pixel	800 x 600 (SVGA)	1024 x 768 (XGA)	
Display Brightness	280 nits (typ)		
LCD Panel Dot Pitch	0.3075 mm x 0.3075 mm	0.297 mm x 0.297 mm	
Color Scale	65,536 colors		
Backlight Average Lifetime*	50,000 hours @ 25°C		
Touch Panel Type **	Four-wire analog resistive, single touch		
Project Memory	82MB		
Number of Screens	Up to 999 screens – limited by project memory		
Realtime Clock	Realtime clock built into panel, backed up for 30 days at 25°C		
Calendar – Month / Day / Year	Yes - monthly deviation 60sec (Reference)		
Serial Port 1	15-pin D-sub female – RS232C, RS-422/485		
Serial Port 2	3-wire terminal block – RS-485	N/A	3-wire terminal block – RS-485
Serial Port 3	RJ-12 modular jack – RS-232C	N/A	RJ-12 modular jack – RS-232C
USB Port – Type B	USB 2.0 High speed (480 Mbps) Type B – Download/Program – Max. cable length 15-feet		
USB Port – Type A	USB 2.0 High speed (480 Mbps) Type A – for USB device options – Max. cable length 15-feet – Bus Power – Less than 200mA at 5VDC		
Ethernet Port	10/100 Base-T, auto MDI/MDI-X		
Ethernet Port - Expansion Module	EA-ECOM	N/A	EA-ECOM
Audio Line Out	3.5 mm mini jack – requires amplifier and speaker(s)	N/A	3.5 mm mini jack – requires amplifier and speaker(s)
Mic In (Future)	3.5 mm mini jack	N/A	3.5 mm mini jack
SD Card Slot	2 slots support max 2GB (SD), max 32GB (SDHC)		
HDMI Video Out	HDMI Type A Port	N/A	HDMI Type A Port
HDMI Supported Resolution	800 x 600 (SVGA)	N/A	1024 x 768 (XGA)
Supply Power	10.2-26.4 VDC Class 2, Use Class2 and SELV (Safety Extra-Low Voltage) Circuit and Limited Energy Circuit (LEC), or use the AC/DC Power Adapter, EA-AC, to power the touch panel from a 100-240 VAC, 50/60 Hz power source. Reverse Polarity Protected		
Power Consumption	21.0 W 1.75 A @ 12VDC 0.88 A @ 24VDC	29.0 W 2.40 A @ 12VDC 1.20 A @ 24VDC	
Internal Fuse (non-replaceable)	6.3 A		
Altitude	Up to 2000m (6562ft)		
Operating Temperature	0 to 50°C (32 to 122°F) Maximum surrounding air temperature rating: 50°C (122°F) IEC 60068-2-14 (Test Nb, Thermal Shock)		
Storage Temperature	–20 to +60°C (–4 to +140°F) IEC 60068-2-1 (Test Ab, Cold) IEC 60068-2-2 (Test Bb, Dry Heat) IEC 60068-2-14 (Test Na, Thermal Shock)		
Humidity	5-95% RH (non-condensing)		
Environment	For use in Pollution Degree 2 environment, no corrosive gases permitted		
Noise Immunity	(EN61131-2), EN61000-4-2 (ESD), EN61000-4-3 (RFI), EN61000-4-4 (FTB), EN61000-4-5 (Serge), EN61000-4-6 (Conducted) EN61000-4-8 (Power frequency magnetic field immunity) (Local Test) RFI, (145MHz, 440Mhz 10W @ 10cm), Impulse 1000V @ 1µs pulse		
Withstand Voltage	1000VAC, 1min. (FG to Power supply)		
Insulation Resistance	> 10M ohm @ 500VDC (FG to Power supply)		
Vibration	IEC60068-2-6 (Test Fc)		
Shock	IEC60068-2-27 (Test Ea)		
Emission	EN55011 Class A (Radiated RF emission)		
Enclosure	NEMA 250 type 4/4X indoor use only UL50 type 4X indoor use only IP-65 indoor use only (When mounted correctly)		
Agency Approvals	UL508, E157382 CE (EN61131-2), RoHS (2011/65/EU) CUL Canadian C22.2		

NOTES: ****The backlight average lifetime is defined as the average usage time it takes before the brightness becomes 50% of the initial brightness. The lifetime of the backlight depends on the ambient temperature. The lifetime will decrease under low or high temperature usage.***
*****The touchscreen is designed to respond to a single touch. If it is touched at multiple points at the same time, an unexpected object may be activated.***

C-more 15" TFT Color Touch Panel - Base Model

EA9-T15CL-R

C-more EA9 series touch screen interface panel, 15-inch color TFT (15 inch viewable screen), 64K colors, 1024 x 768 pixel XGA screen resolution, 800MHz CPU, 12-24 VDC powered, NEMA 4/4X, IP65 (when mounted correctly; for indoor use only), non-replaceable LED backlight. Includes (1) serial port, USB 2.0 Type A and B ports and Ethernet port; supports (2) SD memory cards. Compatible with EA9-PGMSW programming software version 6.4 or later.



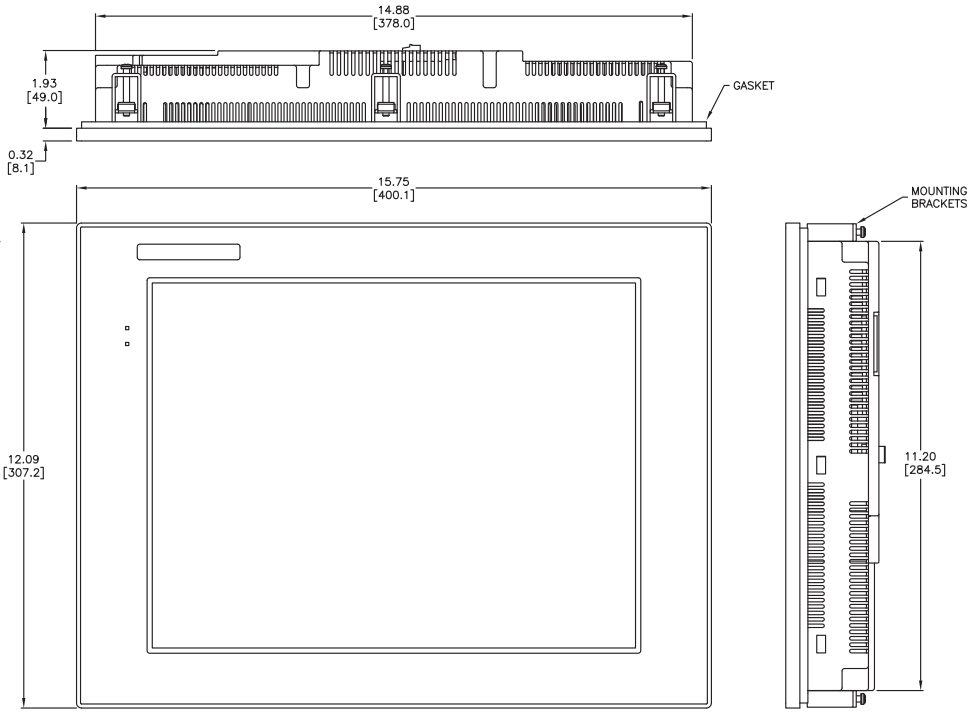
Features

- 15.0" diagonal color TFT (Thin Film Transfer) LCD display with 64K colors
- 1024x 768 pixel resolution
- 280 NITS display brightness
- 50,000 hour average backlight half-life
- Analog resistive (1024 X 1024) touch screen allowing unlimited touch areas
- USB port B (program/download) and USB port A (USB device options)
- Ethernet 10/100 Base-T port (program/download & PLC communication)
- Remote Internet access
- Serial PLC interface (RS-232/422/485)
- Two built-in SD memory card slots
- 12–24 VDC powered, 110VAC power adapter (optional)
- 82MB project memory
- Data logging
- 0 to 50°C [32 to 122°F] operating temperature range
- NEMA 4/4X, IP65 compliant when mounted correctly, indoor use only
- Slim design saves panel space
- UL, cUL & CE agency approvals
- 2-year warranty from date of purchase

Function	Available
Ethernet	Yes
USB	Yes
SD Card	Yes
Audio Out	No
HDMI Video Out	No
Expansion Module	No

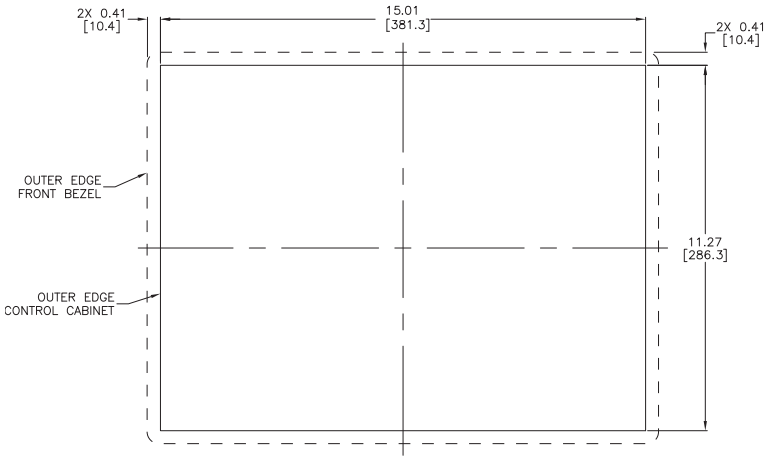
Dimensions

inches [mm]

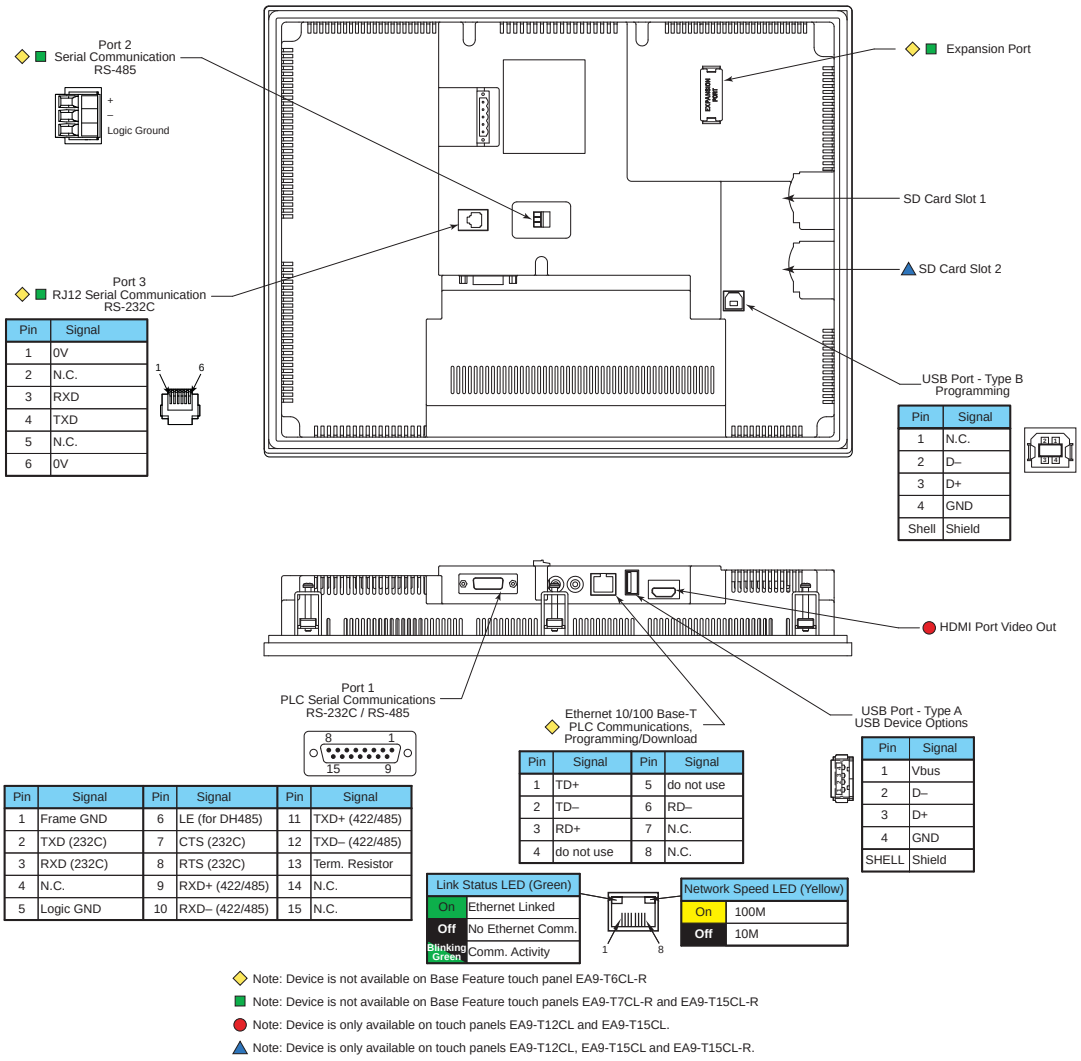


See our website www.AutomationDirect.com for complete engineering drawings.

Mounting Cutout



C-more Communication Ports



Pin	Signal
1	0V
2	N.C.
3	RXD
4	TXD
5	N.C.
6	0V

Pin	Signal
1	N.C.
2	D–
3	D+
4	GND
Shell	Shield

Pin	Signal	Pin	Signal	Pin	Signal
1	Frame GND	6	LE (for DH485)	11	TXD+ (422/485)
2	TXD (232C)	7	CTS (232C)	12	TXD– (422/485)
3	RXD (232C)	8	RTS (232C)	13	Term. Resistor
4	N.C.	9	RXD+ (422/485)	14	N.C.
5	Logic GND	10	RXD– (422/485)	15	N.C.

Pin	Signal	Pin	Signal
1	TD+	5	do not use
2	TD–	6	RD–
3	RD+	7	N.C.
4	do not use	8	N.C.

Pin	Signal
1	Vbus
2	D–
3	D+
4	GND
SHELL	Shield

Note: Device is not available on Base Feature touch panel EA9-T6CL-R

Note: Device is not available on Base Feature touch panels EA9-T7CL-R and EA9-T15CL-R

Note: Device is only available on touch panels EA9-T12CL and EA9-T15CL.

Note: Device is only available on touch panels EA9-T12CL, EA9-T15CL and EA9-T15CL-R.

Ethernet Port

The Ethernet port has several uses:

- Download program to panel
- Communicate to PLCs/PCs
- Send e-mail
- Access FTP server
- Act as a Web server
- Remote Internet access

The Ethernet port has an RJ-45 8-wire modular connector with green and yellow LEDs.

- The yellow LED indicates network speed – off for a 10 Mbps connection and illuminated for a 100 Mbps connection.
- The green LED indicates link status and illuminates when a link is established.

Note: EA6-T6CL-R does not include an Ethernet port, and does not have these capabilities.

Expansion Port

The expansion port supports the EA-ECOM module to provide a second Ethernet Port for all full featured models.

USB Port B

Program *C-more* via the USB programming port. It's fast and easy, with no baud rate settings, parity, or stop bits to worry about. We stock standard USB cables for your convenience. USB Port B can be used to upload or download projects to and from a PC.

USB Port A

The Universal Serial Bus (USB) Port A is a standard feature on all models and can be used to connect various USB HID (Human Input Device) devices to the panel, such as the following:

- USB flash drives (USB-FLASH)
- USB keyboards
- USB barcode scanners
- USB card scanners

C-more can log data to the USB flash drive as well as load projects to the panel from the pen drive. You can also back up project files and panel firmware.

Sound Interface (Audio Line Out)

When attached to an amplifier and speaker(s), *C-more* can play warning sounds or pre-recorded messages such as: "conveyor is jammed". *C-more* supports WAV type files. The output is stereo.

Serial Port

Port 1 - Connect to your serial controller network via Port 1. Port 1 is a 15-pin port that supports RS-232 or RS-422/485.

Port 2 - Connect your RS-485 network via Port 2. Port 2 is provided with a 3-wire removable terminal block.

Port 3 - Connect to your RS-232C device via Port 3. Port 3 is an RJ12 connection.

HDMI Video Out

EA9-T12CL and EA9-T15CL include an HDMI Type A port to provide video output to a projector or remote monitor.

C-more Communication Protocols & Cables

Compatibility Table

PLC Family	Model		Protocols
Allen-Bradley	MicroLogix 1000, 1100, 1200, 1400, 1500, SLC 5-/01/02/03		DH485/AIC/AIC+
	MicroLogix 1000, 1100, 1200, 1400 and 1500		DF1 Half Duplex; DF1 Full Duplex
	SLC 5-/03/04/05		
	ControlLogix™, CompactLogix™, FlexLogix™		
	PLC-5		DF1 Full Duplex
	ControlLogix, CompactLogix, FlexLogix - Tag Based		DF1 Half Duplex; DF1 Full Duplex
	ControlLogix, CompactLogix, FlexLogix - Generic I/O Messaging		EtherNet/IP Server
	ControlLogix, CompactLogix, FlexLogix - Tag Based		EtherNet/IP Client
	Micrologix 1100, 1400 & SLC5/05, all via native Ethernet port		
	MicroLogix 1000, 1100, 1200, 1400,1500 & SLC 5-03/04/05, all via ENI Adapter		
	Micro 800 series		Modbus RTU
			Modbus TCP
	Micro 800 series - Tag Based		DF1 Full Duplex
			EtherNet/IP Client
Modbus RTU	Modbus RTU devices		Modbus RTU
Modbus TCP/IP	Modbus TCP/IP devices		Modbus TCP/IP
GE	90/30, 90/70, Micro 90, VersaMax Micro		SNPX
	90/30, Rx3i		SRTP Ethernet
Mitsubishi	FX Series		FX Direct
	Q02, Q02H, Q06H, Q12H, Q25H		Q CPU
	Q, QnA Serial		QnA Serial
	Q, QnA Ethernet		QnA Ethernet
Omron	C200 Adapter, C500		Host Link
	CJ1/CS1 Serial, CJ1/CS1 Ethernet		FINS
Modicon	984 CPU, Quantum 113 CPU, AEG Modicon Micro Series 110 CPU: 311-xx, 411-xx, 512-xx, 612-xx		Modbus RTU
Siemens	S7-200 CPU, RS-485 Serial		PPI
	S7-200 CPU, S7-300 CPU, S7-400, S7-1200 CPU, S7-1500; Ethernet		Ethernet ISO over TCP
Productivity Series	all		AutomationDirect P3000 Serial
			AutomationDirect P3000 Ethernet
Do-more	all		Do-more Serial
			Do-more Ethernet
CLICK	all		AutomationDirect Modbus (CLICK)
DirectLOGIC	DL05/DL06	all	K-Sequence
			*Direct*NET
			Modbus (Koyo addressing)
		H0-ECOM/H0-ECOM100	*Direct*LOGIC Ethernet
	DL105	all	K-Sequence
	DL205	D2-230	K-Sequence
		D2-240	K-Sequence
			*Direct*NET
		D2-250/D2-250-1/D2-260/ D2-262	K-Sequence
			*Direct*NET
			Modbus (Koyo addressing)
		D2-240/D2-250-1/D2-260 using D2-DCM	*Direct*NET
			Modbus (Koyo addressing)
		H2-ECOM/H2-ECOM100	*Direct*LOGIC Ethernet
	DL305	D3-330/330P (Requires the use of a Data Communications Unit)	*Direct*NET
		D3-340	*Direct*NET
		D3-350	K-Sequence
			*Direct*NET
			Modbus (Koyo addressing)
		D3-350 using D3-DCM	*Direct*NET
			Modbus (Koyo addressing)
	DL405	D4-430	K-Sequence
			*Direct*NET
		D4-440	K-Sequence
			*Direct*NET
		D4-450/D4-454	K-Sequence
			*Direct*NET
			Modbus (Koyo addressing)
		All with D4-DCM	*Direct*NET
			Modbus (Koyo addressing)
		H4-ECOM/H4-ECOM100	*Direct*LOGIC Ethernet
	H2-WinPLC (Think & Do) Live V5.2 or later and Studio any version		Think & Do Modbus RTU (serial port)
	H2-WinPLC (Think & Do) Live V5.5.1 or later and Studio V7.2.1 or later		Think & Do Modbus TCP/IP (Ethernet port)

Cable Description	Cable Part Number	Price
Communication cable, 15-pin male D-sub to 6-pin RJ12, shielded, 9.8ft/3m cable length. For use with *C-more* or *C-more* Micro panel and AutomationDirect PLCs with RJ12 ports.	***EA-2CBL***	$21.50
Communication cable, 15-pin male D-sub to 15-pin D-sub HD15 male, shielded, 3m/9.8ft cable length. For use with *C-more* or *C-more* Micro panel and a DL06, D2-250(-1), D2-260 or D2-262 (bottom port) CPU.	***EA-2CBL-1***	$22.00
Communication cable, 15-pin male D-sub to 4-pin RJ11, shielded, 3m/9.8ft cable length. For use with *C-more* or *C-more* Micro panel and a D3-340 CPU top or bottom port.	***EA-3CBL***	$21.50
Communication cable, 15-pin male D-sub to 15-pin male D-sub, shielded, 3m/9.8ft cable length. For use with *C-more* or *C-more* Micro panel and a DL405 (top port) CPU.	***EA-4CBL-1***	$21.50
Communication cable, 15-pin male D-sub to 25-pin male D-sub, shielded, 3m/9.8ft cable length. For use with *C-more* or *C-more* Micro panel and a D2-DCM, D3-232-DCU, D3-350 (bottom port) or DL405 (bottom port) CPU.	***EA-4CBL-2***	$22.50
Communication cable, 15-pin male D-sub to 8-pin male mini DIN, shielded, 3m/9.8ft cable length. For use with *C-more* or *C-more* Micro panel and an Allen-Bradley Micrologix CPU.	***EA-MLOGIX-CBL***	$33.00
Communication cable, 15-pin male D-sub to 9-pin female D-sub, shielded, 3m/9.8ft cable length. For use with *C-more* or *C-more* Micro panel and an Allen-Bradley SLC 5/03, 5/04 or 5/05 CPU with DF-1 port.	***EA-SLC-232-CBL***	$21.50
Communication cable, 15-pin male D-sub to 25-pin male D-sub, 3m/9.8ft cable length. For use with *C-more* or *C-more* Micro panel and an Allen-Bradley PLC-5 CPU with a DF1 port.	***EA-PLC5-232-CBL***	$21.50
Communication cable, 15-pin male D-sub to 6-pin RJ45, shielded, 3m/9.8ft cable length. For use with *C-more* or *C-more* Micro panel and an Allen-Bradley SLC 5/01, 5/02 or 5/03 CPU with a DH485 port cable.	***EA-DH485-CBL***	$21.00
Communication cable, 15-pin male D-sub to 15-pin male D-sub, shielded, 3m/9.8ft cable length. For use with *C-more* or *C-more* Micro and GE Fanuc Series 90/30 or 90/70 serial port.	***EA-90-30-CBL***	$21.50
Communication cable, 15-pin male D-sub to 25-pin male D-sub, 3m/9.8ft cable length. For use with *C-more* or *C-more* Micro panel and a Mitsubishi FX Series CPU.	***EA-MITSU-CBL***	$21.50
Communication cable, 15-pin male D-sub to 8-pin male mini DIN, shielded, 3m/9.8ft cable length. For use with *C-more* or *C-more* Micro panel and a Mitsubishi FX Series CPU.	***EA-MITSU-CBL-1***	$21.50
Communication cable, 15-pin male D-sub to 25-pin male D-sub, shielded, 3m/9.8ft cable length. For use with *C-more* or *C-more* Micro panel and an Omron C200 or C500 CPU.	***EA-OMRON-CBL***	$21.50

Example Cables:

EA-2CBL



EA-2CBL-1



ID	IO Type	TAG Prefix	Tag 1	Description	PLC Tag	Unit	Rack	Slot	Point	Address
0	DI	YI	B1	Air Stripper Blower 1 MS Running Status	existing	na	0	1	0	Local:1:I.Data.0
1	DI	ZI	B1	Air Stripper Blower 1 HOA Auto Status	existing	na	0	1	1	Local:1:I.Data.1
2	DI	YI	P1	Discharge Pump 1 VFD Running Status	existing	na	0	1	2	Local:1:I.Data.2
3	DI			DI spare	existing	na	0	1	3	Local:1:I.Data.3
4	DI	YA	P1	Discharge Pump 1 VFD Fault Status	existing	na	0	1	4	Local:1:I.Data.4
5	DI			DI spare	existing	na	0	1	5	Local:1:I.Data.5
6	DI	YI	EW1	Extraction Well 1 Pump VFD Running Status	existing	na	0	1	6	Local:1:I.Data.6
7	DI	YA	EW1	Extraction Well 1 Pump VFD Fault Status	existing	na	0	1	7	Local:1:I.Data.7
8	DI	YA2	EW1	Extraction Well 1 Pump Dry Run Fault Status	existing	na	0	1	8	Local:1:I.Data.8
9	DI	YI	EW2	Extraction Well 2 Pump VFD Running Status	existing	na	0	1	9	Local:1:I.Data.9
10	DI	YA	DPT	Bag Filter Differential Pressure High High Status	existing	na	0	1	10	Local:1:I.Data.10
11	DI	YA	EW2	Extraction Well 2 Pump VFD Fault Status	existing	na	0	1	11	Local:1:I.Data.11
12	DI	YA2	EW2	Extraction Well 2 Pump Dry Run Fault Status	existing	na	0	1	12	Local:1:I.Data.12
13	DI	LAL	PIT1	Groundwater Influent Pressure Low Status	existing	na	0	1	13	Local:1:I.Data.13
14	DI	LAH	PIT1	Groundwater Influent Pressure High Status	existing	na	0	1	14	Local:1:I.Data.14
15	DI	LSL	LS400	Air Stripper Sump Level Switch Low Status	existing		0	1	15	Local:1:I.Data.15
16	DI	LSH	LS400	Air Stripper Level Switch High High Status	existing	na	0	2	0	Local:2:I.Data.0
17	DI	VSH	V502	Air Stripper Blower 1 VS High Status	existing	na	0	2	1	Local:2:I.Data.1
18	DI	PSH	PS502	Air Stripper Blower 1 Pressure High Status	existing	na	0	2	2	Local:2:I.Data.2
19	DI	PSHH	PS502	Air Stripper Blower 1 Pressure High High Status	existing	na	0	2	3	Local:2:I.Data.3
20	DI	TSH	TS502	Air Stripper Blower 1 Temperature High Status	existing	na	0	2	4	Local:2:I.Data.4
21	DI	TSHH	TS502	Air Stripper Blower 1 Temperature High High Status	existing	na	0	2	5	Local:2:I.Data.5
22	DI	FSL	FS502	Air Stripper Blower 1 Flow Low Status	existing	na	0	2	6	Local:2:I.Data.6
23	DI	PSL	P1	Discharge Pump Pressure Low Status	existing	na	0	2	7	Local:2:I.Data.7
24	DI	PSH	P1	Discharge Pump Pressure High Status	existing	na	0	2	8	Local:2:I.Data.8
25	DI	DPH	BF	Bag Filters Differential Pressure High Status	existing	na	0	2	9	Local:2:I.Data.9
26	DI	LHH	SU	Sump Level High High Status	existing	na	0	2	10	Local:2:I.Data.10
27	DI	YI	PB1	System Start Pushbutton Status	existing	na	0	2	11	Local:2:I.Data.11
28	DI	YI	PB2	System Stop Pushbutton Status	existing	na	0	2	12	Local:2:I.Data.12
29	DI	YI	PB3	System Reset Pushbutton Status	existing	na	0	2	13	Local:2:I.Data.13
30	DI	YI	EPB1	Emergency Stop Pushbutton Status	existing	na	0	2	14	Local:2:I.Data.14
31	DI	YA	PLC	PLC Power Failure Status	existing		0	2	15	Local:2:I.Data.15
32	DI	YA	PH	Phase Monitor Status	existing	na	0	3	0	Local:3:I.Data.0
33	DI	ZO	V1	Effluent Shut Off Valve Open Limit Switch Status	existing	na	0	3	1	Local:3:I.Data.1
34	DI	ZC	V1	Effluent Shut Off Valve Closed Limit Switch Status	existing	na	0	3	2	Local:3:I.Data.2
35	DI	YI	EW3	Extraction Well 3 Pump VFD Running Status	new	na	0	3	3	Local:3:I.Data.3

ID	IO Type	TAG Prefix	Tag 1	Description	PLC Tag	Unit	Rack	Slot	Point	Address
36	DI	YA	EW3	Extraction Well 3 Pump VFD Fault Status	new	na	0	3	4	Local:3:I.Data.4
37	DI	YA2	EW3	Extraction Well 3 Pump Dry Run Fault Status	new	na	0	3	5	Local:3:I.Data.5
38	DI			DI spare		na	0	3	6	Local:3:I.Data.6
39	DI			DI spare		na	0	3	7	Local:3:I.Data.7
40	DI			DI spare		na	0	3	8	Local:3:I.Data.8
41	DI			DI spare		na	0	3	9	Local:3:I.Data.9
42	DI			DI spare		na	0	3	10	Local:3:I.Data.10
43	DI			DI spare		na	0	3	11	Local:3:I.Data.11
44	DI			DI spare		na	0	3	12	Local:3:I.Data.12
45	DI			DI spare		na	0	3	13	Local:3:I.Data.13
46	DI			DI spare		na	0	3	14	Local:3:I.Data.14
47	DI			DI spare			0	3	15	Local:3:I.Data.15
64	DO	YIC	B1	Air Stripper Blower 1 Run Auto CR	existing	na	0	4	0	Local:4:I.Data.0
65	DO	YIC	P1	Discharge Pump 1 Run Auto CR	existing	na	0	4	1	Local:4:I.Data.1
66	DO	YIC	EW1	Extraction Well 1 Pump Run Auto CR	existing	na	0	4	2	Local:4:I.Data.2
67	DO	YIC	EW2	Extraction Well 2 Pump Run Auto CR	existing	na	0	4	3	Local:4:I.Data.3
68	DO	YIC	SRST	System Reset Required	existing	na	0	4	4	Local:4:I.Data.4
69	DO	YIC	V2	Effluent Shut Off Valve Open Command CR	existing	na	0	4	5	Local:4:I.Data.5
70	DO	YIC	V2	Effluent Shut Off Valve Close Command CR	existing	na	0	4	6	Local:4:I.Data.6
71	DO			DO spare		na	0	4	7	Local:4:I.Data.7
72	DO	YIC	ADL	AutoDialer In 1	existing	na	0	4	8	Local:4:I.Data.8
73	DO	YIC	ADL	AutoDialer In 2	existing	na	0	4	9	Local:4:I.Data.9
74	DO	YIC	ADL	AutoDialer In 3	existing	na	0	4	10	Local:4:I.Data.10
75	DO	YIC	ADL	AutoDialer In 4	existing	na	0	4	11	Local:4:I.Data.11
76	DO	YIC	ADL	AutoDialer In 5	existing	na	0	4	12	Local:4:I.Data.12
77	DO	YIC	ADL	AutoDialer In 6	existing	na	0	4	13	Local:4:I.Data.13
78	DO	YIC	ADL	AutoDialer In 7	existing	na	0	4	14	Local:4:I.Data.14
79	DO	YIC	ADL	AutoDialer In 8	existing	na	0	4	15	Local:4:I.Data.15
64	DO	YIC	PLC	PLC WatchDog Control Relay	existing	na	0	5	0	Local:5:I.Data.0
65	DO	YIC	EW3	Extraction Well 3 Pump Run Auto CR	new	na	0	5	1	Local:5:I.Data.1
66	DO			DO spare	existing		0	5	2	Local:5:I.Data.2
67	DO			DO spare	existing		0	5	3	Local:5:I.Data.3
68	DO			DO spare	existing		0	5	4	Local:5:I.Data.4
69	DO			DO spare	existing		0	5	5	Local:5:I.Data.5
70	DO			DO spare	existing		0	5	6	Local:5:I.Data.6
71	DO			DO Spare	existing		0	5	7	Local:5:I.Data.7

ID	IO Type	TAG Prefix	Tag 1	Description	PLC Tag	Unit	Rack	Slot	Point	Address
72	DO			DO Spare	existing		0	5	8	Local:5:I.Data.8
73	DO			DO Spare	existing		0	5	9	Local:5:I.Data.9
74	DO			DO Spare	existing		0	5	10	Local:5:I.Data.10
75	DO			DO Spare	existing		0	5	11	Local:5:I.Data.11
76	DO			DO Spare	existing		0	5	12	Local:5:I.Data.12
77	DO			DO Spare	existing		0	5	13	Local:5:I.Data.13
78	DO			DO Spare	existing		0	5	14	Local:5:I.Data.14
79	DO			DO Spare	existing		0	5	15	Local:5:I.Data.15
112	AI	LT	400	Air Stripper Level Transmitter Indication	existing	na	0	6	0	Local:6:I.Data.Ch.0
113	AI	LT	100	Extraction Well 1 Level Transmitter Indication	existing	na	0	6	1	Local:6:I.Data.Ch.1
114	AI	FT	106	Extraction Well 1 Flow Transmitter Indication	existing	na	0	6	2	Local:6:I.Data.Ch.2
115	AI	LT	200	Extraction Well 2 Level Transmitter Indication	existing	na	0	6	3	Local:6:I.Data.Ch.3
116	AI	FT	206	Extraction Well 2 Flow Transmitter Indication	existing	na	0	6	4	Local:6:I.Data.Ch.4
117	AI	PH	100	Discharge Pump pH Transmitter Indication	existing	na	0	6	5	Local:6:I.Data.Ch.5
118	AI	LT	420	Injection Well 1 Level Transmitter Indication	existing	na	0	6	6	Local:6:I.Data.Ch.6
119	AI	FT	420	Injection Well 1 Flow Transmitter Indication	existing	na	0	6	7	Local:6:I.Data.Ch.7
120	AI	LT	422	Injection Well 2 Level Transmitter Indication	existing	FT	0	7	0	Local:7:I.Data.Ch.0
121	AI	FIT	422	Injection Well 2 Flow Transmitter Indication	existing	GPM	0	7	1	Local:7:I.Data.Ch.1
122	AI	LT	424	Injection Well 3 Level Transmitter Indication	existing	FT	0	7	2	Local:7:I.Data.Ch.2
123	AI	FIT	424	Injection Well 3 Flow Transmitter Indication	existing	GPM	0	7	3	Local:7:I.Data.Ch.3
124	AI	LT	426	Injection Well 4 Level Transmitter Indication	existing	FT	0	7	4	Local:7:I.Data.Ch.4
125	AI	FIT	426	Injection Well 4 Flow Transmitter Indication	existing	GPM	0	7	5	Local:7:I.Data.Ch.5
126	AI	LT	428	Injection Well 5 Level Transmitter Indication	existing	FT	0	7	6	Local:7:I.Data.Ch.6
127	AI	FIT	428	Injection Well 5 Flow Transmitter Indication	existing	GPM	0	7	7	Local:7:I.Data.Ch.7
120	AI	FIT	502	Air Stripper Blower Flow Transmitter Indication	existing	GPM	0	8	0	Local:8:I.Data.Ch.0
121	AI	PT	502	Air Stripper Blower Pressure Transmitter Indication	existing	PSI	0	8	1	Local:8:I.Data.Ch.1
122	AI	LT	300	Extraction Well 3 Level Transmitter Indication	new	FT	0	8	2	Local:8:I.Data.Ch.2
123	AI	FT	306	Extraction Well 3 Flow Transmitter Indication	new	GPM	0	8	3	Local:8:I.Data.Ch.3
124	AI	SI	P1	Discharge Pump 1 Speed Feedback Indication	existing	%	0	8	4	Local:8:I.Data.Ch.4
125	AI	SI	EW1	Extraction Well 1 Pump Speed Feedback Indication	existing	%	0	8	5	Local:8:I.Data.Ch.5
126	AI	SI	EW2	Extraction Well 2 Pump Speed Feedback Indication	existing	%	0	8	6	Local:8:I.Data.Ch.6
127	AI	SI	EW3	Extraction Well 3 Pump Speed Feedback Indication	new	%	0	8	7	Local:8:I.Data.Ch.7
168	AO	SC	P1	Discharge Pump 1 Speed Speed Command	existing	%	0	9	0	Local:9:O.Data.Ch.0
169	AO	SC	EW1	Extraction Well 1 Pump SpeedSpeed Command	existing	%	0	9	1	Local:9:O.Data.Ch.1
170	AO	SC	EW2	Extraction Well 2Pump Speed Speed Command	existing	%	0	9	2	Local:9:O.Data.Ch.2
171	AO	SC	EW3	Extraction Well 3 Pump Speed Speed Command	new	%	0	9	3	Local:9:O.Data.Ch.3

ID	IO Type	TAG Prefix	Tag 1	Description	PLC Tag	Unit	Rack	Slot	Point	Address

APPENDIX D
Monthly O&M Inspection and Sample Log

NYSDEC
Division of Environmental Remediation

NEW YORK STATE | Department of Environmental Conservation

Contract No.

DEC Insp. –

DEC PM –

Contractor Supt. –

Engineer PM –

Engineer Insp. –

Site Location:

Weather Conditions				
General Description		AM		PM
Temperature		AM		PM
Wind		AM		PM

Health & Safety
If any box below is checked "Yes", provide explanation under "Health & Safety Comments".

Were there any changes to the Health & Safety Plan?	*Yes	No	NA
Were there any exceedances of the perimeter air monitoring reported on this date?	*Yes	No	NA
Were there any nuisance issues reported/observed on this date?	*Yes	No	NA

Health & Safety Comments

Summary of Work Performed	Arrived at site:		Departed Site:	

Equipment/Material Tracking
If any box below is checked "Yes", provide explanation under "Material Tracking Comments".

Were there any vehicles which did not display proper D.O.T numbers and placards?	*Yes	No	NA
Were there any vehicles which were not tarped?	* Yes	No	NA
Were there any vehicles which were not decontaminated prior to exiting the work site?	* Yes	No	NA

Personnel and Equipment

Individual	Company	Trade	Total Hours

Equipment Description	Contractor/Vendor	Quantity	Used

Material Description	Imported/ Delivered to Site	Exported off Site	Waste Profile (If Applicable)	Source or Disposal Facility (If Applicable)	Daily Loads	Daily Weight (tons)*

Visitors to Site			
Name	**Representing**	**Entered Exclusion/CRZ Zone**	
		Yes	**No**
		Yes	**No**
		Yes	**No**
		Yes	**No**
		Yes	**No**
		Yes	**No**
		Yes	**No**
		Yes	**No**
		Yes	**No**

Site Representatives	
Name	**Representing**

Project Schedule Comments

Issues Pending

Interaction with Public, Property Owners, Media, etc.

Include (insert) figures with markups showing location of work and job progress

Site Photographs (Descriptions Below)	

Comments	
Site Inspector(s):	**Date:**

Videos of discreet operations have been provided to the DEC Project Manager to facilitate understanding of the ongoing work? Yes ☐ No ☐ N/A ☐

REMEDIAL ACTIVITIES AT OTHER PROPERTIES
[Residential, Adjacent, AWS, non-Site Properties]
(Section may be deleted for ongoing remedial sites)

1. Does the Department and its Contractor(s) have permission to enter the property or properties for the day's work?	Yes ☐	No ☐
2. Does anyone at this location have any symptoms of a respiratory infection (e.g., cough, sore throat, fever, or shortness of breath)?	Yes ☐	No ☐
3. Has anyone at this location been tested and confirmed to have COVID-19?	Yes ☐	No ☐
4. If Yes to 1, 2 or 3, follow the latest NYSDOH COVID-19 guidance: https://coronavirus.health.ny.gov/home	Yes ☐	No ☐
Comments:		

ON-SITE WASTE STORAGE

Drums, roll offs and piles are staged in secure areas?	Yes ☐	No ☐	N/A☐
Liners and berms have been installed if necessary to prevent cross contamination of clean areas?	Yes ☐	No ☐	N/A☐
Containers are in good condition or properly overpacked?	Yes ☐	No ☐	N/A☐
Waste materials are scheduled to be properly characterized and disposed of prior to demobilization?	Yes ☐	No ☐	N/A☐
Complying with RCRA 90 day storage limitation for hazardous waste?	Yes ☐	No ☐	N/A☐
Piles are securely covered when not in use?	Yes ☐	No ☐	N/A☐
Containers are closed when not in use?	Yes ☐	No ☐	N/A☐
Staging areas should be inspected periodically and any issues addressed immediately?	Yes ☐	No ☐	N/A☐
Signage and labeling comply with RCRA requirements for all staging areas and containers?	Yes ☐	No ☐	N/A☐
If any issues noted, has Contractor been notified?	Yes ☐	No ☐	N/A☐
Comments:			

NUISANCE CHECKLIST

Were there any community complaints related to work on this date?	Yes ☐	No ☐	N/A☐
Were there any odors detected on this date?	Yes ☐	No ☐	N/A☐
Was noise outside specification and/or above background on this date?	Yes ☐	No ☐	N/A☐
Were vibration readings outside specification and/or above background on this date?	Yes ☐	No ☐	N/A☐
Any visible dust observed beyond the work perimeter on this date?	Yes ☐	No ☐	N/A☐
Any visible contrast (turbidity) beyond engineering controls observed on this date?	Yes ☐	No ☐	N/A☐
Was turbidity checked at the outfall(s)?	AM ☐	PM ☐	N/A☐
Were any property owners NOT provided advance notice for work performed on this property on this date?	Yes ☐	No ☐	N/A☐

Was the temporary fabric structure closed at the end of the day?	Yes ☐	No ☐	N/A☐
Has Contractor failed to protect all foundations and structures adjacent to and adjoining the site which are affected by the excavations or other operations connected with performance of the Work?	Yes ☐	No ☐	N/A☐
If yes, has Contractor been notified?	Yes ☐	No ☐	N/A☐
Comments:			

RESILIENCE/GREEN REMEDIATION CHECKLIST

Is site power procured from renewable energy sources (e.g., solar, wind, geothermal, biomass and biogas)?	Yes ☐	No ☐	N/A☐
Is the Contractor employing 2007 or newer or retrofitted (BART*) diesel on-road trucks and non-road equipment?	Yes ☐	No ☐	N/A☐
Is vehicle idling adequately reduced per 6NYCRR Part 217-3?	Yes ☐	No ☐	N/A☐
Have equipment operators been trained in the idling requirements of 6NYCRR Part 217-3?	Yes ☐	No ☐	N/A☐
Is BART-equipped equipment properly maintained and working?	Yes ☐	No ☐	N/A☐
Is work being sequenced to avoid double handling?	Yes ☐	No ☐	N/A☐
Is there an onsite recycling program for CONTRACTOR-generated wastes and is it complied with?	Yes ☐	No ☐	N/A☐
Are office trailer heating and cooling systems maintained at efficient set points, have programable thermostats been installed?	Yes ☐	No ☐	N/A☐
Are products and materials used in performance of the work appropriately certified (e.g., LEED, Energy Star, Sustainable Forestry Initiative®, etc.)?	Yes ☐	No ☐	N/A☐
Are resiliency features included in the design, or completed remedy properly installed and/or maintained (flood control, storm water controls, erosion measures, etc.)?	Yes ☐	No ☐	N/A☐
Are green remediation elements included in the design, or completed remedy properly installed and/or maintained (e.g., porous pavement, geothermal, variable speed drives, native plantings, natural stream bank restoration, etc.)?	Yes ☐	No ☐	N/A☐
Has Contractor been notified of any deficiencies?	Yes ☐	No ☐	N/A☐
Are remote/call in job meetings being held in lieu of meeting in person where possible?	Yes ☐	No ☐	N/A☐
Comments:			

* BART – Best Available Retrofit Technology

LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE #152016
LAI GWT SYSTEM INSPECTION CHECKLIST
PORT JEFFERSON, NY

Field Technician _____

Date _____

Time _____

SYSTEM PARAMETER	Flow Rate (gpm)	Totalizer Reading (gallons)	Water Table (feet)	Pressure at Well (psi)	pH	Temperature (c*)	Time	Comments
Extraction Well No. 1								
Extraction Well No. 2								
Extraction Well No. 3								
Injection Well No. 1								
Injection Well No. 2								
Injection Well No. 3								
Injection Well No. 4								
Injection Well No. 5								
PLC Totalizer Reading								

SYSTEM UNITS	Pressure IN (psi)	Pressure OUT (psi)	Comments
Bag Filter No. 1			
Blue LPGAC Unit 1			
Blue LPGAC Unit 2			
Fiberglass LPGAC Unit 1A			
Fiberglass LPGAC Unit 2A			

MAINTENANCE TASK	Check?	Comments
Change Bag Filters		
Check vapor GAC and stack for moisture collection and drain as necessary.		
Grease blower driveshaft bearings.		
Re-start and Update Computers		
Inspect well vaults for leaks.		

MISCELLANEOUS	Name		Representing	Reason for Visit
Visitors to Site				

Interaction with Public, Police? _____

Notes/Observations: _____

Monthly Test of Emergency Lights (30 seconds): _____

Annual Test of Emergency Lights (90 minutes): _____

Monthly inspection of fire extinguishers: _____

APPENDIX J-2

OMP O&M MANUAL

OPERATIONS AND MAINTENANCE PLAN AND MANUAL
OLD MILL POND GROUNDWATER TREATMENT SYSTEM

LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
OPERABLE UNIT 1, LONG TERM REMEDIAL ACTION
PORT JEFFERSON, SUFFOLK COUNTY, NEW YORK



Prepared for
U.S. Army Corps of Engineers
Kansas City District

Contract. W912DQ-17-D-3016
Delivery Order: W912DQ20F3045

February 2021



HGL
HydroGeoLogic, Inc

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE

For use of this form, see ER 415-1-0; the proponent agency is CECW-CE

DATE	TRANSMITTAL NO.
3/21/2022	1800-69

SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS (This section will be initiated by the contractor)

TO:	FROM:	CONTRACT NO.	THIS IS A:
Eastern Resident Office US Army Corps of Engineers 355 RXR Plaza Uniondale, New York 11556	HydroGeoLogic, Inc. 11107 Sunset Hills Road, Suite 400 Reston VA 20190 USA	W912DQ-17-D-3016 W912DQ20F3045	NEW TRANSMITTAL

SPECIFICATION SEC. NO. (Covers only one section with each transmittal)	PROJECT TITLE AND LOCATION 01	THIS TRANSMITTAL IS FOR: (Check one)
1800-Operation and Maintenace of Existing Systems	LAI Superfund Site OU 1-LTRA ,Port Jefferson, New	☐ FIO ☒ GA ☐ DA ☐ CR ☐ DA/CR ☐ DA/GA ☐ S

ITEM NO. (See Note 3) a.	DESCRIPTION OF SUBMITTAL ITEM (Type size, model number/etc) b.	SUBMITTAL TYPE CODE (See Note 8) c.	NO. OF COPIES d.	CONTRACT REFERENCE DOCUMENT		FOR CONTRACTOR USE g.	VARIATION (See Instruction No. 6) h.	FOR CE USE CODE (Note 9) i.
				SPEC. PARA NO. e.	DRAWING SHEET NO. f.			
89	LAI O&M Manual - HGL page replacement	10 - OPERATIONS AND MAINTENANCE DATA	1	1.3.1.1		A	No	A
90	LAI Plan of Operation - HGL page replace	10 - OPERATIONS AND MAINTENANCE DATA	1	1.3.1.2		A	No	A

Remarks from Contractor

Replacement page 4-1 with extraction well EW-03 survey data

I certify that the above submitted items have been reviewed in detail and are correct and in the strict conformance with the contract drawings and specifications except as otherwise stated. Eric Dambaugh - HydroGeoLogic, Inc.

Eric Dambaugh Digitally signed by Eric Dambaugh Date: 2022.03.21 12:01:48 -04'00'

NAME AND SIGNATURE OF CONTRACTOR

SECTION II - APPROVAL ACTION

ENCLOSURES RETURNED (List by Item No.)	NAME, TITLE AND SIGNATURE OF APPROVING AUTHORITY	DATE
	BIAN.SHEWEN.1228728337 Digitally signed by BIAN.SHEWEN.1228728337 Date: 2022.03.22 17:57:43 -04'00'	3/22/2022

4.0 SYSTEM COMPONENTS

The treatment system consists of three active groundwater extraction wells, a 1,071 square foot, above grade building that houses the treatment system equipment, and discharge piping to the injection wellfield. The treatment system building also contains all of the electrical distribution equipment, instrumentation and control equipment for the groundwater treatment process, and other building support systems.

4.1 EXTRACTION WELLS, PUMPS, AND PIPING

The treatment system utilizes three active groundwater extraction wells: EW-1, EW-2, and EW-3. The extraction wells are located along the western boundary of the Lawrence Aviation Industries property. The locations of the extraction wells are presented on Figure 1.2. The well construction details are provided below in Table 4.1.

Table 4-1 Extraction Well Construction Details

Well Number	Top of Casing Elevation (ft amsl)	X Coordinate	Y Coordinate	Well Diameter (inches)	Top of Screened Interval (ft bgs)	Bottom of Screened Interval (ft bgs)	Well Depth (ft bgs)
EW-1	219.30	1241213.95	278985.42	10	182 238	222 248	252
EW-2	222.61	1241367.23	279180.5	10	182 229	214 240	250
EW-3	228.25	1241388.766	278959.8493	6	186	226	230

Notes:
Each well is constructed of polyvinyl chloride piping.
X and Y coordinates are in New York State Plane - Long Island, Datum: NAD83, units of feet.
amsl = feet above mean sea level

The layout of the extraction wells was selected to provide hydraulic control of the groundwater plume and to recover VOC-impacted groundwater for treatment. Groundwater is extracted from each well using a submersible groundwater pump. Each pump has a variable frequency drive (VFD) motor that allows the pump operation to be adjusted to the desired flow rate. A water level transducer is located in each extraction well to provide water level inputs to the supervisory, control, and data acquisition (SCADA) system. Extraction well flow rate information is displayed by the human-machine interface (HMI).

Table 4-2 provides the design flow rates for each of the active extraction wells. The extraction well flow rates have been adjusted as necessary based on the field monitoring of water levels and an evaluation of the contaminant plume. The extraction well pumping rates will be evaluated and optimized to achieve maximum contaminant removal from the aquifer that is within the capacity of the treatment system.

The design flow rate for the extraction wells is 150 gpm. They can operate up to a flow rate of 200 gpm. The current influent flow rate for the treatment system is approximately 120 gpm.

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE

For use of this form, see ER 415-1-0; the proponent agency is CECW-CE

DATE	TRANSMITTAL NO.
2/5/2021	1800-10

SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS (This section will be initiated by the contractor)

TO:	FROM:	CONTRACT NO.	THIS IS A:
Eastern Resident Office US Army Corps of Engineers 355 RXR Plaza Uniondale, New York 11556	HydroGeoLogic, Inc. 11107 Sunset Hills Road, Suite 400 Reston VA20190 USA	W912DQ-17-D-3016 W912DQ20F3045	NEW TRANSMITTAL

SPECIFICATION SEC. NO. (Cover only one section with each transmittal)	PROJECT TITLE AND LOCATION 01	THIS TRANSMITTAL IS FOR: (Check one)
1800-Operation and Maintenace of Existing Systems	LAI Superfund Site OU 1-LTRA , Port Jefferson, New York	☐ FIO ☑ GA ☐ DA ☐ CR ☐ DA/CR ☐ DA/GA ☐ S

ITEM NO. (See Note 3) a.	DESCRIPTION OF SUBMITTAL ITEM (Type size, model number/etc) b.	SUBMITTAL TYPE CODE (See Note 8) c.	NO. OF COPIES d.	CONTRACT REFERENCE DOCUMENT		FOR CONTRACTOR USE g.	VARIATION (See Instruction No. 6) h.	FOR CE USE CODE (Note 9) i.
				SPEC. PARA NO. e.	DRAWING SHEET NO. f.			
18	O&M Manual - HGL	10 - OPERATIONS AND MAINTENANCE DATA	1	1.3.1.1		A	No	A
19	Plan of Operation - HGL	01 - PRECONSTRUCTION SUBMITTALS	1	1.3.1.2		A	No	A

Remarks from Contractor

I certify that the above submitted items have been reviewed in detail and are correct and in the strict conformance with the contract drawings and specifications except as otherwise stated.

Eric Dambaugh - HydroGeoLogic, Inc.

Eric Dambaugh Digitally signed by Eric Dambaugh Date: 2021.02.05 08:54:22 -05'00'

NAME AND SIGNATURE OF CONTRACTOR

SECTION II - APPROVAL ACTION

ENCLOSURES RETURNED (List by item No.)	NAME, TITLE AND SIGNATURE OF APPROVING AUTHORITY	DATE
	BIAN.SHEWEN.1228728337 Digitally signed by BIAN.SHEWEN.1228728337 Date: 2021.03.16 10:34:59 -04'00'	3/16/2021

OPERATIONS AND MAINTENANCE PLAN AND MANUAL
OLD MILL POND GROUNDWATER TREATMENT SYSTEM

LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
OPERABLE UNIT 1, LONG TERM REMEDIAL ACTION
PORT JEFFERSON, SUFFOLK COUNTY, NEW YORK

Prepared for:

U.S. Army Corps of Engineers
Kansas City District
601 E. 12th Federal Building
Kansas City, MO 64106-2896

Prepared by:

HydroGeoLogic, Inc.
Northway 10 Executive Park
313 Ushers Road
Ballston Lake, NY 12019

February 2021

This page was intentionally left blank.

This document was prepared by HydroGeoLogic, Inc. and has received the appropriate technical review and approval.

Prepared by:

Skaarup, John Digitally signed by Skaarup, John Date: 2021.02.05 08:52:37 -05'00'

2/5/2021

John Skaarup **Date**
Project Engineer/Waste Disposal Quality Control Manager

Reviewed by:

Eric Dambaugh Digitally signed by Eric Dambaugh Date: 2021.02.05 09:48:56 -05'00'

2/5/2021

Eric Dambaugh, P.G. **Date**
Contractor Quality Control System Manager

Approved by:

Dacyk, Pete Digitally signed by Dacyk, Pete Date: 2021.02.05 10:42:12 -05'00'

2/5/2021

Peter Dacyk, P.G. **Date**
Project Manager

Document Revision Log

Revision No.	Review/ Revision Date	Summary of Changes
0	2/2021	First submittal of this document

This page was intentionally left blank.

TABLE OF CONTENTS

1.0 INTRODUCTION 1-1
1.1 O&M PLAN AND MANUAL ORGANIZATION 1-1
1.2 REMEDIAL ACTION OBJECTIVES AND GOALS 1-2
1.3 TREATMENT SYSTEM OVERVIEW 1-3
1.4 PROJECT ORGANIZATION AND STAFFING PLAN 1-3

2.0 SITE DESCRIPTION AND HISTORY 2-1
2.1 SITE DESCRIPTION 2-1
2.2 SITE AND PROJECT HISTORY 2-1
2.3 SITE GEOLOGY AND HYDROLOGY 2-2
2.4 SITE CONTAMINATION 2-3

3.0 SITE PERMITS 3-1

4.0 SYSTEM COMPONENTS 4-1
4.1 EXTRACTION WELLS, PUMPS, AND PIPING 4-1
4.2 AIR STRIPPER 4-3
4.3 AIR SRIPPER BLOWER 4-4
4.4 VGAC UNITS 4-5
4.5 AIR STRIPPER DISCHARGE PUMP 4-5
4.6 LGAC UNITS 4-6
4.7 PARTICLE FILTRATION UNITS 4-7
4.8 PROCESS AREA SUMP PUMP 4-7
4.9 DISCHARGE LOCATIONS 4-7
4.10 PROCESS CONTROL AND OPERATIONS 4-8
4.11 ELECTRICAL DISTRIBUTION 4-9
4.12 HEATING, VENTILATION, AND AIR CONDITIONING 4-9
4.13 POTABLE WATER 4-9
4.14 BUILDING AND LANDSCAPING 4-9
4.15 ONE-CALL MARKOUTS 4-10

5.0 SYSTEM OPERATIONS 5-1
5.1 INITIAL CONDITIONS 5-1
5.2 STARTUP SEQUENCE 5-1
5.3 SHUTDOWN SEQUENCE 5-2
5.3.1 Operator Shutdown 5-2
5.3.2 Controlled System Shut Down 5-2
5.3.3 Extended Shut Down 5-2
5.4 SWITCHING TREATMENT PLANT DISCHARGE LOCATIONS 5-3
5.4.1 Discharging to the Old Mill Creek 5-3
5.4.2 Discharging to Old Mill Pond 5-3
5.5 EMERGENCY PROCEDURES 5-4
5.5.1 Equipment Malfunction 5-4
5.5.2 Spill 5-4
5.5.3 Power Failure 5-5
5.5.4 Manual Shutdown 5-5

5.5.5 Evacuation 5-5
5.5.6 Emergency Contact Information and Hospital Location 5-5
5.5.7 Reporting Permit Non-Compliance, Chemical Spills, and Release of Contaminants to Groundwater 5-6
5.6 CARBON CHANGE OUT EVENTS 5-9
5.6.1 VGAC 5-9
5.6.2 LGAC 5-10

6.0 INSPECTIONS AND MAINTENANCE 6-1
6.1 SYSTEM INSPECTIONS AND MONITORING 6-1
6.2 SYSTEM MAINTENANCE 6-1

7.0 SAMPLING AND MONITORING ACTIVITIES 7-1
7.1 SITE-WIDE GROUNDWATER MONITORING 7-1
7.2 PERFORMANCE AND COMPLIANCE MONITORING 7-1

8.0 RECORD KEEPING AND REPORTING 8-1
8.1 PROGRESS AND STATUS REPORTS 8-1
8.2 COMPLIANCE REPORTING 8-2

9.0 GOVERNMENT PROPERTY 9-1

10.0 HEALTH AND SAFETY 10-1
10.1 HAZARDS 10-1

11.0 REFERENCES 11-1

LIST OF FIGURES

Figure 1.1 Site Location
Figure 1.2 Site Layout, Old Mill Pond Treatment System
Figure 1.3 Treatment System Building Layout, Old Mill Pond
Figure 1.4 Process Flow Diagram, Old Mill Pond Treatment System

LIST OF TABLES

Table 1-1 New York State Groundwater Quality Standards 1-2
Table 3-1 NYSPDES Discharge Criteria 3-1
Table 3-2 New York Air Permit Equivalent Criteria 3-1
Table 4-1 Extraction Well Construction Details 4-1
Table 4-2 Extraction Well Design and Typical Flow Rates 4-2
Table 4-3 Extraction Well Pump Design Data 4-2
Table 4-4 Extraction Well Pump Manufacturer and Distributor Contact Information 4-2
Table 4-5 Air Stripper Design Data 4-3
Table 4-6 Air Stripper Manufacturer Contact Information 4-3
Table 4-7 Air Stripper Blower Design Data 4-4
Table 4-8 Air Stripper Blower Manufacturer Contact Information 4-4
Table 4-9 Vapor Phase Carbon Media Design Data 4-5
Table 4-10 Vapor Phase Carbon Media Replacement Contact Information 4-5
Table 4-11 Air Stripper Discharge Pump Design Data 4-5
Table 4-12 Air Stripper Discharge Pump Manufacturer Contact Information 4-6
Table 4-13 Liquid Phase Carbon Media Design Data 4-6
Table 4-14 Liquid Phase Carbon Media Replacement Contact Information 4-7
Table 4-15 Sump Pump Characteristics 4-7
Table 5-1 Emergency Contact Information 5-5
Table 7-1 Site-Wide Groundwater Monitoring Schedule 7-1
Table 7-2 Treatment System Performance and Compliance Monitoring Schedule 7-2

LIST OF APPENDICES

Appendix A As-Built Drawings
Appendix B Permit Equivalencies
- B-1 New York State Pollution Discharge Elimination System Permit Equivalent
- B-2 Air Permit Equivalent

Appendix C Equipment Operation and Maintenance Manuals/Literature
- C-1 Extraction Well Pumps
- C-2 Stride Ethernet Switches
- C-3 Actuated Ball Valves
- C-4 Signet Magmeter Flow Sensor
- C-5 GE Sensing, PTX/PDCR 1230 Depth and Level Sensors
- C-6 C-More Hardware (Human Machine Interface) User Manual
- C-7 Automation Direct DL205 Programmable Logic Controller User Manual
- C-8 Automation Direct Ethernet Communications Modules
- C-9 Stride Industrial Ethernet Switches
- C-10 Transfer Pump Installation, Operation, and Maintenance Instructions
- C-11 Dura Pulse AC Drive User Manual
- C-12 Proline Promag 50P, 53P Technical Information
- C-13 Shallow Tray Air Stripper Model 31231 Technical Information
- C-14 Wayne Sump Pump Technical Information
- C-15 Lorex True Definition Bullet Security Camera

Appendix D Health and Safety Inspection Checklist
Appendix E Hospital Route Map
Appendix F Groundwater Sampling Summary Table
Appendix G Government Property List and Subcontractor/Vendor List
Appendix H Government Property Transfer Form

LIST OF ACRONYMS AND ABBREVIATIONS

APP	Accident Prevention Plan
cfm	cubic feet per minute
CFR	Code of Federal Regulations
cis-1,2-DCE	cis-1, 2-dichloroethene
CP	control panel
1,1-DCE	1,1-dichloroethene
F	Fahrenheit
ft	feet
GAC	granular activated carbon
gpm	gallons per minute
H&S	health and safety
HGL	HydroGeoLogic, Inc.
HMI	Human-machine interface
Hp	horsepower
lb	Pound
LE	level element
LGAC	Liquid-phase granular activated carbon
µg/L	micrograms per liter
NYSDEC	New York State Department of Environmental Conservation
NYSPDES	New York State Pollutant Discharge Elimination System
OSR	Off-Site Rule
O&M	operations and maintenance
OSHA	Occupational Safety and Health Administration
OU1	Operable Unit 1
PCE	tetrachloroethene
%	Percent
PID	photo-ionization detection
PLC	programmable logic controller
PPE	personal protective equipment
PVC	polyvinyl chloride
QAPP	Quality Assurance Project Plan
RAO	remedial action objective

rpm	revolutions per minute
SCADA	supervisory control and data acquisition
SDS	safety data sheet
SU	standard units
1,1,1-TCA	1,1,1-trichoroethane
TCE	trichloroethene
UFP	Uniform Federal Policy
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VC	vinyl chloride
VGAC	vapor-phase granular activated carbon
VOC	volatile organic compound

OPERATIONS AND MAINTENANCE PLAN AND MANUAL
OLD MILL POND GROUNDWATER TREATMENT SYSTEM

OPERABLE UNIT 1, LONG TERM REMEDIAL ACTION
LAWRENCE AVIATION SUPERFUND SITE
PORT JEFFERSON, NEW YORK

1.0 INTRODUCTION

This Operations and Maintenance (O&M) Plan and Manual has been prepared by HydroGeoLogic, Inc. (HGL) for the Old Mill Pond groundwater treatment system operating for Operable Unit 1 (OU1) of the Lawrence Aviation Industries Superfund Site. This document has been prepared for the U.S. Army Corps of Engineers (USACE) under contract W912DQ-17-D-3016 in accordance with Specifications Section 01800 – Operation and Maintenance of Existing Systems.

This document is intended to be the primary reference for the operation and maintenance of the groundwater treatment system. The O&M specifications for key system components are described in this document. The document must be read in conjunction with the following project planning documents:

- Environmental Protection Plan (HGL, 2020a);
- Contractor Quality Control Plan (HGL, 2020b);
- Staffing Plan (HGL, 2020c);
- Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP) (HGL, 2021a); and
- Accident Prevention Plan (APP) (HGL, 2021b).

This document may be updated periodically to reflect any changes in operating, sampling, or reporting procedures that are introduced in the future.

1.1 O&M PLAN AND MANUAL ORGANIZATION

This O&M Plan and Manual is organized as follows:

- Section 1 Introduction - Includes the remedial action objectives (RAO), an overview of the treatment system, and a description of the project organization and staffing.
- Section 2 Site Description and History - Provides a description of the site and the historical operations.
- Section 3 Permits - Describes the permits required for system operation.
- Section 4 System Components - Describes each remedial system component and its operation.

- Section 5 System Operations - Describes the procedures for system start-up and shutdown.
- Section 6 Inspection and Maintenance - Summarizes the system maintenance requirements and inspections. This section also discusses the warrantees for the treatment plant.
- Section 7 Sampling and Monitoring Activities - Provides a summary of the system sampling and monitoring activities, including performance and compliance sampling and groundwater quality monitoring.
- Section 8 Record Keeping and Reporting - Summarizes the remedial system record keeping and reporting requirements.
- Section 9 Government Property - Explains contractor's duties to document Government property location.
- Section 10 Health and Safety - Provides a summary of the O&M health and safety requirements.
- Section 11 References - Material references within the O&M Manual.

1.2 REMEDIAL ACTION OBJECTIVES AND GOALS

The RAOs for the treatment system are to restore the groundwater aquifer to drinking water quality and prevent human ingestion of contaminated groundwater. These objectives are met by extracting contaminating groundwater, treating it through air stripping and activated carbon, and then discharging treated water to Old Mill Pond or to Old Mill creek.

The RAOs for the groundwater were developed to address the human health risks and environmental concerns and are as follows:

- Restore the groundwater aquifer to drinking water quality; and
- Prevent human ingestion of contaminated groundwater.

The objectives will be achieved through implementation of the following:

- Extraction of contaminated groundwater;
- Treatment of extracted groundwater using air stripping and granular activated carbon (GAC) adsorption; and
- Discharge of treated water to Old Mill Pond or Old Mill Creek, while meeting all required water quality standards.

The New York State Groundwater Quality Standards for site related contaminants and associated daughter products are shown in Table 1-1.

Table 1-1 New York State Groundwater Quality Standards

Parameter	New York Groundwater Quality Standards micrograms per liter (µg/L)
Vinyl Chloride (VC)	2
Tetrachloroethene (PCE)	5
Trichloroethene (TCE)	5
cis-1,2-Dichlorethene (cis-1,2-DCE)	5
1,1,1-Trichlorethane (1,1,1-TCA)	5
1,1-Dichloroethane (1,1-DCA)	5
1,1-Dichloroethene (1,1-DCE)	5
Chloroform	7

1.3 TREATMENT SYSTEM OVERVIEW

The groundwater treatment system includes three extraction wells that extract groundwater from the contaminated portion of the aquifer at various depths, for a total influent flow rate of approximately 225 to 245 gallons per minute (gpm). The combined influent groundwater enters an air stripper, where volatile organic compounds (VOC) are stripped out of the water and enter into the air stream. VOCs in the air stripper off-gas are treated by three vapor-phase granular activated carbon (VGAC) units before the effluent air is discharged to the atmosphere. The VGAC units are normally operated in series, as a lead/lag arrangement.

Process water from the air stripper is pumped through two liquid-phase granular activated carbon (LGAC) units. Residual VOCs that may be present in the process water are removed by GAC media in the two LGAC units. The LGAC units are normally operated in series, as a lead/lag arrangement. Treated water is discharged to Old Mill Pond or Old Mill Creek.

The treatment system is highly automated for control, monitoring, alarms, and shutdowns. Further details for the system components and controls, and operation of the treatment system, are included in Sections 4.0 and 5.0.

The location of the Old Mill Pond groundwater treatment system is shown on Figure 1.1. The site layout for the Old Mill Pond system is shown on Figure 1.2 and the layout of the treatment system building is shown on Figure 1.3. Details for the treatment system process water and air components, system instrumentation, and process piping are shown on Figure 1.4. The treatment system as-built drawings are presented in Appendix A.

1.4 PROJECT ORGANIZATION AND STAFFING PLAN

Treatment system construction was completed, and operation began in 2011. HGL began performing O&M activities on October 19, 2020. The project is staffed by qualified personnel to ensure that the treatment system is operated and maintained to meet the RAOs. A project

staffing plan (HGL, 2020c) outlines the proposed project staff, staff roles and certifications, subcontractors, and includes an organization chart.

A minimum of two treatment system operators will be provided to perform O&M tasks. One operator will act as the person responsible for routine plant operation, responding to system shutdowns, etc., and the second operator will serve as a backup in the event the primary operator is unavailable or additional resources are needed to complete O&M tasks. The operator will be present at the facility at a minimum of 1 day per week and will respond to alarm conditions within 2 hours of the shutdown notification. A minimum of two people will be on site for periodic O&M tasks when safety concerns warrant, in accordance the approved site-specific APP (HGL, 2021b).

2.0 SITE DESCRIPTION AND HISTORY

2.1 SITE DESCRIPTION

The Lawrence Aviation Industries Superfund Site OU1 includes two groundwater treatment systems. One system is located at the former manufacturing facility on former Lawrence Aviation Drive; it is the subject of a separate Operation and Maintenance Plan and Manual. The Old Mill Pond groundwater treatment system is the subject of this document; it is located at 103 Brook Road in Port Jefferson, Suffolk County, New York, as shown on Figure 1.2.

Site activities that do not occur within the Old Mill Pond water treatment system building, such as inspections of the Old Mill Creek discharge outfall, or monitoring well sampling, will take place within public areas in Port Jefferson.

2.2 SITE AND PROJECT HISTORY

The Lawrence Aviation Industries Site encompasses approximately 126 acres and consists of the former Lawrence Aviation Industries manufacturing facility and outlying parcels. The former facility is approximately 42 acres in size and was a titanium sheeting manufacturer. The former facility consists of 10 buildings, which are located in the southern portion of the property.

The Long Island Railroad and Sheep Pasture Road form the northern border of the former facility. To the east and west are various residential single family houses and to the south is a wooded area, beyond that is a residential area with more single family houses. The village of Port Jefferson and Port Jefferson Harbor, an embayment of Long Island Sound, lie approximately 1 mile to the north.

The section of the property currently occupied by former facility was previously a turkey farm, which was owned by Lawrence Aviation Industries' corporate predecessor, Ledkote Products Co. of New York. Ledkote produced items that included lead gutters and spouts for roof drains. In 1959, Ledkote Products Co. of New York changed names to Lawrence Aviation Industries, Inc. The former facility manufactured products from titanium sheet metal, including golf clubs and products for the aeronautics industry.

A Remedial Investigation was performed from 2003 to 2005; it documented a VOC plume originating at the former facility. The primary VOCs in the groundwater plume originating from the site are TCE and PCE. Other VOCs are present to a lesser extent, such as: chloromethane, 1,1-DCE, methyl tert-butyl ether, 1,1- DCA, cis-1,2- DCE, chloroform, and 1,1,1- TCA.

The Record of Decision was signed on September 29, 2006. The selected remedy documented in the Record of Decision included the construction of two groundwater pump and treatment systems; one located at the former facility on former Lawrence Aviation Drive, and a second system located approximately 1 mile downgradient within the village of Port Jefferson. Operation of the system at the former facility began in September 2011.

Throughout 2009 and continuing into 2010, the U.S. Environmental Protection Agency (USEPA) had several meetings with town officials in Port Jefferson, New York, to determine

the location of the off-site treatment system. After much discussion, USEPA and the village of Port Jefferson agreed upon the Old Mill Pond location for the treatment building. The parcel selected is located at the intersection of Book Road and Caroline Avenue. USEPA met and procured the services of the local architect to ensure the building conformed to the town's historical appeal and was designed within local building codes.

During the spring of 2010, USEPA and its contractors performed a cleanup of the Old Mill Pond and the downstream creek. Over 120 cubic yards of debris was removed from this area, including household trash and dead vegetation. This task was completed to prevent flooding of streets during heavy rains and to ensure the stream would be able to accept the discharge from the treatment system. Old Mill Pond treatment system construction was completed, and operation began in 2011.

2.3 SITE GEOLOGY AND HYDROLOGY

Three aquifers are present beneath the site: the Upper Glacial Aquifer, the Magothy Aquifer, and the Lloyd Sand Member of the Raritan Formation (Koszalka. 1984). The Magothy and underlying Lloyd Sand Aquifers are separated by the Raritan Clay member of the Raritan Formation. Consequently, water is interchanged more readily between the Upper Glacial and Magothy Aquifers than between the Magothy and Lloyd Aquifers. The presence of the Raritan Clay, directly underlying the Magothy Aquifer, is the lower boundary of the upper flow system. Investigations at the site have only focused on the Upper Glacial Aquifer and the top of the Magothy Aquifer.

The Magothy Aquifer consists of Upper Cretaceous Magothy deposits to the top of the confining clay unit of the Raritan Formation. It consists of fine to medium sand with interbedded silts and clays. It extends between the bottom of the Upper Glacial Aquifer and the Raritan Clay. The aquifer has a fluvial-deltaic depositional origin, is wedge shaped, and thickens progressively towards the south and southeast. The Magothy deposits were unconformably overlain by a veneer of Pliocene and Pleistocene deposits, chiefly of glacial origin (Franke and McClymonds, 1972). Deposition of the glacial deposits left the top of the Magothy Aquifer with discontinuous clay bodies in the deposits of the Pliocene-Pleistocene succession (Upper Glacial Aquifer), Smithtown Clay Unit, or Magothy Formation. This upper portion of the Magothy will be referred to as the reworked Magothy. The top of the Magothy Aquifer, which underlies the Upper Glacial Aquifer, was observed at a depth of 324 feet below ground surface (ft bgs) (99 ft below mean sea level [msl]) in stratigraphic boring ST-03. This unit also was observed in the boring for MPW-09 at a depth of 108 ft bgs (98.34 ft below msl).

The site is directly underlain by the Pleistocene-age Harbor Hill moraine, a remnant of the most recent glaciation. The moraine is up to 70 ft thick and composed primarily of sand and gravel with occasional lenses of silty sand and silt. The moraine deposits thin to the south and to the north.

At the former industrial facility, the moraine deposits are underlain by well graded fine to medium grained sands and silts with occasional layers of silt and clay or sand and gravel. The clay-rich layers observed in this zone were thin and discontinuous, likely derived from Magothy

formation materials (or Smithtown Clays), reworked and then re-deposited during the creation of the local moraine. The localized glacial activity at the site has reworked the upper layers of the Magothy Formation and left very complex heterogeneous glacial deposits at the base of the Upper Glacial Aquifer; this material is not differentiated from the reworked Magothy material described above. During the pre-design investigation, an aquifer test was performed on a test well in the area near well MPW-02. The upper 60 ft (180-240 ft bgs) of the aquifer was screened by the test well and piezometers also were screened within the zone from 205 to 225 ft bgs. The lithology observed in the screened zone was predominantly a mixture of fine to medium grained sands with silt.

The Upper Glacial Aquifer is generally under unconfined conditions and the upper limit is the water table. Synoptic groundwater elevation data collected in June 2016 was used to prepare a potentiometric surface map for the Upper Glacial Aquifer from the former facility to the Port Jefferson Harbor. The potentiometric surface map shows that groundwater flow in the vicinity of the former facility is to the north towards Port Jefferson Harbor. There is a downward gradient measured under the moraine, but moving to the north and off of the moraine towards Port Jefferson Harbor there is a significant upward hydraulic gradient driving groundwater towards the water table to discharge at Port Jefferson Harbor. The Upper Glacial Aquifer is under artesian conditions at MPW-09, which is near the Old Mill Pond facility and Old Mill Pond.

2.4 SITE CONTAMINATION

Contaminant removal actions were performed in 1990, 1991, 2009, 2014, and 2015. The remedial actions largely addressed waste materials and contaminated soil.

The June 2008 groundwater sampling results indicated the VOC plume emanated from the vicinity of monitoring wells MPW-02 and MPW-07 and migrates to the northwest. In the vicinity of multiport well MPW-10, approximately 1,000 ft from the western boundary of the former facility, groundwater flow and the VOC plume bend to the north toward Port Jefferson Harbor. There is an upward hydraulic gradient near MPW-09, indicating that contaminated groundwater is moving upward as it moves northward in the vicinity of well MPW-09 (near Old Mill Pond).

Groundwater sampling data indicates that the width of the VOC plume is generally decreasing as the LAI and Old Mill Pond groundwater treatment plants (GWTP) continue to operate. Recent data suggests that groundwater VOC contamination has separated into source area and downgradient plumes. Continued annual groundwater sampling and biennial surface water sampling events will provide additional data for ongoing evaluations of groundwater contamination from the site.

The following information summarizes VOC data for groundwater extracted by the Lawrence Aviation Industries GWTP:

- Total site-related VOC concentrations in EW-01 were detected at 251 µg/L when the sampling program began and were 197 µg/L in October 2012. VOC concentrations in EW-01 decreased to approximately 61.6 µg/L in October 2020; a reduction of approximately 75 percent (%).

- Total site-related VOC concentrations in EW-02 were detected at 154 µg/L when the sampling program began and were 37 µg/L in October 2012. VOC concentrations in EW-02 were approximately 34.7 µg/L in September 2020; a reduction of approximately 77% since the sampling program began. VOC concentrations in EW-02 started to slowly increase again in September 2017.

The following information summarizes VOC data for groundwater extracted by the Old Mill Pond GWTP:

- Total site-related VOC concentrations in EW-1 decreased from 313 µg/L since system startup in August 2011 to 73 µg/L in October 2020; a reduction of approximately 78%.
- Total site-related VOC concentrations in EW-2 decreased since system startup from 454 µg/L in August 2011 to 66 µg/L in October 2020; a reduction of approximately 86%.
- Total site-related VOC concentrations in EW-6 decreased since startup in September 2013 from 934 to 272 µg/L in October 2020; a reduction of approximately 71%.

3.0 SITE PERMITS

The Old Mill Pond treatment system operates under two permit equivalencies, as described below. Copies of the permit equivalencies are included in Appendix B.

- New York State Pollutant Discharge Elimination System (NYSPDES) Discharge Permit Equivalency. The permit equivalency regulates the treatment system effluent water quality and limits the mass and/or concentration of pollutants that may be discharged to Old Mill Pond, a Class D water body. A summary of the permit equivalent criteria is provided below in Table 3-1.

Table 3-1 NYSPDES Discharge Criteria

Parameter	Limits	Units	Frequency
Flow	150	gpm	Continuous
Flow	Monitor	gpd	Continuous
pH (determined in the field)	6.0 – 9.0	S.U.	Monthly
Chloromethane	10	µg/L	Monthly
1,1-DCA	10	µg/L	Monthly
1,1-DCE	10	µg/L	Monthly
cis-1,2-DCE	10	µg/L	Monthly
1,1,1-TCA	10	µg/L	Monthly
TCE	10	µg/L	Monthly
PCE	1.0	µg/L	Monthly
Chromium (total)	16	µg/L	Monthly
Copper	13.4	µg/L	Monthly
Iron	300	µg/L	Monthly
Zinc	120	µg/L	Monthly

Notes:
gpd – gallons per day
S.U. – standard units

- New York Air Permit Equivalent. This permit equivalency regulates Old Mill Pond treatment system air emissions. USEPA, Region 2 is listed as the permittee but monitoring and reporting is performed by the O&M contractor. The permit equivalency does not allow emissions into the atmosphere of substances in quantities that would result in air pollution. A summary of the permit equivalent criteria is provided below in Table 3-2.

Table 3-2 New York Air Permit Equivalent Criteria

Parameter	Criteria
GAC Removal Efficiency	≥ 99 percent
Air Stripper Blower Flow Rate	2,300 cubic ft per minute
Discharge of TCE	1.638 pounds per day
Discharge of PCE	0.0216 pound per day

This page intentionally left blank.

4.0 SYSTEM COMPONENTS

The treatment system consists of three active groundwater extraction wells, an 1,800 square foot, above grade building that houses the treatment system equipment, and discharge piping to Old Mill Pond and Old Mill Pond Creek. Three other extraction wells: EW-3, EW-4, and EW-5, were installed but are not in service. Water from extraction wells EW-3 and EW-4 contained elevated levels of iron. Extraction well EW-5 has a 4-inch diameter; it is too narrow to facilitate the installation of a groundwater pump. The treatment system building also contains all of the electrical distribution equipment, instrumentation and control equipment for the groundwater treatment process, and other building support systems.

4.1 EXTRACTION WELLS, PUMPS, AND PIPING

The treatment system utilizes three active groundwater extraction wells: EW-1, EW-2, and EW-6. Extraction wells EW-1 and EW-2 are located in the grassy area behind the treatment system building, within the fence that separates the treatment system area from the athletic field. Extraction well EW-6 is located on the west side of the treatment system driveway. Extraction wells EW-3 and EW-4 are standby wells because they contained elevated iron concentrations. EW-5 is not used for groundwater extraction because its diameter is too small to house a standard groundwater extraction pump. The locations of the extraction wells are shown on Figure 1.2. The well construction details are provided below in Table 4.1.

Table 4-1 Extraction Well Construction Details

Well Number	Top of Casing Elevation (ft amsl)	X Coordinate	Y Coordinate	Well Diameter (inches)	Top of Screened Interval (ft bgs)	Bottom of Screened Interval (ft bgs)	Well Depth (ft bgs)
ERT-EW-1	22.58	1240345.53	284149.95	6	120	140	139.7
ERT-EW-2	22.76	1240321.71	284149.95	6	90	110	109.4
ERT-EW-3	22.88	1240370.46	284174.31	6	90	110	109.8
ERT-EW-4	22.56	1240343.76	284193.23	6	60	80	79.5
ERT-EW-5	22.84	1240325.56	284206.51	4	20	40	39.6
ERT-EW-6	18.97	1240263.92	284057.195	6	90	120	120

Notes:
Each well is constructed of polyvinyl chloride piping.
X and Y coordinates are in New York State Plane - Long Island, Datum: NAD83, units of feet.
amsl = feet above mean sea level

The layout of the extraction wells was selected to provide hydraulic control of the groundwater plume and to recover VOC-impacted groundwater for treatment. Groundwater is extracted from each well using a submersible groundwater pump. Each pump has a variable frequency drive motor that allows the pump operation to be adjusted to the desired flow rate. A water level transducer is located in each extraction well to provide water level inputs to the supervisory,

control, and data acquisition (SCADA) system. Extraction well flow rate information is displayed by the human-machine interface (HMI).

Table 4-2 provides the design flow rates for each of the active extraction wells. The extraction well flow rates have been adjusted as necessary based on the field monitoring of water levels and an evaluation of the contaminant plume. The extraction well pumping rates will be evaluated and optimized to achieve maximum contaminant removal from the aquifer that is within the capacity of the treatment system.

The design flow rate for the extraction wells is 222 gpm. They can operate up to a flow rate of 240 gpm. The current influent flow rate for the treatment system is approximately 220 gpm.

Table 4-2 Extraction Well Design and Typical Flow Rates

Well Number	Design Flow Rate (gpm)	Typical Operation Flow Rate (gpm)
EW-1	75	60
EW-2	75	75
EW-6	77	85
Total	**227**	**220**

Inside the treatment building, pipes from the three extraction terminate at the air stripper. The individual well pipes contain sample ports for process water sampling.

Table 4-3 provides manufacturer name plate data for each of the extraction well pumps.

Table 4-3 Extraction Well Pump Design Data

	EW-1 and EW-2	EW-6
Manufacturer	Grundfos	Grundfos
Model	75S30-5	77S50-8
Size, inches	4	4
Rated flow, gpm	75	77

Table 4-4 provides manufacturer and distributor contact information.

Table 4-4 Extraction Well Pump Manufacturer and Distributor Contact Information

Manufacturer	Grundfos Pump Corporation 17100 West 118th Terrace Olathe, KS 66061 Phone: 913-227-3400 Fax: 913-227-3500
Local Area Representative	NY Pump and Motor Repair 144 Centre Street Brooklyn, NY 11231 Phone: 718-768-8700

The manufacturer's equipment information and O&M manual for the extraction well pumps are contained in Appendix C-1.

4.2 AIR STRIPPER

Ambient air is forced through the process water to remove VOCs within the air stripper. Ambient air is pushed into the air stripper sump by a blower. During the air stripping process, air and water mix vigorously within the air stripper. As a result, VOCs are transferred from the water into the countercurrent air.

The air stripper is a low-profile unit that contains three trays. Each tray contains numerous orifices to allow the water to bubble as it flows downward due to the air coming up through it, which creates a large surface area to allow the VOCs to be stripped out of the groundwater and placed in the air stream. Air stripper design data is provided below in Table 4-5.

After moving through the last tray, the process water enters into the air stripper sump. The air stripper sump water level is monitored by a level element (LE)/transmitter LE/level indicating transmitter. The air stripper discharge pump transfers the process water to the LGAC units for final treatment prior to discharge to Old Mill Pond or to Old Mill Creek.

Table 4-5 Air Stripper Design Data

Manufacturer	Hydro Quip
Model	NEEP Shallow Tray 31231-3553
Number of units	1
Number of trays	3
Maximum liquid flow rate, gpm	400 - 425
Average liquid flow rate, gpm	200 - 250
Sump capacity, gallons	308
Maximum air flow, cfm (manufacturer's design data)	2,700
Operating air flow, cfm	2,340

Note 1: Differential pressure during startup testing was measured at 24 inches water column.
cfm = cubic feet per minute

Table 4-6 provides manufacturer's contact information for the air stripper.

Table 4-6 Air Stripper Manufacturer Contact Information

Equipment Manufacturer	Hydro Quip 108 Pond Street Seekonk, MA 02703 Phone: 508-399-5771 Fax: 508-399-5352

The manufacturer's equipment information and O&M manual for the air stripper is contained in Appendix C-13.

Due to the excessive throttling of the extraction well pumps and the long extraction well header pipe distance, SCADA may sense a low flow or low-pressure alarm for the air stripper unit, just

before the extraction well pump is able to satisfy the flow and pressure set points. It is recommended that the operator quickly reset the alarm to restart the pump, which will allow the set points to be met before the alarm conditions occur again.

Periodically, the operator will inspect the air stripper trays for solids buildup through the inspection ports. If buildup of solids is observed, the treatment system will need to be shut down to allow cleaning of the air stripper trays.

During the warm humid summer months, the water condensation will form on the exterior of the air stripper. The plant operator shall sweep any condensation that has dripped onto the floor into the system sump, to prevent a slip hazard.

4.3 AIR SRIPPER BLOWER

The air stripper blower forces air through the air stripper trays. The blower transfers the VOC-laden air to the VGAC units for treatment prior to being discharged to the atmosphere.

The blower is designed to raise the temperature of the discharge air through the heat of compression. This rise in temperature reduces the relative humidity of the vapor air to approximately 50% relative humidity, which is optimal for carbon adsorption through the VGAC units.

Table 4-7 Air Stripper Blower Design Data

Manufacturer	American Fan Company
Model (motor)	A442B, Frame #245T
Number of units	1
Motor, hp	15
Motor speed, rpm	3,510
Blower fan speed, rpm	3,500
Electrical requirements	3 phase

Note 1: Values from air stripper and blower approved shop drawing.
Note 2: During normal operations, the blower discharge temperature will range from 96 Fahrenheit (F) to 101F.
Hp = horsepower
rpm = revolutions per minute

Table 4-8 provides manufacturer's contact information for the blower.

Table 4-8 Air Stripper Blower Manufacturer Contact Information

Equipment Manufacturer	U.S. Electric Motors 5693 E. Shelby Drive. Memphis, TN 38141 Phone: 800-233-6890
Local Area Representative	Same (stocking distributor)

The manufacturer's equipment information and O&M manual for the blower is contained in Appendix C-13.

4.4 VGAC UNITS

Three VGAC units treat the air stripper off-gas to meet the air permit equivalency limits. Each of the VGAC units contains 2,000 pounds (lbs) of virgin coconut carbon for a total of 6,000 lbs of carbon media. The VGAC carbon media adsorbs the VOCs as the air stream passes through the carbon beds. Each of the VGAC units has differential pressure indicating transmitter to monitor the differential pressure across the carbon vessel.

The VGAC units are operated in series operation (lead/lag configuration). Treated air is discharged into the atmosphere through a 6-inch stack that extends through the roof of the treatment system building.

Table 4-9 Vapor Phase Carbon Media Design Data

Manufacturer	Cabot Norit
Model	Norit Vapure® 410
Mesh size	4 x 10
Material	Coconut Shell
Expected Contaminant Removal, %	≥ 99

Table 4-10 Vapor Phase Carbon Media Replacement Contact Information

Media Replacement Firm	TetraSolv Services 1424 Abraham Drive Anderson, IN 46013 Phone: 765-643-3941

4.5 AIR STRIPPER DISCHARGE PUMP

Process water from the air stripper is pumped through two LGAC units to remove any residual VOC prior to discharge to Old Mill Pond or to Old Mill Pond Creek. The air stripper discharge pump is powered by a variable-frequency drive motor to allow adjustments for the speed of the pump, to maintain the water level in the air stripper sump, and to maintain water flow through the LGAC units.

Table 4-11 Air Stripper Discharge Pump Design Data

Manufacturer	Goulds Pumps
Model	8SH2M52EO
Number of units	1

Capacity (gpm)	425
Motor, hp	15
Electrical requirements	3-phase

Table 4-12 provides manufacturer's contact information for the air stripper discharge pump.

Table 4-12 Air Stripper Discharge Pump Manufacturer Contact Information

Equipment Manufacturer	ITT Goulds Pumps 240 Fall Street Seneca Falls, NY 13148 Phone: 315-568-2811
Local Area Representative	Hayes Pump Inc. 295 Fairfield Avenue. Fairfield, NJ 07004 Phone: 973-808-0606

The manufacturer's equipment information and O&M manual for the air stripper discharge pump are contained in Appendix C-10.

4.6 LGAC UNITS

Two LGAC units treat process water from the air stripper to ensure that the discharge permit equivalency requirements are achieved. The process water enters each LGAC unit through a 6-inch diameter polyvinyl chloride line at the top of the unit and flows down through the carbon media before exiting through a 6-inch line at the bottom of the unit.

Each of the LGAC units contains 2,000 lbs of virgin coconut carbon for a total of 4,000 lbs of carbon media. The carbon media adsorbs VOC as the water passed through each carbon bed. Each of the LGAC units have a differential pressure transducer that monitors the differential pressure across the carbon vessels.

The LGAC units can be operated in parallel or in series. The normal operation of the LGAC units is in series (lead/lag configuration). The treated water is discharged into the aquifer through a 6-inch line that goes to Old Mill Pond or to Old Mill Pond Creek.

Table 4-13 Liquid Phase Carbon Media Design Data

Manufacturer	TetraSolv Services
Model	Stags
Mesh size	12x30
Material	Coconut Shell
Expected Contaminant Removal, %	≥ 99

Table 4-14 Liquid Phase Carbon Media Replacement Contact Information

Media Replacement Firm	TetraSolv Services 1424 Abraham Drive Anderson, IN 46013 Phone: 765-643-3941

The LGAC units also remove particulate matter that may be present in the process water as it passes through the units.

During the warm humid summer months, condensation will form on exterior of the LGAC units. The plant operator shall sweep any condensation that has dripped on to the floor into the treatment system sump to prevent a slip hazard.

4.7 PARTICLE FILTRATION UNITS

The treatment system includes two particle filter units to remove particulate matter from water that is processed by the air stripper. The particle filters prevent the media in the downstream LGAC units from being fouled by particulates. Each unit houses one size 2 bag filter; 10 micron bag filters are used. Typically, the bag filters are replaced once each month.

4.8 PROCESS AREA SUMP PUMP

The process area includes a sump to collect water that is drained from treatment system components for maintenance activities, etc. The sump contains a submersible sump pump to transfer water into the treatment system. Sump Pump characteristics are summarized below in Table 4.15.

Table 4-15 Sump Pump Characteristics

Sump Pump	Wayne Pumps, www.waynepumps.com Model CDU1000 Single Phase Motor 1 hp 120 volts 5,400 gallons per hour capacity
Distributor	MJN True Value 691 Route 25a Miller Place, NY 11764 Phone: 631-821-3567

4.9 DISCHARGE LOCATIONS

After the final treatment of the groundwater in the LGAC units, the effluent is directed to Old Mill Pond, located adjacent to the treatment system building. The effluent can be directed to an

alternate discharge point located on Old Mill Pond Creek, if water levels in Old Mill Pond are too high. The alternate discharge location is approximately 1,200 ft northeast of the treatment system building, at a culvert near Barnum Avenue. The discharge locations are depicted on Figure 1.2.

4.10 PROCESS CONTROL AND OPERATIONS

The facility equipment is primarily monitored and controlled via a control panel located in the control room inside the treatment system building. This panel is equipped with a programmable logic controller (PLC) system to execute automatic control logic and a HMI to display equipment status, alarms, and input/output diagnostics; to enter operational parameters (operating mode [automatic or manual], set points, etc.); to trend data; and to historically log data. The system can be remotely accessed via a secure internet connection.

The color of motors, valves, and level switches indicates their current operating status. For valves and motors, green indicates operational/within the established parameters and gray indicates not operating/outside of established parameters. For the air stripper level switches, blue indicates the water level is rising and black indicates the water level is decreasing. For the pond and creek discharge level switches, green indicates the water level is decreasing and black indicates the water level is rising.

Extraction well pumps are controlled by the water level in the well, the status of the air stripper, and the established flow rate set point on the HMI. The well pumps will turn off if the water level decreases to the established "stop" water level set point, or if the air stripper operation is shut down or disabled by a high water level alarm.

The air stripper and its blower will be operational if any of the extraction well pumps are active and will turn off if all the extraction well pumps are off. The air stripper will shut down if the sump water level decreases to the established "stop" water level set point.

The system will try to discharge to Old Mill Pond and Old Mill Creek simultaneously. If the Old Mill Pond level switch indicates a high water level in the pond, the system will close the pond discharge valve. The air stripper will not discharge water if both of the pond and creek discharge valves are closed.

The manufacturer's equipment information and O&M manuals for instrumentation and controls system items are included in Appendix C.

The Old Mill Pond treatment system has multiple alarms to shut down the treatment process:

- Air Stripper No Air Flow: A no flow issue indicates a blower failure or clogged VGAC units and stops the extraction wells from pumping more contaminated water into the air stripper. A controlled system shutdown will occur if a no flow condition is detected.
- Air Stripper Sump Water High Level: A high water level alarm in the sump indicates an air stripper discharge pump failure or clogging of the particle filter units. A controlled system shutdown will occur if a water high level condition is detected.

4.11 ELECTRICAL DISTRIBUTION

The treatment system receives its power from a single 480-volt feed from Public Service Energy Group (PSEG Long Island). The power is fed to a single motor control center where the power is branched out to the individual loads. The treatment system is not equipped with any alternative power sources to power the treatment system or building.
As-Built drawings "Power Connection #1" and "Power Connection #2" in Appendix A illustrate the power distribution and the power panel schedule.

The site also has telephone and internet communications. The internet is used to remotely monitor the treatment system, and provide a way for the SCADA system to call out to operations personnel when an alarm condition occurs. The telephone communication service is voice over internet protocol, provided by Optimum.

4.12 HEATING, VENTILATION, AND AIR CONDITIONING

The heating system in the treatment system building consists of a geothermal heater. The treatment system building also contains exhaust fans for regulating the building temperature in warm weather.

4.13 POTABLE WATER

Potable water is used for a variety of uses in the treatment building and system. In the treatment building, the potable water system is protected by one reduced pressure zone backflow prevention device. The device prevents contamination of the potable water distribution system by the treatment system if a siphon is created. The primary use of potable water is for the restroom in the treatment building.

4.14 BUILDING AND LANDSCAPING

The treatment system building is approximately 1,800 square feet in area. The treatment building was designed and constructed to match the appearance of buildings in Port Jefferson. The sanitary system is composed of gravity lines. The floor drain in the bathroom discharges to the sanitary system and the floor drain the process room drains to the building sump.

When pumping out the building sump, to increase the flow rate of the building sump pump, the flow from the extraction wells can be temporarily reduced. This will allow the sump pump to increase the amount of water it pumps into the air stripper. After the building sump pump is stopped, the extraction well pumps should be checked and their flow rates may need to be adjusted to ensure that they are pumping at their desired flow rates.

The perimeter fence, locks, and other security items should be checked for integrity and operation. The surrounding vegetation will be kept in a neat and orderly manner to avoid complaints from neighbors and minimize any insect or wildlife issues with the building or the equipment. Specifically, the contractor will:

- Cut brush and weeds in all areas within the site boundaries as necessary to maintain proper working conditions and site appearance, including mowing of all grassed areas a minimum of six times per year within the fence and adjacent to the access road.

- Properly dispose of all litter, cut brush and weeds, and other similar on-site generated waste.
- Immediately repair minor on-site soil erosion within the site fence to prevent major erosion problems.
- Maintain a litter-free site at all times.
- Maintain neat and clean work areas and equipment at all times.
- Keep trash, debris, and rubbish picked up from the floor, walkways, stairways, and passageways.
- Keep walkways free of grease and oil.
- Keep all roads, drives, and parking areas clear and clean; provide repairs to the parking lot and other areas, if damaged.
- Provide snow removal for the parking area and building entrance to afford continuous operations. If required, ice should be physically removed or have salt placed on it to melt the ice to prevent slips and falls.

4.15 ONE-CALL MARKOUTS

The contractor shall be responsible for performing New York One-Call markouts for the underground extraction well headers and the discharge piping in response to markout requests. Operations personnel receive notifications from New York 811 that provide notice of any planned excavation activities in the area of the GWTP or associated buried utilities. Markouts shall be conducted promptly.

5.0 SYSTEM OPERATIONS

This section of this O&M Manual provides guidance on system startup, shutdown, and what actions to complete in case of an emergency. This section also contains guidance for what actions are required to perform a GAC media change out for the VGAC and LGAC units.

5.1 INITIAL CONDITIONS

The following items are assumed to be completed prior to any startup of the treatment system.

- Power is available, and all electrical breakers are in their correct position;
- All valves are in their correct position;
- Potable water is available;
- All machinery safety guards are installed;
- All maintenance and repairs are complete;
- All instrumentation is operating correctly;
- All programming is complete and correct;
- Carbon is loaded into all GAC units; and
- All equipment is ready for operation.

5.2 STARTUP SEQUENCE

During system startup and restart, the system will require a manual restart. This manual startup procedure will involve a series of steps that the PLC will sequence to startup the system. The steps required for the startup of the treatment system include the following:

1. Place the air stripper blower in "Automatic" mode on the HMI.
2. Start the air stripper blower via the HMI.
3. Check the air stripper blower pressure and ensure it is within the normal operating range.
4. Select the lead/lag positioning for each of the GAC units.
5. Place the air stripper discharge pump in "Automatic" mode via the HMI.
6. Start the applicable extraction well pumps through the HMI.
7. Vent the individual extraction well pumps through their manual vents after startup of the individual pump.
8. Check that all pressure and flow indications match expected values for the extraction well pumps and the air stripper blower.
9. Check that the air stripper discharge pump starts and maintain the sump level in the air stripper.

10. Check the differential pressure across all the GAC units to verify the units are not clogged.
11. Check the injection well water level to ensure that the treated water is being injected into the aquifer.
12. Complete operator round sheets and check that all parameters are within their normal expected values.
13. Conduct operational groundwater quality monitoring.
14. Test external communications by triggering a building entry alarm. This should send an alarm notification without affecting the treatment system processes.

5.3 SHUTDOWN SEQUENCE

Shutdown sequences are presented below.

5.3.1 Operator Shutdown

When an operator determines a shutdown is required, the following actions shall be taken.

1. Stop all extraction well pumps via the HMI. Check to ensure all flow rates and pressures from the extraction wells are indicating "zero."
2. After 2 minutes, stop the air stripper discharge pump via the HMI. Check to ensure the water flow rate into the LGAC units is indicating "zero." This will make sure no water is being discharged and that there is no siphoning from the discharge piping into the treatment system.
3. Wait 5 minutes, then stop the air stripper blower via the HMI. Check that the air flow is indicating "zero."

5.3.2 Controlled System Shut Down

When the PLC determines that a controlled system shut down is required, the PLC performs the following actions:

1. Stop all of the extraction well pumps.
2. Stop the air stripper discharge pump.
3. After an operator-adjustable time delay, the air stripper blower will be shut down.

5.3.3 Extended Shut Down

When the treatment system has to be shut down for long period of time (greater than 1 week), an extended shut down procedure needs to be completed:

1. Complete the actions described in Section 5.3.1 or 5.3.2 of this document.
2. Open all electrical power supply breakers to all of the extraction well pumps.
3. Open the electrical power supply breakers to the air stripper discharge pump.

4. Open the electrical power supply breaker for the air stripper blower.
5. Drain the process piping of water to the maximum extent possible by opening and shutting various vent and drain valves.

5.4 SWITCHING TREATMENT PLANT DISCHARGE LOCATIONS

5.4.1 Discharging to the Old Mill Creek

At times, there may be a need to have the treatment system discharge to Old Mill Creek instead of Old Mill Pond. If this need arises, the steps below will be used to direct the system effluent water to the Old Mill Creek.

1. Perform an operator-initiated plant shut down.
    a. Wait for the air stripper blower to automatically stop after its set run time.
    b. Wait for the water in the air stripper trays to migrate into the air stripper sump.
    c. Wait for the air stripper discharge pump to come to the designed stop set level.
2. With the plant shut down, record the values from the Old Mill Pond discharge flow meter totalizer and the Old Mill Creek flow meter totalizer.
3. Close the Old Mill Pond discharge valve.
4. Open the Old Mill Creek discharge valve.
5. Perform normal system startup activities:
    a. Observe that water is flowing to the air stripper and that the air stripper blower started up.
    b. Wait for the air stripper sump level to reach the start set point for the LGAC feed pumps.
    c. With the air stripper discharge pump operating, watch for discharge to Old Mill Creek.
6. Verify that water flow is being recorded by the Old Mill Creek flow meter.
7. Check that no water is going to Old Mill Pond.

The treatment system will continue to treat the water and discharge the effluent to Old Mill Creek.

5.4.2 Discharging to Old Mill Pond

To change the treatment system from Old Mill Creek discharge to Old Mill Pond discharge, follow the steps below:

1. Perform an operator-initiated system shut down.
    a. Wait for the air stripper blower to automatically stop after its set run time.
    b. Wait for the water in the air stripper trays to migrate into the air stripper sump.

   c. Wait for the air stripper discharge pump to come to the designed stop level set point.
2. With the plant shut down, record the values on the Old Mill Pond discharge flow meter totalizer and the Old Mill Creek flow meter totalizer.
3. Close the Old Mill Creek discharge valve.
4. Open the Old Mill Pond discharge valve.
5. Perform normal system startup activities:
   a. Observe water is flowing to the air stripper and that the blower started up.
   b. Wait for the air stripper sump level to reach the start set point for the air stripper discharge pump.
   c. With the air stripper discharge pump operating, watch for discharge to Old Mill Pond.
6. Check that no water flow is going to Old Mill Creek.

The treatment system will be discharging to Old Mill Pond.

5.5 EMERGENCY PROCEDURES

Emergency procedures provided below should be followed in the event of the following circumstances. USACE shall be notified immediately of all incidents and shutdowns.

5.5.1 Equipment Malfunction

During normal operations, the PLC will determine if operational parameters are out of specification based on the set points of the various instruments and the control logic. If the PLC determines that any item is not functioning correctly, it will complete a controlled shut down of the treatment system (please refer to Section 5.3.2). Malfunctioning extraction well pumps will automatically shut down via the low flow alarm or the pump low pressure alarm. The PLC will send automated email messages to system operators reporting the alarm, and operations will remain suspended until the issue is resolved and cleared from the PLC.

System operators who will be notified by automated email messages currently include USACE personnel and HGL operators.

5.5.2 Spill

The treatment system building includes a sump that is equipped with a high level float switch. In the event of a liquid spill within the O&M building, liquid will collect within the sump. If the high level float switch is triggered, the PLC will complete a controlled shut down of the treatment system. The PLC will send automated email messages to system operators reporting the alarm, and operations will remain suspended until the issue is resolved and cleared from the PLC. A spill may occur due to errors associated with automated controls for pumping rates, air stripper sump level, or may result from damage to system equipment or piping.

5.5.3 Power Failure

In the event of power loss to the treatment system building, treatment plant operations will cease, and the PLC will send automated email messages to system operators reporting the alarm. Operations will remain suspended until power is restored and the system is restarted from the PLC.

5.5.4 Manual Shutdown

In the event of an emergency observed by the operator, which does not trigger a controlled shutdown, the facility will be shut down manually by one of two methods: 1) an operator-initiated shutdown at the HMI performed in accordance with Section 5.3.1; or 2) an emergency shut down at the main breaker switch.

If at any time, the operator observes an emergency, becomes aware of a hazard to personnel, or believes that a piece of equipment is not operating correctly, they should shut down the treatment system. System shut down at the HMI will be performed in accordance with Section 5.3.1, if time allows and the operator can safely access the HMI. Alternately, if time or hazardous conditions do not allow the operator to shut down the facility through the HMI, the operator will go to the main breaker switch in the control room and flip the switch to the "off" position.

5.5.5 Evacuation

Depending on the emergency, personnel may need to evacuate the facility. Personnel should evacuate the facility and perform a head count of personnel that were on site at the time of the emergency. Personnel will gather at the dirt and gravel vacant lot that is located north of the site, at the intersection of Brook Road and West Broadway. Personnel will contact appropriate emergency response personnel as described herein and in the site-specific APP.

5.5.6 Emergency Contact Information and Hospital Location

In the event of a situation or unplanned occurrence requiring assistance, the appropriate contact(s) should be made from the following list:

Table 5-1 Emergency Contact Information

Emergency Contact	Phone Number(s)
Fire/Police/Ambulance/Paramedics - Emergency	911
Emergency Hospital: St. Charles Hospital 200 Belle Terre Road, Port Jefferson, NY 11777	631-474-6000
Poison Control Center	800-222-1222
National Response Center (All spills in reportable quantities)	800-424-8802
NYSDEC Spill Control	800-457-7362
USEPA Remedial Project Manager Maria Jon	212-637-3967

Emergency Contact	Phone Number(s)
USACE KC District Project Manager Jason L'Ecuyer	816-389-3908
USACE KC District Engineer Thomas Zelesky	816-389-3919
USACE NY District Project Engineer/COR Shewen Bian	917-790-6251
USACE NY District Project Manager Rich Gajdek	917-790-8234
USACE Project Engineer/COR Alternate Mike Ortega	917-790-6252
USACE NY Project Manager Kinjal Shah	917-790-8233
HGL 24/7 Emergency Number	800-341-3647
Program Manager Lisa Tholl	913-378-2318
Project Manager Pete Dacyk	518-877-0390
Superintendent/Alternate SSHO James Russell	609-774-4212
Corporate H&S Director/Safety and Health Manager Steve Davis, CSP, CIH	865-659-0499
WorkCare 24/7 Incident Intervention service (First aid and injury management guidance)	888-449-7787

NYSDEC = New York State Department of Environmental Conservation

The nearest hospital is St. Charles Hospital, which is located at 200 Belle Terre Road, Port Jefferson, New York. A map and directions to the hospital are provided in Appendix E and are posted in the treatment system building control room. General first aid equipment is provided on site; however, please seek immediate medical assistance, if necessary.

When the cause of the emergency situation has been determined and repaired or corrected, then the operator may restart operations at the facility using the process designated within this document.

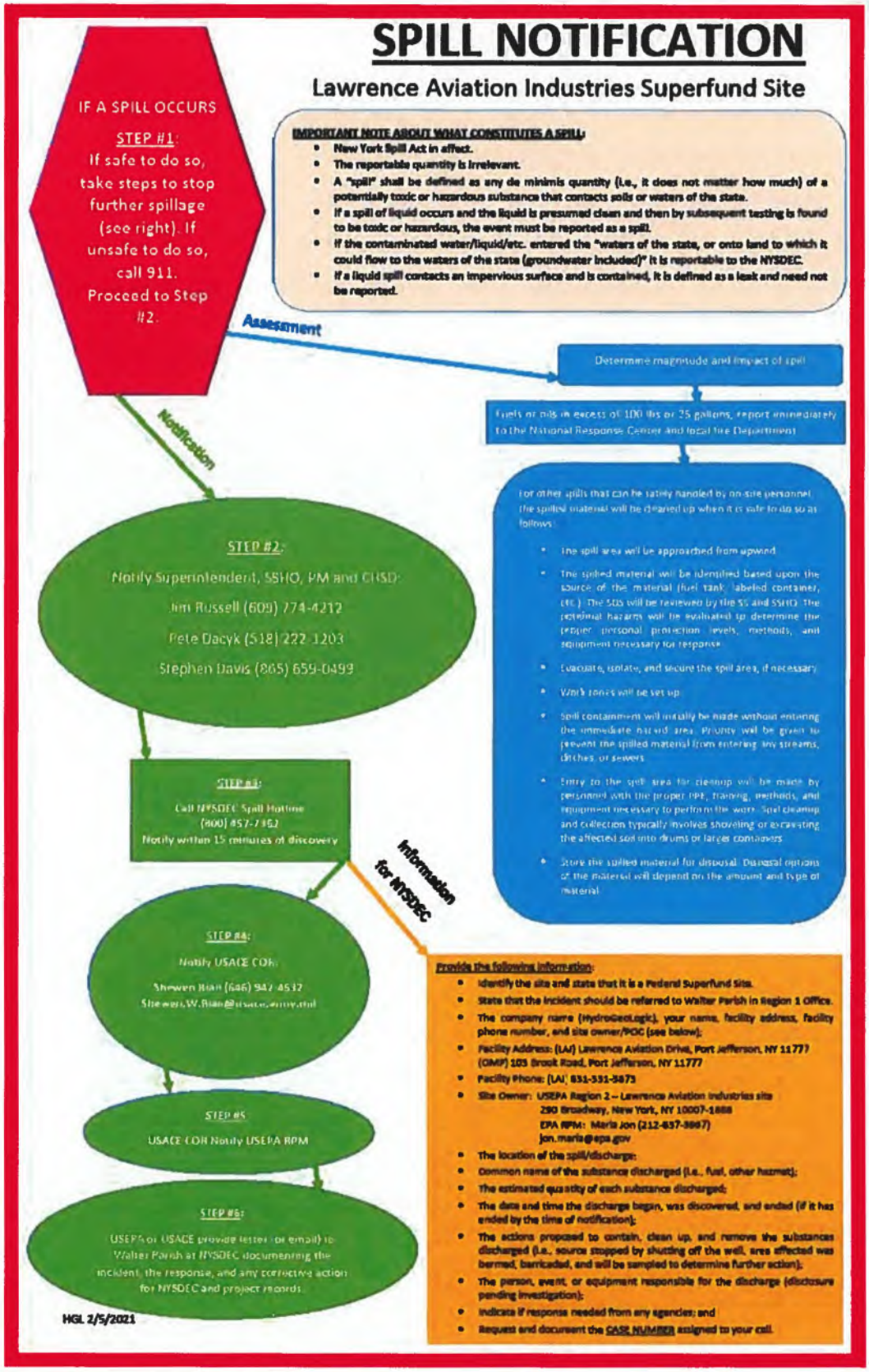
5.5.7 Reporting Permit Non-Compliance, Chemical Spills, and Release of Contaminants to Groundwater

In the event of permit non-compliance, injection well malfunction, or other catastrophic failure of the treatment system, the NYSDEC needs to be notified of the event by calling 1-800-457-7362. NYSDEC must be notified within 2 hours of the commencement of the discharge or of becoming aware of the discharge in the event of permit non-compliance. All information that is provided during the phone call should be recorded in the facility log book. In addition, USACE

will be orally notified as soon as possible, but no later than 24 hours of the event. Written notification will be provided to USACE and USEPA within 72 hours of the event.
Notifications should contain the following information:

- Chemical name (whether the material is extremely hazardous or a Comprehensive Environmental Response, Compensation and Liability Act substance);
- Exact (if known) or estimated quantity of release;
- Time and duration of incident;
- Medium or media into which the release occurred;
- Any known or anticipated health effects and advice regarding medical attention, precautions taken as a result of the release; and
- Name and phone number of the person who may be contacted for further information.

Release notification must be done immediately. If a facility operator fails to report a release, he or she may be subject to penalties. Written follow-up notifications should be submitted no later than 30 days following the release incident. The actual telephone release notification(s) should be made as described above.


SPILL NOTIFICATION
Lawrence Aviation Industries Superfund Site
IF A SPILL OCCURS
STEP #1:
If safe to do so, take steps to stop further spillage (see right). If unsafe to do so, call 911. Proceed to Step #2.
IMPORTANT NOTE ABOUT WHAT CONSTITUTES A SPILL:
New York Spill Act in effect.
The reportable quantity is irrelevant.
A "spill" shall be defined as any de minimis quantity (i.e., it does not matter how much) of a potentially toxic or hazardous substance that contacts soils or waters of the state.
If a spill of liquid occurs and the liquid is presumed clean and then by subsequent testing is found to be toxic or hazardous, the event must be reported as a spill.
If the contaminated water/liquid/etc. entered the "waters of the state, or onto land to which it could flow to the waters of the state (groundwater included)" it is reportable to the NYSDEC.
If a liquid spill contacts an impervious surface and is contained, it is defined as a leak and need not be reported.
Assessment
Determine magnitude and impact of spill
Fuels or oils in excess of 100 lbs or 25 gallons, report immediately to the National Response Center and local fire Department
Notification
STEP #2:
Notify Superintendent, SSHO, PM and CHSD:
Jim Russell (609) 774-4212
Pete Dacyk (518) 222-1203
Stephen Davis (865) 659-0499
For other spills that can be safely handled by on-site personnel, the spilled material will be cleaned up when it is safe to do so as follows:
The spill area will be approached from upwind.
The spilled material will be identified based upon the source of the material (fuel tank, labeled container, etc.). The SDS will be reviewed by the SS and SSHO. The potential hazards will be evaluated to determine the proper personal protection levels, methods, and equipment necessary for response.
Evacuate, isolate, and secure the spill area, if necessary.
Work zones will be set up.
Spill containment will initially be made without entering the immediate hazard area. Priority will be given to prevent the spilled material from entering any streams, ditches, or sewers.
Entry to the spill area for cleanup will be made by personnel with the proper PPE, training, methods, and equipment necessary to perform the work. Spill cleanup and collection typically involves shoveling or excavating the affected soil into drums or large containers.
Store the spilled material for disposal. Disposal options of the material will depend on the amount and type of material.
STEP #3:
Call NYSDEC Spill Hotline
(800) 457-7362
Notify within 15 minutes of discovery
Information for NYSDEC
Provide the following information:
Identify the site and state that it is a Federal Superfund Site.
State that the incident should be referred to Walter Parish in Region 1 Office.
The company name (HydroGeoLogic), your name, facility address, facility phone number, and site owner/POC (see below);
Facility Address: (LAI) Lawrence Aviation Drive, Port Jefferson, NY 11777 (OMP) 105 Brook Road, Port Jefferson, NY 11777
Facility Phone: (LAI) 631-331-5873
Site Owner: USEPA Region 2 – Lawrence Aviation Industries site
290 Broadway, New York, NY 10007-1866
EPA RPM: Maria Jon (212-637-3867)
jon.maria@epa.gov
The location of the spill/discharge;
Common name of the substance discharged (i.e., fuel, other hazmat);
The estimated quantity of each substance discharged;
The date and time the discharge began, was discovered, and ended (if it has ended by the time of notification);
The actions proposed to contain, clean up, and remove the substances discharged (i.e., source stopped by shutting off the well, area affected was bermed, barricaded, and will be sampled to determine further action);
The person, event, or equipment responsible for the discharge (disclosure pending investigation);
Indicate if response needed from any agencies; and
Request and document the CASE NUMBER assigned to your call.
STEP #4:
Notify USACE COR:
Shawen Bian (646) 947-4537
Shawen.W.Bian@usace.army.mil
STEP #5
USACE COR Notify USEPA RPM
STEP #6:
USEPA or USACE provide letter (or email) to Walter Parish at NYSDEC documenting the incident, the response, and any corrective action for NYSDEC and project records.
HGL 2/5/2021

5.6 CARBON CHANGE OUT EVENTS

5.6.1 VGAC

The Old Mill Pond treatment system has three VGAC units that operate in a lead/lag/lag arrangement. Monthly process air sampling results are used to determine when a carbon change out event is required. VGAC media change out events are scheduled when the VOC removal for one or more units begins to decrease significantly. The media in multiple VGAC units can be replaced during a change out event. VOC concentrations are field monitored weekly with a photo-ionization detection (PID) to provide additional data.

The procedure for completing a VGAC media change out for the lead VGAC unit is provided below:

1. Shut down the treatment system.
2. Lockout/tagout the lead VGAC unit following all applicable local, state, and Federal laws.
3. Open the access hatches to the lead VGAC unit.
    a. Prior to opening the GAC unit, staff must wear all appropriate personal protective equipment (PPE) as required by the VGAC Safety Data Sheets (SDS).
4. Use a vacuum truck or other piece of equipment, carefully remove the spent VGAC media and place it in appropriate containers that are United Nations/Department of Transportation approved for transportation to an off-site regeneration facility. Note: Verify USEPA Off-Site Rule (OSR) procedures have been followed (the contractor has submitted regeneration facility information to USEPA OSR personnel and received approval).
5. Label the spent VGAC media containers and include a non-hazardous manifest for proper documentation of the shipment.
6. Use a flash light to inspect the interior of the VGAC unit. Ensure all of the air distribution manifolds are installed and are not damaged.
    a. If damage is observed, implement confined space entry procedures, including having an entrant and attendant/supervisor on site, conduct air monitoring within the VGAC unit, and perform a confined space entry to repair or replace air distribution manifolds as necessary.
7. Using an appropriate method, place 2,000 lbs of fresh, reactivated VGAC media into the vessel. Be certain to exercise caution while installing the fresh media, to avoid damaging the air distribution manifolds within the VGAC unit.
8. Shut and tighten all access hatches.
9. Start the air stripper blower in "Manual" mode and inspect all of the VGAC hatches for leaks using soap bubbles to check for air leaks.
    a. Record the differential pressure across each of the lead and lag VGAC units.
    b. Address any leaks that may have been found prior to system start up.

10. Stop the air stripper blower and place it in "Automatic" control mode at the operator interface terminal.
11. Start the treatment system.

5.6.2 LGAC

A carbon change out event is required when 75% or more of the influent TCE concentration breaks through the lead carbon unit. When breakthrough is approaching, a subcontractor should be scheduled to replace the spent LGAC media with fresh virgin LGAC media. Also, if any effluent sample at any time exceed permitted discharge limits, the treatment system will be shut down and the LGAC will be replaced. The procedure for completing a LGAC media change out event for the lead LGAC unit is provided below.

1. One week before the scheduled change out event, isolate the lead LGAC unit by changing the process water valve positions to route process water through the lag LGAC unit. Lockout/tagout the lead LGAC unit following all applicable local, state, and Federal laws.
2. Allow water to drain from the lead LGAC unit for one to several days. Open the access hatches to the lead LGAC, if desired, to facilitate the water draining.
3. Prior to beginning the change out activities on the day of the event, staff must wear appropriate PPE as required by the LGAC SDS.
4. Using a vacuum truck or other piece of equipment, carefully remove the spent LGAC and place it in appropriate containers that are United Nations/Department of Transportation approved for transportation to an off-site regeneration facility. Note: Verify USEPA OSR procedures have been followed (the contractor has submitted regeneration facility information to USEPA OSR personnel and received approval).
    a. If the LGAC media is difficult to remove, implement confined space entry procedures, including having an entrant and attendant/supervisor on site, conduct air monitoring within the LGAC unit, and perform a confined space entry. Use hand tools such as hammers and shovels to break up the LGAC media so it can be removed. Exercise caution to avoid damaging the water distribution manifold.
5. Label the spent LGAC containers and include a non-hazardous manifest for proper documentation of the shipment.
6. Use a flash light to inspect the interior of the LGAC unit. Ensure that all water distribution manifold and media retention screens are installed and not damaged.
    a. If damage is observed, perform a confined space entry to repair or replace distribution manifold pieces as necessary.
7. Fill one third of the unit with water before placing fresh media in the unit. The water will act as a buffer for the distribution manifold. Place 2,000 lbs of fresh, virgin LGAC media into the vessel in accordance with the vendor's O&M manual.
8. Shut and tighten all access hatches.

9. Change process water piping valve positions to change the lead LGAC unit position into the lag position. The former lag LGAC unit containing relatively older LGAC media will be changed to the lead position.
10. Start the treatment system.
    a. Record the differential pressure across each LGAC unit.

This page was intentionally left blank.

6.0 INSPECTIONS AND MAINTENANCE

The treatment system requires periodic monitoring, inspections, and maintenance to detect any electrical, mechanical, or process issues that may affect the performance of the treatment system. The goal of the contractor's monitoring, inspection, and maintenance program will be to achieve a minimum operational readiness rate of 90%. The readiness rate is defined as the number of fully capable operational days divided by number of available operational days in any particular month. If the readiness rate drops below 90%, the contractor will submit in writing to the Government recommended actions to improve operations. Actions may include additional spare parts or maintenance of equipment, equipment improvements, additional operations or maintenance training, and/or revised operating procedures.

6.1 SYSTEM INSPECTIONS AND MONITORING

The physical inspection and review of equipment and operating parameters will be performed during each operator visit (a minimum of once per week). Inspections will include, at a minimum, visual observations that all equipment is working as intended and that no leaks are observed in any treatment equipment or piping. During the inspections, the operator will collect operational parameter readings from the treatment system and note any abnormalities that are observed.

The treatment system also will be monitored by obtaining water and vapor samples at several locations through the treatment train to determine the treatment efficiency; confirm that the system is operating in accordance with the requirements of the permits and equivalencies; and to estimate the frequency of carbon change out events. The system sampling and monitoring is described in Section 7.2.

6.2 SYSTEM MAINTENANCE

The treatment system equipment requires periodic maintenance to achieve the required system readiness rate and to ensure that the equipment is able to operate at its design capacity for long periods of time. Maintenance activities include:

- Routine maintenance including lubrication, belt tensioning, adjustment of pump packing glands, and routine adjustments;
- Preventive maintenance including inspection, cleaning, lubrication, adjustment, calibration, and minor part and component replacement (e.g., filters, hoses, oil, and grease) as required to minimize malfunctions, breakdown, and deterioration of equipment; and
- Corrective maintenance and repair work that is required to return a system or component to its proper operating condition, including overhauling, reprocessing, or replacing parts or materials that have deteriorated by action of the elements or usage and have not been addressed through preventative maintenance.

An inventory of spare parts, tools, and materials will be maintained on site as necessary to operate the system in accordance with equipment manufacturers' information, including health

and safety supplies, personnel protection equipment, and first aid supplies. The contractor will replenish the spare parts, tools, and materials inventory as parts and materials are used for maintenance and will keep the inventory up-to-date and fully stocked.

Equipment and materials warranties are included in Appendix C. The contractor will operate and maintain all equipment, systems, processes, and appurtenances in accordance with the manufacturers' recommendations to ensure that the warranties or guarantees are not voided. Corrective maintenance performed by suppliers, manufacturers or subcontractors on warranted equipment, components, materials or workmanship will be coordinated by the contractor with the Government and supplier, subcontractor, or manufacturer. Corrective maintenance involving replacement due to normal failure of equipment and materials not under warranty will be performed by the contractor utilizing the on-site maintenance staff to the greatest extent possible.

The contractor will characterize, dispose, and handle all debris and waste generated by the treatment system O&M activities and sampling events, including the off-site regeneration of spent carbon. If site waste is characterized as hazardous waste, it shall be handed in accordance with the accumulation and storage requirements of a Small Quantity Generator. All hazardous waste will be disposed at USEPA-approved disposal facilities in accordance with OSR procedures. General refuse will be picked up as part of the normal neighborhood collection service.

7.0 SAMPLING AND MONITORING ACTIVITIES

This section provides an overview of the sampling and monitoring activities that have been developed to monitor the performance of the treatment system and compliance with permit requirements. All sampling activities will be performed in accordance with the UFP-QAPP (HGL, 2021a) and site permit equivalencies. Site permit equivalencies are provided in Appendix B.

7.1 SITE-WIDE GROUNDWATER MONITORING

The groundwater monitoring program includes the collection of groundwater samples and groundwater level data from site-wide monitoring wells. The wells will be sampled on an annual basis to evaluate the reduction in groundwater contaminant concentrations. The list of long-term monitoring wells to be sampled and analytical parameters is provided in Appendix F. The sampling locations are shown on Figure 1.1.

Table 7-1 Site-Wide Groundwater Monitoring Schedule

Location	Frequency	Medium	Monitoring Required
Extraction wells: EW-1, EW-2, EW-4, EW-5, and EW-6	Annual	Water	VOCs, metals, and wet chemistry parameters (alkalinity, sulfate, hardness, chloride, fluoride, total Kjeldahl nitrogen, total organic carbon, total suspended solids, total dissolved solids, and ammonia) In addition to the above-referenced parameters, EW-1, EW-2, and EW-6 are monitored for 1,4-dioxane.
Long-term monitoring wells*	Annual	Water	VOCs, metals, and wet chemistry parameters (alkalinity, sulfate, hardness, chloride, fluoride, total Kheljal nitrogen, total organic carbon, total suspended solids, total dissolved solids, and ammonia) In addition to the above-referenced parameters, select wells are monitored for 1,4-dioxane.
Long-term monitoring wells*	Annual**	Water	Synoptic water levels

*See Appendix F for a list of wells.
** To coincide with the groundwater sampling events.

7.2 PERFORMANCE AND COMPLIANCE MONITORING

Performance and compliance sampling and monitoring will be performed to confirm that the treatment system is operating as intended and the permit discharge criteria are being met. A

summary of the performance and compliance sampling and monitoring is summarized below. Analytical detection limits must be sufficiently low to achieve the applicable permit limits.

Table 7-2 Treatment System Performance and Compliance Monitoring Schedule

Equipment	Purpose	Frequency	Medium	Analytical Required
Treatment System Discharge				
Treated Water Effluent to Old Mill Pond or Old Mill Pond Creek	Compliance: NYSPDES	Monthly	Water	Select VOCs, select metals (total), pH (field parameter)
Treated Air Effluent	Compliance: Air Permit Equivalent	Weekly	Air	Total VOCs using PID
Treated Air Effluent	Compliance: Permit Equivalent	Monthly	Air	Grab sample VOCs (Summa canister)
VGAC				
Influent VGAC	Performance	Weekly	Air	Total VOCs using PID
Effluent VGAC	Compliance	Weekly	Air	Total VOCs using PID
VGAC Post Lead Unit	Performance	Weekly	Air	Total VOCs using PID
VGAC Post Second Unit	Performance	Weekly	Air	Total VOCs using PID
Extraction Wells				
EW-1, EW-2, and EW-6	Performance	Monthly	Water	Select VOCs, select metals (total)
Air Stripper				
Air Stripper Effluent	Performance	Monthly	Water	Select VOCs, select metals (total)
LGAC Discharge				
LGAC Mid-Train	Performance	Monthly	Water	Select VOCs, select metals (total)

8.0 RECORD KEEPING AND REPORTING

Records documenting the O&M of the treatment system will be maintained electronically (SCADA system) and via physical records (visual site inspection, and maintenance logs and log books). A regular backup schedule will be employed to prevent inadvertent loss of electronic data. The records will be retained as hard copies on site and electronically as scanned copies. Site inspection and maintenance logs will be completed during the weekly routine site inspections, and during emergency site inspections (e.g., following a system shutdown) to document system operation and maintenance activities.

8.1 PROGRESS AND STATUS REPORTS

Monthly Progress Reports and Annual Groundwater Sampling Reports will be prepared and submitted to the Government to aid in tracking system performance and effectiveness in achieving the RAOs. The Monthly Progress Reports will describe treatment system operations and will be submitted to the Government by the 15th day of the following month (pending receipt of data from the laboratory). The progress reports will include, but not be limited to, discussions of the following items:

- Health and safety (H&S) activities, including safety hours (hours on site) status, H&S problems encountered, safety instruction, accidents, corrective actions, and any deficiencies noted during routine inspections;
- A description of all O&M activities that occurred;
- Total water and air volumes treated and estimates for contaminant mass removed in each unit process per month, and total removal to date;
- Readiness rate determined by fully capable operational days divided by available operational days in the reporting period;
- A summary of performance and compliance sampling, analytical results, problems, and corrective actions;
- A summary of data logged by the PLC per month;
- Carbon use per month, to date, and projection for the timing of the next change out;
- If used, chemical consumption per month, to date, and projection for next month, including quantities and cost to contractor;
- Updated O&M logs;
- Identification of problems, suggested correction actions, and activities performed by the contractor to correct the problem;
- Planned activities and schedule for significant operations, maintenance, laboratory, and administrative activities to be performed; and
- All other factors that affect the operation, maintenance, and management of the treatment system.

Annual Groundwater Sampling Reports will be prepared upon receipt of annual sampling event data, in accordance with the guidance USEPA 542-R-05-010 O&M Report Template for Groundwater Remedies. The report will generally include, but not be limited to:

- Proposed changes to standard operating procedures for unit process items that maximize performance and minimize chemical usage, energy requirements, etc.
- A summary of the groundwater monitoring data to evaluate the effectiveness of the groundwater remedy, including statistical trends and a comparison to the site cleanup goals.
- A summary of the groundwater monitoring well inventory and recommended repairs, if needed.
- The "remedy progress" section of the annual report will summarize remedy progress with respect to the system goals and will include the following:
    - A brief summary of the groundwater extraction and treatment system goals;
    - A discussion of data collected during the reporting period (e.g., water levels, groundwater concentrations, etc.) and whether the data is consistent or inconsistent with expectations and/or previous data (if not, include a brief description of the difference);
    - A description of whether the short-term remedy goals are being met, based on an interpretation of data collected and implementation of institutional controls;
    - A description of whether longer-term remedy goals are being met or when they will likely be met, based on an interpretation of data collected and implementation of institutional controls; and
    - A discussion of new inconsistencies or gaps in the current "site conceptual model," if any have been identified based on an interpretation of O&M data, and whether or not the site conceptual model has been updated accordingly.
- The "proposed modifications" section of the Annual Groundwater Sampling Report will present modifications to the groundwater remedy and long-term monitoring program for consideration by stakeholders. It will include the following:
    - A brief description of any such recommendations; and
    - The details of recommended modifications, including the rationale behind those recommendations, and estimated costs and/or savings associated with the recommendations.

8.2 COMPLIANCE REPORTING

Monthly reports shall be prepared for each period the Old Mill Pond treatment system is operational. Reports are submitted to USACE.

9.0 GOVERNMENT PROPERTY

One of the contractor's duties is to maintain a list of Government property that is present at the site. The current Government property list is provided in Appendix G.

During the course of normal treatment system operations, various equipment may be imported or exported from the Old Mill Pond treatment system building based on needs and goals of USACE or USEPA. Proper tracking of equipment transfer involves organized recordkeeping practices. When transferring any equipment to the job site or away from the job site, a transfer form must be completed and signed off on by a USACE representative. A copy of all transfer forms will be maintained on file at the site in the control room filing system. A standard form used to document inventory transfers to other Government-owned sites is presented in Appendix H.

This page was intentionally left blank.

10.0 HEALTH AND SAFETY

The Contractor is responsible for all aspects of H&S associated with O&M activities, including safety of lower-tier subcontractors in accordance with project specification section 01 35 26 - Safety, Health, and Emergency Response. All work will be performed in accordance with the APP and the Activity Hazard Analysis forms that have been prepared and submitted for site activities. The contractor will:

- Maintain up-to-date H&S records for all on-site personnel;
- Inform the Government of all near misses, incidents, on-site accidents, and related claims;
- Provide all necessary personal protective equipment for the contractor personnel prior to proceeding with the work;
- Provide hard hats, safety glasses, reflective vests, and hearing protection to Government personnel and other visitors; and
- Show proper Occupational Safety and Health Administration (OSHA)-approved 40-hour H&S training and subsequent 8-hour refreshers for all workers associated with any activity that may be exposed to contaminated materials.

A H&S Checklist is provided in Appendix D for guidance on the number and type of equipment that is housed within the treatment system building. SDSs are included in the hazardous communications binder, which is located on site. SDS for new materials that are brought on site will be added to binder. The SDS binder will be reviewed for accuracy a minimum of once per year to ensure that all required information is included.

10.1 HAZARDS

During normal O&M of the treatment system, operators will be exposed to the following hazards:

- **Process Equipment and Electrical Components-** Operators should be aware of all the potential physical hazards associated with the use of motorized equipment (e.g., pumps and blowers) and electrical equipment (e.g., electrical panels, motors, instrumentation, and wiring) during the operation of the treatment system components.
- **Heavy Equipment-** Operators must be aware of the potential physical hazards associated with the use of heavy equipment (such as vacuum trucks) during the O&M of the treatment system.
- **Slip/Trips/Falls-** Significant slip/trip/fall hazards exist within in the treatment system building. This includes piping, vaults, equipment skids, secondary containment berms, and outdoor components of the groundwater extraction and treatment system.
- **Chemical Vapors-**Volatile organic vapors may be released from process equipment and piping due to leaks. These vapors could potentially accumulate within the process building at unsafe levels.

- **Hazardous Energy-** All maintenance and repairs that are completed for the treatment system must be compliant with the OSHA standard for The Control of Hazardous Energy (Lockout/Tagout) (29 Code of Federal Regulations [CFR] 1910.147). Hazardous energy includes pressurized fluids, gases, compressed springs, and electrical equipment as examples. Controlling hazardous energy includes removing the energy by depressurizing piping and removing electrical power from components and completing a full and proper lockout/tagout of the components. Prior to any work being completed, staff should test their lockout/tagout boundaries to ensure the hazardous energy is removed. If the isolations do not remove all of the hazardous energy, or the component must be operational to troubleshoot or repair, notify supervisors and only qualified personnel should conduct the repairs or troubleshooting.
- **Confined Space Entry-** The VGAC and LGAC vessels are considered permit required confined spaces. Although it is highly unlikely that the vessels will need to be entered, whenever operators are required to enter the spaces, confined space procedures must be followed. This includes initial and continuous monitoring of the atmosphere inside the spaces prior to and during entry.
- **Ladder Safety-** Operators must utilize proper ladder safety procedures when using fixed and portable ladders. Portable ladders must be secured to a fixed surface that will support more than the anticipated total load. When climbing or descending a ladder, personnel must face the ladder and maintain three points of contact at all times.
- **Elevated Work Locations and Fall Protection-** Work performed at heights greater than 6 feet where a fall hazard exists requires fall protection. Fall protection may include guardrails, safety nets, or personal fall arrest systems. Fall protection must be used in accordance with the OSHA Standard for Fall Protection (29 CFR 1926 Subpart M). Operators should not use fall arrest equipment until they have been properly trained.
- **Pressurized Equipment-** Pressurized conditions resulting from pump and blower operations are regulated under normal conditions by process control equipment. Any observed leaks within piping or loose components of equipment should be immediately repaired to prevent spills or pressurized releases. Routine equipment and piping inspections should be performed as preventative measures to minimize hazards that may result from pressurized releases. Operators must wear appropriate PPE at all times.
- **Noise-** Noise (decibel) levels inside the process area can be expected to exceed OSHA permissible exposure limits. It is recommended that hearing protection be used whenever personnel will be inside the process area within the treatment system building.
- **PPE-** Operators must wear all appropriate PPE before entering the treatment system building and the extraction vaults. As a minimum, nitrile gloves, safety glasses, hard hat, hearing protection, and steel toe shoes should be worn or used.

All activities that are conducted on site must be compliant with all local, state, and Federal rules and regulations. Examples of such activities include ladder use and working in confined spaces.

Health and safety information including the hospital map and directions, emergency contact list, safety checklists, and regulatory postings are posted in the treatment plant control room.

The nearest hospital is St. Charles Hospital, located at 200 Belle Terre Road, Port Jefferson, New York. General first aid equipment is provided on site; however, please seek immediate medical assistance if necessary. USACE must be notified immediately via e-mail or phone of all safety incidents. An emergency contact list is provided in Section 5.5.6.

In the event of treatment system-related emergencies, emergency shutdown procedures will be conducted in accordance with Section 5.5.

This page was intentionally left blank.

11.0 REFERENCES

Franke, O.L., and McClymonds, N.E., 1972. *Summary of the Hydrologic Situation on Long Island, New York, as a Guide to Water-Management Alternatives.* Geological Survey Professional Paper 627-F.

HydroGeoLogic, Inc. (HGL), 2020c. *Staffing Plan, Lawrence Aviation Industries Superfund Site Operable Unit 1, Long-Term Remedial Action, Port Jefferson, New York.* December.

HGL, 2020b. *Contractor Quality Control Plan, Lawrence Aviation Industries Superfund Site Operable Unit 1, Long-Term Remedial Action, Port Jefferson, New York.* October.

HGL, 2020a. *Environmental Protection Plan, Lawrence Aviation Industries Superfund Site Operable Unit 1, Long-Term Remedial Action, Port Jefferson, New York.* October.

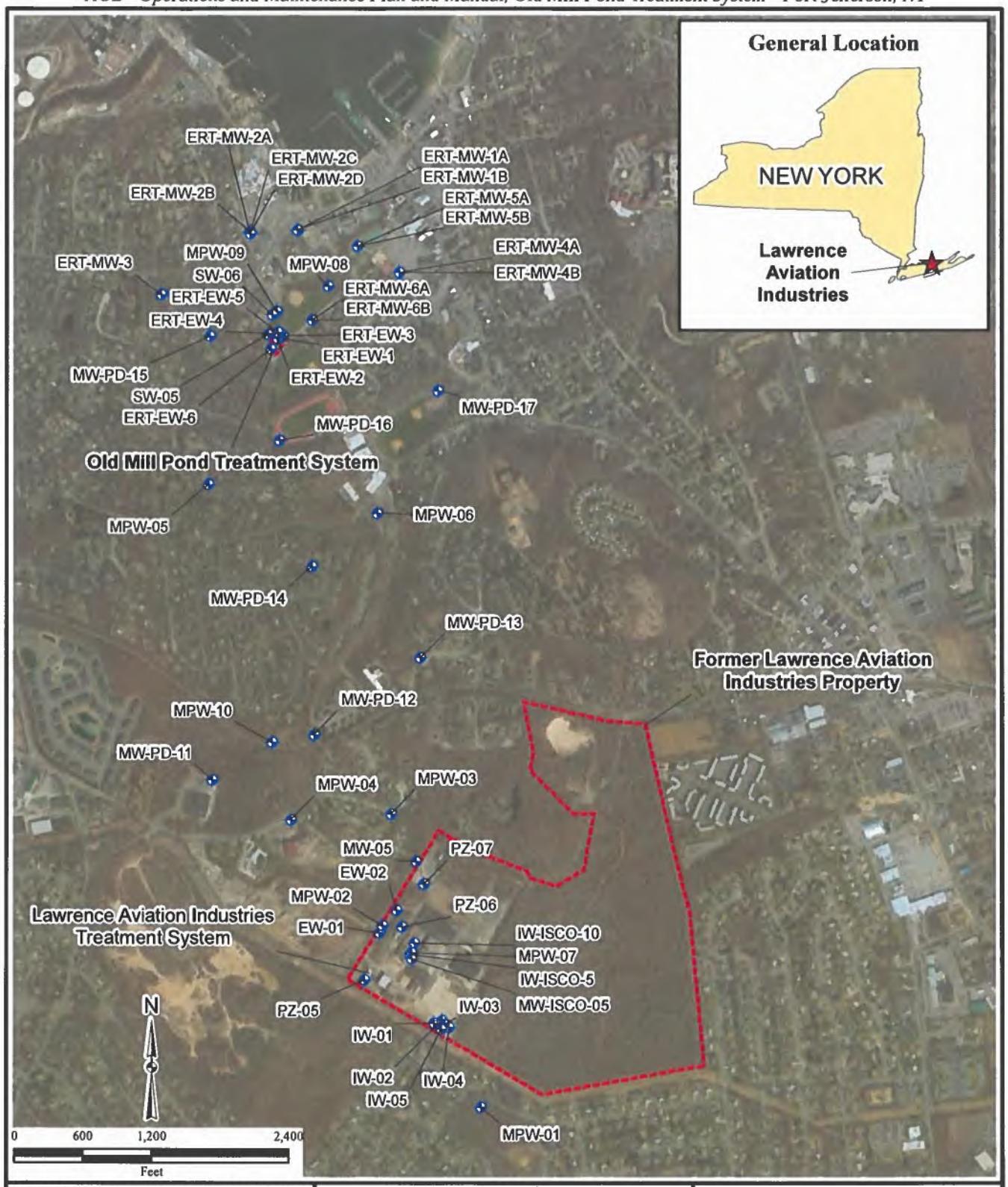
HGL, 2021a. *Project-Specific Uniform Federal Policy Quality Assurance Project Plan, Lawrence Aviation Industries Superfund Site Operable Unit 1, Long-Term Remedial Action, Port Jefferson, New York.* January.

HGL, 2021b. *Accident Prevention Plan, Lawrence Aviation Industries Superfund Site Operable Unit 1, Long-Term Remedial Action, Port Jefferson, New York.* January.

Koszalka, E.J., 1984. *Geohydrology of the northern part of the Town of Brookhaven, Suffolk County, New York.* USGS Water-Resources Investigations Report 83-4042.

This page was intentionally left blank.

FIGURES



\\Srv-gst-01\hglgis\Lawrence_Aviation_K13006_MSIW\OMPM\(1-1)Site_Location.mxd
2/1/2021 TH
Source: HGL, HDR, ESRI
ArcGIS Online Imagery

Legend

- Monitoring Well
- Site Location
- Site Boundary

Figure 1.1
Site Location

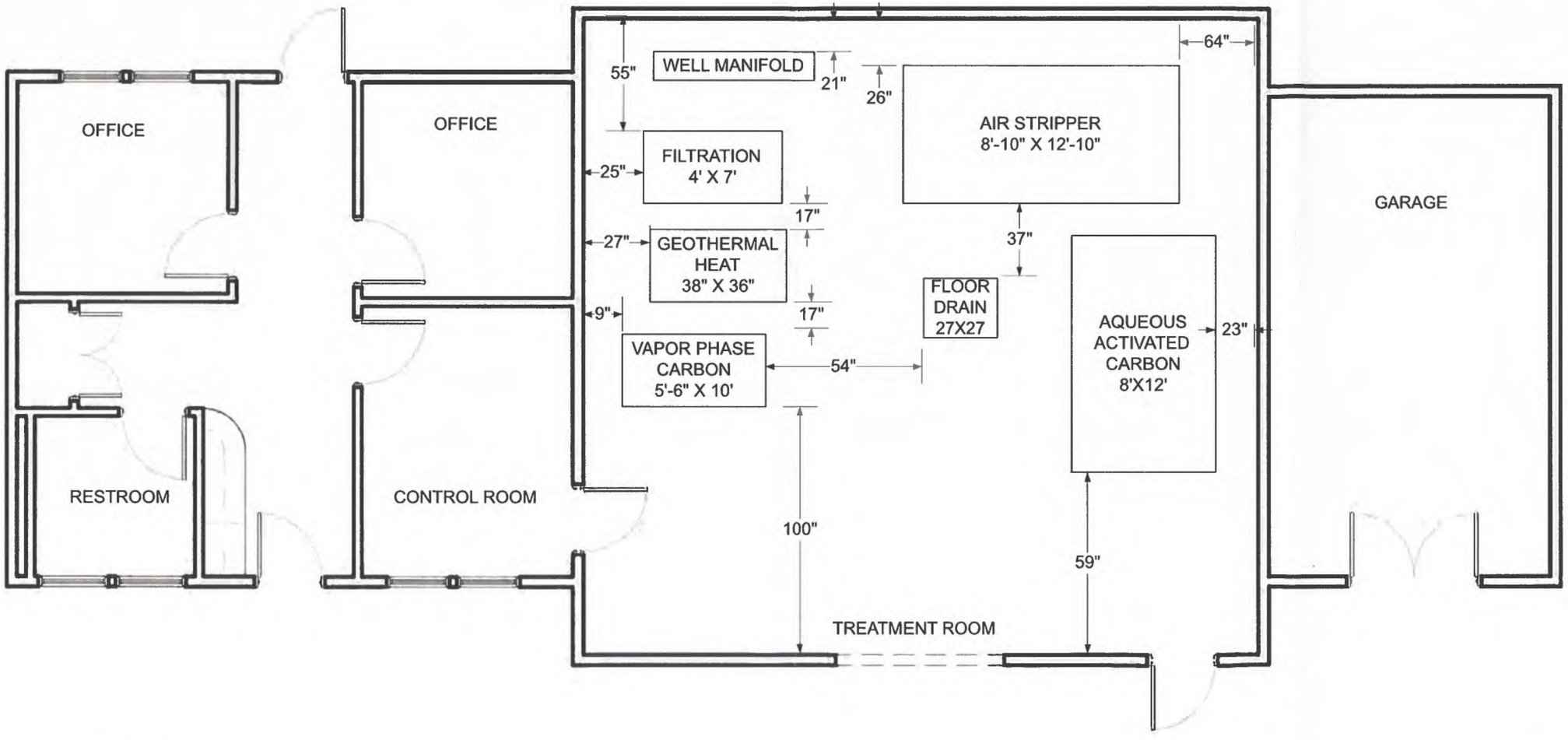


\\Srv-gst-01\hglgis\Lawrence_Aviation_K13006_MSIW OMPM\(1-2)OMP_Layout.mxd
2/1/2021 TH
Source: HGL, HDR, ESRI ArcGIS Online Imagery

Legend

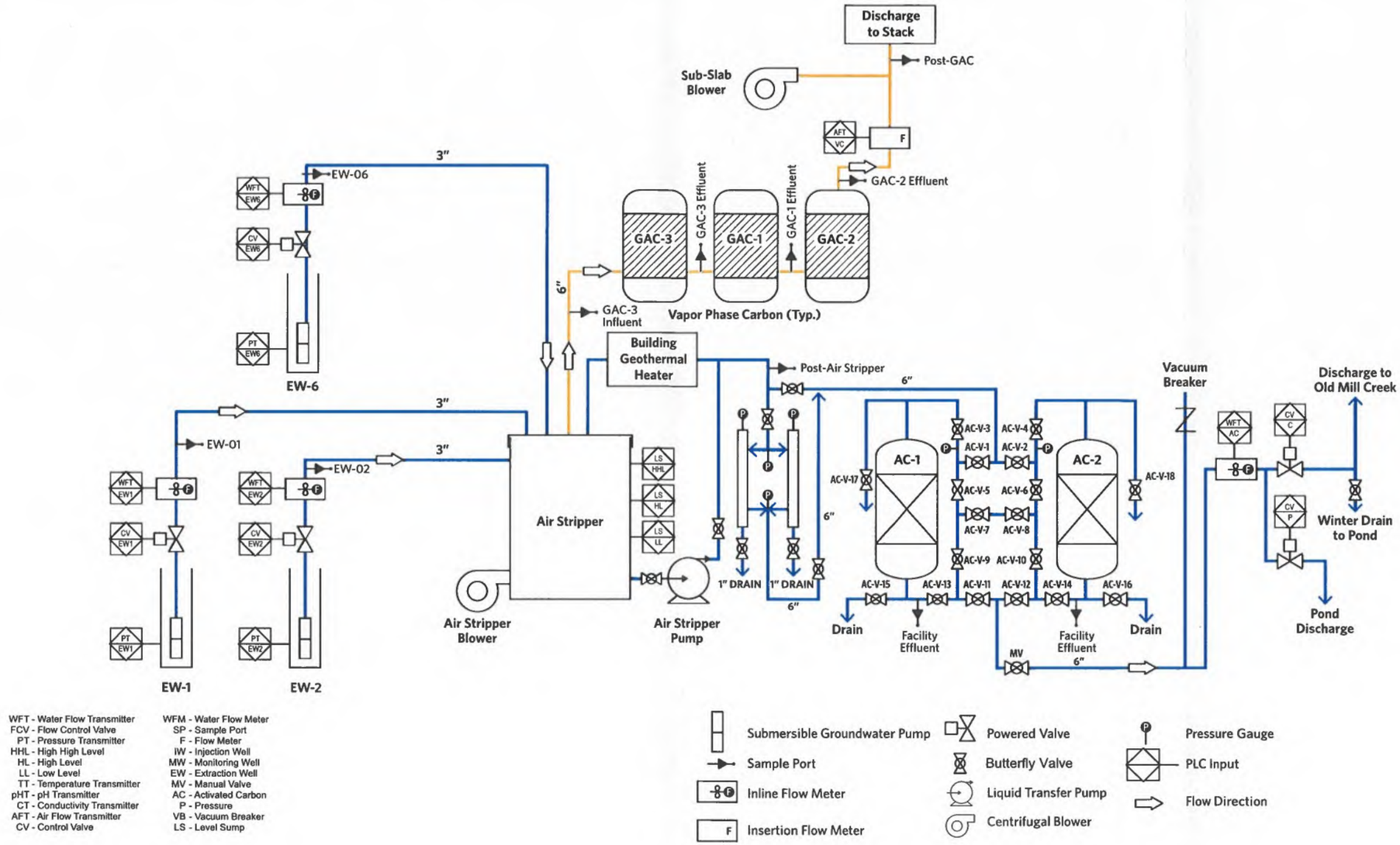
- Extraction Well
- Approximate Discharge Line
- Site Boundary

Figure 1.2
Site Layout
Old Mill Pond Treatment System



\\Srv-gst-01\hglgis\Lawrence_Aviation_K13006_MSIW\OMPM\
(1-3)Treatment_Sys_Building.cdr
2/1/2021 TH
Source: Environmental Restoration, LLC

Figure 1.3
Treatment System Building Layout
Old Mill Pond



\\Srv-gst-01\hglgis\Lawrence_Aviation_K13006_MSIW\OMPM\ (1-4)Process_Flow_OMP.cdr
2/1/2021 TH
Source: Environmental Restoration, LLC, HDR

Legend

Water Piping

Air Piping

Figure 1.4
Process Flow Diagram
Old Mill Pond
Treatment System

APPENDIX A

AS-BUILT DRAWINGS

Report of Significant Differences for the Down Gradient Water Treatment Facility
Lawrence Aviation Industries Superfund Site
Old Mill Pond Area
Port Jefferson, NY

Final Version: May 2012

INTRODUCTION

In June 2009 Lockheed Martin, under contract with US EPA Region II, prepared bid specifications for the construction of a down gradient water treatment facility for the Lawrence Aviation Industries Superfund Site located in Port Jefferson, NY. These specifications were then used as a guide by Environmental Restoration, LLC ("ER"), the Emergency and Rapid Response Services ("ERRS") contractor in Region II, to construct the water treatment plant. This report provides a summary of significant differences between the original proscriptive design criteria presented in the draft final bid specification report, prepared by the Lockheed Martin Response Engineering and Analytical Contract ("REAC") dated June 23, 2009, and the final treatment plant as constructed. The REAC report listed major treatment system items on pages 5 through 7 as items a. through m. under the Project Objectives. This report will provide the difference between what is described in the REAC report for each of the items as listed and what was determined to be necessary based on final site conditions and ground water testing results. This report is intended to be utilized as a cross-reference to explain differences between the REAC report and the final treatment plant as constructed.

SYSTEM COMPONENTS

Building (a): A pre-engineered metal building was not used to house the water treatment facility. The building used to house the treatment plant is a slab on grade wooden frame structure approximately 75'x30' with the outward appearance of a residential home. The treatment facility is located in the corner of a baseball field on public property at the existing recovery well site adjacent to a residential neighborhood. The architectural design required review and approval by the Village of Port Jefferson Architectural Review Committee, elected officials, and the general public. Because of the treatment building location in a residential neighborhood the committee required the structure to have the outward appearance of a residence.

Public sewers were not available at the selected plant site. Bathroom wastewater is collected in an on-site underground holding tank and is pumped by a septic tank cleaning and disposal contractor as required.

Green technologies were used during construction activities and incorporated into the design of the facility whenever practical. For example the building is heated using approximately 8 GPM of the recovered groundwater through a geothermal heat pump. Open cell concrete pavers were installed around the building to minimize impervious areas and direct storm water back into the water table.

Extraction Well Pumps (b): Four variable speed well pumps, each capable of a pumping range of 10 to 90 gpm, are provided. The programmable logic control system (PLC) controls the pump speeds through variable speed drives to provide a specific flow from each well. Each well has a level transducer that allows for continuous water level monitoring through the PLC. Only 4 wells were equipped with pumps because the 5th well was not of adequate size (diameter) or depth for a pump. After review of the pumping capacity of the four variable speed pumps it was determined by the OSC that a 5th well was not needed and this well would be better suited to monitor the water level in the adjacent pond.

Equalization Vessel (c): An equalization vessel was considered not necessary for this system. This decision was made to simplify system operation, eliminate a pump and pumping control system and the need for pumping the water twice; once from the extraction wells to the tank and again from the tank to the air stripper.

Influent Transfer Pump (d): An equalization vessel (see c. above) was not used and this eliminated the need for a transfer pump.

Influent Filter (e): An influent filter was installed in the system and operated for approximately 3 months. During this time it was determined that the influent water quality was such that it was not needed. However, it was found that the treated water leaving the Air Stripper contained small quantities of oxidized iron that was precipitating out of solution and accumulating in the aqueous carbon units. Therefore, it was decided that the filters were better suited being located between the Air Stripper and the aqueous activated carbon filter.

Air Stripper (f): A stainless steel forced air shallow tray air stripper capable of more than 200 gpm was cleaned, inspected and repurposed from another site for the treatment system.

Off-Gas Treatment (g): A single vapor phase granular activated carbon unit is provided to treat off-gas from the air stripper. A single unit was used because the low concentrations of volatile organics presently found in the site groundwater did not justify the need for two carbon units.

Effluent Discharge Pump (h): An effluent discharge pump was provided that meets the performance specifications. The pump discharges the treated water to a surface water body.

Treated Water Discharge (i): The effluent discharge system consists of two discharge points. One is an adjacent pond and the second is a stream located at the culvert on Barnum Ave. Internal discharge system piping, control valves and water level monitors at the pond monitor discharge conditions and control which location is used for effluent discharge. The system is designed to monitor water levels during storm events to minimize localized flooding. The system shuts down during high water level conditions in the stream and the pond.

Liquid Phase Carbon Polishing (j): The liquid phase carbon units are equipped with hard piping and valves to enable either unit to be operated in a lead or lag mode. The valving also enables the carbon units to be operated in a parallel mode.

Effluent Filter (k): An effluent filter was installed to remove particulate material prior to the aqueous phase activated carbon filters. The influent water chemistry indicated low concentrations of iron present from some sampling events. Iron has been found intermittently and infrequently in influent samples. An influent filter was installed as a precautionary measure to prolong the life of the aqueous phase carbon units.

Control System (l): A PLC is provided that meets or exceeds the requirement in the specifications.

Well Vault System (m): Well vaults are provided that meet the requirement in the specification.

ADDITIONAL INFORMATION

Process flow diagrams, as-built drawings, and control panel schematics can be found in the compendium to this document, titled "Lawrence Aviation Site: Process Flow Diagram and Control Panel Drawings".

CONCLUSION

The document generated by Lockheed Martin in June 2009 was utilized as a guide when developing the down gradient pump and treatment plant. During the design and construction phases, site conditions and water chemistry caused slight deviations from the proposal. Although these "real-world" conditions produced equipment and technique alterations, the overall objectives of the facility were met. Sampling events have shown that the performance of the system is appropriate and compatible with the scope outlined in the proposal.

P.E. CERTIFICATION

I, Harold U. Nash, am a professional engineer licensed in the Commonwealth of Virginia (registration number 8533). I attest that I have visited the subject property located at 103 Brook Road, Port Jefferson, Suffolk County, New York. I am familiar with the requirements outlined in the Record of Decision for the Remedial Action proposed for the Lawrence Aviation Industries Site. These deviations are appropriate and adequate for meeting the goals and objectives outlined by EPA as part of an overall groundwater contamination remediation effort. The building and process design implemented has been constructed under my direction using good engineering practices. Based on my reviews during construction, review of the final constructed facility and observation of the operation of the facility, I certify that the facility was constructed in substantial conformance with the detailed construction, engineering, and architectural plans developed for the project. In addition, to the best of my knowledge the facility was constructed in conformance with local codes and laws, and is an adequate structure for the area.

Harold U. Nash, P.E.
Virginia Registration No. 8533

5/22/12
Date



Lawrence Aviation Site

Process Flow Diagram and Control Panel Drawings

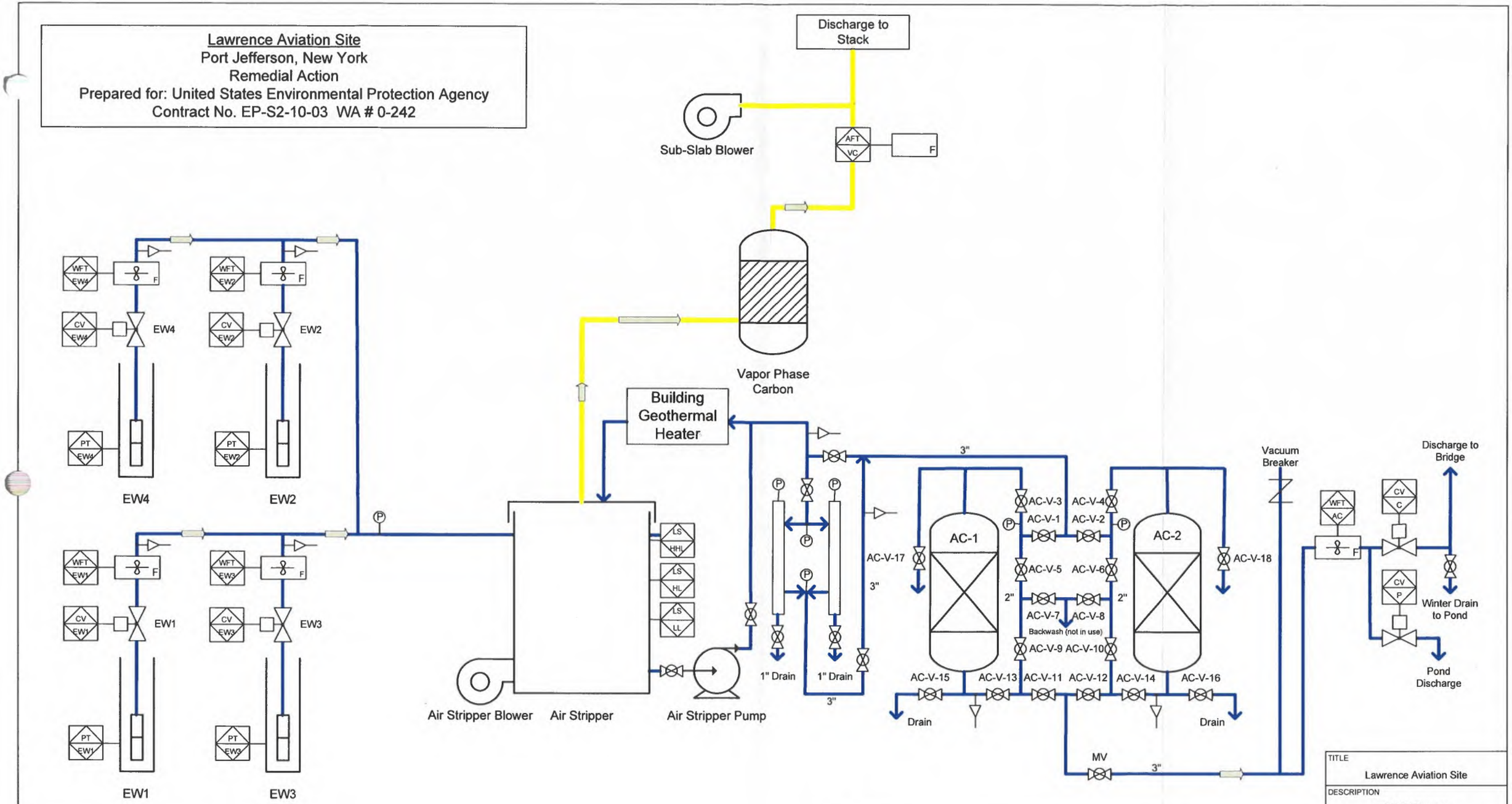
TITLE	Stanton Cleaners Treatment System
DESCRIPTION	Cover Page
DRAWN BY	Environmental Remediation
DATE	5/14/2011
REVISED	4/4/2012
PAGE	1 OF 15

Table of Contents

Page 1 – Cover page
Page 2 – Table of Contents
Page 3 – Process and Instrumentation Diagram
Page 4 – Power Connections #1
Page 5 – Power Connections #2
Page 6 – PLC Layout
Page 7 – Analog Inputs #1
Page 8 – Analog Inputs #2
Page 9 – 24 VDC Inputs #1
Page 10 – Relay Outputs #1
Page 11 – Door Layout
Page 12 – Panel Layout
Page 13 –Lighting #1
Page 14 – Lighting #2
Page 15 – Building Layout

TITLE	Lawrence Aviation Site
DESCRIPTION	Table of Contents
DRAWN BY	Environmental Remediation
DATE	7/13/2010
REVISED	4/4/2012
PAGE	2 OF 15

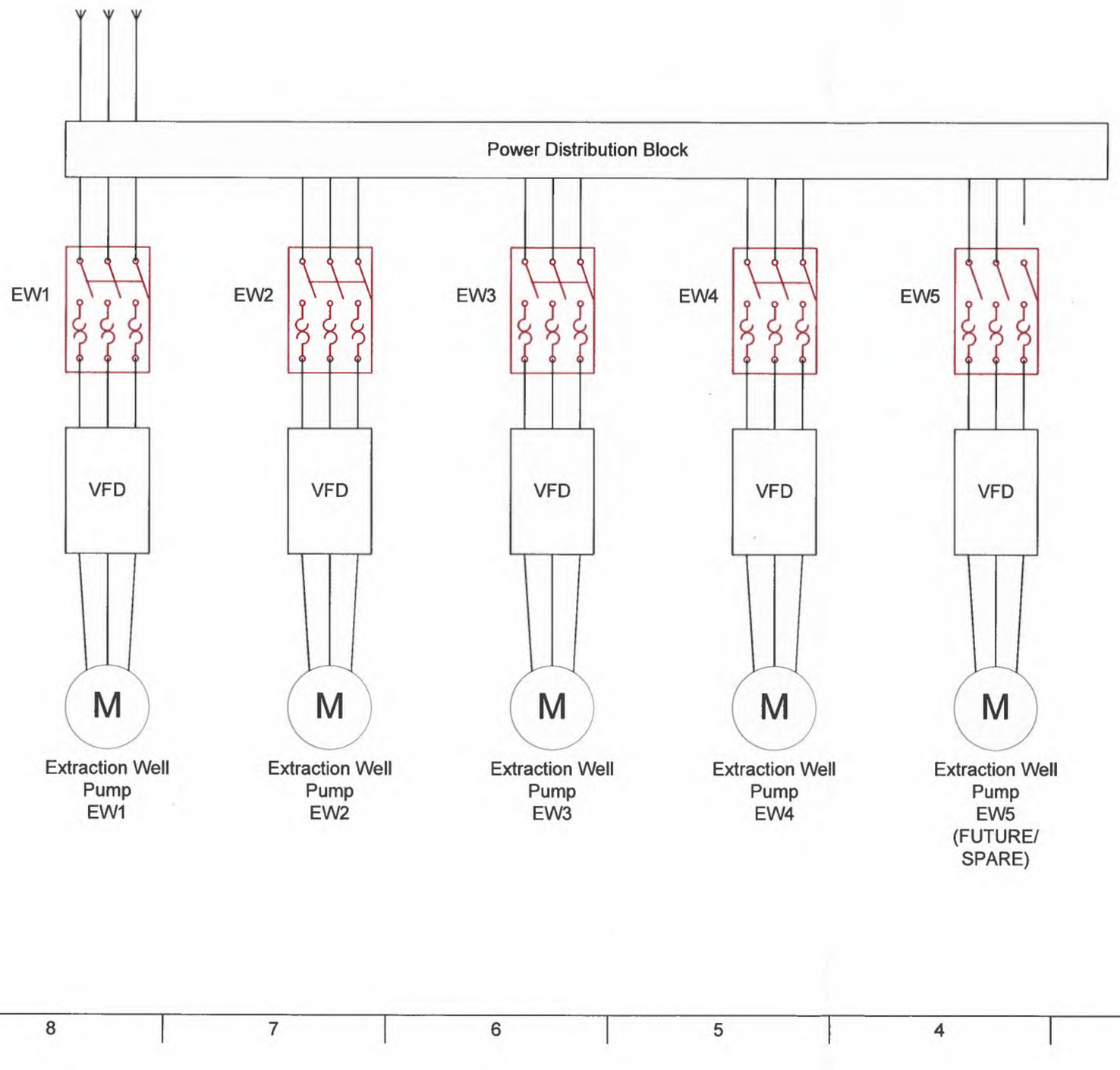
Lawrence Aviation Site
Port Jefferson, New York
Remedial Action
Prepared for: United States Environmental Protection Agency
Contract No. EP-S2-10-03 WA # 0-242



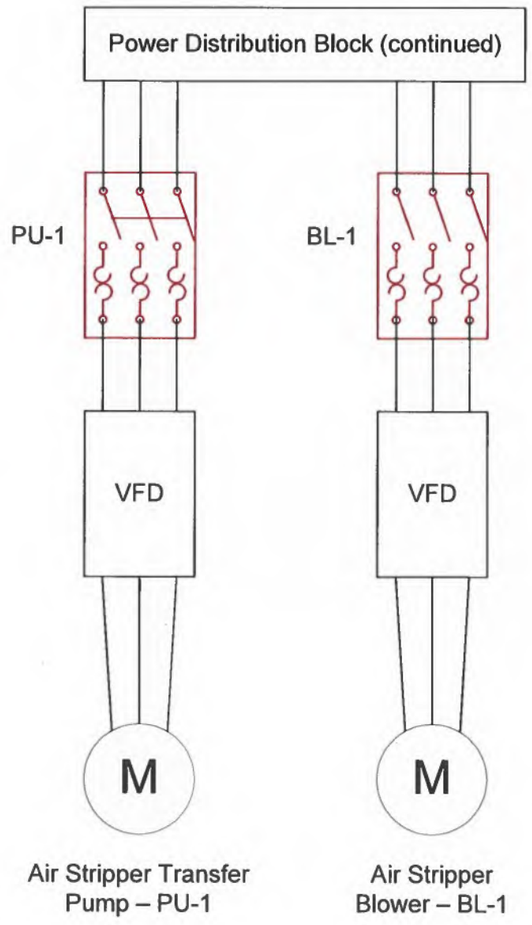
WFT – Water Flow Transmitter
FCV – Flow Control Valve
PT – Pressure Transmitter
HHL – High High Level
– High Level
– Low Level
TT – Temperature Transmitter
pHT – pH Transmitter
CT – Conductivity Transmitter
AFT – Air Flow Transmitter
CV – Control Valve
WFM – Water Flow Meter
SP – Sample Port
F – Flow Meter
IW – Injection Well
MW – Monitoring Well
MV – Manual Valve
AC – Activated Carbon
P - Pressure
VB – Vacuum Breaker
Water Piping
Air Piping

Submersible Groundwater Pump
Sample Port
Inline Flow Meter
Insertion Flow Meter
Powered Valve
Ball Valve
Liquid Transfer Pump
Centrifugal Blower
Pressure Gauge
PLC Input
Flow Direction

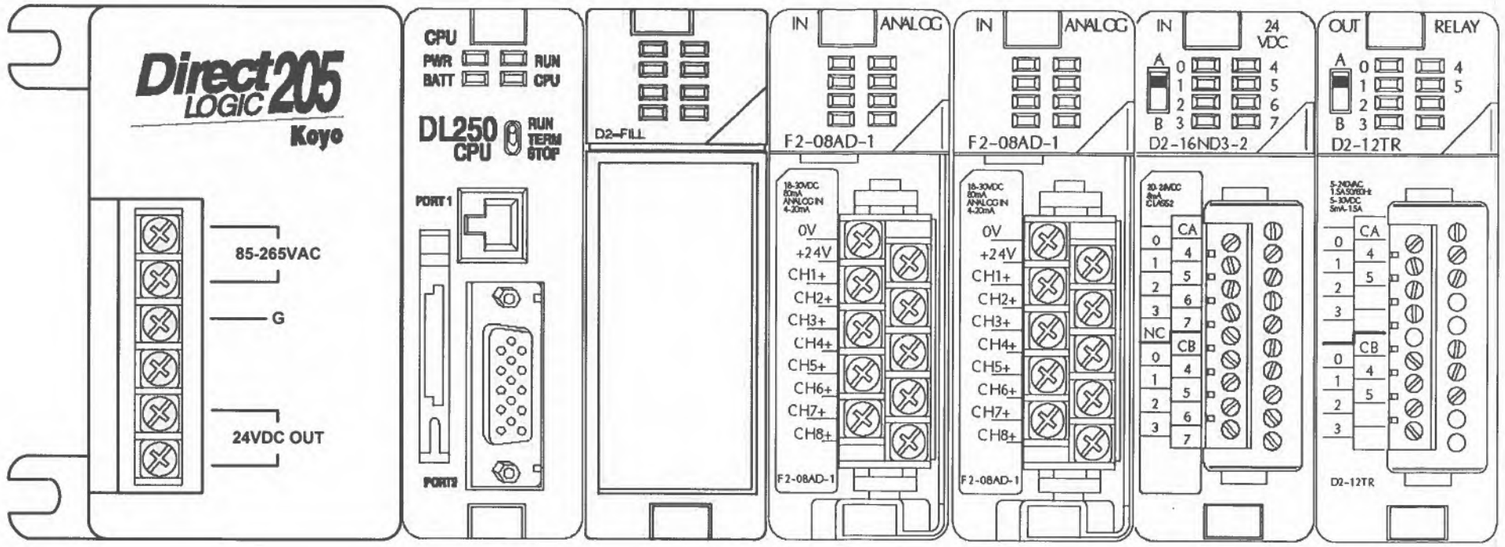
TITLE	Lawrence Aviation Site
DESCRIPTION	P&ID Diagram
DRAWN BY	Environmental Remediation
DATE	7/14/2010
REVISED	4/11/2012
PAGE	3 OF 15



TITLE	Lawrence Aviation Site
DESCRIPTION	Power Connections #1
DRAWN BY	Environmental Remediation
DATE	7/13/2010
REVISED	4/4/2012
PAGE	4 OF 15

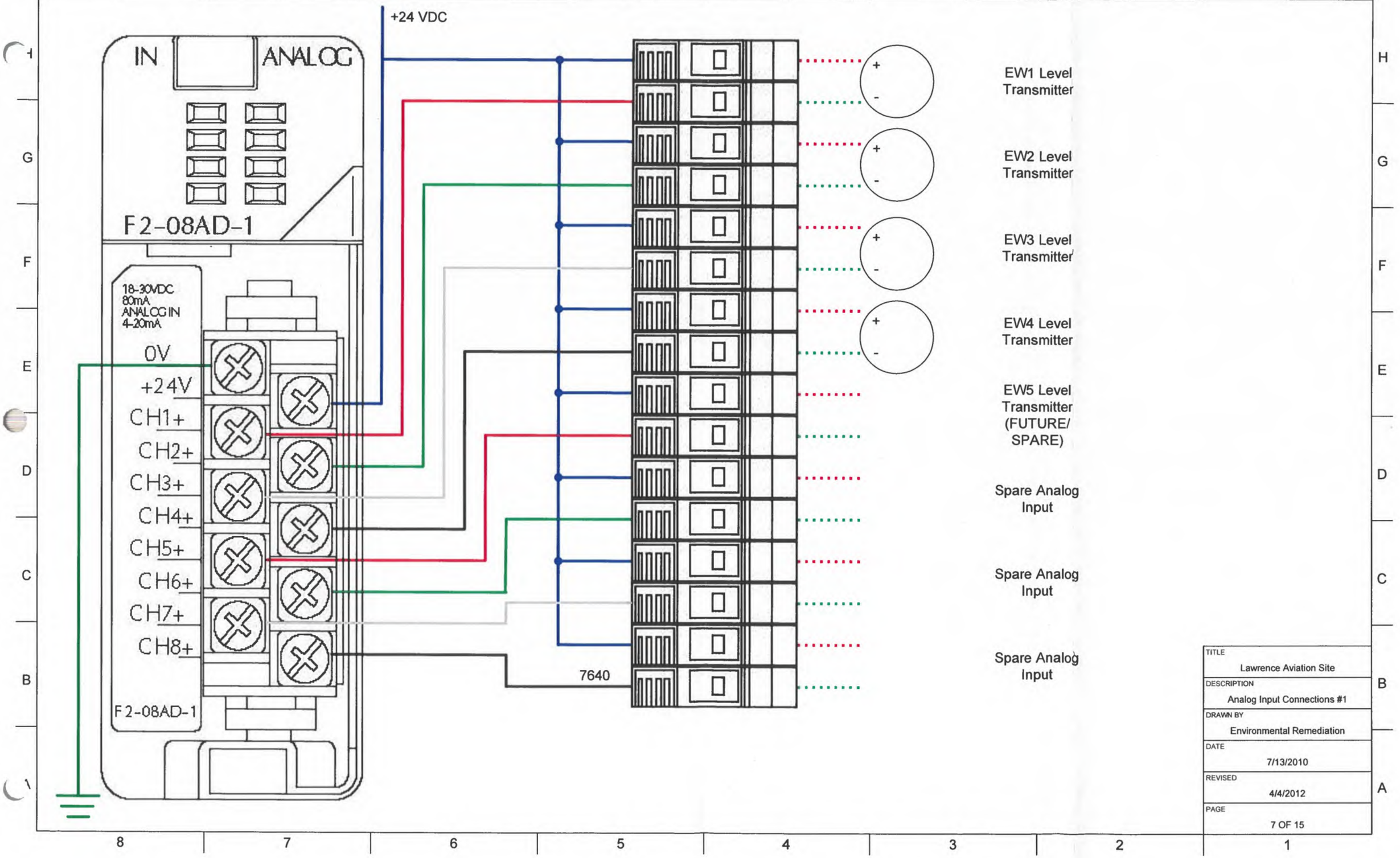


TITLE	Lawrence Aviation Site
DESCRIPTION	Power Connections #2
DRAWN BY	Environmental Restoration
DATE	7/13/2010
REVISED	4/4/2012
PAGE	5 OF 15

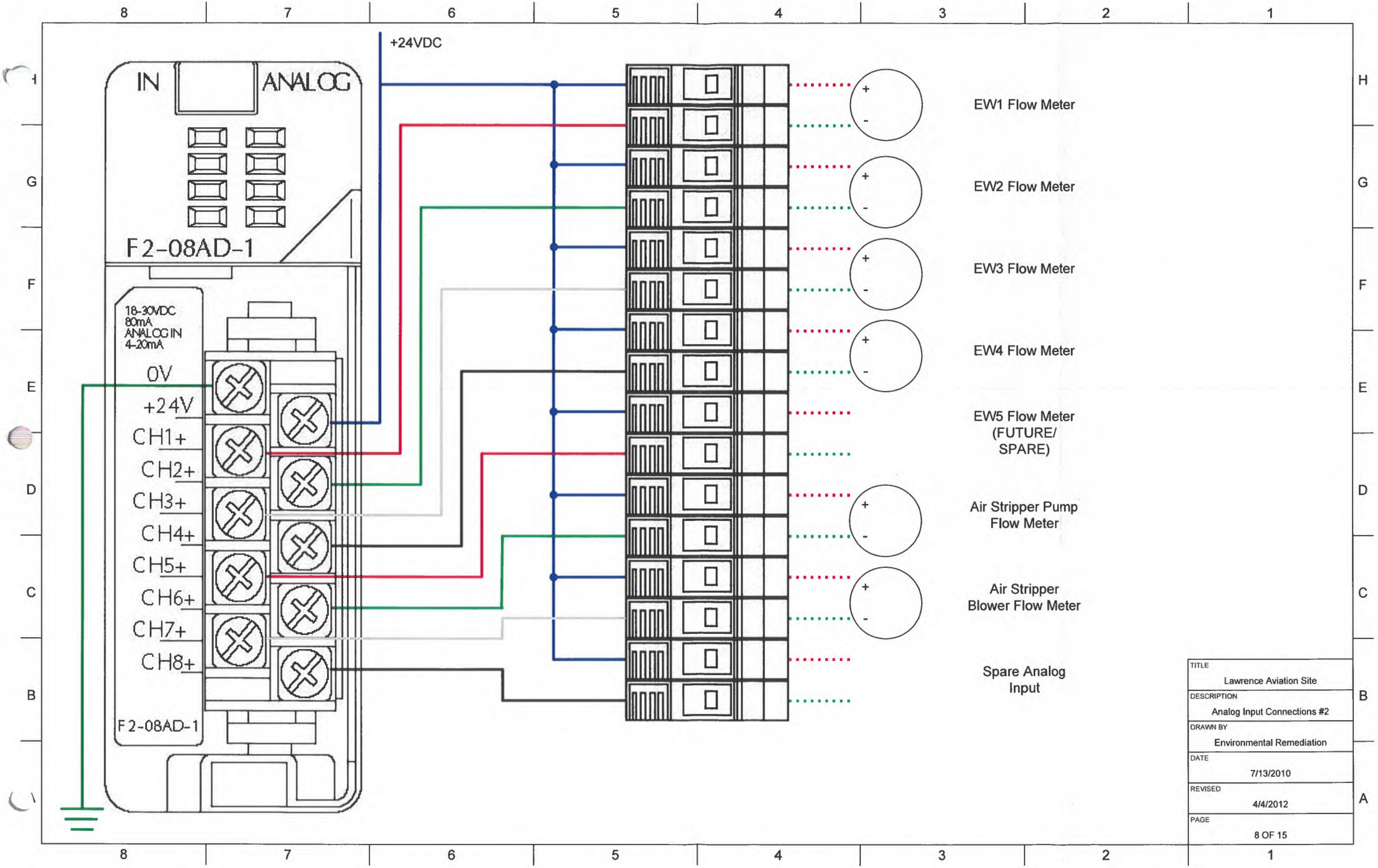


Rack #1

TITLE	Lawrence Aviation Site
DESCRIPTION	PLC Layout
DRAWN BY	Environmental Remediation
DATE	7/13/2010
REVISED	4/4/2012
PAGE	6 OF 15



TITLE	Lawrence Aviation Site
DESCRIPTION	Analog Input Connections #1
DRAWN BY	Environmental Remediation
DATE	7/13/2010
REVISED	4/4/2012
PAGE	7 OF 15


+24VDC
IN
ANALOG
F2-08AD-1
18-30VDC
80mA
ANALOG IN
4-20mA
0V
+24V
CH1+
CH2+
CH3+
CH4+
CH5+
CH6+
CH7+
CH8+
F2-08AD-1
EW1 Flow Meter
EW2 Flow Meter
EW3 Flow Meter
EW4 Flow Meter
EW5 Flow Meter
(FUTURE/
SPARE)
Air Stripper Pump
Flow Meter
Air Stripper
Blower Flow Meter
Spare Analog
Input
TITLE
Lawrence Aviation Site
DESCRIPTION
Analog Input Connections #2
DRAWN BY
Environmental Remediation
DATE
7/13/2010
REVISED
4/4/2012
PAGE
8 OF 15

Air Stripper High High Level

Air Stripper High Level

Air Stripper High Level

+24VDC

IN

24 VDC

A

B

0 1 2 3

4 5 6 7

D2-16ND3-2

20-28VDC
9mA
CLASS2

CA

0 1 2 3

4 5 6 7

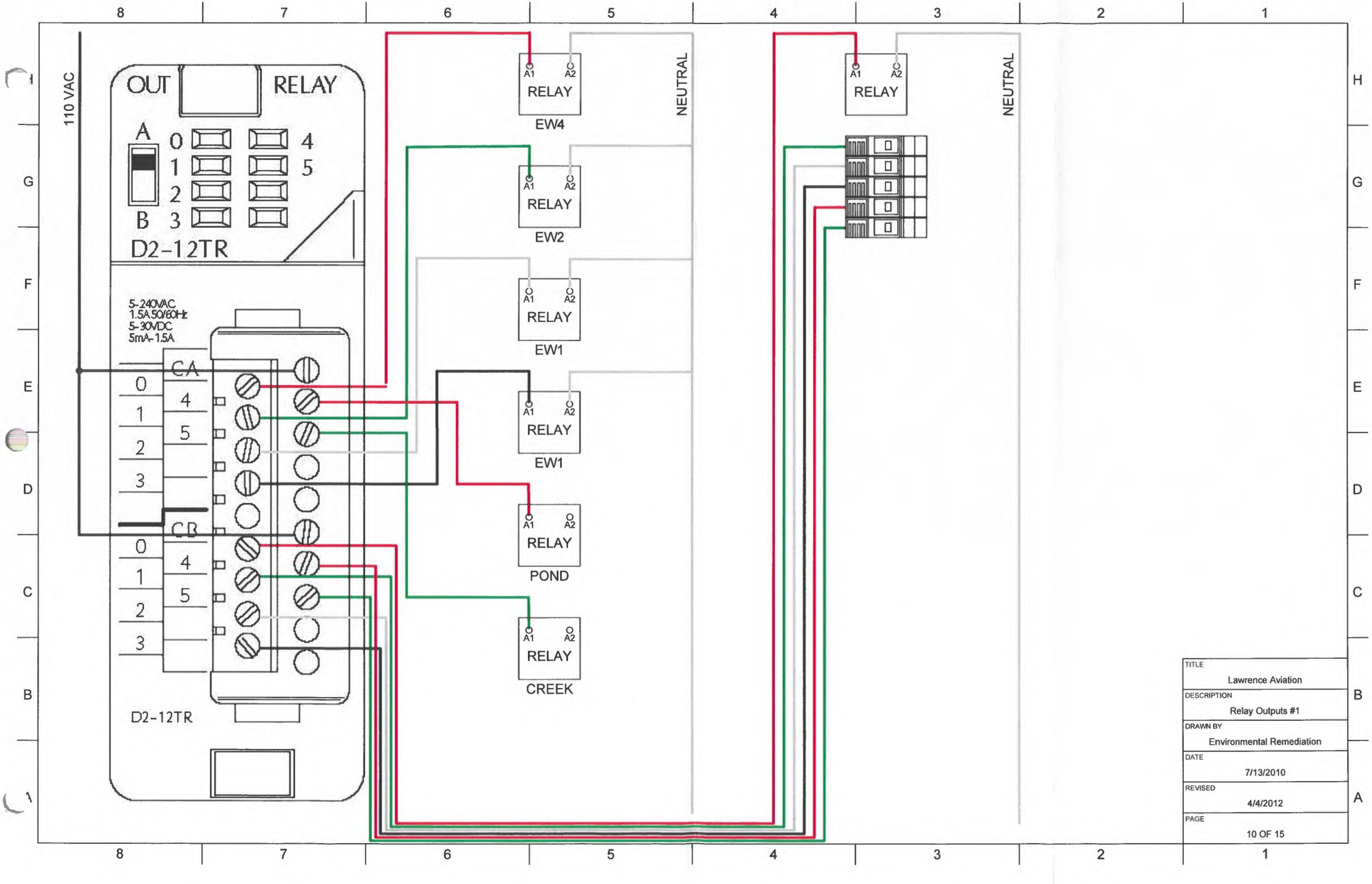
NC

CB

0 1 2 3

4 5 6 7

TITLE	Lawrence Aviation
DESCRIPTION	24VDC Inputs #1
DRAWN BY	Environmental Remediation
DATE	7/13/2010
REVISED	4/4/2012
PAGE	9 OF 15



TITLE	Lawrence Aviation
DESCRIPTION	Relay Outputs #1
DRAWN BY	Environmental Remediation
DATE	7/13/2010
REVISED	4/4/2012
PAGE	10 OF 15

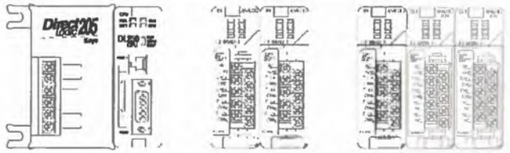
HMI SCREEN

TITLE	Lawrence Aviation
DESCRIPTION	Door Layout
DRAWN BY	Environmental Remediation
DATE	7/13/2010
REVISED	4/4/2012
PAGE	11 OF 15

Power Distribution Block

Transformer

Disconnect



ETHER NET

ETHER NET

ETHER NET

ETHER NET

ETHER NET

ETHER NET

ETHER NET

CB CB CB

CB CB CB

VFD

VFD

VFD

VFD

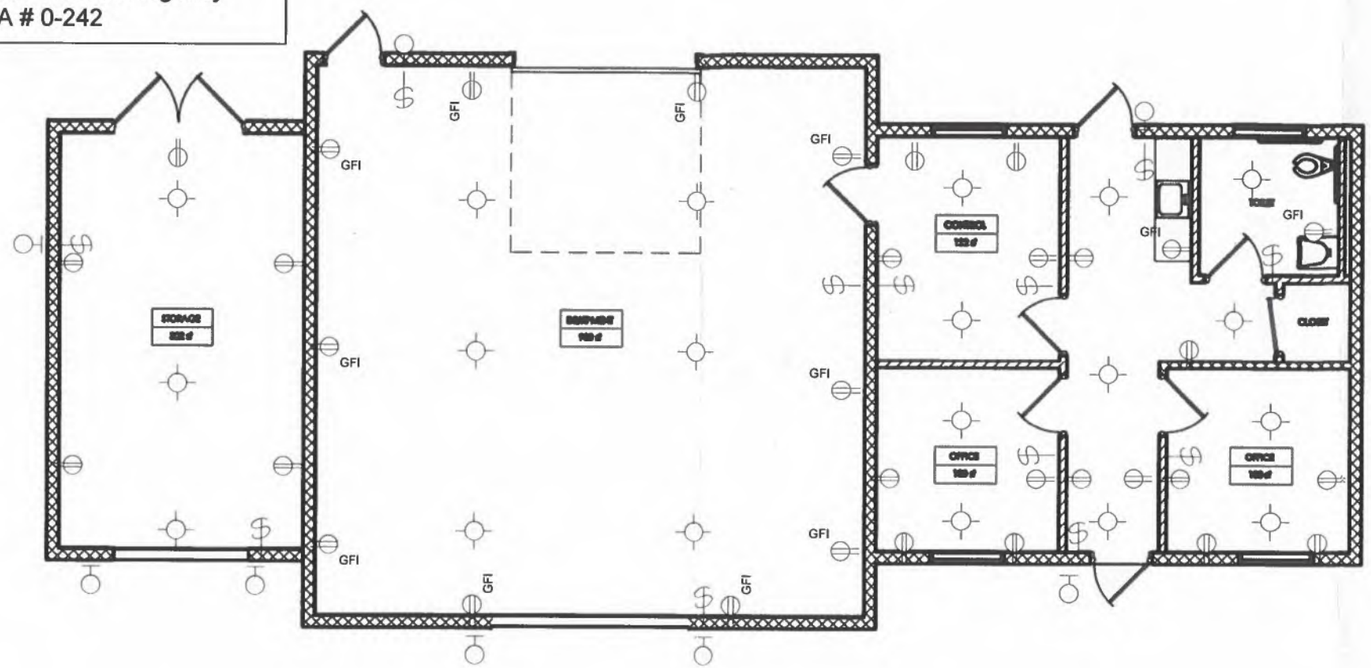
VFD

VFD

VFD

TITLE	Lawrence Aviation
DESCRIPTION	SubPanel Layout
DRAWN BY	Environmental Remediation
DATE	7/13/2010
REVISED	4/4/2012
PAGE	12 OF 15

Lawrence Aviation Site
Port Jefferson, New York
Remedial Action
Prepared for: United States Environmental Protection Agency
Contract No.EP-C-04-032 WA # 0-242

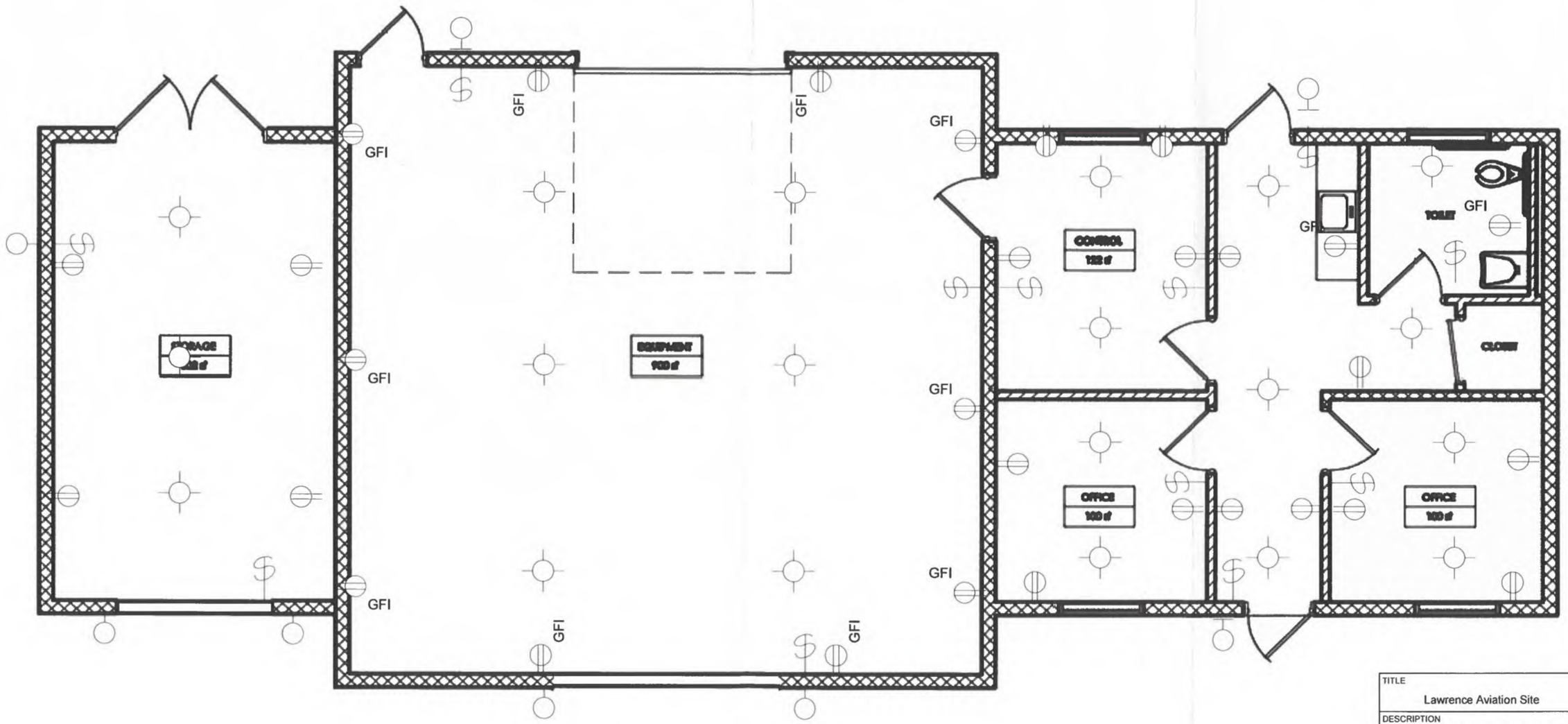




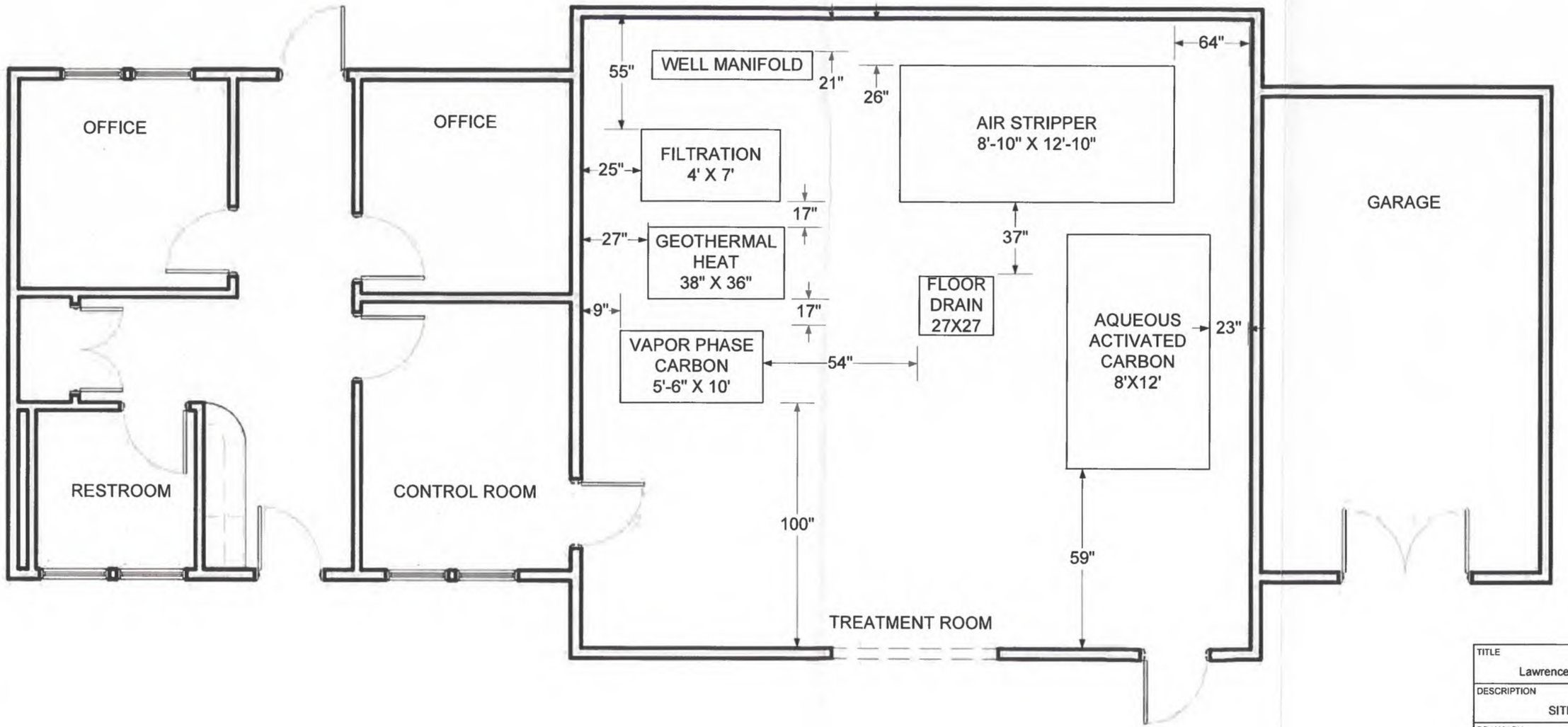
Surface ceiling light
Wall light
Switches
Socket outlets
GFI outlets

TITLE	Lawrence Aviation Site
DESCRIPTION	Building Electrical Diagram
DRAWN BY	Environmental Remediation
DATE	8/03/2010
REVISED	8/03/2010
PAGE	13 OF 15

Lawrence Aviation Site
Port Jefferson, New York
Remedial Action
Prepared for: United States Environmental Protection Agency
Contract No.EP-C-04-032 WA # 0-242


GFI
GFI
GFI

Lawrence Aviation Site
Port Jefferson, New York
Remedial Action
Prepared for: United States Environmental Protection Agency
Contract No.EP-C-04-032 WA # 0-242



TITLE	Lawrence Aviation Site
DESCRIPTION	SITE PLAN
DRAWN BY	ENVIRONMENTAL REMEDIATION
DATE	8/23/2010
REVISED	4/11/2012
PAGE	15 OF 15

APPENDIX B

PERMIT EQUIVALENCIES

B-1 Air Permit Equivalent
B-2 New York State Pollution Discharge Elimination System Permit Equivalent

New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau A, 12th Floor
625 Broadway, Albany, New York 12233-7015
Phone: (518) 402-9620 • **Fax:** (518) 402-9022
Website: www.dec.ny.gov

Joe Martens
Commissioner

September 19, 2014

Ms. Yashodhara Saha
Project Engineer
HDR Inc.
500 Seventh Avenue
New York, NY 10018

RE: Lawrence Aviation Industries
Site, NYSDEC Site No. 152016
Suffolk County, Brookhaven (T).

Dear Ms. Saha:

HDR Inc. as contractor for the United States Environmental Protection Agency (USEPA), has submitted a revised draft of the final Air Permit Equivalent for the New York State Department of Environmental Conservation (NYSDEC) review. This Air Permit Equivalent is for the Old Mill Pond Groundwater Pump and Treat system associated with part of the operation, maintenance and monitoring of the remediation at the Lawrence Aviation Industries National Priority List (NPL) site.

The groundwater treatment system by the Old Mill Pond uses the best available control technology (BACT) to remove the contaminants of concern from the air stream. This consists of vapor phase carbon prior to air discharge. This vapor phase carbon system removes greater than 99 percent of the site-related contaminants. This will be confirmed by periodic system monitoring.

Based on my review, all NYSDEC comments have been addressed and, by means of this letter, the NYSDEC approves this permit equivalent for immediate implementation.

If you have any questions, please call me directly at 518-402-9620.

Sincerely,

Steven M. Scharf, P.E.
Remedial Bureau A
Division of Environmental Remediation

Enclosure: Air Permit Equivalent
ec/w/enc:
J. Swartwout
W. Parish
M. Jon, EPA region 2
D. Kleredes, HDR Inc.

New York State Department of Environmental Conservation
Air Permit Application

DEC ID	APPLICATION ID	OFFICE USE ONLY
- - -	- /	/ /

Section I - Certification

Title V Certification N/A

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information [required pursuant to 6 NYCRR 201-6.3(d)] I believe the information is, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Responsible Official	Title
Signature	Date / /

State Facility Certification N/A

I certify that this facility will be operated in conformance with all provisions of existing regulations.

Responsible Official	Title
Signature	Date / /

Section II - Identification Information

Title V Facility Permit N/A
- New
- Renewal
- Significant Modification
- Minor Modification
- Administrative Amendment

General Permit Title: _____

State Facility Permit N/A
- New
- Modification

General Permit Title: _____

- Application involves construction of new facility
- Application involves construction of new emission unit(s)

Owner/Firm

Name U.S EPA REGION 2

Street Address 290 BROADWAY, 20TH FLOOR

City NEW YORK | State NY | Country USA | Zip 10007-1866

Owner Classification X Federal
- State
- Municipal
- Corporation/Partnership
- Individual

Taxpayer ID

Facility

- Confidential

Name OLD MILL POND (OMP) GROUNDWATER TREATMENT FACILITY (GWTF)

Location Address INTERSECTION OF CAROLINE AVE. + BROOK RD.

City / Town / Village PORT JEFFERSON / NEW YORK | Zip 11777

Project Description

- Continuation Sheet(s)

REFER CONTINUATION SHEET FOLLOWING PAGE 1

Owner/Firm Contact Mailing Address

Name (Last, First, Middle Initial) N/A | Phone No. ( )

Affiliation U.S EPA, REGION 2 | Title | Fax No. ( )

Street Address 290 BROADWAY, 20th FLOOR

City NEW YORK | State NY | Country USA | Zip 10007

Facility Contact Mailing Address

Name (Last, First, Middle Initial) JON, MARIA | Phone No. (212) 637-3967

Affiliation U.S EPA, REGION 2 | Title REMEDIAL PROJECT MANAGER | Fax No. ( )

Street Address 290 BROADWAY, 20th FLOOR

City NEW YORK | State NY | Country USA | Zip 10007

DEC ID
- -

Section II - Identification Information

Project Description (continuation)

The Old Mill Pond (OMP) facility is associated with the Lawrence Aviation Industries (LAI) Superfund Site in Port Jefferson Station, NY. The groundwater at the source area, which is the LAI industrial facility has been impacted by chlorinated volatile organic compounds (CVOCs), specifically tetrachloroethene (PCE) and trichloroethene (TCE) due to past disposal practices. A groundwater extraction and treatment plant has been in operation at the LAI industrial facility since September, 2010. Groundwater and air discharges from the source area treatment plant are covered under a separate permit equivalent.

As per the September 29, 2006 record of decision (ROD) issued by EPA, a second groundwater treatment facility was completed at the downgradient contaminated groundwater plume, located to the north of the LAI industrial facility, near Old Mill Pond, and has been in operation since August 2011. The downgradient OMP groundwater treatment facility is located at the intersection of Caroline Avenue and Brook Road in Port Jefferson, NY and provides hydraulic control of the groundwater plume downgradient from the source area. Groundwater containing CVOCs is extracted via 3 extraction wells at the OMP facility and treated in an air stripper. The treated water leaving the air stripper is sent through liquid phase granular activated carbon (GAC) units prior to surface discharge under a NYSDEC SPDES permit equivalent. The volatilized contaminants leaving the air stripper is treated using vapor phase GAC units prior to discharge to the atmosphere.

This application seeks to obtain a permit equivalent for the air emissions leaving the air stripper at the OMP facility. The permit equivalent will not change facility operations. The purpose of the permit equivalent is to monitor the emissions from the OMP facility on a monthly basis and to evaluate the need for change-out of carbon from the GAC units when saturation of carbon is near and prior to permit equivalent numbers are exceeded.

HDR has been conducting the long-term response action including operation, maintenance, and monitoring of both treatment facilities since October 2012.

New York State Department of Environmental Conservation
Air Permit Application

DEC ID
- -

Section III - Facility Information

Classification N/A

• Hospital • Residential • Educational/Institutional • Commercial • Industrial • Utility

Affected States (Title V Only) N/A

• Vermont • Massachusetts • Rhode Island • Pennsylvania Tribal Land:_____
• New Hampshire • Connecticut • New Jersey • Ohio Tribal Land:_____

SIC Codes

Facility Description • Continuation Sheet(s)

REFER CONTINUATION SHEET FOLLOWING PAGE 2

Compliance Statements (Title V Only) N/A

I certify that as of the date of this application the facility is in compliance with all applicable requirements: • YES • NO
If one or more emission units at the facility are not in compliance with all applicable requirements at the time of signing this application (the 'NO' box must be checked), the noncomplying units must be identified in the "Compliance Plan" block on page 8 of this form along with the compliance plan information required. For all emission units at this facility that are operating in compliance with all applicable requirements complete the following:

- This facility will continue to be operated and maintained in such a manner as to assure compliance for the duration of the permit, except those units referenced in the compliance plan portion of Section IV of this application.
- For all emission units, subject to any applicable requirements that will become effective during the term of the permit, this facility will meet all such requirements on a timely basis.
- Compliance certification reports will be submitted at least once a year. Each report will certify compliance status with respect to each requirement, and the method used to determine the status.

Facility Applicable Federal Requirements • Continuation Sheet(s)

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

Facility State Only Requirements • Continuation Sheet(s)

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

New York State Department of Environmental Conservation
Air Permit Application Form

DEC ID
- -

Section III - Facility Information

Facility Description (continuation)

The Lawrence Aviation Industries Superfund Site (EPA identification #NYD002041531) is located in Port Jefferson Station, New York. The Lawrence Aviation Industries Site was included on the National Priorities List (NPL) on March 6, 2000 and consists of the source area at the Lawrence Aviation industries (LAI) facility and the downgradient plume area in the vicinity of Old Mill Pond. Past disposal practices at the LAI industrial facility resulted in a variety of contaminant releases including trichloroethene and tetrachloroethene, acid wastes, oils, sludge, metals, and other industrial plant wastes. Previous investigations in the Site's vicinity suggest that releases of hazardous substances from the facility have affected site soils and groundwater, surface water and sediments downgradient of the site.

The primary function of the Old Mill Pond (OMP) groundwater extraction and treatment facility listed on this permit application form is to provide hydraulic control of the chlorinated volatile organic compounds containing groundwater plume and prevent migration of contaminated groundwater further downgradient from the Lawrence Aviation Industries source area into Old Mill Pond, Old Mill Creek, and Port Jefferson Harbor.

The groundwater extraction and treatment system at the OMP facility operates with 3 active extraction wells (EW-1, EW-2 and EW-6) at a combined influent groundwater flow rate of approxdmately 150 gpm. The treated groundwater leaving the air stripper is sent through liquid phase granular activated carbon (GAC) units and then discharged to a nearby natural pond under a NYSDEC SPDES permit equivalent. The VOC-contaminated air from the air stripper is treated by vapor phase GAC units before discharge to atmosphere via a stack on the roof of the building. Each vapor phase GAC unit consists of 2,000 pounds of reactivated coconut GAC with a mesh size of 4x8. The air stripper blower operates up to a maximum of 2,300 cfm.

Since the Site is listed on the NPL, a permit equivalent is warranted for the treated air discharged at the downgradient OMP facility.

New York State Department of Environmental Conservation
Air Permit Application

DEC ID
- - - - - - - - -

Section III - Facility Information (continued)

Facility Compliance Certification N/A • Continuation Sheet(s)

Rule Citation

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

• Applicable Federal Requirement • State Only Requirement	• Capping	CAS No.	Contaminant Name
		- -	

Monitoring Information

• Ambient Air Monitoring • Work Practice Involving Specific Operations • Record Keeping/Maintenance Procedures

Description

Work Practice Type	Process Material Code	Process Material Description	Reference Test Method

Parameter Code	Parameter Description	Manufacturer Name/Model No.

Limit Upper	Limit Lower	Limit Units Code	Limit Units Description

Averaging Method Code	Averaging Method Description	Monitoring Frequency Code	Monitoring Frequency Description	Reporting Requirements Code	Reporting Requirements Description

Facility Emissions Summary • Continuation Sheet(s)

CAS No.	Contaminant Name	PTE (lbs/yr)	PTE Range Code	Actual (lbs/yr)
NY075 - 00 - 5	PM-10			
NY075 - 00 - 0	PARTICULATES			
7446 - 09 - 5	SULFUR DIOXIDE			
NY210 - 00 - 0	OXIDES OF NITROGEN			
630 - 08 - 0	CARBON MONOXIDE			
7439 - 92 - 1	LEAD			
NY998 - 00 - 0	VOC			
NY100 - 00 - 0	HAP			
00127 - 18 - 4	TETRACHLOROETHENE	7.88	N/A	N/A
00079 - 01 - 6	TRICHLOROETHENE	597.87	N/A	N/A
- -				
- -				
- -				

New York State Department of Environmental Conservation
Air Permit Application

DEC ID
- | | | | | - | | | | |

Section IV - Emission Unit Information

Emission Unit Description

• Continuation Sheet(s)

EMISSION UNIT 1-00EU1 VOLATILE ORGANIC COMPOUNDS ARE REMOVED FROM GROUNDWATER IN AN AIR STRIPPER. THE VOLATILIZED CONTAMINANTS LEAVING THE TOP OF THE AIR STRIPPER ARE TREATED VIA GAC UNITS PRIOR TO DISCHARGE TO AIR VIA A VENT STACK ON THE ROOF OF THE BUILDING.

Building

• Continuation Sheet(s)

Building	Building Name	Length (ft)	Width (ft)	Orientation
BLDG-1	OMP GROUNDWATER TREATMENT BUILDING	74	31	0°

Emission Point

• Continuation Sheet(s)

EMISSION PT. 00EP1

Ground Elev. (ft)	Height (ft)	Height Above Structure (ft)	Inside Diameter (in)	Exit Temp. (°F)	Cross Section Length (in)	Cross Section Width (in)
0'-0"	29	3	12	75		
Exit Velocity (FPS)	**Exit Flow (ACFM)**	**NYTM (E) (KM)**	**NYTM (N) (KM)**	**Building**	**Distance to Property Line (ft)**	**Date of Removal**
49	2,300	0.018	0.018	BLDG-1	30	N/A

EMISSION PT.

Ground Elev. (ft)	Height (ft)	Height Above Structure (ft)	Inside Diameter (in)	Exit Temp. (°F)	Cross Section Length (in)	Cross Section Width (in)
Exit Velocity (FPS)	**Exit Flow (ACFM)**	**NYTM (E) (KM)**	**NYTM (N) (KM)**	**Building**	**Distance to Property Line (ft)**	**Date of Removal**

Emission Source/Control

• Continuation Sheet(s)

Emission Source ID	Type	Date of Construction	Date of Operation	Date of Removal	Control Type Code	Control Type Description	Manufacturer's Name/Model No.
BLDG-1	1	AUG 2011	AUG 2011	N/A	048	VAPOR GAC	NEEP AIR STRIPPER / MODEL 31231-3553

Design Capacity	Design Capacity Units Code	Design Capacity Units Description	Waste Feed Code	Waste Feed Description	Waste Type Code	Waste Type Description

Emission Source ID	Type	Date of Construction	Date of Operation	Date of Removal	Control Type Code	Control Type Description	Manufacturer's Name/Model No.

Design Capacity	Design Capacity Units Code	Design Capacity Units Description	Waste Feed Code	Waste Feed Description	Waste Type Code	Waste Type Description

New York State Department of Environmental Conservation
Air Permit Application

DEC ID
1 -					-				

Section IV - Emission Unit Information (continued)

Process Information

• Continuation Sheet(s)

EMISSION UNIT 1-00EU1 PROCESS 01A

Description

VOLATILE ORGANIC COMPOUNDS CONTAMINATED GROUNDWATER IS EXTRACTED VIA 3 EXTRACTION WELLS, COMBINED INFLUENT OF ≈150 GPM IS TREATED IN AN AIR STRIPPER. THE AIR STRIPPER IS A 3-TRAY SHALLOW LOW PROFILE AIR STRIPPER. THE PROCESS USES FORCED DRAFT, COUNTER CURRENT AIR STRIPPING THROUGH HORIZONTAL TRAYS TO REMOVE VOC'S FROM WATER. CONTAMINATED WATER IS SPRAYED INTO THE TOP TRAY AND AIR IS SENT UP FROM THE BOTTOM USING A BLOWER. THE VOLATILIZED CONTAMINANTS ARE EMITTED AS AIR STRIPPER OFF-GAS WHICH IS SENT THROUGH VAPOR PHASE GAC UNITS FOR TREATMENT PRIOR TO DISCHARGE TO THE ATMOSPHERE VIA VENT ON ROOF OF BUILDING.

Source Classification Code (SCC)	Total Thruput		Thruput Quantity Units	
	Quantity/Hr	Quantity/Yr	Code	Description

• Confidential X Operating at Maximum Capacity • Activity with Insignificant Emissions	Operating Schedule		Building	Floor/Location
	Hrs/Day	Days/Yr		
	24	365	BLDG-1	MAIN

Emission Source/Control Identifier(s)

BLDG-1							

EMISSION UNIT - PROCESS

Description

Source Classification Code (SCC)	Total Thruput		Thruput Quantity Units	
	Quantity/Hr	Quantity/Yr	Code	Description

• Confidential • Operating at Maximum Capacity • Activity with Insignificant Emissions	Operating Schedule		Building	Floor/Location
	Hrs/Day	Days/Yr		

Emission Source/Control Identifier(s)

New York State Department of Environmental Conservation
Air Permit Application

DEC ID
- - - - - - - - -

Section IV - Emission Unit Information (continued)

Emission Unit	Emission Point	Process	Emission Source	Emission Unit Applicable Federal Requirements • Continuation Sheet(s)									
				Title	Type	Part	Sub Part	Section	Sub Division	Parag	Sub Parag	Clause	Sub Clause
-													
-													
-													
-													

Emission Unit	Emission Point	Process	Emission Source	Emission Unit State Only Requirements • Continuation Sheet(s)									
				Title	Type	Part	Sub Part	Section	Sub Division	Parag.	Sub Parag.	Clause	Sub Clause
-													
-													
-													
-													

Emission Unit Compliance Certification • Continuation Sheet(s)

Rule Citation

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause
6	NYCRR	212							

• Applicable Federal Requirement • State Only Requirement X Capping

Emission Unit	Emission Point	Process	Emission Source	CAS No.	Contaminant Name
1-00EU1	00EP1	GAC	BLDG-1	00079 - 01 - 6	TRICHLOROETHENE

Monitoring Information

- Continuous Emission Monitoring
- X Intermittent Emission Testing
- Ambient Air Monitoring
- Monitoring of Process or Control Device Parameters as Surrogate
- Work Practice Involving Specific Operations
- Record Keeping/Maintenance Procedures

Description

GRAB AIR SAMPLES ARE COLLECTED FROM INFLUENT AND EFFLUENT PORTS OF EACH GAC VESSEL USING SUMMA CANISTERS ON A MONTHLY BASIS + ANALYSED FOR TO-15 VOCs. PID READINGS ARE NOTED ON A WEEKLY BASIS. RESULTS REPORTED IN MONTHLY REPORTS.

Work Practice Type	Process Material Code	Process Material Description	Reference Test Method
			EPA-TO-15

Parameter Code	Parameter Description	Manufacturer Name/Model No.
54	VOLATILE ORGANIC COMPOUNDS	SUMMACANISTER

Limit Upper	Limit Lower	Limit Units Code	Limit Units Description
			lb/d

Averaging Method Code	Averaging Method Description	Monitoring Frequency Code	Monitoring Frequency Description	Reporting Requirements Code	Reporting Requirements Description
		11	MONTHLY	11	MONTHLY

New York State Department of Environmental Conservation
Air Permit Application

DEC ID
- - - - - - - - - -

Section IV - Emission Unit Information (continued)

Determination of Non-Applicability (Title V Only) • Continuation Sheet(s)

Rule Citation

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

Emission Unit	Emission Point	Process	Emission Source	• Applicable Federal Requirement • State Only Requirement
-				

Description

Rule Citation

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

Emission Unit	Emission Point	Process	Emission Source	• Applicable Federal Requirement • State Only Requirement
-				

Description

Process Emissions Summary • Continuation Sheet(s)

EMISSION UNIT	1-00EU1				PROCESS	
CAS No.	Contaminant Name	% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
00079-01-6	TRICHLOROETHENE		100	95	0.06825	05

PTE (lbs/hr)	PTE (lbs/yr)	PTE (standard units)	Standard Units	PTE How Determined	Actual (lbs/hr)	Actual (lbs/yr)
					N/A	N/A

EMISSION UNIT	1-00EU1				PROCESS	
CAS No.	Contaminant Name	% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
00127-18-4	TETRACHLOROETHENE		100	95	0.0009	05

PTE (lbs/hr)	PTE (lbs/yr)	PTE (standard units)	Standard Units	PTE How Determined	Actual (lbs/hr)	Actual (lbs/yr)
					N/A	N/A

EMISSION UNIT	-				PROCESS	
CAS No.	Contaminant Name	% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
- -						

PTE (lbs/hr)	PTE (lbs/yr)	PTE (standard units)	Standard Units	PTE How Determined	Actual (lbs/hr)	Actual (lbs/yr)

New York State Department of Environmental Conservation
Air Permit Application

DEC ID
- - - - - - - - -

Section IV - Emission Unit Information (continued)

EMISSION UNIT	Emission Unit Emissions Summary • Continuation Sheet(s)			
-				
CAS No.	Contaminant Name			
- -				
ERP (lbs/yr)	PTE Emissions		Actual	
	(lbs/hr)	(lbs/yr)	(lbs/hr)	(lbs/yr)
CAS No.	Contaminant Name			
- -				
ERP (lbs/yr)	PTE Emissions		Actual	
	(lbs/hr)	(lbs/yr)	(lbs/hr)	(lbs/yr)
CAS No.	Contaminant Name			
- -				
ERP (lbs/yr)	PTE Emissions		Actual	
	(lbs/hr)	(lbs/yr)	(lbs/hr)	(lbs/yr)
CAS No.	Contaminant Name			
- -				
ERP (lbs/yr)	PTE Emissions		Actual	
	(lbs/hr)	(lbs/yr)	(lbs/hr)	(lbs/yr)
CAS No.	Contaminant Name			
- -				
ERP (lbs/yr)	PTE Emissions		Actual	
	(lbs/hr)	(lbs/yr)	(lbs/hr)	(lbs/yr)

Compliance Plan N/A • Continuation Sheet(s)

For any emission units which are not in compliance at the time of permit application, the applicant shall complete the following

Consent Order — Certified progress reports are to be submitted every 6 months beginning ___/___/___

Emission Unit	Process	Emission Source	Applicable Federal Requirement									
			Title	Type	Part	Sub Part	Section	Sub Division	Parag.	Sub Parag.	Clause	Sub Clause
-												

Remedial Measure / Intermediate Milestones	R/I	Date Scheduled

New York State Department of Environmental Conservation
Air Permit Application

DEC ID

Section IV - Emission Unit Information (continued)

Request for Emission Reduction Credits N/A • Continuation Sheet(s)

EMISSION UNIT

Emission Reduction Description

Contaminant Emission Reduction Data N/A

Baseline Period ___/___/___ to ___/___/___

Reduction Date	Reduction Method
___/___/___	

CAS No.	Contaminant Name	ERC (lbs/yr) Netting	ERC (lbs/yr) Offset
- -			
- -			
- -			

Facility to Use Future Reduction

Name | APPLICATION ID

Location Address

• City / • Town / • Village | State | Zip

Use of Emission Reduction Credits N/A • Continuation Sheet(s)

EMISSION UNIT

Proposed Project Description

Contaminant Emissions Increase Data

CAS No.	Contaminant Name	PEP (lbs/yr)
- -		

Statement of Compliance N/A

• All facilities under the ownership of this "ownership/firm" are operating in compliance with all applicable requirements and state regulations including any compliance certification requirements under Section 114(a)(3) of the Clean Air Act Amendments of 1990, or are meeting the schedule of a consent order.

Source of Emission Reduction Credit - Facility

Name | PERMIT ID

Location Address

• City / • Town / • Village | State | Zip

Emission Unit	CAS No.	Contaminant Name	ERC (lbs/yr) Netting	ERC (lbs/yr) Offset
-	- -			
-	- -			
-	- -			

New York State Department of Environmental Conservation
Air Permit Application

DEC ID
- - -

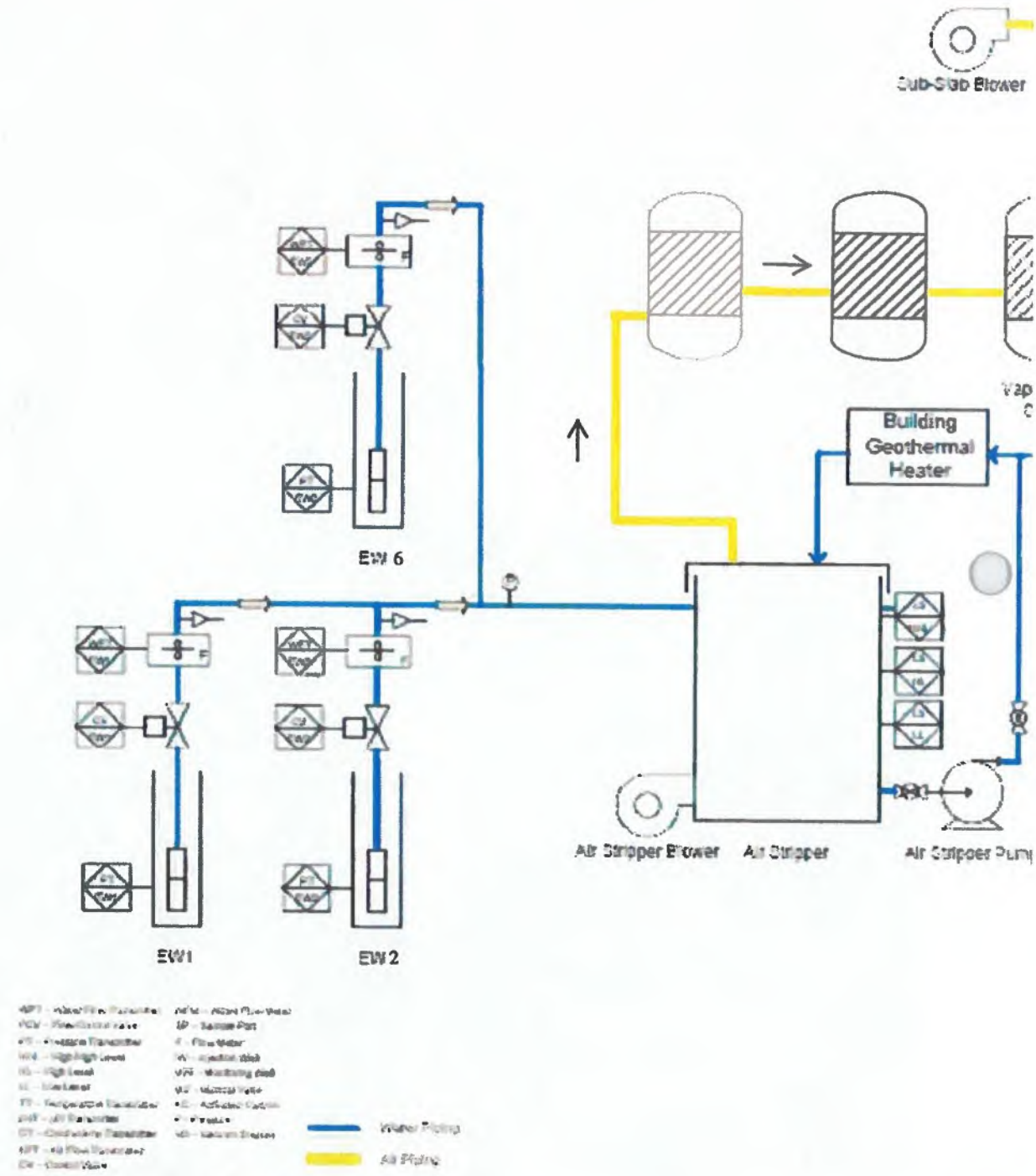
Supporting Documentation

- P.E. Certification (form attached)
- List of Exempt Activities (form attached)
- ✓ Plot Plan
- Methods Used to Determine Compliance (form attached)
- ✓ Calculations
- ✓ Air Quality Model (Results / ____)
- Confidentiality Justification
- Ambient Air Monitoring Plan (____ / ____ / ____)
- Stack Test Protocols/Reports (____ / ____ / ____)
- Continuous Emissions Monitoring Plans/QA/QC (____ / ____ / ____)
- MACT Demonstration (____ / ____ / ____)
- Operational Flexibility: Description of Alternative Operating Scenarios and Protocols
- Title IV: Application/Registration
- ERC Quantification (form attached)
- Use of ERC(s) (form attached)
- Baseline Period Demonstration
- Analysis of Contemporaneous Emission Increase/Decrease
- LAER Demonstration (____ / ____ / ____)
- BACT Demonstration (____ / ____ / ____)
- Other Document(s): _____ (/ /)

FIGURES



HDR	Henningson, Durham & Richardson Architecture and Engineering, P.C. One Blue Hill Plaza Pearl River, NY 10965	**Old Mill Pond GWTF Layout** **Lawrence Aviation Industries Superfund Site** **Port Jefferson Station, New York**	**Figure 1**



Source: Environmental Restoration, LLC, 2012.

ATTACHMENTS

Lawrence Aviation Industries- Old Mill Pond Groundwater Treatment Building
Attachment A
Air Emissions Calculations
EP-1, BLDG1

Air Emissions Calculations- without application of Control Equipment

CAS No.	Contaminant Name	Max Estimated Influent Water Concentration (µg/L)	Volume of Influent (gpm)	Mass of Contaminant (lb/day)	Mass of Contaminant (lb/hr)	Mass of Contaminant (lb/yr)
00127-18-4	Tetrachloroethene	12	150	0.0216	0.0009	7.884
00079-01-6	Trichloroethene	910	150	1.638	0.06825	597.87

Mass of VOCs removed was calculated using:

$M_w = (Vinf)\ (iC)\ k$

where,

M_w- mass of VOCs in pounds per day
V_{inf}- volume of influent (gpm)
$_iC$- concentration of total VOCs in influent (µg/L)
k is a constant to balance units

Legend:
µg/L - microgram per liter
gpm - gallons per minute
lb - pounds
hr - hour
yr - year

Input Parameters:	Units	Conversions (if any)
Stack dimensions:		
Stack height	29 ft	
Stick up	3 ft	
Outer Diameter	12 in	
Inner Diameter	12 in	1.00 ft
Building dimensions:		
Height	25 ft	
Width	31 ft	
Length	74 ft	
Building to property line	30 ft	
Air stripper pump (TDH)	45 in	
GW temp (MPW-02)	14 deg C	57.2 deg F
Approx Air Temp	80 deg F	
Assuming heat loss	75 deg F	
Max Air flow rate	2300 cfm	38 cfs
Velocity	49 ft/sec	

Scenario 1: EW-01, EW-02 and EW-06 through air stripper

Contaminant of Concern	CAS No	Groundwater Influent Concentration (µg/L)	Groundwater Flow Rate (gpm)	Emissions Rate[1] (lbs/day)	Emissions Rate (lbs/hr)	Emissions Rate (lbs/yr)
Trichloroethene	00079-01-6	910	150	1.6423	0.0684306	599.45
Tetrachloroethene	00127-18-4	12	150	0.0217	0.0009024	7.90

Acronyms:
EW - extraction well
CAS No - chemical abstract service number
µg/L - microgram per liter
gpm - gallons per minute
lbs - pounds
AGC - annual guideline concentration value
SGC - short-term guideline concentration value
Short-term maximum - sum of the max individual short-term contaminant impacts
Potential annual - sum of individual contaminant's potential annual impacts which are actual failures that may occur if the source operates conti

Notes:
1. Emissions rate calculated by:
   Groundwater influent concentration (µg/L) x Groundwater flow rate (gpm) x 1440 (min/day) x (1 lb/453.6 g) x (3.79 L/1 gal) x (1 g/10^6 µg)
2. Obtained from running input parameters and the calculated emissions rate for each contaminant through the DAR-1 model.

----- Message from "Bruce Terbush" <brterbus@gw.dec.state.ny.us> on Fri, 10 Apr 2009 13:50:50 -0400 -----
To: "Steven Scharf" <sxscharf@gw.dec.state.ny.us>
Subject: Lawrence Aviation - Draft Effluent Criteria for Downgradient Groundwater Treatment Facility

Steve,

Attached is the draft effluent criteria for the Lawrence Aviation Industries Downgradient Groundwater Treatment Facility for three discharge alternatives. These limits are based upon the draft SPDES Permit Equivalent Application provided by Jeff Catanzarita of EPA on December 3, 2008.

This remedial project is intended to support the onsite groundwater pump & treat system by intercepting the offsite groundwater plume that is migrating from the Lawrence Aviation Industries site toward Port Jefferson Harbor. Groundwater will be intercepted at point prior to where groundwater enters Old Mill Pond and will be treated by sediment filters, air stripping and activated carbon prior to discharge. EPA has requested that this review provide draft effluent criteria and comments for several discharge alternatives including: (1) groundwater reinjection; (2) a discharge to Old Mill Pond; and (3) a discharge to the storm sewer system discharging to Port Jefferson Harbor. The draft effluent criteria is provided in the attached file as Alternatives I, II and III, respectively.

For alternative I, the effluent criteria is based upon our Division of Water's TOGS 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. Monitoring for aluminum was substituted in place of a limit based upon facility sampling indicating a high local background concentration.

For alternative II, the effluent criteria for chloromethane, 1,1-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethylene, 1,1,1-trichloroethane and trichloroethylene reflect technology limits in Attachment C from our Division of Water's TOGS 1.2.1 Industrial Permit Writing Manual. The effluent criteria for tetrachloroethylene, hexavalent chromium, copper, iron and zinc are based upon the Division of Water's TOGS 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations for Class D waters. Zero dilution has been assumed at this point of the review because no information has been provided regarding the location of this discharge. It must also be noted that the discharge to Old Mill Pond may be subject to the Class SC standards if Old Mill Pond is determined to be a continuous flowing natural stream tributary to Port Jefferson Harbor in accordance with 6NYCRR Part 925.4. This information should be addressed in your final SPDES Permit Equivalent Application.

For alternative III, the effluent criteria for chloromethane, 1,1-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethylene, 1,1,1-trichloroethane and trichloroethylene reflect technology limits in Attachment C from our Division of Water's TOGS 1.2.1 Industrial Permit

Writing Manual. The effluent criteria for tetrachloroethylene, hexavalent chromium, copper, lead, nickel and zinc are based upon the Division of Water's TOGS 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations for Class SC waters. Again zero dilution has been assumed at this point of the review because no information has been provided regarding the location of this discharge. As mentioned above the discharge to Old Mill Pond may be subject to the Class SC standards if Old Mill Pond is determined to be a continuous flowing natural stream tributary to Port Jefferson Harbor in accordance with 6NYCRR Part 925.4.

In light of the above, the attached draft limits should be considered for your system design. Information should be collected to determine if the flow in Old Mill Pond is intermittent or continuously flowing to Port Jefferson Harbor. This will help to determine whether Alternative II or III will apply to the proposed discharge to Old Mill Pond. Additionally, information regarding location of the outfall may allow for some consideration of dilution where effluent criteria is based upon the ambient water quality standards. This would include the configuration of the storm sewer discharge pipe to Port Jefferson Harbor.

Please provide this information to EPA. If you have any questions, I can be reached at the number below.

Bruce Terbush
NYSDEC, Bureau of Water Permits
625 Broadway
Albany, NY 12233-3505
(518) 402-8235

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
2890 WOODBRIDGE AVENUE
EDISON, NJ 08837

August 15, 2011

Steven M. Scharf, P.E.
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Action, Bureau A
625 Broadway
Albany, NY 12233-7015

Subject : SPDES Permit Equivalent for Lawrence Aviation Industries – Old Mill Creek

Mr. Scharf:

As you are aware, the U.S. Environmental Protection Agency ("EPA") is in the process of constructing a groundwater pump and treatment facility at the intersection of Caroline Avenue and Brook Road in Port Jefferson, Suffolk County, New York. When the treatment facility becomes fully operational, effluent waters will be discharged into the Old Mill Pond and Creek. On December 3, 2008 EPA provided the New York State Department of Environmental Protection ("DEC") with a State Pollution Discharge Elimination System ("SPDES") Permit Equivalent Application. The application listed three post treatment water discharge options. This memo is being submitted to notify DEC that EPA will be discharging water into the Old Mill Pond and Creek, an option outlined in 2008.

On April 10, 2009 DEC provided EPA with effluent criteria detailing limitations and monitoring requirements that must be met for discharged waters into Old Mill Pond and Creek. EPA agrees with the draft criteria set forth in the document with the exception of hexavalent chromium. This contaminant has not been found to be associated with activities at the Lawrence Aviation Industries Site. Groundwater samples collected throughout the area by EPA and its contractors have not found chromium to be at levels of concern. It is with this that EPA accepts the effluent parameters without hexavalent chromium. EPA shall adhere to these criteria by sampling on a monthly basis, following an eight (8) week consecutive sampling event showing no exceedances.

Sincerely,

Keith Glenn
US EPA Region II
Regional Emergency Response Operations
2890 Woodbridge Avenue
Edison, NJ 08837
732-321-4454
glenn.keith@epa.gov

Attachment: LAI Downgradient Limits for Discharge Alternative II

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning: Upon Start-up of Treatment System

and lasting until: Start-up + 5 years

the discharges from this treatment system to groundwater shall be limited and monitored by the operator as specified below:

Outfall and Parameters	Limitations		Units	Minimum Monitoring Requirements	
	Daily Avg.	Daily Max.		Measurement Frequency	Sample Type
Treated Groundwater Remediation Discharge to Mill Pond (Class D)					
Flow	Monitor	150	GPM	Continuous	Recorder
Flow	Monitor	Monitor	GPD	Continuous	Recorder
pH (range)	6.0 to 9.0		SU	Monthly	Grab
Chloromethane	NA	10.0	µg/l	Monthly [1]	Grab
1,1-Dichloroethane	NA	10.0	µg/l	Monthly [1]	Grab
1,1-Dichloroethene	NA	10.0	µg/l	Monthly [1]	Grab
cis-1,2-Dichloroethylene	NA	10.0	µg/l	Monthly [1]	Grab
1,1,1-Trichloroethane	NA	10.0	µg/l	Monthly [1]	Grab
Trichloroethylene	NA	10.0	µg/l	Monthly [1]	Grab
Tetrachloroethylene	NA	1.0	µg/l	Monthly [1]	Grab
Chromium, Hexavalent [2]	NA	16	µg/l	Monthly [1]	Grab
Copper	NA	13.4	µg/l	Monthly [1]	Grab
Iron	NA	0.3	mg/l	Monthly [1]	Grab
Zinc	NA	0.12	mg/l	Monthly [1]	Grab

DRAFT

Footnotes:

(1) The minimum measurement frequency shall be monthly following a period of 8 consecutive weekly sampling events showing no exceedances of the stated discharge limitations.

(2) Limit based on the dissolved form of hexavalent chromium.

Additional Conditions:

(1) Discharge is not authorized until such time as an engineering submission showing the method of treatment is approved by the Department. The discharge rate may not exceed the effective or design treatment system capacity. All monitoring data, engineering submissions and modification requests must be submitted to:

Salvatore Badalimenti - Remedial Project Manager (RPM)
USEPA - Region 2
290 Broadway, 20th Floor
New York, NY 10007-1866
Phone: (212) 637-3314

and

DRAFT

Steven M. Scharf
NYSDEC
Division of Environmental Remediation, Remedial Action, Bureau A
625 Broadway
Albany, New York 12233-7015
Phone: (518) 402-9620

With a copy sent to:

Regional Water Manager
NYSDEC - Region 1
SUNY Campus, Bldg. 40
Stony Brook, New York 11790
Phone: (631) 444-0405

(2) Only groundwater from the extraction wells for this remedial project is authorized for treatment and discharge.

(3) Authorization to discharge is valid only for the period noted above but may be renewed if appropriate. A request for renewal must be received 6 months prior to the expiration date to allow for a review of monitoring data and reassessment of monitoring requirements.

(4) Both concentration (mg/l or µg/l) and mass loadings (lbs/day) must be reported to the Department for all parameters except flow and pH.

(5) Any use of corrosion/scale inhibitors, biocidal-type compounds, or other water treatment chemicals used in the treatment process must be approved by the department prior to use.

(6) This discharge and administration of this discharge must comply with the substantive requirements of 6NYCRR Part 750.

{In Archive} Lawrence Aviation Offsite Pump and Treat SPDES Modification
Steven Scharf
to:
Keith Glenn
09/23/2011 08:57 AM
Cc:
Salvatore Badalamenti, Maria Jon, "John Swartwout", "John Conover", "William Spitz"
Hide Details
From: "Steven Scharf" <sxscharf@gw.dec.state.ny.us> Sort List...

To: Keith Glenn/R2/USEPA/US@EPA

Cc: Salvatore Badalamenti/R2/USEPA/US@EPA, Maria Jon/R2/USEPA/US@EPA, "John Swartwout" <jbswarto@gw.dec.state.ny.us>, "John Conover" <jeconove@gw.dec.state.ny.us>, "William Spitz" <whspitz@gw.dec.state.ny.us>

History: This message has been replied to.
Archive: This message is being viewed in an archive.

1 Attachment

letter.hw152016.2011-08-15.Offsite_Pump_&_Treat_EPA_SPDES_Permit_Equivalent_Discharge_Response,pdf.pdf

Keith,

This e-mail is in response to the USEPA request to remove hexavalent chromium from the State Pollution Discharge Elimination System (SPDES) analysis requirements for the Lawrence Aviation Industries Offsite Pump and Treat System. This is for the discharge of that offsite pump and treat system, located in the Village of Port Jefferson. The NYSDEC has reviewed your request to remove hexavalent chromium, and by means of this e-mail, hereby approves the USEPA request.

The analyses for the Lawrence Aviation Industries Offsite Pump and Treat system will continue to monitor for total chromium as part of the inorganic analyses. Should the chromium values change significantly, the USEPA will initiate an evaluation of this rise in chromium values and report those findings to the NYSDEC.

A letter will not follow this e-mail. Should you have any questions, please contact me at your earliest convenience.

Steven M. Scharf, P.E.
Project Engineer
New York State Department of
Environmental Conservation
Division of Environmental Remediation
Remedial Action, Bureau A
625 Broadway
Albany, NY 12233-7015
(518)402-9620
Fax: (518)402-9022
EDOCS Information
Region 1, Suffolk (C), Brookhaven (T)
NYSDEC Site No. 152016-OMM
FOILable

Steve : Attached is the memo from EPA accepting the draft effluent criteria for the LAI - Old Mill Creek pump and treatment system. As discussed, we are accepting the limits with the exception of hexavalent chromium. Let me know if you have any questions.

Thanks,

Keith Glenn
EPA Region II
Regional Emergency Operations Center
2890 Woodbridge Avenue
Edison, NJ 08837
glenn.keith@epa.gov
732/321.4454

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
2890 WOODBRIDGE AVENUE
EDISON, NJ 08837

November 22, 2011

ELECTRONIC COORESPONDANCE

Steven M. Scharf, P.E.
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Action, Bureau A
625 Broadway
Albany, NY 12233-7015

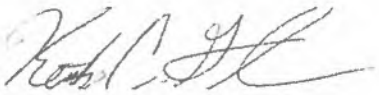
Subject : Commencement of Monthly Sampling; Completion of Weekly Sampling

Mr. Scharf:

On September 23, 2011 the U.S. Environmental Protection Agency (EPA) received approved criteria for discharge of treated groundwater at the Lawrence Aviation Industries Site-Old Mill Pond (LAI) location in Port Jefferson, NY. The discharge criteria were established to meet the New York State Department of Environmental Conservation (NYSDEC) State Pollution Discharge Elimination System (SPDES) program elements.

EPA has been conducting sampling events at the LAI-Old Mill Pond Site since August 18, 2011. Sampling and analytical procedures have been conducted in accordance with the SPDES equivalent criteria agreed upon. A total of twelve (12) sampling events have been conducted between August and November 2011, encompassing eight (8) consecutive operating weeks of the treatment system. Samples collected included influent waters, pre-air stripper, pre-carbon filtration, post-filtration, effluent, and others. Based on the results of the sampling events, the discharge criteria have been met for all parameters. No exceedances were noted in any of the sampling events. As such, EPA has completed the eight week minimum measurement frequency sampling phase of the project. EPA will commence with a monthly sampling protocol that will test for the parameters as outlined in the SPDES criteria. As specified in the SPDES equivalent memo, monthly sampling will be conducted for the next five (5) years or until conditions have changed. Should you have any questions, feel free to contact me.

Sincerely,



Keith Glenn
US EPA Region II
Regional Emergency Response Operations
2890 Woodbridge Avenue
Edison, NJ 08837
732-321-4454
glenn.keith@epa.gov

APPENDIX C

EQUIPMENT OPERATION AND MAINTENANCE MANUALS

C-1 Extraction Well Pumps
C-2 Stride Ethernet Switches
C-3 Actuated Ball Valves
C-4 Signet Magmeter Flow Sensor
C-5 GE Sensing, PTX/PDCR 1230 Depth and Level Sensors
C-6 C-More Hardware (Human Machine Interface) User Manual
C-7 Automation Direct DL205 Programmable Logic Computer User Manual
C-8 Automation Direct Ethernet Communications Models
C-9 Stride Industrial Ethernet Switches
C-10 Transfer Pump Installation, Operation, and Maintenance Instructions
C-11 Dura Pulse AC Drive User Manual
C-12 Proline Promag 50P, 53P Technical Information
C-13 Shallow Tray Air Stripper Model 31231 Technical Information
C-14 Wayne Sump Pump Technical Information
C-15 Lorex True Definition Bullet Security Camera

Due to the overly large size of the Equipment Manual file, it has been omitted from this hard copy of the O&M Manual. The Equipment Manual can be found on the HGL Client Portal and also on a compact disc of the entire O&M Manual that is included with this manual.

APPENDIX D

HEALTH AND SAFETY INSPECTION CHECKLIST

HGL
HydroGeoLogic, Inc
Exceeding Expectations

28.3 USACE FACILITY SAFETY INSPECTION CHECKLIST

Facility	Date:	Inspected by:

INSTRUCTIONS

The purpose of this inspection checklist is to record your facility self-inspection.

The checklist is divided into major hazard groups. Under each hazard group are **Statements** about various conditions in the facility. There are three possible answers for each statement: **Yes** means that that there are no deficiencies associated with that statement anywhere in the facility; **No** means that there are one or more deficiencies; **N/A** means that the statement is not applicable to your facility; and, **Corrected** means that all the deficiencies connected to that statement have been corrected during the inspection. For example, if an electric wall socket is missing a cover plate but it was immediately corrected, then the **No** and the **Corrected** boxes would be checked. A "No" deficiency will be noted in the Deficiency Description box. If three wall sockets in various employees' facility offices were missing cover plates and either none of them or not all of them were corrected, then the **No** box would be checked and one or more deficiencies would be recorded in the Deficiency Description box.

The entry in the Deficiency Description box should include a deficiency number as explained in the Office and Facility Inspection Program, Section 3, the statement number of the deficiency, and the location(s) of the deficiency. Deficiencies found in multiple locations under the same statement number can be grouped under one deficiency number.

Forward the completed Inspection Checklist to the responsible manager and to the Director, Health & Safety by the 15th of the first month of the calendar Quarter in which the inspection is due.

HGL
HydroGeoLogic, Inc
Exceeding Expectations

28.3 USACE FACILITY SAFETY INSPECTION CHECKLIST

Facility	Date:	Inspected by:

1.0 GENERAL FACILITIES ISSUES

Workplace Conditions	Yes	No	N/A	Corrected	EM 385-1-1 or OSHA reference
1.1 Bulletin board: State and federal Labor Posters are current and posted in an area frequented by employees. OSHA 300A posted Feb 1-April 30.					01.A.07h and 01.A.07.g
1.2 Bulletin board: Emergency phone numbers are posted where they can be found in case of an emergency. A map to the nearest emergency care facility is available					01.A.07a-b
1.3 Bulletin board: The facility has a copy of the APP.					01.A.07c
1.4 Bulletin board: The facility has a deficiency tracking log.					01.A.07.e
1.5 Bulletin board: The facility has an up to date SDS book or other system for making SDSs available to personnel and a list of chemicals and quantities with their locations.					01.A.07.i
1.6 Facility offices and cubicles are kept neat without excessive piles of files, books, plans either on top of or under desks, that could pose a hazard or impede egress.					02.B.03
1.7 Lighting is adequate, especially in escape routes.					07.A and 07.B.02
1.8 Are there new hazards or hazards not addressed by this checklist that should be assessed or controlled?					
Notes					

2.0 WALKING AND WORKING SURFACES

Workplace Conditions	Yes	No	N/A	Corrected	EM 385-1-1 or OSHA reference
2.1 Floors are clean. Free of trip, slip, and fall hazards. Floors are free of protrusions, loose tiles, or carpets.					14.D.02
2.2 Corridors, passageways and aisles are clear and unobstructed.					14.D.02
2.3 Stair treads and edgings are in good repair.					14.D.02
2.4 Handrails are present and in good repair.					24.C
2.5 Exits are clear and unobstructed.					14.C.07
2.6 Outside exit landings and walkways are clear and unobstructed.					29 CFR 1910.37

28.3 USACE FACILITY SAFETY INSPECTION CHECKLIST

Facility	Date:	Inspected by:

Workplace Conditions	Yes	No	N/A	Corrected	EM 385-1-1 or OSHA reference
2.7 Exits are marked with visible signs. If exit signs are illuminated there are no burnt out bulbs.					08 Table 8-1 Accident prevention signs
2.8 Facility exit doors open easily and without use of keys or other actions that might impede egress.					OSHA 29 CFR 1910.36 and 1910.37 NFPA 101 life safety codes
Notes					

3.0 STORAGE

Workplace Conditions	Yes	No	N/A	Corrected	EM 385-1-1 or OSHA reference
3.1 Storage areas are neat and maintain at least 2 feet of unobstructed aisle space.					14.C.07
3.2 Adequate storage shelving is available. Boxes are not stacked on the floor or on top of file cabinets or in other locations that might pose a hazard or impede egress.					14.C.01
3.3 Vertical storage shelving and other storage systems are sturdy and stable or are secured to walls or to each other to prevent falling over or collapsing (bookcases are excluded from this requirement).					14.C
3.4 Materials are properly stacked (heaviest materials on the bottom).					14.C
3.5 Step ladders are present to enable access to top shelves and the ladders are in good condition and have slip resistant feet.					24B.08
3.6 Flammable/combustible liquids or compressed gases are not stored in offices.					09.B.01
3.7 Field equipment is cleaned before it is returned to the facility for storage.					OSHA 29 CFR 1910.303(b)(1)(i)
3.8 If there are more than 10 gallons of flammable solvents and chemicals stored inside, they are stored in NFPA and OSHA compliant cabinets away from sources of ignition. If less than 10 gallons they will be stored in original containers.					09.B.12 and OSHA 29 CFR1910.106 and 29 CFR 1910.101

HGL
HydroGeoLogic, Inc
Exceeding Expectations

28.3 USACE FACILITY SAFETY INSPECTION CHECKLIST

Facility	Date:	Inspected by:

Workplace Conditions	Yes	No	N/A	Corrected	EM 385-1-1 or OSHA reference
3.9 Each container of hazardous substances is labeled with the name of the chemical and its hazards or it bears the original label from the manufacturer.					06.B.01.a (4)b OSHA 29 CFR 1910.1200
3.10 Mezzanines used for storage have been evaluated for static load capacity and a sign stating the allowable weight per square foot posted.					OSHA 29 CFR1926.250 and 1910.30(a)
Notes					

4.0 EQUIPMENT AND FURNISHINGS

Workplace Conditions	Yes	No	N/A	Corrected	EM 385-1-1 or OSHA reference
4.1 Office furniture is functional without obvious defects (clean and without protruding splinters or sharp metal edges).					5(a)1 OSHA General Duty Clause
4.2 Space heaters have guards in front of the heating elements, are positioned clear of combustible materials, and have a working tip switch.					09.D.09
4.3 Machines with rotating parts, pinch points, flying debris, or sparks adequately guarded.					17.A.03
4.4 Power saws and all mechanical cutting and grinding equipment are adequately guarded.					13.C.02
4.5 Machinery and equipment are inspected well maintained and clean.					18.G.02
Notes					

HGL
HydroGeoLogic, Inc
Exceeding Expectations

28.3 USACE FACILITY SAFETY INSPECTION CHECKLIST

Facility	Date:	Inspected by:

5.0 ELECTRICAL SAFETY

Workplace Conditions	Yes	No	N/A	Corrected	EM 385-1-1 or OSHA reference
5.1 Electrical equipment is used in the application for which it was rated (power levels for extension cords, wet vs. dry service, etc.).					11.A.04
5.2 Power cords are in good condition – no exposed wires, not spliced, not frayed or with cracked or damaged plugs.					11.A.04e
5.3 Power cords are used safely – placed/secured to prevent tripping and not run under carpets or chair mats or anything else that might compress the cords or retain heat.					11.A.04
5.4 Temporary wiring used for 90 days or less shall be marked with the date put into service.					National Electric code section 590.3 (B)and OSHA 29 CFR 1910.305(a)(2)(i)(B)
5.5 There is no daisy chaining of extension cords and/or power strips.					OSHA 29CFR 1910.303 (a) and 1910.304(b)(2)
5.6 Ground fault circuit interrupter outlets are in place near water (sinks, showers, etc.).					19.A.05m
5.7 Outlets (receptacles) are grounded with no evidence of cracking or burning.					EM 385-1-1 Appendix E OSHA 29 CFR 1910.304 (a)
5.8 All wall electrical receptacles and switches are protected with a cover plate so that no wires or energized components are exposed.					OSHA 29 CFR 1926.405(j)(1)(i) and 29 CFR 1910.305 (b)(2)(i)
5.9 Circuit breaker boxes have securely fastened covers.					11.C.01 11.C.05
5.10 Each circuit breaker is marked with the outlet or circuit it controls.					11.C.04
5.11 Access to each circuit breaker box is not impeded by stored materials (3 feet of clearance taped off on the floor in front of the circuit breaker box marking an access way is best practice).					11.C.01 OSHA 29 CFR 1910.303
5.12 All unused openings (including conduit knockouts) in electrical enclosures and fittings are closed with appropriate covers, plugs, and plates. There are no exposed energized components.					11.A
5.13 Portable electric hand tools are grounded or double insulated.					11.D

HGL
HydroGeoLogic, Inc
Exceeding Expectations

28.3 USACE FACILITY SAFETY INSPECTION CHECKLIST

Facility	Date:	Inspected by:

Notes

6.0 FIRE AND EMERGENCY RESPONSE

Workplace Conditions	Yes	No	N/A	Corrected	EM 385-1-1 or OSHA reference
6.1 Fire extinguishers are the proper type for the hazard.					09.A
6.2 The location of the nearest fire extinguisher is indicated by a sign on the wall over its location.					08.A.05 f (1)
6.3 Access to fire extinguishers is not impeded by stored materials					OSHA 29 CFR 1910.157
6.4 Sprinkler heads, if present, are in good condition and their operation is unimpeded (there is at least 18 inches of clearance all the way around sprinkler heads). Nothing is hung from exposed sprinkler heads.					OSHA 29 CFR 1910.159(c)(10)
6.5 Building management conducts annual sprinkler system testing.					OSHA 29CFR1910.159(c)(2); NFPA 25 5.1 and Table 5.1.
6.6 Smoke and/or heat detectors, if present, are in good condition and their operation is unimpeded.					OSHA 29 CFR 1019.164
6.7 Building management conducts annual smoke and/or heat detector testing.					National Fire Protection Association, National Fire Alarm Code, NPFA-72
6.8 Evacuation routes are posted near every exit door and in the elevator lobby.					33.B.02 n.(3)
6.9 Each employee knows the rally point to meet after evacuation.					01.E.01.d.(3)
6.10 One employee is responsible for bringing the visitor's log from the building.					OSHA 29 CFR 1910.38
6.11 The building runs fire drills at least annually, if occupancy exceeds 50 personnel.					Fire brigade drills 09.J.02
6.12 Smoking prohibited except in designated areas and signs posted.					33.B.02 i.(1)

HGL
HydroGeoLogic, Inc
Exceeding Expectations

28.3 USACE FACILITY SAFETY INSPECTION CHECKLIST

Facility	Date:	Inspected by:

Notes

7.0 FIRST AID AND SANITATION

Workplace Conditions	Yes	No	N/A	Corrected	EM 385-1-1 or OSHA reference
7.1 Kitchenette appliances are clean and in safe working order:					OSHA 29 CFR 1910.141
7.1.1 Toasters in good condition and free of heavy accumulations of crumbs, which can pose a fire hazard.					OSHA 29 CFR 1910.141
7.1.2 Coffee Makers in good condition with no exposed wiring or signs of overheating.					OSHA 29 CFR 1910.141
7.1.3 Microwaves in good condition: doors close securely and protective covers in place.					OSHA 29 CFR 1910.141
7.2 Materials in First Aid and CPR kits are within their expiration dates.					03.A.03 a. (2)b.
7.3 Facility toilets and washing stations are clean and sanitary.					02.E
7.4 Facility quick water flush systems in place if corrosive liquids are present.					06.B.02 b. and OSHA 29 CFR 1910.151(c)
7.5 Potable water and refreshment for extreme temperature work (hot or cold) is available.					5(a)1 OSHA General Duty Clause
Notes					

8.0 CHECKS AND INSPECTIONS

Workplace Conditions	Yes	No	N/A	Corrected	EM 385-1-1 or

HGL
HydroGeoLogic, Inc
Exceeding Expectations

28.3 USACE FACILITY SAFETY INSPECTION CHECKLIST

Facility	Date:	Inspected by:

					OSHA reference
8.1 A monthly functional test of emergency lights is conducted for 30 seconds. Lights should be fully operational during the entire test.					NFPA Life Safety Code (101) OSHA 29 CFR 1910.37
8.2 Fire extinguishers are inspected monthly by HGL or building management and serviced annually by a service company.					09.F.01 a.
8.3 First aid kits/CPR equipment are inspected minimally every 3 months and consumed or out of date supplies replaced.					03.B.03
8.4 Eyewash and emergency shower stations inspected every 30 days.					OSHA 29 CFR 1910.151(c)
Notes					

9.0 PERSONAL PROTECTIVE EQUIPMENT

Workplace Conditions	Yes	No	N/A	Corrected	EM 385-1-1 or OSHA reference
9.1 Eye protection available					05.B
9.2 Head protection available					05.D
9.3 Hand protection available					05.H
9.4 Electrical/Arc Flash equipment available					05.I/11.B.02
9.5 Protective clothing available					05.A.06
9.6 Fall protection equipment available					05.A.09
9.7 Respiratory protection available					05.G
9.8 Lockout/Tagout equipment available					12.B.02
9.9 Insect repellent available					06. E. 01
9.10 Hearing protection available					05.C.04
9.11 Permit-required confined space entry equipment available					Section 34
Notes					

HGL
HydroGeoLogic, Inc
Exceeding Expectations

28.3 USACE FACILITY SAFETY INSPECTION CHECKLIST

Facility	Date:	Inspected by:

10.0 COVID-19

		Yes	No	N/A	Corrected
10.1	Controls comply with current client requirements.				
10.2	Controls comply with current CDC recommendations.				
10.3	Controls comply with local or project requirements.				
10.4	Personnel spaced at least 6 feet apart.				
10.5	Personnel wearing face covers over nose and mouth when near others.				
10.6	Handwashing facilities readily available and stocked with soap or hand sanitizer.				
10.7	Meetings are held outside or in well ventilated spaces that allow distancing.				
10.8	Commonly touched surfaces are disinfected regularly.				
10.9	Persons with signs of illness, such as coughing, are excluded.				
10.10	Personnel are reminded that they are to evaluate their health status every morning before coming to work and that they are not to come to work if ill.				
Notes					

APPENDIX E

HOSPITAL ROUTE MAP



St. Charles Hospital
200 Belle Terre Road
Port Jefferson, NY 11777
(631) 474-6000

Directions to St. Charles Hospital from the Old Mill Pond treament system (1.1 miles, 4 minutes):

1. Take a right turn out of the treatment system driveway onto Brook Road.
2. Turn right onto West Broadway.
3. Continue onto East Broadway.
4. Turn right onto Belle Terre Road.
5. Turn right at 200 Belle Terre Road to St. Charles Hospital.

\\Srv-gst-01\hglgis\Lawrence_Aviation_K13006_MSIW APP_SSHP\(x)OMP_Hospital_Route.mxd
11/9/2020 JG
Source: HGL, HDR, ESRI ArcGIS Online Imagery

Legend

- H — St. Charles Hospital
- Hospital Route
- Site Boundary

Hosptial Route Map
Old Mill Pond Facility

HGL HydroGeoLogic, Inc

APPENDIX F

GROUNDWATER SAMPLING SUMMARY TABLE

Table 01800-3

Environmental Monitoring Schedule for Groundwater

Lawrence Aviation Industries Superfund Site, Port Jefferson Station, New York

Well Type	Well ID	Port	Annual Monitoring		Synoptic Water Levels	
			All other parameters	1,4-Dioxane only	Annually	Continuously
Extraction Well	EW-01	N/A	X	X		X
Extraction Well	EW-02	N/A	X	X		X
Injection Well	IW-01	N/A				X
Injection Well	IW-02	N/A				X
Injection Well	IW-03	N/A				X
Injection Well	IW-04	N/A				X
Injection Well	IW-05	N/A				X
Multiport Well	MPW-01	A	X		X	
		B	X		X	
		C	X		X	
Multiport Well	MPW-02	A	X		X	
		B	X		X	
		C	X		X	
		D	X		X	
Multiport Well	MPW-03	A	X		X	
		B	X		X	
		C	X		X	
		D	X		X	
Multiport Well	MPW-04	A	X		X	
		B	X		X	
		C	X		X	
		D	X		X	
		E	X		X	
Multiport Well	MPW-05	A	X		X	
		B	X		X	
		C	X		X	
		D	X		X	
Multiport Well	MPW-06	A	X		X	
		B	X		X	
		C	X		X	
		D	X		X	
Multiport Well	MPW-07	A	X		X	
		B	X		X	
		C	X		X	
Multiport Well	MPW-08	A	X		X	
		B	X		X	
		C	X		X	
		D	X		X	
		E	X		X	
Multiport Well	MPW-09	A	X	X	X	
		B	X	X	X	
		C	X	X	X	
		D	X	X	X	
		E	X	X	X	
Multiport Well	MPW-10	A	X		X	
		B	X		X	
		C	X		X	
		D	X		X	
Monitoring Well	MW-PD-11	N/A	X		X	
Monitoring Well	MW-PD-12	N/A	X	X	X	
Monitoring Well	MW-PD-13	N/A	X		X	
Monitoring Well	MW-PD-14	N/A	X		X	
Monitoring Well	MW-PD-15	N/A	X		X	
Monitoring Well	MW-PD-16	N/A	X	X	X	
Monitoring Well	MW-PD-17	N/A	X		X	
Monitoring Well	MW-1	N/A	X		X	
Monitoring Well	MW-05	N/A	X		X	

Table 01800-3

Environmental Monitoring Schedule for Groundwater

Lawrence Aviation Industries Superfund Site, Port Jefferson Station, New York

Well Type	Well ID	Port	Annual Monitoring		Synoptic Water Levels	
			All other parameters	1,4-Dioxane only	Annually	Continuously
Monitoring Well	FG-01	N/A	X		X	
Piezometer	PZ-01	N/A			X	
Piezometer	PZ-02	N/A			X	
Piezometer	PZ-03	N/A			X	
Piezometer	PZ-04	N/A			X	
Piezometer	PZ-05	N/A	X		X	
Piezometer	PZ-06	N/A	X		X	
Piezometer	PZ-07	N/A	X		X	
Monitoring Well	MW-ISCO-1	N/A				
Monitoring Well	MW-ISCO-2	N/A	X			
Monitoring Well	MW-ISCO-3	N/A				
Monitoring Well	MW-ISCO-4	N/A	X	X		
Monitoring Well	MW-ISCO-5	N/A	X			
ISCO Injection Well	IW-ISCO-10	N/A	X			
Extraction Well	EW-1	N/A	X	X		X
Extraction Well	EW-2	N/A	X	X		X
Extraction Well	EW-3	N/A	X			X
Extraction Well	EW-4	N/A	X			X
Extraction Well *	EW-6	N/A	X	X		X
Monitoring Well	EW-5	N/A	X		X	
Monitoring Well	TB-01	N/A	X		X	
Monitoring Well	RB-01	N/A	X		X	
Monitoring Well	MW-1A	N/A	X		X	
Monitoring Well	MW-1B	N/A	X		X	
Monitoring Well	MW-2A	N/A	X		X	
Monitoring Well	MW-2B	N/A	X	X	X	
Monitoring Well	MW-3	N/A	X		X	
Monitoring Well	SDW-1	N/A	X		X	
Monitoring Well *	MW-2C	N/A	X		X	
Monitoring Well *	MW-2D	N/A	X		X	
Monitoring Well *	MW-4A	N/A	X		X	
Monitoring Well *	MW-4B	N/A	X		X	
Monitoring Well *	MW-5A	N/A	X		X	
Monitoring Well *	MW-5B	N/A	X		X	
Monitoring Well *	MW-6A	N/A	X		X	
Monitoring Well *	MW-6B	N/A	X		X	

Notes:

Samples will be collected for VOCs, metals, and wet chemistry parameters (alkalinity, sulfate, hardness, chloride, fluoride, TKN, TOC TSS, TDS, and ammonia.

Field measurements will be collected for water level, DO, temperature, conductivity, pH, turbidity, ferrous iron, and ORP.

Synoptic groundwater levels will be collected during annual groundwater sampling events.

Continuous water level measurements will be recorded using a pressure transducer installed in the well.

Sample will be collected from all ports at the multiport wells.

* Wells installed in July 2013 by ERT/USEPA.

APPENDIX G

GOVERNMENT PROPERTY LIST

AND

SUBCONTRACTOR/VENDOR LIST

Old Mill Pond GWTP 8/9/2

Site	Asset Name	Barcnments	Status
Lawrence Avia	Building and Treatment System	V-003	
Lawrence Avia	Air Stripper Unit	G-002	
Lawrence Avia	Air Stripper Pump/Blower/Motor	G-002	
Lawrence Avia	Liquid Carbon Vessel 2000lbs	G-002	
Lawrence Avia	Liquid Carbon Vessel 2000 lbs	G-002	
Lawrence Avia	Vapor Carbon Vessel 2000 lbs	G-002	
Lawrence Avia	Vapor Carbon Vessel 2000 lbs	G-002	
Lawrence Avia	Vapor Carbon Vessel 2000 lbs	G-002	
Lawrence Avia	Dehumidifier	G-002	
Lawrence Avia	Sump Pump	G-002	
Lawrence Avia	Single Cell Bag Filter Unit	G-002	
Lawrence Avia	Single Cell Bag Filter Unit	G-002	
Lawrence Avia	Leaf Blower	G-002	
Lawrence Avia	Power Washer	G-002	
Lawrence Avia	Snow Blower	G-002	
Lawrence Avia	Weed Trimmer	G-002	
Lawrence Avia	Hedge Trimmer	G-002	
Lawrence Avia	Control Box	G-002	
Lawrence Avia	Control Box	G-002	
Lawrence Avia	Extra light for celing	V-003	
Lawrence Avia	Fire Extinguishers w/ compressed nitrogen/ var	V-003	
Lawrence Avia	Ear Plugs	V-003	
Lawrence Avia	Overhead bench light (in box)	V-003	
Lawrence Avia	Floor runners	V-003	
Lawrence Avia	Box of ceiling tiles (extra)	V-003	
Lawrence Avia	Air Stripper Blower Motor, 20 HP	V-003	
Lawrence Avia	Discharge Pump Motor, 7.5 HP	V-003	
Lawrence Avia	Discharge Pump & Motor, 15 HP	V-003	
Lawrence Avia	Blower VFD/Motor Starter, 20 HP	V-003	
Lawrence Avia	Discharge Pump VFD/Motor Starter, 15 HP	V-003	
Lawrence Avia	Water Level Transducer, 80 ft	V-003	
Lawrence Avia	Baldor, Blower Motor, 20 HP	construction of the system in 2011. V-003erations. perating condition is not known	Can be removed from site
Lawrence Avia	Baldor, Pump and Motor, 15 HP	construction of the system in 2011. V-003erations. perating condition is not known	Can be removed from site
Lawrence Avia	Baldor, Pump and Motor, 7.5 HP	construction of the system in 2011. V-003erations. perating condition is not known	Can be removed from site

Subcontractor	POC	Phone
C. Schultes, Inc.	Alex Rodack	856-845-5656
Adler Industrial Service	Bob Dias	973-468-5145
All Wired Up	Archie	631-474-2244
Allstar Electronics	Rich Talbot Jr.	631-474-2896
Aptus Control Systems, Inc.	Brian Hibshman	717-838-3807
Aquifer Drilling & Testing	William Poupis	516-616-6026
AWT Environmental Services	Robert Gaupp	732-613-1660
Layne Christensen Company	Donald Ranft	631-218-0749
Lund Valve Testing	Mary Jones	631-345-3334
TCS Fabricators, Inc.	Tim Simmonds	908-812-7255
Tetrasolv Services	Doug Dallmer	713-703-6516

Vendor Name	Account #	Phone #	Type
K13006 - LAI/OMP			
Optimum - OMP	07840-889371-02	(866) 251-4435	Phone/Internet
PSE&G Long Island - OMP	8574525554	(800) 966-4818	Electric
Suffolk County Water Authority - (	3000830406	(631) 698-9500	Water

APPENDIX H

GOVERNMENT PROPERTY TRANSFER FORM

Government-Furnished Property Transfer Form
LAI Superfund Site, Operable Unit 1
Old Mill Pond GWTP

Date: _____

Item Being Transferred: _____

Quantity:_____

Manufacturer's Name:_____

Model No: _____

Serial No: _____

Identification No: _____

Condition at time of transfer: ___ **Good** ___**Fair** ___**Poor**

Owner's Manuals Provided:___**Yes** __**No**

Maintenance Records Provided:___**Yes** __**No**
Other Information:

Transfer FROM contract: _____

HydroGeoLogic (HGL) _____
Sign-out: **Print Name/Signature**

USACE sign-out:_____
Print Name/Signature

Transfer TO contract: _____

HGL, Inc.
_____
sign-in: **Print Name/Signature**

USACE sign-in: _____
Print Name/Signature

Date Item removed from LAI OMP GWTP database: _____
Note: Copies of this Government-Furnished Property Transfer Form are to be kept as part of the project record for both contracts.

APPENDIX K-1

GREEN REMEDIATION METRICS

Summary of Green Remediation Metrics for Site Management

Site Name:	Lawrence Aviation Facility	Site Code:	**152016**
Address:	100 Sheep Pasture Road	City:	Port Jefferson
State:	NY	Zip Code:	11776
County:	Suffolk		

Initial Report Period (Start Date of period covered by the Initial Report submittal)

Start Date: September 2006

Current Reporting Period

Reporting Period From: 04/01/2025 To: 04/01/2030

Contact Information

Preparer's Name: Derek Roy Phone No.: 860-674-9570
Preparer's Affiliation: HRP Associates, Inc.

I. Energy Usage: Quantify the amount of energy used directly onsite and the portion of that derived from renewable energy sources.

	Current Reporting Period	Total to Date
Fuel Type 1 (e.g., natural gas (cf))		
Fuel Type 2 (e.g., fuel oil, propane (gals))		
Electricity (kWh)		
Of that Electric usage, provide quantity:		
Derived from renewable sources (e.g., solar, wind)		
Other energy sources (e.g., geothermal, solar thermal (Btu))		

Provide a description of all energy usage reduction programs for the site in the space provided on Page 3.

II. Solid Waste Generation: Quantify the management of solid waste generated onsite.

	Current Reporting Period (tons)	Total to Date (tons)
Total waste generated onsite		
OM&M generated waste		
Of that total amount, provide quantity:		
Transported offsite to landfills		
Transported offsite to other disposal facilities		

	Current Reporting Period (tons)	Total to Date (tons)
Transported offsite for recycling/reuse		
Reused onsite		

Provide a description of any implemented waste reduction programs for the site in the space provided on Page 3.

III. Transportation/Shipping: Quantify the distances travelled for delivery of supplies and lab-supplied bottles, shipping of laboratory samples, and the removal of waste.

	Current Reporting Period (miles)	Total to Date (miles)
Standby Engineer/Contractor		
Laboratory Courier/Delivery Service (bottle and sample delivery)		
Waste Removal/Hauling		

Provide a description of all mileage reduction programs for the site in the space provided on Page 3. Include specifically any local vendor/services utilized that are within 50 miles of the site.

IV. Water Usage: Quantify the volume of water used onsite from various sources.

	Current Reporting Period (gallons)	Total to Date (gallons)
Total quantity of water used onsite (not including treated water)		
Of that total amount, provide quantity:		
Public potable water supply usage		
Surface water usage		
Onsite groundwater usage		
Collected or diverted storm water usage		

Provide a description of any implemented water consumption reduction programs for the site in the space provided on Page 3.

V. Land Use and Ecosystems: Quantify the amount of land and/or ecosystems disturbed and the area of land and/or ecosystems restored to a pre-development condition (i.e., Green Infrastructure).

	Current Reporting Period (acres)	Total to Date (acres)
Land disturbed		
Land restored		

Provide a description of any implemented land restoration/green infrastructure programs for the site in the space provided on Page 3.

Description of green remediation programs reported above (Attach additional sheets if needed)
Energy Usage:
Waste Generation:
Transportation/Shipping:
Water usage:
Land Use and Ecosystems:
Recommendations/Other:

CONTRACTOR CERTIFICATION
I, _____ (**Name**) do hereby certify that I am _____ (**Title**) of _____ (**Contractor Name**), which is responsible for the work documented on this form. According to my knowledge and belief, all of the information provided in this form is accurate and the site management program complies with the DER-10, DER-31, and CP-49 policies. _____ **Date Contractor**

APPENDIX K-2

GREEN REMEDIATION MEASURES

APPENDIX K-2 – LAWRENCE AVIATION FACILITY
GREEN REMEDIATION MEASURES

3.3.6 Green Remediation Practices

"Green Remediation" is the practice of considering all environmental effects of the implementation of a remedy and incorporating options to maximize the net environmental benefit of cleanup actions. During procurement of the RA Subcontractor, the bidder's approach for complying with EPA Region 2's "Clean & Green" policy and implementing additional green remediation strategies was included as one of the evaluation criteria. In addition, financial incentives were included in the subcontract documents for implementing selected green remediation practices. Green remediation practices accounted for 35 percent of the total incentive pool.
The following green practices were implemented at the site during GWTF construction:

Energy

- 100 percent of electricity purchased during the treatment facility construction and operations came from renewable sources available through a green power program for the local utility company, LIPA (Renewable Energy Certificates). Approximately 26,000 kilowatt-hours (kWhs) were used during site construction.
- A geothermal heat pump was installed in the treatment facility to circulate treated effluent water under an open loop system. The heat pump serves as a renewable energy source for heating the process area of the building. The heat pump contains an internal electric heater to provide heat during system shutdowns as required.
- Industrial grade insulation curtains were installed on the inside of the treatment facility building roll-up doors to improve the low "R" value of the doors. The insulation curtains will save energy and reduce heating costs.
- Skylights were utilized in the facility process equipment area to minimize use of electrical lighting.
- High efficiency lighting was used in the treatment facility.
- High efficiency motors were used for all process equipment where possible.
- The treatment facility PLC has remote alarm acknowledgement and programming capabilities to reduce fuel consumption associated with driving to the site.
- The tankless hot water heater was installed for the bathroom sink and emergency shower which can have an energy efficiency of up to 99.5 percent.

Fuel

- Ultra-low sulfur diesel was used for all construction vehicles. A total of 2,500 gallons of ultra-low sulfur diesel was used over the course of site construction.
- Equipment idling time during construction was held to five minutes or less to reduce fuel consumption.
- 100 percent of the craft labor for this project was local to the area to reduce fuel consumption associated with driving to the site.

Material Re-Use and Recycling

- Soil Re-use - Soils excavated during trenching was used as trench backfill material rather than importing new material from offsite. Existing topsoil was stripped during clearing and used to re-establish

vegetation in disturbed areas. In addition, approximately 200 tons of drill cuttings were shipped to Soil Safe facility in Logan Township, New Jersey, which operates under a redevelopment plan which approves use of waste soils as fill material and qualifies as a beneficial re-use of the waste.

- Coal Combustion Products in Concrete - The concrete poured at the site used coal combustion product (CCP) materials such as fly ash to replace a portion of traditional cement. The mix for structural concrete that was used for the building foundation contains 122 lbs of fly ash per CY of concrete. A total of 3 tons of fly ash was used.
- Recycled Steel – Approximately 70 percent of the pre-engineered metal building consists of recycled steel, which equates to 5.1 tons of recycled material.
- Recycled Concrete Aggregate - RCA was used in place of crushed stone for the treatment facility access roads and parking areas, for the temporary access roads, and backfilling the AOC 2 excavation. The total quantity of RCA placed was 320 tons.
- Asphalt - Approximately 60 tons of demolition asphalt for the pipe trenching was transported for off-site recycling. Asphalt using recycled materials was used to restore the asphalt that was demolished.
- Cleared Vegetation - Chipping of cleared vegetation was performed by the neighboring local commercial tree chipping facility instead of disposing the material offsite. Approximately 75 CY of cleared material was chipped.
- Re-usable Concrete Form Work – Approximately 1,000 SF of re-usable concrete forms were used during pouring of concrete for the GWTF foundation.

Sustainable Site Practices

- Site Re-Use - The groundwater treatment facility was constructed on a previously developed site (at the LAI facility), which minimizes habitat destruction and minimizes the amount of infrastructure required to service the facility.
- Vegetation Protection - Vegetation was cleared only as required for construction activities, and yard piping was routed to minimize the clearing required.
- Stormwater Runoff Quantity /Quality and Aquifer Recharge - Groundwater from the extraction well and effluent injection well step tests and from well development was treated on site and disposed in the effluent injection wells to recharge the aquifer and minimize offsite disposal. Approximately 770,000 gallons of wastewater were treated and discharged to injection wells.

The following green remediation practices will be performed during facility operations:

- 100 percent of the energy used during facility O&M will be purchased through a green power program for the local utility company, LIPA (Renewable Energy Certificates).
- Spent GAC from the vapor phase granular activated carbon units will be replaced with regenerated carbon.
- Pending waste disposal sampling results, spent carbon will be disposed of at a carbon regeneration facility.
- In addition, several technologies implemented during facility construction will reduce the energy used during facility operations including using high efficiency lighting, installation of a geothermal heat pump, use of high efficiency motors, installation of skylights, installation of a high efficiency hot water heater, and installation of an insulation curtain at the roll-up doors.

Source: Remedial Action Report Groundwater Extraction and Treatment System for the Groundwater Remedy on the Lawrence Aviation Industries Property, Section 3.3.2. CDM, 2011

Lawrence Aviation Industries Site
Old Mill Pond Area
Port Jefferson, New York

Site Green Sheet

INTRODUCTION

It is the policy of the U.S. Environmental Protection Agency (EPA) to apply earth friendly technologies to remedial and removal projects within Region 2. Conscious efforts were made to utilize green techniques and resources while maintaining monetary and time efficient standards for the subject project. Some limitations, such as costs, environmental conditions, and other issues, prevented specific technologies from being utilized. Although formal cost analysis formulations were not fully used to predict differences in technology costs between conventional and green practices, loose cost-benefit structures assisted in determining the resources used.

This paper identifies the environmental and ecological friendly techniques and technologies utilized as part of the joint Remedial/Removal Action at the Lawrence Aviation Industries Site – Old Mill Pond location. Although it is not a full report on all green resources and applications utilized, it is a bulk discussion on the more available products and techniques that are considered sustainable.

Discussed in this document are a number of specific brands and/or products. This is not a designation of endorsement by the EPA or its contractors, partners, or the federal government. Where applicable, solicitations for materials and services were conducted as per citations outlined in the Federal Acquisition Regulations.

SITE HISTORY

Lawrence Aviation Industries (LAI) is located in the Village of Port Jefferson, Town of Brookhaven, Suffolk County, New York. Previously a turkey farm, LAI was a manufacturer of titanium sheeting for the aeronautics industry. Throughout the years, LAI practices for disposal of containers and chemicals were found to have caused negative environmental impacts. Drums containing trichloroethylene (TCE), tetrachloroethylene (PCE), and other wastes were allowed to leak onto the ground, making way to the underlying groundwater. EPA continues to conduct work at the LAI Superfund Site, and more information can be found at http://epaosc.org/lawrenceaviation

In September 2006, the Record of Decision (ROD) selected groundwater extraction and treatment to address groundwater contamination with the installation of groundwater treatment systems. Two have been proposed, with one system located at the facility and one within the plume area near Old Mill Pond.

Beginning in the Fall of 2007 and continuing through the summer of 2008, EPA and it's contractors conducted a groundwater investigation around the LAI Site. Based on June 2008 sampling results, it was determined that a groundwater TCE plume was traveling from the LAI Site to the north towards Port Jefferson Harbor.

In the fall of 2009, EPA authorized the allocation of funding to build a groundwater pump and treat system near Old Mill Pond. The system was designed to assist in drawing contaminated water from the up-gradient LAI Site, as well as prevent contaminated water from leaching into the Old Mill Pond, Old Mill Creek, and Port Jefferson Harbor.



Exterior view of the groundwater pump and treatment facility at the LAI-Old Mill Pond Site.

In 2010, EPA initiated and completed a number of projects throughout Port Jefferson in support of groundwater remediation. Portions of the Old Mill Pond and Old Mill Creek were cleaned and dredged. House-hold trash, dead vegetation, and other debris was removed from the surface water and creek embankment. Discharge piping was placed along Caroline Avenue and Barnum Avenue to carry discharge water to the Creek. In October 2010, EPA broke ground on construction of the groundwater pump and treatment system at the intersection of Caroline Avenue and Brook Road. The system became operation in August 2011. More information on this project can be found at www.epaosc.org/LAI_OldMillCreek

GREEN STRATEGY

Utilization of eco-friendly products and deployment of environmentally friendly techniques was discussed and primarily developed during the site development phase of activities. Project managers reviewed a variety of documents for ideas and established criteria that would benefit the project, environment, and human health. Documents associated with the United States Green Building Council (USGBC) supplied the platform for decision making concepts to follow, such as the Leadership in Energy and Environmental Design (LEED) program. Although this project has not been registered to receive a LEED accreditation, the guidelines set forth in the *LEED 2009 for New Construction and Major Renovations* were followed. This was the most current document published by the USGBC for LEED certification at the time of project design and construction.

Inspiration for utilizing specific techniques was also acquired through EPA Region 2 assets and EPA Superfund documentation. Site managers reviewed the *EPA Region 2 Clean and Green Policy, EPA Office of Solid Waste and Emergency Response Superfund*

Green Remediation Strategy, and various additional Agency publications. Reach-out and idea suggestions for specific tasks were provided by EPA Region 2 personnel working in sustainability design, as well as those working in the EPA Office of Superfund Remediation and Technology Innovation.

MATERIALS

LUMBER

Most lumber products used at the Site were purchased from a commercial yard located less than 5 miles from the Old Mill Pond location. The company is a "Certified Green Dealer™" and stocks products that are environmentally friendly, renewable, and energy conscious.

Lumber utilized for permanent structures on the facility has the potential for meeting LEED certification credits for New Construction, Materials and Resources, Credit 7 for Certified Wood (1 point). All lumber used for this project was grown and processed in the United States.

Framing

Framing is a construction technique that is based around structural members to provide a frame in which interior and exterior walls are attached. Materials utilized for framing generally include studs, solid wood in 2X4 or 2X6 dimensions. In creating the frame of the pump and treatment facility, studs were purchased from a local vendor located less than 4 miles from the Site. The wood selected is made of new wood that is rapidly-renewable.

Sheathing

Sheathing is plywood that is attached as an outer layer of a structure after the fame has been built. It is primarily attached to the wall studs and roof joists of a timber frame. Sheathing is used to protect the interior from adverse climate, provide privacy, and supply security. It is the space between sheathing and frame that insulation is typically placed for additional interior climate control. For the Lawrence Aviation Industries – Old Mill Pond Site, sheathing utilized was obtained from Boise Cascade, a company that promotes and practices sustainable responsibility. Although the company does not own timberlands, the pine plywood utilized for this project has undergone third party certification for sustainability. All wood procurement practices are audited and certified under the Sustainable Forestry Initiative® (SFI®) and the Program for Endorsement of Forest Certification (PEFC)[1].

[1] Information obtained from website http://www.bc.com/sustainability.html

WINDOWS

When choosing products to be utilized for the construction of the groundwater treatment system, energy efficiency was at the fore-front of thought. Choosing the right windows proved to be no exception. Windows chosen needed to be of character to the exterior structure to provide an aesthetic look, but also needed to provide natural light, ventilation, and energy efficiency while being cost efficient. A total of eight windows were purchased and installed for the LAI-Old Mill Pond project. All windows are double hung, argon filled with an Energy Performance U-Factor of 0.30. All windows are Energy Star® qualified and rated by the National Fenestration Rating Council®.

Windows were purchased from a facility located in Farmingdale, NY, approximately 30 miles from the project site.

ROOFING

During the design phase of this project, EPA decided to utilize a roof that would provide a better energy efficiency rating than a standard black asphalt-shingle roof. A cool roof is made of material and/or color that has a solar reflectance index rating of 29 or greater. This not only provides for lower energy costs (due to cooling the interior), but also reduces the occurrence of a heat island effect. EPA decided to go with a metal roof due to look, colors available, durability, and its wide variety of uses in the community. A request for bid to provide this type of roof was developed and sent to various companies for proposal. The awarded firm supplies metal roofs manufactured by ATAS International. EPA supplied the Village of Port Jefferson with a list of colors available with an SRI value of 29 and greater. Working with the Architectural Review Committee and Port Jefferson Beautification Committee, a metal roof painted medium bronze was selected. The roof has a SRI value of 29, meeting the definition of a cool roof.



Site personnel install a metal roof that meets the criteria for a cool roof, reducing the heat island effect.

ATAS International Roofs have the potential for meeting LEED certification credits for New Construction, Sustainable Sites, Credit 7.2 for Heat Island Effect – Roof (1 point). ATAS International Roofs are made in the United States.

SIDING

A variety of siding options are available on the market, however, the theme of the municipality limited choices. HardiePlank® Lap Siding was chosen for its common look

throughout Port Jefferson and the Northeastern United States, but also for the environmental friendly qualities. HardiePlank® is made of sustainable products that are low in toxicity, including wood pulp, cement, sand, and water[2]. The finished material is durable in cold and wet climates and is resistant to damage from insects, hail, wind, and fire. The material is low maintenance requiring little upkeep. The HardiePlank® was generated from a facility located in Blanders, PA, approximately 175 miles from the project site. All coloring is conducted at the manufacturing plant, allowing no additional application of paint, stain, or other finishing materials. The color selected was chosen by the people of Port Jefferson during a public meeting with input from the Architectural Review Committee, Beautification Committee, and Port Jefferson Mayor's Office.

HardiePlank® Lap Siding has the potential for meeting LEED certification credits for New Construction, Materials and Resources, Credit 5.1 and 5.2 for Regional Materials (2 credits). HardiePlank® is made in the United States.

INSULATION

A decision agreed upon by site management was for the use of a spray-foam insulation. After thorough research, spray foam insulations were found to be better insulators against exterior climate changes, thus reducing interior energy consumption. They tend to stop air and moisture more efficiently than traditional insulation materials, save energy costs, keep dust and pollen out, and reduce requirements necessary on HVAC systems[3]. EPA's contractor generated a Request for Proposals for spray foam insulation. SoyTherm® was chosen based on price, product stability, and environmental benefits. SoyTherm® is a soy-based material that is free of formaldehyde, petroleum, asbestos, fiberglass, and volatile organic compounds (VOCs). The material is an air barrier that limits the amount of pollen and dust penetrating into the work space and reduces energy consumption due to climate control. SoyTherm® provides for noise reduction, an important issue to the surrounding residential property owners. It comes in various "models" of thickness, allowing for site tailored requirements for noise and climate control to be met. The material is a 100% renewable resource and is made in the United States[4].



Workers apply soy-based spray foam insulation that acts as a climate barrier and noise reducer.

[2] Information obtained from James Hardie, "Developing and Building Sustainably with James Hardie," document #99084SL, February 2009.

[3] Information obtained from www.sprayfoam.com

[4] Information gathered from www.soytherm.com/greenbuilding

SoyTherm® assists in potentially meeting LEED certification credits for New Construction, Materials and Resources, Credit 6 : Rapidly Renewable Materials (1 Point).

INTERIOR TRIM

Trim board is used to hide the gaps in sheet rock where it meets doors, windows, and the ceiling. It is used for aesthetics and assists in sealing any vapor exchange between interior and exterior spaces. The trim selected for use at the groundwater pump and treatment plant was one of recycled content. All trim purchased at 8-feet in length was generated from at least 85% recovered and recycled fiber content. All trim purchased at lengths of 12-feet was generated from at least 72% recovered and recycled fiber content.

This material has been certified by the Scientific Certification Systems, a third-party independent verification unit for environmental sustainability. The interior trim utilized has the potential for meeting LEEDS certification credits for New Construction, Materials and Resources, Credit 4 : Recycled Content (2 Points).

PERVIOUS PAVEMENT

Through the planning phase of the pump and treatment facility, EPA coordinated efforts and received input from various local committees and organizations. The Port Jefferson Beautification Committee is responsible for the recommendation and approval of landscaping throughout Port Jefferson. The Committee assisted EPA in the design of the surrounding outdoor environment. One request was the utilization of a pervious pavement system instead of the conventional asphalt pavement for parking and access areas. A "living driveway" was suggested to allow for grass to grow through the pavement, while allowing penetration of rain water through the pavement system.



The community requested pervious pavers in lieu of a traditional asphalt driveway, creating a "living" component.

Following review of various pervious pavement systems, EPA selected Nicolock Turfstone with agreement from local committees. This material is manufactured from local sources located approximately 25 miles away from the Site and is made in the United States. Pervious pavement has the potential for meeting LEED certification credits for New Construction, Sustainable Sites, Credit 6.1 and 6.2 for Stormwater Design-Quality Control (2 credits).

ASPHALT

Great attempts were made to not utilize traditional petroleum based asphalt mixes for the driveway, however a proper apron was necessary to join the driveway to the main street.

Following research, a cold-mix asphalt product that is environmentally friendly was purchased and utilized for the task. Green Patch® uses a biodegradable; renewable organic solution to replace petroleum derivatives normally found in conventional cold mix asphalt[5]. The material contains no VOCs, uses biodegradable solvents, and is approximately 40% recycled content. Green Patch ® contains no petroleum derivatives including benzene, diesel, or naphthalene.

Green Patch® is endorsed by the National Green Energy Council and is a member of the U.S. Green Building Council. The asphalt utilized has the potential for meeting LEED certification credits for New Construction, Materials and Resources, Credit 4 : Recycled Content (2 Points).

GEOTHERMAL

Groundwater held within the earth is at a constant temperature. Because of this, technology exists to utilize the water for heating and cooling interior climates. In Port Jefferson, NY the groundwater temperature is approximately 56^0F. Wells were already established for the extraction and treatment of groundwater. Prior to going through the treatment process to remove VOC contamination and following sediment filtration, water is carried to a geothermal heat exchange. This unit utilizes the constant temperature to provide a more efficient way of heating and cooling the support areas of the facility (i.e. offices, restrooms, meeting room, etc.).



A geothermal heat exchange unit allows for a more energy efficient way to heat and cool the interior of the structure.

Geothermal heat exchanges have the potential for accumulating 20 LEED credits, encompassing all New Construction, Energy and Atmosphere, Credits 1-6 (17 Points) and several in New Construction, Indoor Environment Quality, Credits 6.2 – 7.2 (3 Points).

WATER HEATER

Tank-less hot water heaters eliminate the storage of hot water, and are more energy conscious than conventional hot water tanks. Water flows through the heat exchangers only when hot water is required, as in a kitchen sink or bathroom. This saves money by lowering energy demands because there is no hot water reservoir to maintain a specified temperature, thus limiting standing heat loss.

The tank-less water heater selected for this project is Energy Star® qualified, requires less maintenance than conventional hot water tanks, and tends to last longer. Tank-less

[5] As stated on the product packaging and website www.greenpatch.com

water heaters have the potential for meeting LEED certification credits for New Construction, Energy and Atmosphere, Credit 1 : Optimize Energy Performance (1-19 Points).

TREATMENT EQUIPMENT

Designs for the treatment of contaminated water were developed in the early phases of the project. Utilization of an air stripper, aqueous carbon vessels, a vapor phase carbon vessel, and piping were outlined prior to determination of a location. The components of the system, along with the type of treatment to be conducted, were presented in the final Record of Decision. Around the time construction of the treatment was to commence, another groundwater pump and treatment facility located in Suffolk County was in the process of becoming decommissioned. The facility utilized a majority of the same equipment necessary for the LAI – Old Mill Pond Site. A decision was made to reuse as much equipment as possible from the Circuitron Corporation Site located in Farmingdale, New York. Two aqueous phase carbon vessels, a vapor phase carbon vessel, bag filters, a blower device, a significant amount of piping, valves, connectors, pumps, electrical wiring, interior lights, and supplemental equipment was reconditioned/refabricated to meet the needs of the LAI Site. An air stripper was brought in from the Stanton Cleaners Site located in Nassau County, where it was no longer being utilized. In general, not much equipment needed to be purchased for the establishment of the treatment process. This not only saved money on the purchasing side of the equation, but also prevented this material from being disposed of in landfills.

VARIABLE SPEED DRIVES

Pumps are used to extract contaminated water from the wells and control the flow of water through the treatment system. The speed of the pumps does not remain constant, and the pumps must be adjusted at various times. To control the speed of the pumps, variable speed drives were installed. Conventional technologies utilize single speed drives that would turn pumps on and off. By using variable speed drives, the pumps can adjust according to conditions at the time without the need to stop and start abruptly. This process uses less energy than single speed drives, and has the added benefit of producing less stress on the treatment equipment. As such, costs associated with maintenance and replacement time of the equipment is significantly reduced.

FLOORING

Various flooring techniques were utilized for the construction of the treatment facility. In the process equipment room, logical reasoning determined that materials should be limited due to the potential for water spills, condensation build-up, and humidity levels when equipment is operating. Site managers determined to keep the concrete foundation of the floor, grind the surface to create a smoother texture, and apply an epoxy sealant. This assists in creating a low-maintenance floor that will not require harsh chemicals for cleaning and caring.

Flooring was installed in the support areas of the treatment facility, including the hallway, control room, break area, and offices. The material utilized for the underlayment is Eco Silent Sound HD™, made of 100% post consumer recycled granulated rubber tires and high-density polyurethane foam using rapidly renewable resources[6]. The material contains a moisture barrier and antimicrobial protection while providing cushioning and floor noise reduction.



Cork flooring was choosen because it is a rapidly renewable resource and could be installed without VOC containing glues.

Flooring underlayment used for this project has the potential for meeting LEED certification credits for New Construction, Materials and Resources, Credit 4.2 for Recycled Content (2 Points); Credit 5.2 for Regional Materials (2 Points); Credit 6 for Rapidly Renewable Materials (1 Point); Indoor Environmental Quality, Credit 4.3 for Low-Emitting Materials – Flooring Systems (1 Point). Eco Silent Sound HD™ underlayment is made in the United States.

Following the underlayment, cork flooring was installed. This material is harvested from the bark of trees, with a number of years spanning until the next harvest. The tree is not cut down, allowing the forest to remain undamaged. Cork flooring is a rapidly renewable resource that was hand installed without the use of VOC containing glues or adhesives.

Cork flooring utilized for this project has the potential for meeting LEEDS certification credits for New Construction, Materials and Resources, Credit 4.2 for Recycled Content (2 Points); Credit 5.1 for Regional Materials (1 Point); Credit 6 for Rapidly Renewable Materials (1 Point); Indoor Environmental Quality, Credit 4.3 for Low-Emitting Materials-Flooring Systems (1 Point).

CEILING

As with most office space, a drop ceiling system was installed in the support areas of the facility. This includes the control room, office space, break area, and restroom. However, unlike traditional ceiling drop tiles, EPA selected a material that is made of renewable resources. The Armstrong® Tierra™ ceiling tile is comprised of 45% rapidly renewable resources and 23% recycled content[7]. Although made of unique materials, the product maintains characteristics of other commercially available ceiling tiles. The acoustical performance, insulation value, and fire performance are in-line with less eco-friendly products. A high light-reflective finish provides daylight effectiveness without utilizing additional energy sources. It meets standards associated with the California

[6] Information obtained from Product Specification Sheet of Eco Silent Sound HD™, Lumber Liquidators
[7] Information obtained from www.armstrong.com/tierra

Department of Health and Collaborative for High Performance Schools (CHPS) in low-emitting VOC materials.

Armstrong® Tierra™ ceiling tiles have the potential for meeting LEED certification credits in New Construction, Materials and Resources, Credit 4 : Recycled Content (2 Points), Credit 6 : Rapidly Renewable Materials (1 Point), and Indoor Environmental Quality, Credit 8.1 : Daylight and Views – Daylight (1 Point). The LAI – Old Mill Pond location is the first structure on Long Island to utilize this product.

VEGETATION

From pre-construction to beyond the completion of construction activities, landscaping and vegetation management was conducted by EPA personnel. EPA requested that the Village of Port Jefferson Beautification Committee become involved in all re-vegetation and landscaping that was to be performed by EPA. During cleaning of the Old Mill Creek near the Barnum Avenue Bridge, many invasive species of plants were extracted from the area. This included poison ivy, locusts, phragmites, reeds, and brambles. Following the removal of these non-local plants and activities necessary for cleaning the Old Mill Creek, jute mat was placed in lieu of traditional filter fabric. Jute mat is vegetable fibers that have been spun into a mesh sheet and provides an anchoring to control soil erosion. It allows planted vegetation to take root and stabilize creek embankments while not harming the environment.



Native species and jute mat were utilized in restoratoration activities following the removal of invasive plants.

The use of native vegetation was applied to these areas following placement of jute mat. Species were determined by the Beautification Committee and approved by the New York State Department of Environmental Conservation (NYSDEC) regulation 375-6.8. Materials selected included fruit producing, flower generating, evergreen-native species that have a wildlife significance.

During the construction of the pump and treatment building, several trees and vegetation had to be removed due to the footprint of the structure. All trees that were removed were chipped and mulched. This material was utilized in the landscaping along the southern property boundary. Again, EPA requested the assistance of the community-based Beautification Committee. The Committee provided EPA with a landscape design plan indicating species of interest. Re-vegetation and landscaping activities included the use of vegetation having wildlife significance and of native origin.

Water supplied to irrigate vegetation located at the pump and treatment facility is that of the treatment system. The system was designed to provide treated water that may be

utilized for irrigating landscape, so that potable water supplied by the water utility would not have to be used. This concept eliminates the use of potable water for landscaping, and with the planting of native vegetations, the need for irrigation becomes limited. The landscaping has the potential for meeting LEED certification credits in New Construction, Water Efficiency, Credit 1 : Water Efficient Landscaping (4 Points).

RESOURCE RE-USE

The re-use of on-site materials was conducted whenever feasible and practical. For example, materials that were purchased but not used at the Site were returned to the point of origin for obtaining refunds. Vegetation that was removed in order to construct a building or clean the Old Mill Creek was chipped and used as mulch. Left over materials from construction activities, including framing and sheathing, were used to create a variety of products necessary per the design selected by the local community.

Carriage doors were requested to be placed on the façade of the structure facing the street and Caroline Avenue Ball Field. This would add to the character of the building and blend with the architectural theme of the Village. Instead of purchasing carriage doors that were not going to be functional, materials left over from the building of the frame were used for constructing the doors. The same hold true for cabinets constructed for the break-room area and supports for some of the process equipment.

Approximately 240 tons of soil had to be removed from the Site in order to install the pervious pavement. Following analytical testing of the material, the soil was removed by the Port Jefferson Highway Department to be utilized in various projects throughout the municipality. This provided a cost savings to EPA by not having to dispose of the material in a landfill, but also provided reuse of material that still had value.

RENEWABLE ENERGY

The process of drawing water from groundwater aquifers, treating the water to remove contamination, and releasing it back into the environment is a high energy demand. To compensate for high usage, EPA uses renewable energy as a means of electrical supply. Purchased through Community Energy® and the local utility authority, the entire facility is powered by 60% wind and 40% small hydrologic projects. Community Energy® adds an equal amount of renewable power to the grid that is used as a result of operations at the treatment facility[8].

ECONOMIC IMPACTS

Great strides were done to provide economic growth in Port Jefferson, NY and the surrounding communities. Local area businesses potentially profited from the operations conducted by EPA and contractors. During the cleaning operations at the Old Mill Creek with Barnum Avenue partially closed, more vehicular and pedestrian traffic was forced

[8] Set up with Long Island Power Authority and Community Energy to purchase renewable energy was in the process of being established at the time of writing.

onto East Broadway, East Main Street, Main Street, Rt. 25A and other roads. These roads constitute the Port Jefferson downtown district where a vast majority of local businesses are located. Shortly after the completion of EPA activities along Barnum Avenue, signs in the area were changed to promote more traffic flow away from Barnum and onto the downtown roads.

As typical with projects, EPA contractors and employees were housed in local accommodations and frequented local restaurants and grocers. EPA and contractor personnel visited local restaurants and shops for procuring a variety of needs. Food services, gifts, clothing, and other personal needs were purchased from various Port Jefferson businesses. During the peak of activities, over a dozen personnel were working on the facility project and visiting local businesses.

Site logistical needs were also obtained from sources located in the general area. Tools, hardware, electronic equipment, equipment rentals, disposal facilities, and others were sourced out through local vendors, stores, and businesses. Exterior doors needed to be fabricated to specifications in the design plans. A business located approximately 5 miles from the Site was chosen to construct the metal doors. All landscaping needs, including vegetation, crushed stone, mulch, and pervious pavers were purchased from local small businesses. The pervious pavers were manufactured from a facility located approximately 25 miles from the Site.

Office space utilized by EPA and contractors was rented for nearly one year in the heart of Port Jefferson. Conventional projects generally bring trailers for office space. Not only was the utilized method good for local economic strengthening, but also cost beneficial for EPA.

Several subcontracts were necessary to provide specialized services to meet project demands. One such need was that of an architectural firm. John Grillo Architects was selected based on price, knowledge, and location. Located in Port Jefferson, John Grillo personnel were familiar with local building requirements and regulations. Working with the architect, EPA was able to have a facility designed that met the needs of treating contaminated groundwater, was sustainable in design, appealed to the Architectural Review Board, blended with neighboring residential properties, and met all necessary codes. Other subcontracts were awarded to local firms for electrical services and gutter installation.

Additional economic advantages stemming from EPA activities include the removal of invasive vegetation located at the Barnum Avenue Bridge and Caroline Avenue Ball Field. Household trash and debris was removed from the waters of the Old Mill Pond and Creek. A beautification project was completed adjacent to the Barnum Avenue Bridge. Removal of invasive plant species provides an economic advantage by encouraging native plant growth, limiting the need for irrigation, and not having future removal needs of invasive species.

The intent of constructing a groundwater pump and treatment plant is to remove contamination that may, in the future, penetrate indoor air quality. The removal of contaminates from the groundwater will prevent future needs of installing and maintaining indoor air remediation systems. This provides an economic savings to local residents that may have been forced to increase energy demands for operating the systems. Also, the elimination of contaminates from the groundwater may provide a better quality of life for local residents and visitors, knowing that individuals and families can rest easily because threats have been limited.



View of the facility from Brook Road, the main entrance to the facility.

Green technologies do not come without additional costs in comparison to conventional technologies. Several items proved to have significant cost differences, such as the insulation. The cost for purchase and installation of the spray-foam insulation was nearly five times the amount of fiberglass insulation that can be obtained through local home improvement markets. However, the spray foam not only acted in the capacity of weather control for the interior of the facility, but aided in the noise reduction of the treatment equipment. Noise control was necessary as the area is a residential neighborhood, and fiberglass insulation would not supply this need. Had conventional methods been employed, additional measures would have been necessary to purchase, install, and/or fabricate to meet this requirement.

Operations of a groundwater treatment facility require a significant amount of electricity, and the purchase of renewable energy imposes an additional cost of approximately 1.3 cents per kWh. However, this money goes to pay for the harvesting and transporting of renewable energy to the facility. It is energy that is obtained from areas in New York State, providing local jobs as a result. Moneys also ensure that future projects for renewable energy continue to commence and thrive in New York State. The purchase of renewable energy in lieu of renewable energy credits was the least expensive option.

CONCLUSION

This paper is not a comprehensive report detailing all green technologies or LEED credits that may be available at the LAI Site. Several issues, such as alternative transportation, energy performance, light pollution, solar technology, and indoor environment quality aspects were left out of discussions. The intent was to focus on the approaches that are readily available and demonstrate that individuals need not to focus on advanced technologies or new concepts, but those that can be implemented without much deviation from conventional means.

A LEED certification was not pursued for the project because of potential conflicts of interest and additional costs associated with obtaining an official designation. This project followed LEED guidelines for New Construction as a pilot for determining the level of ease and efficiency of using green technologies for sustainable construction. Use of the EPA guidelines and recommendations were followed because of instituted policies and directives.

After completing the design and construction of the Lawrence Aviation Industries Site - Old Mill Pond groundwater pump and treatment facility, it was learned that use of the green techniques outlined in and out of this document did not constitute any great discomfort for project personnel. Overall, costs were slightly higher for purchasing certain items or systems; however the projected long term cost savings should outweigh the need for replacement, maintenance, and energy consumption required by conventional items or systems.

REFRENCES

US EPA, OSRTI, *Superfund Green Remediation Strategy*, September 2010, www.epa.gov/superfund/greenremediation

US EPA, OSWER, *Principles for Greener Cleanups*, August 2009

US EPA, OSWER, *Green Remediation Best Management Practices: Integrating Renewable Energy into Site Cleanup*, April 2011

US EPA, Region 2, *Region 2 Clean and Green Policy*, March 17, 2009

US Green Building Council, *LEED 2009 for New Construction and Major Renovations*, November 2008, updated February 2011.

Clu-In, http://www.clu-in.org/techfocus/default.focus/sec/Remediation_Optimization/cat/Overview/

ADDITIONAL INFORMATION

Additional information regarding the technologies and resources utilized at the Lawrence Aviation Industries – Old Mill Pond Site can be obtained by contacting the EPA On-Scene Coordinator.

Keith Glenn
US EPA Region 2
2890 Woodbridge Avenue
Edison, NJ 08837
glenn.keith@epa.gov
732-321-4454

Lawrence Aviation Industries Site
Old Mill Pond Area
Port Jefferson, New York

Site Green Sheet

INTRODUCTION

It is the policy of the U.S. Environmental Protection Agency (EPA) to apply earth friendly technologies to remedial and removal projects within Region 2. Conscious efforts were made to utilize green techniques and resources while maintaining monetary and time efficient standards for the subject project. Some limitations, such as costs, environmental conditions, and other issues, prevented specific technologies from being utilized. Although formal cost analysis formulations were not fully used to predict differences in technology costs between conventional and green practices, loose cost-benefit structures assisted in determining the resources used.

This paper identifies the environmental and ecological friendly techniques and technologies utilized as part of the joint Remedial/Removal Action at the Lawrence Aviation Industries Site – Old Mill Pond location. Although it is not a full report on all green resources and applications utilized, it is a bulk discussion on the more available products and techniques that are considered sustainable.

Discussed in this document are a number of specific brands and/or products. This is not a designation of endorsement by the EPA or its contractors, partners, or the federal government. Where applicable, solicitations for materials and services were conducted as per citations outlined in the Federal Acquisition Regulations.

SITE HISTORY

Lawrence Aviation Industries (LAI) is located in the Village of Port Jefferson, Town of Brookhaven, Suffolk County, New York. Previously a turkey farm, LAI was a manufacturer of titanium sheeting for the aeronautics industry. Throughout the years, LAI practices for disposal of containers and chemicals were found to have caused negative environmental impacts. Drums containing trichloroethylene (TCE), tetrachloroethylene (PCE), and other wastes were allowed to leak onto the ground, making way to the underlying groundwater. EPA continues to conduct work at the LAI Superfund Site, and more information can be found at http://epaosc.org/lawrenceaviation

In September 2006, the Record of Decision (ROD) selected groundwater extraction and treatment to address groundwater contamination with the installation of groundwater treatment systems. Two have been proposed, with one system located at the facility and one within the plume area near Old Mill Pond.

Beginning in the Fall of 2007 and continuing through the summer of 2008, EPA and it's contractors conducted a groundwater investigation around the LAI Site. Based on June 2008 sampling results, it was determined that a groundwater TCE plume was traveling from the LAI Site to the north towards Port Jefferson Harbor.

In the fall of 2009, EPA authorized the allocation of funding to build a groundwater pump and treat system near Old Mill Pond. The system was designed to assist in drawing contaminated water from the up-gradient LAI Site, as well as prevent contaminated water from leaching into the Old Mill Pond, Old Mill Creek, and Port Jefferson Harbor.



Exterior view of the groundwater pump and treatment facility at the LAI-Old Mill Pond Site.

In 2010, EPA initiated and completed a number of projects throughout Port Jefferson in support of groundwater remediation. Portions of the Old Mill Pond and Old Mill Creek were cleaned and dredged. House-hold trash, dead vegetation, and other debris was removed from the surface water and creek embankment. Discharge piping was placed along Caroline Avenue and Barnum Avenue to carry discharge water to the Creek. In October 2010, EPA broke ground on construction of the groundwater pump and treatment system at the intersection of Caroline Avenue and Brook Road. The system became operation in August 2011. More information on this project can be found at www.epaosc.org/LAI_OldMillCreek

GREEN STRATEGY

Utilization of eco-friendly products and deployment of environmentally friendly techniques was discussed and primarily developed during the site development phase of activities. Project managers reviewed a variety of documents for ideas and established criteria that would benefit the project, environment, and human health. Documents associated with the United States Green Building Council (USGBC) supplied the platform for decision making concepts to follow, such as the Leadership in Energy and Environmental Design (LEED) program. Although this project has not been registered to receive a LEED accreditation, the guidelines set forth in the *LEED 2009 for New Construction and Major Renovations* were followed. This was the most current document published by the USGBC for LEED certification at the time of project design and construction.

Inspiration for utilizing specific techniques was also acquired through EPA Region 2 assets and EPA Superfund documentation. Site managers reviewed the *EPA Region 2 Clean and Green Policy, EPA Office of Solid Waste and Emergency Response Superfund*

Green Remediation Strategy, and various additional Agency publications. Reach-out and idea suggestions for specific tasks were provided by EPA Region 2 personnel working in sustainability design, as well as those working in the EPA Office of Superfund Remediation and Technology Innovation.

MATERIALS

LUMBER

Most lumber products used at the Site were purchased from a commercial yard located less than 5 miles from the Old Mill Pond location. The company is a "Certified Green Dealer™" and stocks products that are environmentally friendly, renewable, and energy conscious.

Lumber utilized for permanent structures on the facility has the potential for meeting LEED certification credits for New Construction, Materials and Resources, Credit 7 for Certified Wood (1 point). All lumber used for this project was grown and processed in the United States.

Framing

Framing is a construction technique that is based around structural members to provide a frame in which interior and exterior walls are attached. Materials utilized for framing generally include studs, solid wood in 2X4 or 2X6 dimensions. In creating the frame of the pump and treatment facility, studs were purchased from a local vendor located less than 4 miles from the Site. The wood selected is made of new wood that is rapidly-renewable.

Sheathing

Sheathing is plywood that is attached as an outer layer of a structure after the fame has been built. It is primarily attached to the wall studs and roof joists of a timber frame. Sheathing is used to protect the interior from adverse climate, provide privacy, and supply security. It is the space between sheathing and frame that insulation is typically placed for additional interior climate control. For the Lawrence Aviation Industries – Old Mill Pond Site, sheathing utilized was obtained from Boise Cascade, a company that promotes and practices sustainable responsibility. Although the company does not own timberlands, the pine plywood utilized for this project has undergone third party certification for sustainability. All wood procurement practices are audited and certified under the Sustainable Forestry Initiative® (SFI®) and the Program for Endorsement of Forest Certification (PEFC)[1].

[1] Information obtained from website http://www.bc.com/sustainability.html

WINDOWS

When choosing products to be utilized for the construction of the groundwater treatment system, energy efficiency was at the fore-front of thought. Choosing the right windows proved to be no exception. Windows chosen needed to be of character to the exterior structure to provide an aesthetic look, but also needed to provide natural light, ventilation, and energy efficiency while being cost efficient. A total of eight windows were purchased and installed for the LAI-Old Mill Pond project. All windows are double hung, argon filled with an Energy Performance U-Factor of 0.30. All windows are Energy Star® qualified and rated by the National Fenestration Rating Council®.

Windows were purchased from a facility located in Farmingdale, NY, approximately 30 miles from the project site.

ROOFING

During the design phase of this project, EPA decided to utilize a roof that would provide a better energy efficiency rating than a standard black asphalt-shingle roof. A cool roof is made of material and/or color that has a solar reflectance index rating of 29 or greater. This not only provides for lower energy costs (due to cooling the interior), but also reduces the occurrence of a heat island effect. EPA decided to go with a metal roof due to look, colors available, durability, and its wide variety of uses in the community. A request for bid to provide this type of roof was developed and sent to various companies for proposal. The awarded firm supplies metal roofs manufactured by ATAS International. EPA supplied the Village of Port Jefferson with a list of colors available with an SRI value of 29 and greater. Working with the Architectural Review Committee and Port Jefferson Beautification Committee, a metal roof painted medium bronze was selected. The roof has a SRI value of 29, meeting the definition of a cool roof.



Site personnel install a metal roof that meets the criteria for a cool roof, reducing the heat island effect.

ATAS International Roofs have the potential for meeting LEED certification credits for New Construction, Sustainable Sites, Credit 7.2 for Heat Island Effect – Roof (1 point). ATAS International Roofs are made in the United States.

SIDING

A variety of siding options are available on the market, however, the theme of the municipality limited choices. HardiePlank® Lap Siding was chosen for its common look

throughout Port Jefferson and the Northeastern United States, but also for the environmental friendly qualities. HardiePlank® is made of sustainable products that are low in toxicity, including wood pulp, cement, sand, and water[2]. The finished material is durable in cold and wet climates and is resistant to damage from insects, hail, wind, and fire. The material is low maintenance requiring little upkeep. The HardiePlank® was generated from a facility located in Blanders, PA, approximately 175 miles from the project site. All coloring is conducted at the manufacturing plant, allowing no additional application of paint, stain, or other finishing materials. The color selected was chosen by the people of Port Jefferson during a public meeting with input from the Architectural Review Committee, Beautification Committee, and Port Jefferson Mayor's Office.

HardiePlank® Lap Siding has the potential for meeting LEED certification credits for New Construction, Materials and Resources, Credit 5.1 and 5.2 for Regional Materials (2 credits). HardiePlank® is made in the United States.

INSULATION

A decision agreed upon by site management was for the use of a spray-foam insulation. After thorough research, spray foam insulations were found to be better insulators against exterior climate changes, thus reducing interior energy consumption. They tend to stop air and moisture more efficiently than traditional insulation materials, save energy costs, keep dust and pollen out, and reduce requirements necessary on HVAC systems[3]. EPA's contractor generated a Request for Proposals for spray foam insulation. SoyTherm® was chosen based on price, product stability, and environmental benefits. SoyTherm® is a soy-based material that is free of formaldehyde, petroleum, asbestos, fiberglass, and volatile organic compounds (VOCs). The material is an air barrier that limits the amount of pollen and dust penetrating into the work space and reduces energy consumption due to climate control. SoyTherm® provides for noise reduction, an important issue to the surrounding residential property owners. It comes in various "models" of thickness, allowing for site tailored requirements for noise and climate control to be met. The material is a 100% renewable resource and is made in the United States[4].



Workers apply soy-based spray foam insulation that acts as a climate barrier and noise reducer.

[2] Information obtained from James Hardie, "Developing and Building Sustainably with James Hardie," document #99084SL, February 2009.

[3] Information obtained from www.sprayfoam.com

[4] Information gathered from www.soytherm.com/greenbuilding

SoyTherm® assists in potentially meeting LEED certification credits for New Construction, Materials and Resources, Credit 6 : Rapidly Renewable Materials (1 Point).

INTERIOR TRIM

Trim board is used to hide the gaps in sheet rock where it meets doors, windows, and the ceiling. It is used for aesthetics and assists in sealing any vapor exchange between interior and exterior spaces. The trim selected for use at the groundwater pump and treatment plant was one of recycled content. All trim purchased at 8-feet in length was generated from at least 85% recovered and recycled fiber content. All trim purchased at lengths of 12-feet was generated from at least 72% recovered and recycled fiber content.

This material has been certified by the Scientific Certification Systems, a third-party independent verification unit for environmental sustainability. The interior trim utilized has the potential for meeting LEEDS certification credits for New Construction, Materials and Resources, Credit 4 : Recycled Content (2 Points).

PERVIOUS PAVEMENT

Through the planning phase of the pump and treatment facility, EPA coordinated efforts and received input from various local committees and organizations. The Port Jefferson Beautification Committee is responsible for the recommendation and approval of landscaping throughout Port Jefferson. The Committee assisted EPA in the design of the surrounding outdoor environment. One request was the utilization of a pervious pavement system instead of the conventional asphalt pavement for parking and access areas. A "living driveway" was suggested to allow for grass to grow through the pavement, while allowing penetration of rain water through the pavement system.



The community requested pervious pavers in lieu of a traditional asphalt driveway, creating a "living" component.

Following review of various pervious pavement systems, EPA selected Nicolock Turfstone with agreement from local committees. This material is manufactured from local sources located approximately 25 miles away from the Site and is made in the United States. Pervious pavement has the potential for meeting LEED certification credits for New Construction, Sustainable Sites, Credit 6.1 and 6.2 for Stormwater Design-Quality Control (2 credits).

ASPHALT

Great attempts were made to not utilize traditional petroleum based asphalt mixes for the driveway, however a proper apron was necessary to join the driveway to the main street.

Following research, a cold-mix asphalt product that is environmentally friendly was purchased and utilized for the task. Green Patch® uses a biodegradable; renewable organic solution to replace petroleum derivatives normally found in conventional cold mix asphalt[5]. The material contains no VOCs, uses biodegradable solvents, and is approximately 40% recycled content. Green Patch ® contains no petroleum derivatives including benzene, diesel, or naphthalene.

Green Patch® is endorsed by the National Green Energy Council and is a member of the U.S. Green Building Council. The asphalt utilized has the potential for meeting LEED certification credits for New Construction, Materials and Resources, Credit 4 : Recycled Content (2 Points).

GEOTHERMAL

Groundwater held within the earth is at a constant temperature. Because of this, technology exists to utilize the water for heating and cooling interior climates. In Port Jefferson, NY the groundwater temperature is approximately 56^0F. Wells were already established for the extraction and treatment of groundwater. Prior to going through the treatment process to remove VOC contamination and following sediment filtration, water is carried to a geothermal heat exchange. This unit utilizes the constant temperature to provide a more efficient way of heating and cooling the support areas of the facility (i.e. offices, restrooms, meeting room, etc.).



A geothermal heat exchange unit allows for a more energy efficient way to heat and cool the interior of the structure.

Geothermal heat exchanges have the potential for accumulating 20 LEED credits, encompassing all New Construction, Energy and Atmosphere, Credits 1-6 (17 Points) and several in New Construction, Indoor Environment Quality, Credits 6.2 – 7.2 (3 Points).

WATER HEATER

Tank-less hot water heaters eliminate the storage of hot water, and are more energy conscious than conventional hot water tanks. Water flows through the heat exchangers only when hot water is required, as in a kitchen sink or bathroom. This saves money by lowering energy demands because there is no hot water reservoir to maintain a specified temperature, thus limiting standing heat loss.

The tank-less water heater selected for this project is Energy Star® qualified, requires less maintenance than conventional hot water tanks, and tends to last longer. Tank-less

[5] As stated on the product packaging and website www.greenpatch.com

water heaters have the potential for meeting LEED certification credits for New Construction, Energy and Atmosphere, Credit 1 : Optimize Energy Performance (1-19 Points).

TREATMENT EQUIPMENT

Designs for the treatment of contaminated water were developed in the early phases of the project. Utilization of an air stripper, aqueous carbon vessels, a vapor phase carbon vessel, and piping were outlined prior to determination of a location. The components of the system, along with the type of treatment to be conducted, were presented in the final Record of Decision. Around the time construction of the treatment was to commence, another groundwater pump and treatment facility located in Suffolk County was in the process of becoming decommissioned. The facility utilized a majority of the same equipment necessary for the LAI – Old Mill Pond Site. A decision was made to reuse as much equipment as possible from the Circuitron Corporation Site located in Farmingdale, New York. Two aqueous phase carbon vessels, a vapor phase carbon vessel, bag filters, a blower device, a significant amount of piping, valves, connectors, pumps, electrical wiring, interior lights, and supplemental equipment was reconditioned/refabricated to meet the needs of the LAI Site. An air stripper was brought in from the Stanton Cleaners Site located in Nassau County, where it was no longer being utilized. In general, not much equipment needed to be purchased for the establishment of the treatment process. This not only saved money on the purchasing side of the equation, but also prevented this material from being disposed of in landfills.

VARIABLE SPEED DRIVES

Pumps are used to extract contaminated water from the wells and control the flow of water through the treatment system. The speed of the pumps does not remain constant, and the pumps must be adjusted at various times. To control the speed of the pumps, variable speed drives were installed. Conventional technologies utilize single speed drives that would turn pumps on and off. By using variable speed drives, the pumps can adjust according to conditions at the time without the need to stop and start abruptly. This process uses less energy than single speed drives, and has the added benefit of producing less stress on the treatment equipment. As such, costs associated with maintenance and replacement time of the equipment is significantly reduced.

FLOORING

Various flooring techniques were utilized for the construction of the treatment facility. In the process equipment room, logical reasoning determined that materials should be limited due to the potential for water spills, condensation build-up, and humidity levels when equipment is operating. Site managers determined to keep the concrete foundation of the floor, grind the surface to create a smoother texture, and apply an epoxy sealant. This assists in creating a low-maintenance floor that will not require harsh chemicals for cleaning and caring.

Flooring was installed in the support areas of the treatment facility, including the hallway, control room, break area, and offices. The material utilized for the underlayment is Eco Silent Sound HD™, made of 100% post consumer recycled granulated rubber tires and high-density polyurethane foam using rapidly renewable resources[6]. The material contains a moisture barrier and antimicrobial protection while providing cushioning and floor noise reduction.



Cork flooring was choosen because it is a rapidly renewable resource and could be installed without VOC containing glues.

Flooring underlayment used for this project has the potential for meeting LEED certification credits for New Construction, Materials and Resources, Credit 4.2 for Recycled Content (2 Points); Credit 5.2 for Regional Materials (2 Points); Credit 6 for Rapidly Renewable Materials (1 Point); Indoor Environmental Quality, Credit 4.3 for Low-Emitting Materials – Flooring Systems (1 Point). Eco Silent Sound HD™ underlayment is made in the United States.

Following the underlayment, cork flooring was installed. This material is harvested from the bark of trees, with a number of years spanning until the next harvest. The tree is not cut down, allowing the forest to remain undamaged. Cork flooring is a rapidly renewable resource that was hand installed without the use of VOC containing glues or adhesives.

Cork flooring utilized for this project has the potential for meeting LEEDS certification credits for New Construction, Materials and Resources, Credit 4.2 for Recycled Content (2 Points); Credit 5.1 for Regional Materials (1 Point); Credit 6 for Rapidly Renewable Materials (1 Point); Indoor Environmental Quality, Credit 4.3 for Low-Emitting Materials-Flooring Systems (1 Point).

CEILING

As with most office space, a drop ceiling system was installed in the support areas of the facility. This includes the control room, office space, break area, and restroom. However, unlike traditional ceiling drop tiles, EPA selected a material that is made of renewable resources. The Armstrong® Tierra™ ceiling tile is comprised of 45% rapidly renewable resources and 23% recycled content[7]. Although made of unique materials, the product maintains characteristics of other commercially available ceiling tiles. The acoustical performance, insulation value, and fire performance are in-line with less eco-friendly products. A high light-reflective finish provides daylight effectiveness without utilizing additional energy sources. It meets standards associated with the California

[6] Information obtained from Product Specification Sheet of Eco Silent Sound HD™, Lumber Liquidators
[7] Information obtained from www.armstrong.com/tierra

Department of Health and Collaborative for High Performance Schools (CHPS) in low-emitting VOC materials.

Armstrong® Tierra™ ceiling tiles have the potential for meeting LEED certification credits in New Construction, Materials and Resources, Credit 4 : Recycled Content (2 Points), Credit 6 : Rapidly Renewable Materials (1 Point), and Indoor Environmental Quality, Credit 8.1 : Daylight and Views – Daylight (1 Point). The LAI – Old Mill Pond location is the first structure on Long Island to utilize this product.

VEGETATION

From pre-construction to beyond the completion of construction activities, landscaping and vegetation management was conducted by EPA personnel. EPA requested that the Village of Port Jefferson Beautification Committee become involved in all re-vegetation and landscaping that was to be performed by EPA. During cleaning of the Old Mill Creek near the Barnum Avenue Bridge, many invasive species of plants were extracted from the area. This included poison ivy, locusts, phragmites, reeds, and brambles. Following the removal of these non-local plants and activities necessary for cleaning the Old Mill Creek, jute mat was placed in lieu of traditional filter fabric. Jute mat is vegetable fibers that have been spun into a mesh sheet and provides an anchoring to control soil erosion. It allows planted vegetation to take root and stabilize creek embankments while not harming the environment.



Native species and jute mat were utilized in restoratoration activities following the removal of invasive plants.

The use of native vegetation was applied to these areas following placement of jute mat. Species were determined by the Beautification Committee and approved by the New York State Department of Environmental Conservation (NYSDEC) regulation 375-6.8. Materials selected included fruit producing, flower generating, evergreen-native species that have a wildlife significance.

During the construction of the pump and treatment building, several trees and vegetation had to be removed due to the footprint of the structure. All trees that were removed were chipped and mulched. This material was utilized in the landscaping along the southern property boundary. Again, EPA requested the assistance of the community-based Beautification Committee. The Committee provided EPA with a landscape design plan indicating species of interest. Re-vegetation and landscaping activities included the use of vegetation having wildlife significance and of native origin.

Water supplied to irrigate vegetation located at the pump and treatment facility is that of the treatment system. The system was designed to provide treated water that may be

utilized for irrigating landscape, so that potable water supplied by the water utility would not have to be used. This concept eliminates the use of potable water for landscaping, and with the planting of native vegetations, the need for irrigation becomes limited. The landscaping has the potential for meeting LEED certification credits in New Construction, Water Efficiency, Credit 1 : Water Efficient Landscaping (4 Points).

RESOURCE RE-USE

The re-use of on-site materials was conducted whenever feasible and practical. For example, materials that were purchased but not used at the Site were returned to the point of origin for obtaining refunds. Vegetation that was removed in order to construct a building or clean the Old Mill Creek was chipped and used as mulch. Left over materials from construction activities, including framing and sheathing, were used to create a variety of products necessary per the design selected by the local community.

Carriage doors were requested to be placed on the façade of the structure facing the street and Caroline Avenue Ball Field. This would add to the character of the building and blend with the architectural theme of the Village. Instead of purchasing carriage doors that were not going to be functional, materials left over from the building of the frame were used for constructing the doors. The same hold true for cabinets constructed for the break-room area and supports for some of the process equipment.

Approximately 240 tons of soil had to be removed from the Site in order to install the pervious pavement. Following analytical testing of the material, the soil was removed by the Port Jefferson Highway Department to be utilized in various projects throughout the municipality. This provided a cost savings to EPA by not having to dispose of the material in a landfill, but also provided reuse of material that still had value.

RENEWABLE ENERGY

The process of drawing water from groundwater aquifers, treating the water to remove contamination, and releasing it back into the environment is a high energy demand. To compensate for high usage, EPA uses renewable energy as a means of electrical supply. Purchased through Community Energy® and the local utility authority, the entire facility is powered by 60% wind and 40% small hydrologic projects. Community Energy® adds an equal amount of renewable power to the grid that is used as a result of operations at the treatment facility[8].

ECONOMIC IMPACTS

Great strides were done to provide economic growth in Port Jefferson, NY and the surrounding communities. Local area businesses potentially profited from the operations conducted by EPA and contractors. During the cleaning operations at the Old Mill Creek with Barnum Avenue partially closed, more vehicular and pedestrian traffic was forced

[8] Set up with Long Island Power Authority and Community Energy to purchase renewable energy was in the process of being established at the time of writing.

onto East Broadway, East Main Street, Main Street, Rt. 25A and other roads. These roads constitute the Port Jefferson downtown district where a vast majority of local businesses are located. Shortly after the completion of EPA activities along Barnum Avenue, signs in the area were changed to promote more traffic flow away from Barnum and onto the downtown roads.

As typical with projects, EPA contractors and employees were housed in local accommodations and frequented local restaurants and grocers. EPA and contractor personnel visited local restaurants and shops for procuring a variety of needs. Food services, gifts, clothing, and other personal needs were purchased from various Port Jefferson businesses. During the peak of activities, over a dozen personnel were working on the facility project and visiting local businesses.

Site logistical needs were also obtained from sources located in the general area. Tools, hardware, electronic equipment, equipment rentals, disposal facilities, and others were sourced out through local vendors, stores, and businesses. Exterior doors needed to be fabricated to specifications in the design plans. A business located approximately 5 miles from the Site was chosen to construct the metal doors. All landscaping needs, including vegetation, crushed stone, mulch, and pervious pavers were purchased from local small businesses. The pervious pavers were manufactured from a facility located approximately 25 miles from the Site.

Office space utilized by EPA and contractors was rented for nearly one year in the heart of Port Jefferson. Conventional projects generally bring trailers for office space. Not only was the utilized method good for local economic strengthening, but also cost beneficial for EPA.

Several subcontracts were necessary to provide specialized services to meet project demands. One such need was that of an architectural firm. John Grillo Architects was selected based on price, knowledge, and location. Located in Port Jefferson, John Grillo personnel were familiar with local building requirements and regulations. Working with the architect, EPA was able to have a facility designed that met the needs of treating contaminated groundwater, was sustainable in design, appealed to the Architectural Review Board, blended with neighboring residential properties, and met all necessary codes. Other subcontracts were awarded to local firms for electrical services and gutter installation.

Additional economic advantages stemming from EPA activities include the removal of invasive vegetation located at the Barnum Avenue Bridge and Caroline Avenue Ball Field. Household trash and debris was removed from the waters of the Old Mill Pond and Creek. A beautification project was completed adjacent to the Barnum Avenue Bridge. Removal of invasive plant species provides an economic advantage by encouraging native plant growth, limiting the need for irrigation, and not having future removal needs of invasive species.

The intent of constructing a groundwater pump and treatment plant is to remove contamination that may, in the future, penetrate indoor air quality. The removal of contaminates from the groundwater will prevent future needs of installing and maintaining indoor air remediation systems. This provides an economic savings to local residents that may have been forced to increase energy demands for operating the systems. Also, the elimination of contaminates from the groundwater may provide a better quality of life for local residents and visitors, knowing that individuals and families can rest easily because threats have been limited.



View of the facility from Brook Road, the main entrance to the facility.

Green technologies do not come without additional costs in comparison to conventional technologies. Several items proved to have significant cost differences, such as the insulation. The cost for purchase and installation of the spray-foam insulation was nearly five times the amount of fiberglass insulation that can be obtained through local home improvement markets. However, the spray foam not only acted in the capacity of weather control for the interior of the facility, but aided in the noise reduction of the treatment equipment. Noise control was necessary as the area is a residential neighborhood, and fiberglass insulation would not supply this need. Had conventional methods been employed, additional measures would have been necessary to purchase, install, and/or fabricate to meet this requirement.

Operations of a groundwater treatment facility require a significant amount of electricity, and the purchase of renewable energy imposes an additional cost of approximately 1.3 cents per kWh. However, this money goes to pay for the harvesting and transporting of renewable energy to the facility. It is energy that is obtained from areas in New York State, providing local jobs as a result. Moneys also ensure that future projects for renewable energy continue to commence and thrive in New York State. The purchase of renewable energy in lieu of renewable energy credits was the least expensive option.

CONCLUSION

This paper is not a comprehensive report detailing all green technologies or LEED credits that may be available at the LAI Site. Several issues, such as alternative transportation, energy performance, light pollution, solar technology, and indoor environment quality aspects were left out of discussions. The intent was to focus on the approaches that are readily available and demonstrate that individuals need not to focus on advanced technologies or new concepts, but those that can be implemented without much deviation from conventional means.

A LEED certification was not pursued for the project because of potential conflicts of interest and additional costs associated with obtaining an official designation. This project followed LEED guidelines for New Construction as a pilot for determining the level of ease and efficiency of using green technologies for sustainable construction. Use of the EPA guidelines and recommendations were followed because of instituted policies and directives.

After completing the design and construction of the Lawrence Aviation Industries Site - Old Mill Pond groundwater pump and treatment facility, it was learned that use of the green techniques outlined in and out of this document did not constitute any great discomfort for project personnel. Overall, costs were slightly higher for purchasing certain items or systems; however the projected long term cost savings should outweigh the need for replacement, maintenance, and energy consumption required by conventional items or systems.

REFRENCES

US EPA, OSRTI, *Superfund Green Remediation Strategy*, September 2010, www.epa.gov/superfund/greenremediation

US EPA, OSWER, *Principles for Greener Cleanups*, August 2009

US EPA, OSWER, *Green Remediation Best Management Practices: Integrating Renewable Energy into Site Cleanup*, April 2011

US EPA, Region 2, *Region 2 Clean and Green Policy*, March 17, 2009

US Green Building Council, *LEED 2009 for New Construction and Major Renovations*, November 2008, updated February 2011.

Clu-In, http://www.clu-in.org/techfocus/default.focus/sec/Remediation_Optimization/cat/Overview/

ADDITIONAL INFORMATION

Additional information regarding the technologies and resources utilized at the Lawrence Aviation Industries – Old Mill Pond Site can be obtained by contacting the EPA On-Scene Coordinator.

Keith Glenn
US EPA Region 2
2890 Woodbridge Avenue
Edison, NJ 08837
glenn.keith@epa.gov
732-321-4454

APPENDIX K-3

SEFA SPREADSHEETS

Note: The tabs in this workbook are for data compilation only, and are not intended for user input.

Lawrence Avaiton Facility

Spreadsheets for Environmental Footprint Analysis (SEFA) Version 3.0, November 2019

Calculations Workbook

Groundwater Extraction and Treatment System

	Enter the path name (if not saved in the same directory) and file name of the "Input" workbook for the project.
Path Name:	
Input File Name:	SEFA_input_LAI_.xlsm

Component	**Remedy Component Names**
Component 1	Excavation/ Trenching
Component 2	Drilling
Component 3	Groundwater Monitoring
Component 4	O&M
Component 5	Non routine Site Visits
Component 6	< Component 6 >

Component names are autofilled from the "Main" workbook.

The following color coding applies to cells in the worksheets in this workbook.

	Green cells indicate notes or instructions
	Values in blue are obtained from the "Input Summary" tab in the "Input" workbook.
	Gray cells are not available and/or not applicable for data entry
	Orange cells are calculated metrics that are forwarded to the "Energy & Air" tabs in the "Main" workbook.

Spreadsheets for Environmental Footprint Analysis (SEFA) Version 3.0, November 2019

U.S. Environmental Protection Agency (EPA), Office of Superfund Remediation and Technology Innovation

Overview of the "Calculations" Workbook

The "Calculations" workbook is used for applying footprint conversion factors for materials and activities entered in the "Input Template" tab in the "Input" workbook. The application of the footprint conversion factors occurs automatically and does not require attention by the user.

However, you must ensure that the "Input File Name" in Row 11 of the "General" tab of the "Calculations" workbook is filled in correctly (that is, to correctly reflect the file name of the "Input" workbook) in order for the SEFA workbooks to exchange data.

Notes Regarding the "Calculations" Workbook

1) The "Calculations" workbook receives information about the cleanup site from the "Input Summary" tab of the "Input" workbook (Columns Q – W). The information is populated automatically into Column C of the "Component 1 - 6" tabs and the "All Components" tab. The footprint conversion factors are automatically applied in Columns D through O.

2) The results of the footprint calculations are transferred automatically to the "Energy & Air" tabs in the "Main" workbook. From there the results are compiled and presented in the "Summary" and "Totals by Scope and Component" tab of the "Main" workbook.

3) The data transfer and calculation portions of the "Component" tabs are locked to prevent alteration by the user.

4) However, you may access the calculations in the "Component" tabs for use in custom-designed summaries, tables, and charts. The custom-designed summaries may be useful for a variety of purposes, including:

(a) On-site NOx, SOx, and PM are reported in aggregate in the "Summary" tab of the "Main" workbook, but may be accessed individually in the "Component" tabs in the "Calculations" workbook.

(b) Unique points of interest may be addressed, such as summing the footprint from all construction materials or all treatment chemicals.

(c) Total fuel and materials usages, or wastes generated, may be obtained from Column C of the "Component" tabs.

5) Additional subtotals are provided at the end of each "Component" tab (beginning at Row 221), for the convenience of the user.

6) The automatic calculations in the "Component" tabs are set to a default formatting and do not imply true significant figures. You may want to adjust calculated values to proper significant figures if you are using these sheets for summary or presentation purposes.

7) Certain sections throughout the "Calculations" tabs are unlocked to allow for notes and supplemental calculations by the user.

Excavation/ Trenching - On-Site Footprint (Scope 1)

Contributors to Footprints	Units	Usage	Energy		GHG		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
On-Site														
On-site Renewable Energy														
Renewable electricity generated on-site	MWh	0	3.413	0										
Landfill gas combusted on-site for energy use	ccf CH4	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
On-site biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
On-site biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
User-defined on-site renewable energy use #1	gal	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined on-site renewable energy use #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
On-site Renewable Energy Subtotals				**0**		**0**		**0**		**0**		**0**		**0**
Notes:														
On-site Conventional Energy														
On-site grid electricity	MWh	0	3.413	0										
On-site diesel use - Other	Gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
On-site diesel use <75 hp	Gal	0	0.139	0	22.21	0	0.1565	0	0.000145	0	0.0145	0	0.00004	0
On-site diesel use 75<hp<750	Gal	0	0.139	0	22.24	0	0.101	0	0.00013	0	0.009	0	0.00004	0
On-site diesel use >750 hp	Gal	0	0.139	0	22.24	0	0.149	0	0.00013	0	0.006	0	0.00004	0
On-site gasoline use - Other	Gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
On-site gasoline use <25 hp	Gal	0	0.124	0	17.48	0	0.037	0	0.00025	0	0.165	0	0.00008	0
On-site gasoline use >25 hp	Gal	0	0.124	0	19.93	0	0.032	0	0.00029	0	0.002	0	0.00009	0
On-site natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
On-site compressed natural gas use - Other	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
On-site compressed natural gas use	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
On-site liquified petroleum gas use - Other	gal	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
On-site liquified petroleum gas use	gal	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
Other forms of on-site conventional energy use #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Other forms of on-site conventional energy use #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
On-site Conventional Energy Subtotals				**0**		**0**		**0**		**0**		**0**		**0**
Notes:														
Other On-site Emissions														
On-site HAP process emissions	lbs	0											1	0
On-site GHG emissions	lbs CO2e	0			1	0								
On-site carbon storage	lbs CO2e	0			1	0								
GHG avoided by flaring on-site landfill methane	Lbs	0			-262	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Other on-site NOx emissions or reductions	lbs	0					1	0						
Other on-site SOx emissions or reductions	lbs	0							1	0				
Other on-site PM emissions or reductions	lbs	0									1	0		
Notes:														
On-site Totals				**0.00**		**0**		**0**		**0**		**0**		**0**

Excavation/ Trenching - Electricity Generation Footprint (Scope 2)

Contributors to Footprints	Units	Usage	Energy		GHG		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Electricity Generation														
Grid electricity	MWh	0	6.929	0	1124.3	0	2.2421	0	4.607887	0	0.057518	0	0.210237	0
Voluntary purchase of renewable electricity	MWh	0												
Voluntary purchase of RECs	MWh	0												
Notes:														

Excavation/ Trenching - Transportation Footprint (Scope 3a)

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Conventional Energy														
Transportation diesel use	gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
Transportation diesel use - car	gal	0	0.139	0	22.57	0	0.015	0	0.0002	0	0.003	0	0.00252	0
Transportation diesel use - passenger truck	gal	0	0.139	0	22.545	0	0.0585	0	0.0002	0	0.007	0	0.002605	0
Transportation diesel use - User Defined	gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
Transportation gasoline use	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
Transportation gasoline use - car	gal	0	0.124	0	19.77	0	0.027	0	0.00036	0	0.003	0	0.0067	0
Transportation gasoline use - passenger truck	gal	0	0.124	0	19.79	0	0.035	0	0.00036	0	0.003	0	0.00661	0
Transportation gasoline use - User Defined	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
Transportation natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Transportation natural gas use - User Defined	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
User-defined conventional energy transportation #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined conventional energy transportation #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Conventional Energy Subtotals				**0**		**0**		**0**		**0**		**0**		**0**
Notes:														
Renewable Energy														
Transportation biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Transportation biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
User-defined renewable energy transportation #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined renewable energy transportation #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Renewable Energy Subtotals				**0**		**0**		**0**		**0**		**0**		**0**
Notes:														
Transportation Totals				**0**		**0**		**0**		**0**		**0**		**0**

Excavation/ Trenching - Off-Site Footprint (Scope 3b)

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Construction Materials														
Aluminum, Rolled Sheet	lb	0	0.0633	0	9.15	0	0.0148	0	0.0283	0	0.0088	0	0.00102	0
Asphalt, mastic	lb	0	0.0412	0	0.85	0	0.00271	0	0.00798	0	0.000766	0	0.00107	0
Asphalt, paving-grade	lb	0	0.5	0	8.58	0	0.0299	0	0.0969	0	0.0091	0	0.0133	0
Ethanol, Corn, 95%	lb	0	0.0318	0	-0.0199	0	0.00425	0	0.00303	0	0.000469	0	8.46E-05	0
Ethanol, Corn, 99.7%	lb	0	0.0324	0	0.0591	0	0.00431	0	0.0031	0	0.000472	0	0.000087	0
Ethanol, Petroleum, 99.7%	lb	0	0.0205	0	1.25	0	0.00199	0	0.00214	0	0.000277	0	5.89E-05	0
Gravel/Sand Mix, 65% Gravel	lb	0	2.48E-05	0	0.0024	0	0.000018	0	4.52E-06	0	2.61E-06	0	3.08E-07	0
Gravel/sand/clay	lb	0	0.000028	0	0.00335	0	1.65E-05	0	0.000015	0	0.000002	0	2.05E-10	0
HDPE	lb	0	0.0332	0	1.94	0	0.00325	0	0.00409	0	0.000439	0	6.41E-05	0
Photovoltaic system (installed)	W	0	0.0336	0	4.47	0	0.015	0	0.032	0	0.00063	0	2.9E-06	0
PVC	lb	0	0.0262	0	2.02	0	0.004	0	0.00274	0	0.000372	0	0.000375	0
Portland cement, US average	lb	0	0.0139	0	1.34	0	0.00654	0	0.0104	0	0.00378	0	0.00097	0
Ready-mixed concrete, 20 MPa	ft3	0	0.217	0	19.5	0	0.0975	0	0.154	0	0.057	0	0.0141	0
Round Gravel	lb	0	2.48E-05	0	0.0024	0	0.000018	0	4.52E-06	0	2.61E-06	0	3.08E-07	0
Sand	lb	0	2.48E-05	0	0.0024	0	0.000018	0	4.52E-06	0	2.61E-06	0	3.08E-07	0
Stainless Steel	lb	0	0.0116	0	3.4	0	0.0075	0	0.012	0	0.0044	0	0.000144	0
Steel	lb	0	0.0044	0	1.1	0	0.0014	0	0.0017	0	0.00056	0	0.000067	0
Other refined construction materials	lb	0	0.01885	0	2.115	0	0.004038	0	0.005133	0	0.001443	0	0.000163	0
Other unrefined construction materials	lb	0	0.000028	0	0.00335	0	1.65E-05	0	0.000015	0	0.000002	0	2.05E-10	0

Notes:

Excavation/ Trenching - Off-Site Footprint (Scope 3b)

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Treatment Materials & Chemicals														
Cheese Whey	lbs	0	0.0025	0	0.031	0	0.000062	0	0.000033	0	0.000002	0	NP	
Emulsified vegetable oil	lbs	0	0.0077	0	3.44	0	0.0066	0	0.0019	0	0.000033	0	NP	
Granular activated carbon, primary	lbs	0	0.0356	0	4.82	0	0.0793	0	0.128	0	0.000987	0	0.000657	0
Granular activated carbon, regenerated	lbs	0	0.00873	0	1.7	0	0.00733	0	0.0129	0	0.000886	0	0.000671	0
Hydrogen Peroxide, 50% in H2O	lbs	0	0.00979	0	1.19	0	0.00142	0	0.0024	0	0.000308	0	6.29E-05	0
Iron (II) Sulfate	lbs	0	0.00147	0	0.167	0	0.000316	0	0.000589	0	0.000103	0	0.000023	0
Lime, Hydrated, Packed	lbs	0	0.00206	0	0.762	0	0.000513	0	0.000358	0	0.00013	0	6.57E-06	0
Molasses	lbs	0	0.0044	0	0.48	0	0.0011	0	0.00024	0	4.1E-06	0	NP	
Phosphoric Acid, 70% in H2O	lbs	0	0.0067	0	0.882	0	0.00282	0	0.0294	0	0.00171	0	0.000163	0
Potassium Permanganate	lbs	0	0.00981	0	1.16	0	0.00234	0	0.0032	0	0.000422	0	0.000122	0
Sodium Hydroxide, 50% in H2O	lbs	0	0.00977	0	1.09	0	0.00194	0	0.00352	0	0.000403	0	0.000129	0
Other Treatment Chemicals & Materials	lbs	0	0.015	0	1.67	0	0.003	0	0.0065	0	0.00061	0	0.000016	0
Notes:														
Fuel Processing														
Biodiesel produced	gal	0	0.029	0	-16.8	0	0.018	0	0.033	0	0.00082	0	NP	
Diesel produced	gal	0	0.017	0	3.02	0	0.0051	0	0.0062	0	0.0017	0	0.0011	0
Gasoline produced	gal	0	0.033	0	2.8	0	0.0046	0	0.005	0	0.0015	0	0.001	0
Liquefied Petroleum Gas Produced	gal	0	0.088	0	1.47	0	0.0016	0	0.0024	0	0.0007	0	0.0003	0
Natural Gas - Compressed Produced	ccf	0	19.983	0	343.92	0	0.4732	0	2.1651	0	0.1846	0	0.2895	0
Natural Gas Produced	ccf	0	0.0052	0	2.2	0	0.0037	0	0.0046	0	0.000072	0	6.1E-06	0
Fuel Processing Subtotals				**0**		**0**		**0**		**0**		**0**		**0**
Notes:														
Public water	gal x 1000	0	0.0092	0	5	0	0.0097	0	0.0059	0	0.016	0	0.000015	0
User-defined water resource #1	gal x 1000	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined water resource #2	gal x 1000	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes:														

Excavation/ Trenching - Off-Site Footprint (Scope 3b)

			Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
Category	Units	Usage	Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Off-Site Services														
Hazardous waste incineration	lb	0	0.00609	0	2.43	0	0.0016	0	0.00167	0	0.000209	0	0.000087	0
Off-site waste water treatment (POTW)	gal x 1000	0	0.015	0	4.4	0	0.016	0	0.015	0	NP		NP	
Off-site non-hazardous waste landfill	ton	0	0.16	0	25	0	0.14	0	0.075	0	0.4	0	0.0014	0
Off-site hazardous waste landfill	ton	0	0.18	0	27.5	0	0.154	0	0.0825	0	0.44	0	0.00154	0
Off-site Laboratory Analysis - Other	sample	0	0.058071	0	6.853438	0	0.131402	0	0.303876	0	0.04557	0	0.033017	0
Off-site Laboratory Analysis - Metals	sample	0	0.212	0	27.4693	0	0.6423	0	1.5072	0	0.2264	0	0.1643	0
Off-site Laboratory Analysis - Mercury	sample	0	0.073171	0	9.325458	0	0.212744	0	0.49824	0	0.074736	0	0.054233	0
Off-site Laboratory Analysis - Inorganic Anions	sample	0	0.007402	0	0.645948	0	0.006768	0	0.014793	0	0.002202	0	0.001554	0
Off-site Laboratory Analysis - Alkalinity	sample	0	0.01744	0	1.338192	0	0.007011	0	0.01325	0	0.00194	0	0.001283	0
Off-site Laboratory Analysis - Perchlorate	sample	0	0.023885	0	1.871705	0	0.007981	0	0.014154	0	0.002055	0	0.001287	0
Off-site Laboratory Analysis - Nitrogen/Nitrate	sample	0	0.033648	0	4.29897	0	0.095459	0	0.222665	0	0.03351	0	0.024251	0
Off-site Laboratory Analysis - Sulfate	sample	0	0.014122	0	1.472673	0	0.007981	0	0.013602	0	0.00198	0	0.001202	0
Off-site Laboratory Analysis - PCBs	sample	0	0.051277	0	5.224902	0	0.083334	0	0.190477	0	0.028439	0	0.021208	0
Off-site Laboratory Analysis - VOCs	sample	0	0.076204	0	9.016814	0	0.104498	0	0.227074	0	0.033951	0	0.023589	0
Off-site Laboratory Analysis - SVOCs	sample	0	0.07156	0	7.870422	0	0.145945	0	0.337304	0	0.050485	0	0.037258	0
Notes:														
Resource Extraction for Electricity														
Coal extraction and processing	MWh	0	3.1	0	180.0	0	0.8	0	0.2	0	0.0	0	NP	
Natural gas extraction and processing	MWh	0	1.6	0	270.0	0	0.2	0	13.0	0	0.0	0	NP	
Nuclear fuel extraction and processing	MWh	0	0.2	0	25.0	0	0.2	0	0.5	0	0.0	0	NP	
Oil extraction and processing	MWh	0	2.3	0	270.0	0	1.7	0	0.1	0	0.0	0	NP	
Other fuel extraction and processing	MWh	0	0	0	0	0	0	0	0	0	0	0	0	0
Resource Extraction Subtotals				**0**		**0**		**0**		**0**		**0**		**0**
Notes:														
Electricity Transmission														
Transmission and distribution losses	MWh	0	1.0342	0	112.43	0	0.22421	0	0.460789	0	0.005752	0	0.021024	0
Notes:														

Excavation/ Trenching - Off-Site Footprint (Scope 3b)

			Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
Category	Units	Usage	Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
User-defined Materials														
User-defined material #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #4	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #5	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #6	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #7	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #8	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #9	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #10	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #11	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #12	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #13	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #14	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #15	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #16	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #17	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #18	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #19	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #20	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes:														
User-defined Waste Destinations														
User-defined recycled/reused off-site #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined recycled/reused off-site #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined recycled/reused off-site #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined non-hazardous waste destination #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined non-hazardous waste destination #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined non-hazardous waste destination #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined hazardous waste destination #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined hazardous waste destination #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined hazardous waste destination #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes:														
Off-site Totals				**0**		**0**		**0**		**0**		**0**		**0**

Excavation/ Trenching - Intermediate Totals

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Total Grid Electricity Footprint														
On-site grid electricity	MWh	0	3.413	0										
Electricity Generation														
Grid electricity	MWh	0	6.929	0	1124.3	0	2.2421	0	4.607887	0	0.057518	0	0.210237	0
Resource Extraction for Electricity														
Coal extraction and processing	MWh	0	3.1	0	180.0	0	0.8	0	0.2	0	0.0	0	NP	
Natural gas extraction and processing	MWh	0	1.6	0	270.0	0	0.2	0	13.0	0	0.0	0	NP	
Nuclear fuel extraction and processing	MWh	0	0.2	0	25.0	0	0.2	0	0.5	0	0.0	0	NP	
Oil extraction and processing	MWh	0	2.3	0	270.0	0	1.7	0	0.1	0	0.0	0	NP	
Other fuel extraction and processing	MWh	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Electricity Transmission														
Transmission and distribution losses	MWh	0	1.0342	0	112.43	0	0.22421	0	0.460789	0	0.005752	0	0.021024	0
Total Grid Electricity Footprint				**0**		**0**		**0**		**0**		**0**		**0**
Total Fuel Footprints														
Total Gasoline Footprint														
On-site gasoline use - Other	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
On-site gasoline use <25 hp	gal	0	0.124	0	17.48	0	0.037	0	0.00025	0	0.165	0	0.00008	0
On-site gasoline use >25 hp	gal	0	0.124	0	19.93	0	0.032	0	0.00029	0	0.002	0	0.00009	0
Transportation gasoline use	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
Transportation gasoline use - car	gal	0	0.124	0	19.77	0	0.027	0	0.00036	0	0.003	0	0.0067	0
Transportation gasoline use - passenger truck	gal	0	0.124	0	19.79	0	0.035	0	0.00036	0	0.003	0	0.00661	0
Transportation gasoline use - User Defined	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
Gasoline produced	gal	0	0.033	0	2.8	0	0.0046	0	0.005	0	0.0015	0	0.001	0
Total Gasoline Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**
Total Diesel Footprint														
On-site diesel use - Other	gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
On-site diesel use <75 hp	gal	0	0.139	0	22.21	0	0.1565	0	0.000145	0	0.0145	0	0.00004	0
On-site diesel use 75<hp<750	gal	0	0.139	0	22.24	0	0.101	0	0.00013	0	0.009	0	0.00004	0
On-site diesel use >750 hp	gal	0	0.139	0	22.24	0	0.149	0	0.00013	0	0.006	0	0.00004	0
Transportation diesel use	gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
Transportation diesel use - car	gal	0	0.139	0	22.57	0	0.015	0	0.0002	0	0.003	0	0.00252	0
Transportation diesel use - passenger truck	gal	0	0.139	0	22.545	0	0.0585	0	0.0002	0	0.007	0	0.002605	0
Transportation diesel use - User Defined	gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
Diesel produced	gal	0	0.017	0	3.02	0	0.0051	0	0.0062	0	0.0017	0	0.0011	0
Total Diesel Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**
Total Biodiesel Footprint														
On-site biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
On-site biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Transportation biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Transportation biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Biodiesel produced	gal	0	0.029	0	-16.8	0	0.018	0	0.033	0	0.00082	0	NP	
Total Biodiesel Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**
Total Natural Gas Footprint														
On-site natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Transportation natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Transportation natural gas use - User Defined	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Natural gas produced	ccf	0	0.0052	0	2.2	0	0.0037	0	0.0046	0	0.000072	0	6.1E-06	0
Total Natural Gas Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**
Total Liquified Petroleum Gas Footprint														
On-site liquified petroleum gas use - Other	ccf	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
On-site liquified petroleum gas use	ccf	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
Liquified petroleum gas produced	ccf	0	0.088	0	1.47	0	0.0016	0	0.0024	0	0.0007	0	0.0003	0
Total Natural Gas Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**
Total Compressed Gas Footprint														
On-site compressed gas use - Other	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
On-site compressed gas use	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
Compressed gas produced	ccf	0	19.983	0	343.92	0	0.4732	0	2.1651	0	0.1846	0	0.2895	0
Total Natural Gas Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**

Notes:

Note: Please refer to the "Default Conversions" tab for references for the default conversion factors used on this calculation sheet.

Space below available for notes and calculations:

Drilling - On-Site Footprint (Scope 1)

Contributors to Footprints	Units	Usage	Energy		GHG		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
On-Site														
On-site Renewable Energy														
Renewable electricity generated on-site	MWh	0	3.413	0										
Landfill gas combusted on-site for energy use	ccf CH4	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
On-site biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
On-site biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
User-defined on-site renewable energy use #1	gal	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined on-site renewable energy use #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
On-site Renewable Energy Subtotals				**0**		**0**		**0**		**0**		**0**		**0**
Notes:														
On-site Conventional Energy														
On-site grid electricity	MWh	0	3.413	0										
On-site diesel use - Other	Gal	420	0.139	58.38	22.5	9450	0.17	71.4	0.0054	2.268	0.0034	1.428	5.2E-06	0.002184
On-site diesel use <75 hp	Gal	0	0.139	0	22.21	0	0.1565	0	0.000145	0	0.0145	0	0.00004	0
On-site diesel use 75<hp<750	Gal	0	0.139	0	22.24	0	0.101	0	0.00013	0	0.009	0	0.00004	0
On-site diesel use >750 hp	Gal	0	0.139	0	22.24	0	0.149	0	0.00013	0	0.006	0	0.00004	0
On-site gasoline use - Other	Gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
On-site gasoline use <25 hp	Gal	0	0.124	0	17.48	0	0.037	0	0.00025	0	0.165	0	0.00008	0
On-site gasoline use >25 hp	Gal	7.751938	0.124	0.96124	19.93	154.4961	0.032	0.248062	0.00029	0.002248	0.002	0.015504	0.00009	0.000698
On-site natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
On-site compressed natural gas use - Other	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
On-site compressed natural gas use	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
On-site liquified petroleum gas use - Other	gal	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
On-site liquified petroleum gas use	gal	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
Other forms of on-site conventional energy use #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Other forms of on-site conventional energy use #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
On-site Conventional Energy Subtotals				**59**		**9,604**		**72**		**2**		**1**		**0**
Notes:														
Other On-site Emissions														
On-site HAP process emissions	lbs	0											1	0
On-site GHG emissions	lbs CO2e	0			1	0								
On-site carbon storage	lbs CO2e	0			1	0								
GHG avoided by flaring on-site landfill methane	Lbs	0			-262	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Other on-site NOx emissions or reductions	lbs	0					1	0						
Other on-site SOx emissions or reductions	lbs	0							1	0				
Other on-site PM emissions or reductions	lbs	0									1	0		
Notes:														
On-site Totals				**59.34**		**9,604**		**72**		**2**		**1**		**0**

Drilling - Electricity Generation Footprint (Scope 2)

Contributors to Footprints	Units	Usage	Energy		GHG		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Electricity Generation														
Grid electricity	MWh	0	6.929	0	1124.3	0	2.2421	0	4.607887	0	0.057518	0	0.210237	0
Voluntary purchase of renewable electricity	MWh	0												
Voluntary purchase of RECs	MWh	0												
Notes:														

Drilling - Transportation Footprint (Scope 3a)

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Conventional Energy														
Transportation diesel use	gal	115.833	0.139	16.10079	22.5	2606.243	0.17	19.69161	0.0054	0.625498	0.0034	0.393832	5.2E-06	0.000602
Transportation diesel use - car	gal	0	0.139	0	22.57	0	0.015	0	0.0002	0	0.003	0	0.00252	0
Transportation diesel use - passenger truck	gal	0	0.139	0	22.545	0	0.0585	0	0.0002	0	0.007	0	0.002605	0
Transportation diesel use - User Defined	gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
Transportation gasoline use	gal	6.3	0.124	0.7812	19.6	123.48	0.11	0.693	0.0045	0.02835	0.00054	0.003402	0.000039	0.000246
Transportation gasoline use - car	gal	0	0.124	0	19.77	0	0.027	0	0.00036	0	0.003	0	0.0067	0
Transportation gasoline use - passenger truck	gal	17.5	0.124	2.17	19.79	346.325	0.035	0.6125	0.00036	0.0063	0.003	0.0525	0.00661	0.115675
Transportation gasoline use - User Defined	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
Transportation natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Transportation natural gas use - User Defined	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
User-defined conventional energy transportation #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined conventional energy transportation #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Conventional Energy Subtotals				**19**		**3,076**		**21**		**1**		**0**		**0**
Notes:														
Renewable Energy														
Transportation biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Transportation biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
User-defined renewable energy transportation #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined renewable energy transportation #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Renewable Energy Subtotals				**0**		**0**		**0**		**0**		**0**		**0**
Notes:														
Transportation Totals				**19**		**3076**		**21**		**1**		**0**		**0**

Drilling - Off-Site Footprint (Scope 3b)

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Construction Materials														
Aluminum, Rolled Sheet	lb	0	0.0633	0	9.15	0	0.0148	0	0.0283	0	0.0088	0	0.00102	0
Asphalt, mastic	lb	0	0.0412	0	0.85	0	0.00271	0	0.00798	0	0.000766	0	0.00107	0
Asphalt, paving-grade	lb	0	0.5	0	8.58	0	0.0299	0	0.0969	0	0.0091	0	0.0133	0
Ethanol, Corn, 95%	lb	0	0.0318	0	-0.0199	0	0.00425	0	0.00303	0	0.000469	0	8.46E-05	0
Ethanol, Corn, 99.7%	lb	0	0.0324	0	0.0591	0	0.00431	0	0.0031	0	0.000472	0	0.000087	0
Ethanol, Petroleum, 99.7%	lb	0	0.0205	0	1.25	0	0.00199	0	0.00214	0	0.000277	0	5.89E-05	0
Gravel/Sand Mix, 65% Gravel	lb	0	2.48E-05	0	0.0024	0	0.000018	0	4.52E-06	0	2.61E-06	0	3.08E-07	0
Gravel/sand/clay	lb	0	0.000028	0	0.00335	0	1.65E-05	0	0.000015	0	0.000002	0	2.05E-10	0
HDPE	lb	0	0.0332	0	1.94	0	0.00325	0	0.00409	0	0.000439	0	6.41E-05	0
Photovoltaic system (installed)	W	0	0.0336	0	4.47	0	0.015	0	0.032	0	0.00063	0	2.9E-06	0
PVC	lb	0	0.0262	0	2.02	0	0.004	0	0.00274	0	0.000372	0	0.000375	0
Portland cement, US average	lb	0	0.0139	0	1.34	0	0.00654	0	0.0104	0	0.00378	0	0.00097	0
Ready-mixed concrete, 20 MPa	ft3	0	0.217	0	19.5	0	0.0975	0	0.154	0	0.057	0	0.0141	0
Round Gravel	lb	0	2.48E-05	0	0.0024	0	0.000018	0	4.52E-06	0	2.61E-06	0	3.08E-07	0
Sand	lb	0	2.48E-05	0	0.0024	0	0.000018	0	4.52E-06	0	2.61E-06	0	3.08E-07	0
Stainless Steel	lb	6200	0.0116	71.92	3.4	21080	0.0075	46.5	0.012	74.4	0.0044	27.28	0.000144	0.8928
Steel	lb	0	0.0044	0	1.1	0	0.0014	0	0.0017	0	0.00056	0	0.000067	0
Other refined construction materials	lb	0	0.01885	0	2.115	0	0.004038	0	0.005133	0	0.001443	0	0.000163	0
Other unrefined construction materials	lb	0	0.000028	0	0.00335	0	1.65E-05	0	0.000015	0	0.000002	0	2.05E-10	0

Notes:

Drilling - Off-Site Footprint (Scope 3b)

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Treatment Materials & Chemicals														
Cheese Whey	lbs	0	0.0025	0	0.031	0	0.000062	0	0.000033	0	0.000002	0	NP	
Emulsified vegetable oil	lbs	0	0.0077	0	3.44	0	0.0066	0	0.0019	0	0.000033	0	NP	
Granular activated carbon, primary	lbs	0	0.0356	0	4.82	0	0.0793	0	0.128	0	0.000987	0	0.000657	0
Granular activated carbon, regenerated	lbs	0	0.00873	0	1.7	0	0.00733	0	0.0129	0	0.000886	0	0.000671	0
Hydrogen Peroxide, 50% in H2O	lbs	0	0.00979	0	1.19	0	0.00142	0	0.0024	0	0.000308	0	6.29E-05	0
Iron (II) Sulfate	lbs	0	0.00147	0	0.167	0	0.000316	0	0.000589	0	0.000103	0	0.000023	0
Lime, Hydrated, Packed	lbs	0	0.00206	0	0.762	0	0.000513	0	0.000358	0	0.00013	0	6.57E-06	0
Molasses	lbs	0	0.0044	0	0.48	0	0.0011	0	0.00024	0	4.1E-06	0	NP	
Phosphoric Acid, 70% in H2O	lbs	0	0.0067	0	0.882	0	0.00282	0	0.0294	0	0.00171	0	0.000163	0
Potassium Permanganate	lbs	0	0.00981	0	1.16	0	0.00234	0	0.0032	0	0.000422	0	0.000122	0
Sodium Hydroxide, 50% in H2O	lbs	0	0.00977	0	1.09	0	0.00194	0	0.00352	0	0.000403	0	0.000129	0
Other Treatment Chemicals & Materials	lbs	0	0.015	0	1.67	0	0.003	0	0.0065	0	0.00061	0	0.000016	0
Notes:														
Fuel Processing														
Biodiesel produced	gal	0	0.029	0	-16.8	0	0.018	0	0.033	0	0.00082	0	NP	
Diesel produced	gal	535.833	0.017	9.109161	3.02	1618.216	0.0051	2.732748	0.0062	3.322165	0.0017	0.910916	0.0011	0.589416
Gasoline produced	gal	31.55194	0.033	1.041214	2.8	88.34543	0.0046	0.145139	0.005	0.15776	0.0015	0.047328	0.001	0.031552
Liquefied Petroleum Gas Produced	gal	0	0.088	0	1.47	0	0.0016	0	0.0024	0	0.0007	0	0.0003	0
Natural Gas - Compressed Produced	ccf	0	19.983	0	343.92	0	0.4732	0	2.1651	0	0.1846	0	0.2895	0
Natural Gas Produced	ccf	0	0.0052	0	2.2	0	0.0037	0	0.0046	0	0.000072	0	6.1E-06	0
Fuel Processing Subtotals				**10.15037**		**1706.561**		**2.877887**		**3.479924**		**0.958244**		**0.620968**
Notes:														
Public water	gal x 1000	2	0.0092	0.0184	5	10	0.0097	0.0194	0.0059	0.0118	0.016	0.032	0.000015	0.00003
User-defined water resource #1	gal x 1000	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined water resource #2	gal x 1000	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes:														

Drilling - Off-Site Footprint (Scope 3b)

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Off-Site Services														
Hazardous waste incineration	lb	0	0.00609	0	2.43	0	0.0016	0	0.00167	0	0.000209	0	0.000087	0
Off-site waste water treatment (POTW)	gal x 1000	0	0.015	0	4.4	0	0.016	0	0.015	0	NP		NP	
Off-site non-hazardous waste landfill	ton	2	0.16	0.32	25	50	0.14	0.28	0.075	0.15	0.4	0.8	0.0014	0.0028
Off-site hazardous waste landfill	ton	0	0.18	0	27.5	0	0.154	0	0.0825	0	0.44	0	0.00154	0
Off-site Laboratory Analysis - Other	sample	0	0.058071	0	6.853438	0	0.131402	0	0.303876	0	0.04557	0	0.033017	0
Off-site Laboratory Analysis - Metals	sample	20	0.212	4.24	27.4693	549.386	0.6423	12.846	1.5072	30.144	0.2264	4.528	0.1643	3.286
Off-site Laboratory Analysis - Mercury	sample	0	0.073171	0	9.325458	0	0.212744	0	0.49824	0	0.074736	0	0.054233	0
Off-site Laboratory Analysis - Inorganic Anions	sample	0	0.007402	0	0.645948	0	0.006768	0	0.014793	0	0.002202	0	0.001554	0
Off-site Laboratory Analysis - Alkalinity	sample	0	0.01744	0	1.338192	0	0.007011	0	0.01325	0	0.00194	0	0.001283	0
Off-site Laboratory Analysis - Perchlorate	sample	0	0.023885	0	1.871705	0	0.007981	0	0.014154	0	0.002055	0	0.001287	0
Off-site Laboratory Analysis - Nitrogen/Nitrate	sample	0	0.033648	0	4.29897	0	0.095459	0	0.222665	0	0.03351	0	0.024251	0
Off-site Laboratory Analysis - Sulfate	sample	0	0.014122	0	1.472673	0	0.007981	0	0.013602	0	0.00198	0	0.001202	0
Off-site Laboratory Analysis - PCBs	sample	0	0.051277	0	5.224902	0	0.083334	0	0.190477	0	0.028439	0	0.021208	0
Off-site Laboratory Analysis - VOCs	sample	20	0.076204	1.52409	9.016814	180.3363	0.104498	2.089961	0.227074	4.541476	0.033951	0.679017	0.023589	0.471784
Off-site Laboratory Analysis - SVOCs	sample	0	0.07156	0	7.870422	0	0.145945	0	0.337304	0	0.050485	0	0.037258	0
Notes:														
Resource Extraction for Electricity														
Coal extraction and processing	MWh	0	3.1	0	180.0	0	0.8	0	0.2	0	0.0	0	NP	
Natural gas extraction and processing	MWh	0	1.6	0	270.0	0	0.2	0	13.0	0	0.0	0	NP	
Nuclear fuel extraction and processing	MWh	0	0.2	0	25.0	0	0.2	0	0.5	0	0.0	0	NP	
Oil extraction and processing	MWh	0	2.3	0	270.0	0	1.7	0	0.1	0	0.0	0	NP	
Other fuel extraction and processing	MWh	0	0	0	0	0	0	0	0	0	0	0	0	0
Resource Extraction Subtotals				**0**		**0**		**0**		**0**		**0**		**0**
Notes:														
Electricity Transmission														
Transmission and distribution losses	MWh	0	1.0342	0	112.43	0	0.22421	0	0.460789	0	0.005752	0	0.021024	0
Notes:														

Drilling - Off-Site Footprint (Scope 3b)

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
User-defined Materials														
User-defined material #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #4	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #5	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #6	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #7	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #8	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #9	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #10	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #11	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #12	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #13	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #14	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #15	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #16	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #17	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #18	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #19	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #20	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes:														
User-defined Waste Destinations														
User-defined recycled/reused off-site #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined recycled/reused off-site #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined recycled/reused off-site #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined non-hazardous waste destination #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined non-hazardous waste destination #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined non-hazardous waste destination #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined hazardous waste destination #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined hazardous waste destination #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined hazardous waste destination #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes:														
Off-site Totals				**88.17286**		**23576.28**		**64.61325**		**112.7272**		**34.27726**		**5.274383**

Drilling - Intermediate Totals

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Total Grid Electricity Footprint														
On-site grid electricity	MWh	0	3.413	0										
Electricity Generation														
Grid electricity	MWh	0	6.929	0	1124.3	0	2.2421	0	4.607887	0	0.057518	0	0.210237	0
Resource Extraction for Electricity														
Coal extraction and processing	MWh	0	3.1	0	180.0	0	0.8	0	0.2	0	0.0	0	NP	
Natural gas extraction and processing	MWh	0	1.6	0	270.0	0	0.2	0	13.0	0	0.0	0	NP	
Nuclear fuel extraction and processing	MWh	0	0.2	0	25.0	0	0.2	0	0.5	0	0.0	0	NP	
Oil extraction and processing	MWh	0	2.3	0	270.0	0	1.7	0	0.1	0	0.0	0	NP	
Other fuel extraction and processing	MWh	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Electricity Transmission														
Transmission and distribution losses	MWh	0	1.0342	0	112.43	0	0.22421	0	0.460789	0	0.005752	0	0.021024	0
Total Grid Electricity Footprint				**0**		**0**		**0**		**0**		**0**		**0**
Total Fuel Footprints														
Total Gasoline Footprint														
On-site gasoline use - Other	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
On-site gasoline use <25 hp	gal	0	0.124	0	17.48	0	0.037	0	0.00025	0	0.165	0	0.00008	0
On-site gasoline use >25 hp	gal	7.751938	0.124	0.96124	19.93	154.4961	0.032	0.248062	0.00029	0.002248	0.002	0.015504	0.00009	0.000698
Transportation gasoline use	gal	6.3	0.124	0.7812	19.6	123.48	0.11	0.693	0.0045	0.02835	0.00054	0.003402	0.000039	0.000246
Transportation gasoline use - car	gal	0	0.124	0	19.77	0	0.027	0	0.00036	0	0.003	0	0.0067	0
Transportation gasoline use - passenger truck	gal	17.5	0.124	2.17	19.79	346.325	0.035	0.6125	0.00036	0.0063	0.003	0.0525	0.00661	0.115675
Transportation gasoline use - User Defined	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
Gasoline produced	gal	31.55194	0.033	1.041214	2.8	88.34543	0.0046	0.145139	0.005	0.15776	0.0015	0.047328	0.001	0.031552
Total Gasoline Footprint		**31.55194**		**4.953654**		**712.6466**		**1.698701**		**0.194658**		**0.118734**		**0.14817**
Total Diesel Footprint														
On-site diesel use - Other	gal	420	0.139	58.38	22.5	9450	0.17	71.4	0.0054	2.268	0.0034	1.428	5.2E-06	0.002184
On-site diesel use <75 hp	gal	0	0.139	0	22.21	0	0.1565	0	0.000145	0	0.0145	0	0.00004	0
On-site diesel use 75<hp<750	gal	0	0.139	0	22.24	0	0.101	0	0.00013	0	0.009	0	0.00004	0
On-site diesel use >750 hp	gal	0	0.139	0	22.24	0	0.149	0	0.00013	0	0.006	0	0.00004	0
Transportation diesel use	gal	115.833	0.139	16.10079	22.5	2606.243	0.17	19.69161	0.0054	0.625498	0.0034	0.393832	5.2E-06	0.000602
Transportation diesel use - car	gal	0	0.139	0	22.57	0	0.015	0	0.0002	0	0.003	0	0.00252	0
Transportation diesel use - passenger truck	gal	0	0.139	0	22.545	0	0.0585	0	0.0002	0	0.007	0	0.002605	0
Transportation diesel use - User Defined	gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
Diesel produced	gal	535.833	0.017	9.109161	3.02	1618.216	0.0051	2.732748	0.0062	3.322165	0.0017	0.910916	0.0011	0.589416
Total Diesel Footprint		**535.833**		**83.58995**		**13674.46**		**93.82436**		**6.215663**		**2.732748**		**0.592203**
Total Biodiesel Footprint														
On-site biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
On-site biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Transportation biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Transportation biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Biodiesel produced	gal	0	0.029	0	-16.8	0	0.018	0	0.033	0	0.00082	0	NP	
Total Biodiesel Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**
Total Natural Gas Footprint														
On-site natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Transportation natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Transportation natural gas use - User Defined	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Natural gas produced	ccf	0	0.0052	0	2.2	0	0.0037	0	0.0046	0	0.000072	0	6.1E-06	0
Total Natural Gas Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**
Total Liquified Petroleum Gas Footprint														
On-site liquified petroleum gas use - Other	ccf	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
On-site liquified petroleum gas use	ccf	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
Liquified petroleum gas produced	ccf	0	0.088	0	1.47	0	0.0016	0	0.0024	0	0.0007	0	0.0003	0
Total Natural Gas Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**
Total Compressed Gas Footprint														
On-site compressed gas use - Other	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
On-site compressed gas use	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
Compressed gas produced	ccf	0	19.983	0	343.92	0	0.4732	0	2.1651	0	0.1846	0	0.2895	0
Total Natural Gas Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**

Notes:

Note: Please refer to the "Default Conversions" tab for references for the default conversion factors used on this calculation sheet.

Space below available for notes and calculations:

Groundwater Monitoring - On-Site Footprint (Scope 1)

Contributors to Footprints	Units	Usage	Energy		GHG		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
On-Site														
On-site Renewable Energy														
Renewable electricity generated on-site	MWh	0	3.413	0										
Landfill gas combusted on-site for energy use	ccf CH4	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
On-site biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
On-site biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
User-defined on-site renewable energy use #1	gal	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined on-site renewable energy use #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
On-site Renewable Energy Subtotals				**0**		**0**		**0**		**0**		**0**		**0**
Notes:														
On-site Conventional Energy														
On-site grid electricity	MWh	0	3.413	0										
On-site diesel use - Other	Gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
On-site diesel use <75 hp	Gal	0	0.139	0	22.21	0	0.1565	0	0.000145	0	0.0145	0	0.00004	0
On-site diesel use 75<hp<750	Gal	0	0.139	0	22.24	0	0.101	0	0.00013	0	0.009	0	0.00004	0
On-site diesel use >750 hp	Gal	0	0.139	0	22.24	0	0.149	0	0.00013	0	0.006	0	0.00004	0
On-site gasoline use - Other	Gal	0.066	0.124	0.008184	19.6	1.2936	0.11	0.00726	0.0045	0.000297	0.00054	3.56E-05	0.000039	2.57E-06
On-site gasoline use <25 hp	Gal	0	0.124	0	17.48	0	0.037	0	0.00025	0	0.165	0	0.00008	0
On-site gasoline use >25 hp	Gal	0	0.124	0	19.93	0	0.032	0	0.00029	0	0.002	0	0.00009	0
On-site natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
On-site compressed natural gas use - Other	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
On-site compressed natural gas use	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
On-site liquified petroleum gas use - Other	gal	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
On-site liquified petroleum gas use	gal	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
Other forms of on-site conventional energy use #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Other forms of on-site conventional energy use #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
On-site Conventional Energy Subtotals				**0**		**1**		**0**		**0**		**0**		**0**
Notes:														
Other On-site Emissions														
On-site HAP process emissions	lbs	0											1	0
On-site GHG emissions	lbs CO2e	0			1	0								
On-site carbon storage	lbs CO2e	0			1	0								
GHG avoided by flaring on-site landfill methane	Lbs	0			-262	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Other on-site NOx emissions or reductions	lbs	0					1	0						
Other on-site SOx emissions or reductions	lbs	0							1	0				
Other on-site PM emissions or reductions	lbs	0									1	0		
Notes:														
On-site Totals				**0.01**		**1**		**0**		**0**		**0**		**0**

Groundwater Monitoring - Electricity Generation Footprint (Scope 2)

Contributors to Footprints	Units	Usage	Energy		GHG		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Electricity Generation														
Grid electricity	MWh	0	6.929	0	1124.3	0	2.2421	0	4.607887	0	0.057518	0	0.210237	0
Voluntary purchase of renewable electricity	MWh	0												
Voluntary purchase of RECs	MWh	0												
Notes:														

Groundwater Monitoring - Transportation Footprint (Scope 3a)

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Conventional Energy														
Transportation diesel use	gal	58.267	0.139	8.099113	22.5	1311.008	0.17	9.90539	0.0054	0.314642	0.0034	0.198108	5.2E-06	0.000303
Transportation diesel use - car	gal	0	0.139	0	22.57	0	0.015	0	0.0002	0	0.003	0	0.00252	0
Transportation diesel use - passenger truck	gal	0	0.139	0	22.545	0	0.0585	0	0.0002	0	0.007	0	0.002605	0
Transportation diesel use - User Defined	gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
Transportation gasoline use	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
Transportation gasoline use - car	gal	0	0.124	0	19.77	0	0.027	0	0.00036	0	0.003	0	0.0067	0
Transportation gasoline use - passenger truck	gal	11.6	0.124	1.4384	19.79	229.564	0.035	0.406	0.00036	0.004176	0.003	0.0348	0.00661	0.076676
Transportation gasoline use - User Defined	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
Transportation natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Transportation natural gas use - User Defined	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
User-defined conventional energy transportation #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined conventional energy transportation #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Conventional Energy Subtotals				**10**		**1,541**		**10**		**0**		**0**		**0**
Notes:														
Renewable Energy														
Transportation biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Transportation biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
User-defined renewable energy transportation #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined renewable energy transportation #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Renewable Energy Subtotals				**0**		**0**		**0**		**0**		**0**		**0**
Notes:														
Transportation Totals				**10**		**1541**		**10**		**0**		**0**		**0**

Groundwater Monitoring - Off-Site Footprint (Scope 3b)

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Construction Materials														
Aluminum, Rolled Sheet	lb	0	0.0633	0	9.15	0	0.0148	0	0.0283	0	0.0088	0	0.00102	0
Asphalt, mastic	lb	0	0.0412	0	0.85	0	0.00271	0	0.00798	0	0.000766	0	0.00107	0
Asphalt, paving-grade	lb	0	0.5	0	8.58	0	0.0299	0	0.0969	0	0.0091	0	0.0133	0
Ethanol, Corn, 95%	lb	0	0.0318	0	-0.0199	0	0.00425	0	0.00303	0	0.000469	0	8.46E-05	0
Ethanol, Corn, 99.7%	lb	0	0.0324	0	0.0591	0	0.00431	0	0.0031	0	0.000472	0	0.000087	0
Ethanol, Petroleum, 99.7%	lb	0	0.0205	0	1.25	0	0.00199	0	0.00214	0	0.000277	0	5.89E-05	0
Gravel/Sand Mix, 65% Gravel	lb	0	2.48E-05	0	0.0024	0	0.000018	0	4.52E-06	0	2.61E-06	0	3.08E-07	0
Gravel/sand/clay	lb	0	0.000028	0	0.00335	0	1.65E-05	0	0.000015	0	0.000002	0	2.05E-10	0
HDPE	lb	0	0.0332	0	1.94	0	0.00325	0	0.00409	0	0.000439	0	6.41E-05	0
Photovoltaic system (installed)	W	0	0.0336	0	4.47	0	0.015	0	0.032	0	0.00063	0	2.9E-06	0
PVC	lb	0	0.0262	0	2.02	0	0.004	0	0.00274	0	0.000372	0	0.000375	0
Portland cement, US average	lb	0	0.0139	0	1.34	0	0.00654	0	0.0104	0	0.00378	0	0.00097	0
Ready-mixed concrete, 20 MPa	ft3	0	0.217	0	19.5	0	0.0975	0	0.154	0	0.057	0	0.0141	0
Round Gravel	lb	0	2.48E-05	0	0.0024	0	0.000018	0	4.52E-06	0	2.61E-06	0	3.08E-07	0
Sand	lb	0	2.48E-05	0	0.0024	0	0.000018	0	4.52E-06	0	2.61E-06	0	3.08E-07	0
Stainless Steel	lb	0	0.0116	0	3.4	0	0.0075	0	0.012	0	0.0044	0	0.000144	0
Steel	lb	0	0.0044	0	1.1	0	0.0014	0	0.0017	0	0.00056	0	0.000067	0
Other refined construction materials	lb	500	0.01885	9.425	2.115	1057.5	0.004038	2.01875	0.005133	2.56625	0.001443	0.721375	0.000163	0.081263
Other unrefined construction materials	lb	0	0.000028	0	0.00335	0	1.65E-05	0	0.000015	0	0.000002	0	2.05E-10	0

Notes:

Groundwater Monitoring - Off-Site Footprint (Scope 3b)

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Treatment Materials & Chemicals														
Cheese Whey	lbs	0	0.0025	0	0.031	0	0.000062	0	0.000033	0	0.000002	0	NP	
Emulsified vegetable oil	lbs	0	0.0077	0	3.44	0	0.0066	0	0.0019	0	0.000033	0	NP	
Granular activated carbon, primary	lbs	0	0.0356	0	4.82	0	0.0793	0	0.128	0	0.000987	0	0.000657	0
Granular activated carbon, regenerated	lbs	0	0.00873	0	1.7	0	0.00733	0	0.0129	0	0.000886	0	0.000671	0
Hydrogen Peroxide, 50% in H2O	lbs	0	0.00979	0	1.19	0	0.00142	0	0.0024	0	0.000308	0	6.29E-05	0
Iron (II) Sulfate	lbs	0	0.00147	0	0.167	0	0.000316	0	0.000589	0	0.000103	0	0.000023	0
Lime, Hydrated, Packed	lbs	0	0.00206	0	0.762	0	0.000513	0	0.000358	0	0.00013	0	6.57E-06	0
Molasses	lbs	0	0.0044	0	0.48	0	0.0011	0	0.00024	0	4.1E-06	0	NP	
Phosphoric Acid, 70% in H2O	lbs	0	0.0067	0	0.882	0	0.00282	0	0.0294	0	0.00171	0	0.000163	0
Potassium Permanganate	lbs	0	0.00981	0	1.16	0	0.00234	0	0.0032	0	0.000422	0	0.000122	0
Sodium Hydroxide, 50% in H2O	lbs	0	0.00977	0	1.09	0	0.00194	0	0.00352	0	0.000403	0	0.000129	0
Other Treatment Chemicals & Materials	lbs	0	0.015	0	1.67	0	0.003	0	0.0065	0	0.00061	0	0.000016	0
Notes:														
Fuel Processing														
Biodiesel produced	gal	0	0.029	0	-16.8	0	0.018	0	0.033	0	0.00082	0	NP	
Diesel produced	gal	58.267	0.017	0.990539	3.02	175.9663	0.0051	0.297162	0.0062	0.361255	0.0017	0.099054	0.0011	0.064094
Gasoline produced	gal	11.666	0.033	0.384978	2.8	32.6648	0.0046	0.053664	0.005	0.05833	0.0015	0.017499	0.001	0.011666
Liquefied Petroleum Gas Produced	gal	0	0.088	0	1.47	0	0.0016	0	0.0024	0	0.0007	0	0.0003	0
Natural Gas - Compressed Produced	ccf	0	19.983	0	343.92	0	0.4732	0	2.1651	0	0.1846	0	0.2895	0
Natural Gas Produced	ccf	0	0.0052	0	2.2	0	0.0037	0	0.0046	0	0.000072	0	6.1E-06	0
Fuel Processing Subtotals				**1.375517**		**208.6311**		**0.350825**		**0.419585**		**0.116553**		**0.07576**
Notes:														
Public water	gal x 1000	0.2	0.0092	0.00184	5	1	0.0097	0.00194	0.0059	0.00118	0.016	0.0032	0.000015	0.000003
User-defined water resource #1	gal x 1000	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined water resource #2	gal x 1000	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes:														

Groundwater Monitoring - Off-Site Footprint (Scope 3b)

			Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
Category	Units	Usage	Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Off-Site Services														
Hazardous waste incineration	lb	0	0.00609	0	2.43	0	0.0016	0	0.00167	0	0.000209	0	0.000087	0
Off-site waste water treatment (POTW)	gal x 1000	0	0.015	0	4.4	0	0.016	0	0.015	0	NP		NP	
Off-site non-hazardous waste landfill	ton	0	0.16	0	25	0	0.14	0	0.075	0	0.4	0	0.0014	0
Off-site hazardous waste landfill	ton	0	0.18	0	27.5	0	0.154	0	0.0825	0	0.44	0	0.00154	0
Off-site Laboratory Analysis - Other	sample	0	0.058071	0	6.853438	0	0.131402	0	0.303876	0	0.04557	0	0.033017	0
Off-site Laboratory Analysis - Metals	sample	0	0.212	0	27.4693	0	0.6423	0	1.5072	0	0.2264	0	0.1643	0
Off-site Laboratory Analysis - Mercury	sample	0	0.073171	0	9.325458	0	0.212744	0	0.49824	0	0.074736	0	0.054233	0
Off-site Laboratory Analysis - Inorganic Anions	sample	0	0.007402	0	0.645948	0	0.006768	0	0.014793	0	0.002202	0	0.001554	0
Off-site Laboratory Analysis - Alkalinity	sample	0	0.01744	0	1.338192	0	0.007011	0	0.01325	0	0.00194	0	0.001283	0
Off-site Laboratory Analysis - Perchlorate	sample	0	0.023885	0	1.871705	0	0.007981	0	0.014154	0	0.002055	0	0.001287	0
Off-site Laboratory Analysis - Nitrogen/Nitrate	sample	0	0.033648	0	4.29897	0	0.095459	0	0.222665	0	0.03351	0	0.024251	0
Off-site Laboratory Analysis - Sulfate	sample	0	0.014122	0	1.472673	0	0.007981	0	0.013602	0	0.00198	0	0.001202	0
Off-site Laboratory Analysis - PCBs	sample	0	0.051277	0	5.224902	0	0.083334	0	0.190477	0	0.028439	0	0.021208	0
Off-site Laboratory Analysis - VOCs	sample	0	0.076204	0	9.016814	0	0.104498	0	0.227074	0	0.033951	0	0.023589	0
Off-site Laboratory Analysis - SVOCs	sample	0	0.07156	0	7.870422	0	0.145945	0	0.337304	0	0.050485	0	0.037258	0
Notes:														
Resource Extraction for Electricity														
Coal extraction and processing	MWh	0	3.1	0	180.0	0	0.8	0	0.2	0	0.0	0	NP	
Natural gas extraction and processing	MWh	0	1.6	0	270.0	0	0.2	0	13.0	0	0.0	0	NP	
Nuclear fuel extraction and processing	MWh	0	0.2	0	25.0	0	0.2	0	0.5	0	0.0	0	NP	
Oil extraction and processing	MWh	0	2.3	0	270.0	0	1.7	0	0.1	0	0.0	0	NP	
Other fuel extraction and processing	MWh	0	0	0	0	0	0	0	0	0	0	0	0	0
Resource Extraction Subtotals				**0**		**0**		**0**		**0**		**0**		**0**
Notes:														
Electricity Transmission														
Transmission and distribution losses	MWh	0	1.0342	0	112.43	0	0.22421	0	0.460789	0	0.005752	0	0.021024	0
Notes:														

Groundwater Monitoring - Off-Site Footprint (Scope 3b)

			Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
Category	Units	Usage	Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
User-defined Materials														
User-defined material #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #4	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #5	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #6	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #7	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #8	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #9	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #10	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #11	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #12	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #13	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #14	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #15	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #16	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #17	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #18	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #19	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #20	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes:														
User-defined Waste Destinations														
User-defined recycled/reused off-site #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined recycled/reused off-site #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined recycled/reused off-site #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined non-hazardous waste destination #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined non-hazardous waste destination #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined non-hazardous waste destination #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined hazardous waste destination #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined hazardous waste destination #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined hazardous waste destination #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes:														
Off-site Totals				**10.80236**		**1267.131**		**2.371515**		**2.987015**		**0.841128**		**0.157025**

Groundwater Monitoring - Intermediate Totals

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Total Grid Electricity Footprint														
On-site grid electricity	MWh	0	3.413	0										
Electricity Generation														
Grid electricity	MWh	0	6.929	0	1124.3	0	2.2421	0	4.607887	0	0.057518	0	0.210237	0
Resource Extraction for Electricity														
Coal extraction and processing	MWh	0	3.1	0	180.0	0	0.8	0	0.2	0	0.0	0	NP	
Natural gas extraction and processing	MWh	0	1.6	0	270.0	0	0.2	0	13.0	0	0.0	0	NP	
Nuclear fuel extraction and processing	MWh	0	0.2	0	25.0	0	0.2	0	0.5	0	0.0	0	NP	
Oil extraction and processing	MWh	0	2.3	0	270.0	0	1.7	0	0.1	0	0.0	0	NP	
Other fuel extraction and processing	MWh	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Electricity Transmission														
Transmission and distribution losses	MWh	0	1.0342	0	112.43	0	0.22421	0	0.460789	0	0.005752	0	0.021024	0
Total Grid Electricity Footprint				**0**		**0**		**0**		**0**		**0**		**0**
Total Fuel Footprints														
Total Gasoline Footprint														
On-site gasoline use - Other	gal	0.066	0.124	0.008184	19.6	1.2936	0.11	0.00726	0.0045	0.000297	0.00054	3.56E-05	0.000039	2.57E-06
On-site gasoline use <25 hp	gal	0	0.124	0	17.48	0	0.037	0	0.00025	0	0.165	0	0.00008	0
On-site gasoline use >25 hp	gal	0	0.124	0	19.93	0	0.032	0	0.00029	0	0.002	0	0.00009	0
Transportation gasoline use	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
Transportation gasoline use - car	gal	0	0.124	0	19.77	0	0.027	0	0.00036	0	0.003	0	0.0067	0
Transportation gasoline use - passenger truck	gal	11.6	0.124	1.4384	19.79	229.564	0.035	0.406	0.00036	0.004176	0.003	0.0348	0.00661	0.076676
Transportation gasoline use - User Defined	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
Gasoline produced	gal	11.666	0.033	0.384978	2.8	32.6648	0.0046	0.053664	0.005	0.05833	0.0015	0.017499	0.001	0.011666
Total Gasoline Footprint		**11.666**		**1.831562**		**263.5224**		**0.466924**		**0.062803**		**0.052335**		**0.088345**
Total Diesel Footprint														
On-site diesel use - Other	gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
On-site diesel use <75 hp	gal	0	0.139	0	22.21	0	0.1565	0	0.000145	0	0.0145	0	0.00004	0
On-site diesel use 75<hp<750	gal	0	0.139	0	22.24	0	0.101	0	0.00013	0	0.009	0	0.00004	0
On-site diesel use >750 hp	gal	0	0.139	0	22.24	0	0.149	0	0.00013	0	0.006	0	0.00004	0
Transportation diesel use	gal	58.267	0.139	8.099113	22.5	1311.008	0.17	9.90539	0.0054	0.314642	0.0034	0.198108	5.2E-06	0.000303
Transportation diesel use - car	gal	0	0.139	0	22.57	0	0.015	0	0.0002	0	0.003	0	0.00252	0
Transportation diesel use - passenger truck	gal	0	0.139	0	22.545	0	0.0585	0	0.0002	0	0.007	0	0.002605	0
Transportation diesel use - User Defined	gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
Diesel produced	gal	58.267	0.017	0.990539	3.02	175.9663	0.0051	0.297162	0.0062	0.361255	0.0017	0.099054	0.0011	0.064094
Total Diesel Footprint		**58.267**		**9.089652**		**1486.974**		**10.20255**		**0.675897**		**0.297162**		**0.064397**
Total Biodiesel Footprint														
On-site biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
On-site biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Transportation biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Transportation biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Biodiesel produced	gal	0	0.029	0	-16.8	0	0.018	0	0.033	0	0.00082	0	NP	
Total Biodiesel Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**
Total Natural Gas Footprint														
On-site natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Transportation natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Transportation natural gas use - User Defined	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Natural gas produced	ccf	0	0.0052	0	2.2	0	0.0037	0	0.0046	0	0.000072	0	6.1E-06	0
Total Natural Gas Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**
Total Liquified Petroleum Gas Footprint														
On-site liquified petroleum gas use - Other	ccf	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
On-site liquified petroleum gas use	ccf	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
Liquified petroleum gas produced	ccf	0	0.088	0	1.47	0	0.0016	0	0.0024	0	0.0007	0	0.0003	0
Total Natural Gas Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**
Total Compressed Gas Footprint														
On-site compressed gas use - Other	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
On-site compressed gas use	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
Compressed gas produced	ccf	0	19.983	0	343.92	0	0.4732	0	2.1651	0	0.1846	0	0.2895	0
Total Natural Gas Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**

Notes:

Note: Please refer to the "Default Conversions" tab for references for the default conversion factors used on this calculation sheet.

Space below available for notes and calculations:

O&M - On-Site Footprint (Scope 1)

Contributors to Footprints	Units	Usage	Energy		GHG		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
On-Site														
On-site Renewable Energy														
Renewable electricity generated on-site	MWh	0	3.413	0										
Landfill gas combusted on-site for energy use	ccf CH4	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
On-site biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
On-site biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
User-defined on-site renewable energy use #1	gal	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined on-site renewable energy use #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
On-site Renewable Energy Subtotals				**0**		**0**		**0**		**0**		**0**		**0**
Notes:														
On-site Conventional Energy														
On-site grid electricity	MWh	403.84	3.413	1378.306										
On-site diesel use - Other	Gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
On-site diesel use <75 hp	Gal	0	0.139	0	22.21	0	0.1565	0	0.000145	0	0.0145	0	0.00004	0
On-site diesel use 75<hp<750	Gal	0	0.139	0	22.24	0	0.101	0	0.00013	0	0.009	0	0.00004	0
On-site diesel use >750 hp	Gal	0	0.139	0	22.24	0	0.149	0	0.00013	0	0.006	0	0.00004	0
On-site gasoline use - Other	Gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
On-site gasoline use <25 hp	Gal	0	0.124	0	17.48	0	0.037	0	0.00025	0	0.165	0	0.00008	0
On-site gasoline use >25 hp	Gal	0	0.124	0	19.93	0	0.032	0	0.00029	0	0.002	0	0.00009	0
On-site natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
On-site compressed natural gas use - Other	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
On-site compressed natural gas use	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
On-site liquified petroleum gas use - Other	gal	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
On-site liquified petroleum gas use	gal	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
Other forms of on-site conventional energy use #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Other forms of on-site conventional energy use #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
On-site Conventional Energy Subtotals				**1,378**		**0**		**0**		**0**		**0**		**0**
Notes:														
Other On-site Emissions														
On-site HAP process emissions	lbs	0											1	0
On-site GHG emissions	lbs CO2e	0			1	0								
On-site carbon storage	lbs CO2e	0			1	0								
GHG avoided by flaring on-site landfill methane	Lbs	0			-262	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Other on-site NOx emissions or reductions	lbs	0					1	0						
Other on-site SOx emissions or reductions	lbs	0							1	0				
Other on-site PM emissions or reductions	lbs	0									1	0		
Notes:														
On-site Totals				**1,378.31**		**0**		**0**		**0**		**0**		**0**

O&M - Electricity Generation Footprint (Scope 2)

Contributors to Footprints	Units	Usage	Energy		GHG		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Electricity Generation														
Grid electricity	MWh	403.84	6.929	2798.207	1124.3	454037.3	2.2421	905.4497	4.607887	1860.849	0.057518	23.22807	0.210237	84.90215
Voluntary purchase of renewable electricity	MWh	0												
Voluntary purchase of RECs	MWh	0												
Notes:														

O&M - Transportation Footprint (Scope 3a)

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Conventional Energy														
Transportation diesel use	gal	25	0.139	3.475	22.5	562.5	0.17	4.25	0.0054	0.135	0.0034	0.085	5.2E-06	0.00013
Transportation diesel use - car	gal	0	0.139	0	22.57	0	0.015	0	0.0002	0	0.003	0	0.00252	0
Transportation diesel use - passenger truck	gal	0	0.139	0	22.545	0	0.0585	0	0.0002	0	0.007	0	0.002605	0
Transportation diesel use - User Defined	gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
Transportation gasoline use	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
Transportation gasoline use - car	gal	0	0.124	0	19.77	0	0.027	0	0.00036	0	0.003	0	0.0067	0
Transportation gasoline use - passenger truck	gal	69.8	0.124	8.6552	19.79	1381.342	0.035	2.443	0.00036	0.025128	0.003	0.2094	0.00661	0.461378
Transportation gasoline use - User Defined	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
Transportation natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Transportation natural gas use - User Defined	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
User-defined conventional energy transportation #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined conventional energy transportation #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Conventional Energy Subtotals				**12**		**1,944**		**7**		**0**		**0**		**0**
Notes:														
Renewable Energy														
Transportation biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Transportation biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
User-defined renewable energy transportation #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined renewable energy transportation #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Renewable Energy Subtotals				**0**		**0**		**0**		**0**		**0**		**0**
Notes:														
Transportation Totals				**12**		**1944**		**7**		**0**		**0**		**0**

O&M - Off-Site Footprint (Scope 3b)

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Construction Materials														
Aluminum, Rolled Sheet	lb	0	0.0633	0	9.15	0	0.0148	0	0.0283	0	0.0088	0	0.00102	0
Asphalt, mastic	lb	0	0.0412	0	0.85	0	0.00271	0	0.00798	0	0.000766	0	0.00107	0
Asphalt, paving-grade	lb	0	0.5	0	8.58	0	0.0299	0	0.0969	0	0.0091	0	0.0133	0
Ethanol, Corn, 95%	lb	0	0.0318	0	-0.0199	0	0.00425	0	0.00303	0	0.000469	0	8.46E-05	0
Ethanol, Corn, 99.7%	lb	0	0.0324	0	0.0591	0	0.00431	0	0.0031	0	0.000472	0	0.000087	0
Ethanol, Petroleum, 99.7%	lb	0	0.0205	0	1.25	0	0.00199	0	0.00214	0	0.000277	0	5.89E-05	0
Gravel/Sand Mix, 65% Gravel	lb	0	2.48E-05	0	0.0024	0	0.000018	0	4.52E-06	0	2.61E-06	0	3.08E-07	0
Gravel/sand/clay	lb	0	0.000028	0	0.00335	0	1.65E-05	0	0.000015	0	0.000002	0	2.05E-10	0
HDPE	lb	0	0.0332	0	1.94	0	0.00325	0	0.00409	0	0.000439	0	6.41E-05	0
Photovoltaic system (installed)	W	0	0.0336	0	4.47	0	0.015	0	0.032	0	0.00063	0	2.9E-06	0
PVC	lb	0	0.0262	0	2.02	0	0.004	0	0.00274	0	0.000372	0	0.000375	0
Portland cement, US average	lb	0	0.0139	0	1.34	0	0.00654	0	0.0104	0	0.00378	0	0.00097	0
Ready-mixed concrete, 20 MPa	ft3	0	0.217	0	19.5	0	0.0975	0	0.154	0	0.057	0	0.0141	0
Round Gravel	lb	0	2.48E-05	0	0.0024	0	0.000018	0	4.52E-06	0	2.61E-06	0	3.08E-07	0
Sand	lb	0	2.48E-05	0	0.0024	0	0.000018	0	4.52E-06	0	2.61E-06	0	3.08E-07	0
Stainless Steel	lb	0	0.0116	0	3.4	0	0.0075	0	0.012	0	0.0044	0	0.000144	0
Steel	lb	0	0.0044	0	1.1	0	0.0014	0	0.0017	0	0.00056	0	0.000067	0
Other refined construction materials	lb	0	0.01885	0	2.115	0	0.004038	0	0.005133	0	0.001443	0	0.000163	0
Other unrefined construction materials	lb	0	0.000028	0	0.00335	0	1.65E-05	0	0.000015	0	0.000002	0	2.05E-10	0

Notes:

O&M - Off-Site Footprint (Scope 3b)

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Treatment Materials & Chemicals														
Cheese Whey	lbs	0	0.0025	0	0.031	0	0.000062	0	0.000033	0	0.000002	0	NP	
Emulsified vegetable oil	lbs	0	0.0077	0	3.44	0	0.0066	0	0.0019	0	0.000033	0	NP	
Granular activated carbon, primary	lbs	0	0.0356	0	4.82	0	0.0793	0	0.128	0	0.000987	0	0.000657	0
Granular activated carbon, regenerated	lbs	0	0.00873	0	1.7	0	0.00733	0	0.0129	0	0.000886	0	0.000671	0
Hydrogen Peroxide, 50% in H2O	lbs	0	0.00979	0	1.19	0	0.00142	0	0.0024	0	0.000308	0	6.29E-05	0
Iron (II) Sulfate	lbs	0	0.00147	0	0.167	0	0.000316	0	0.000589	0	0.000103	0	0.000023	0
Lime, Hydrated, Packed	lbs	0	0.00206	0	0.762	0	0.000513	0	0.000358	0	0.00013	0	6.57E-06	0
Molasses	lbs	0	0.0044	0	0.48	0	0.0011	0	0.00024	0	4.1E-06	0	NP	
Phosphoric Acid, 70% in H2O	lbs	0	0.0067	0	0.882	0	0.00282	0	0.0294	0	0.00171	0	0.000163	0
Potassium Permanganate	lbs	0	0.00981	0	1.16	0	0.00234	0	0.0032	0	0.000422	0	0.000122	0
Sodium Hydroxide, 50% in H2O	lbs	0	0.00977	0	1.09	0	0.00194	0	0.00352	0	0.000403	0	0.000129	0
Other Treatment Chemicals & Materials	lbs	0	0.015	0	1.67	0	0.003	0	0.0065	0	0.00061	0	0.000016	0
Notes:														
Fuel Processing														
Biodiesel produced	gal	0	0.029	0	-16.8	0	0.018	0	0.033	0	0.00082	0	NP	
Diesel produced	gal	25	0.017	0.425	3.02	75.5	0.0051	0.1275	0.0062	0.155	0.0017	0.0425	0.0011	0.0275
Gasoline produced	gal	69.8	0.033	2.3034	2.8	195.44	0.0046	0.32108	0.005	0.349	0.0015	0.1047	0.001	0.0698
Liquefied Petroleum Gas Produced	gal	0	0.088	0	1.47	0	0.0016	0	0.0024	0	0.0007	0	0.0003	0
Natural Gas - Compressed Produced	ccf	0	19.983	0	343.92	0	0.4732	0	2.1651	0	0.1846	0	0.2895	0
Natural Gas Produced	ccf	0	0.0052	0	2.2	0	0.0037	0	0.0046	0	0.000072	0	6.1E-06	0
Fuel Processing Subtotals				**2.7284**		**270.94**		**0.44858**		**0.504**		**0.1472**		**0.0973**
Notes:														
Public water	gal x 1000	0	0.0092	0	5	0	0.0097	0	0.0059	0	0.016	0	0.000015	0
User-defined water resource #1	gal x 1000	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined water resource #2	gal x 1000	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes:														

O&M - Off-Site Footprint (Scope 3b)

			Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
Category	Units	Usage	Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Off-Site Services														
Hazardous waste incineration	lb	0	0.00609	0	2.43	0	0.0016	0	0.00167	0	0.000209	0	0.000087	0
Off-site waste water treatment (POTW)	gal x 1000	0	0.015	0	4.4	0	0.016	0	0.015	0	NP		NP	
Off-site non-hazardous waste landfill	ton	1	0.16	0.16	25	25	0.14	0.14	0.075	0.075	0.4	0.4	0.0014	0.0014
Off-site hazardous waste landfill	ton	0	0.18	0	27.5	0	0.154	0	0.0825	0	0.44	0	0.00154	0
Off-site Laboratory Analysis - Other	sample	36	0.058071	2.090557	6.853438	246.7238	0.131402	4.73047	0.303876	10.93953	0.04557	1.640514	0.033017	1.188595
Off-site Laboratory Analysis - Metals	sample	24	0.212	5.088	27.4693	659.2632	0.6423	15.4152	1.5072	36.1728	0.2264	5.4336	0.1643	3.9432
Off-site Laboratory Analysis - Mercury	sample	0	0.073171	0	9.325458	0	0.212744	0	0.49824	0	0.074736	0	0.054233	0
Off-site Laboratory Analysis - Inorganic Anions	sample	0	0.007402	0	0.645948	0	0.006768	0	0.014793	0	0.002202	0	0.001554	0
Off-site Laboratory Analysis - Alkalinity	sample	24	0.01744	0.418556	1.338192	32.11661	0.007011	0.168255	0.01325	0.317992	0.00194	0.046561	0.001283	0.030794
Off-site Laboratory Analysis - Perchlorate	sample	0	0.023885	0	1.871705	0	0.007981	0	0.014154	0	0.002055	0	0.001287	0
Off-site Laboratory Analysis - Nitrogen/Nitrate	sample	24	0.033648	0.80754	4.29897	103.1753	0.095459	2.29102	0.222665	5.34395	0.03351	0.804238	0.024251	0.582014
Off-site Laboratory Analysis - Sulfate	sample	0	0.014122	0	1.472673	0	0.007981	0	0.013602	0	0.00198	0	0.001202	0
Off-site Laboratory Analysis - PCBs	sample	0	0.051277	0	5.224902	0	0.083334	0	0.190477	0	0.028439	0	0.021208	0
Off-site Laboratory Analysis - VOCs	sample	24	0.076204	1.828908	9.016814	216.4035	0.104498	2.507953	0.227074	5.449771	0.033951	0.81482	0.023589	0.566141
Off-site Laboratory Analysis - SVOCs	sample	0	0.07156	0	7.870422	0	0.145945	0	0.337304	0	0.050485	0	0.037258	0
Notes:														
Resource Extraction for Electricity														
Coal extraction and processing	MWh	24.2304	3.1	73.9948	180.0	4361.472	0.8	18.65741	0.2	3.63456	0.0	0.436147	NP	
Natural gas extraction and processing	MWh	40.384	1.6	65.89861	270.0	10903.68	0.2	7.26912	13.0	524.992	0.0	0.286726	NP	
Nuclear fuel extraction and processing	MWh	8.0768	0.2	1.255716	25.0	201.92	0.2	1.21152	0.5	4.0384	0.0	0.012115	NP	
Oil extraction and processing	MWh	20.192	2.3	46.34872	270.0	5451.84	1.7	34.3264	0.1	1.393248	0.0	0.848064	NP	
Other fuel extraction and processing	MWh	0	0	0	0	0	0	0	0	0	0	0	0	0
Resource Extraction Subtotals				**187.4978**		**20918.91**		**61.46445**		**534.0582**		**1.583053**		**0**
Notes:														
Electricity Transmission														
Transmission and distribution losses	MWh	403.84	1.0342	417.6513	112.43	45403.73	0.22421	90.54497	0.460789	186.0849	0.005752	2.322807	0.021024	8.490215
Notes:														

O&M - Off-Site Footprint (Scope 3b)

			Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
Category	Units	Usage	Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
User-defined Materials														
User-defined material #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #4	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #5	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #6	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #7	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #8	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #9	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #10	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #11	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #12	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #13	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #14	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #15	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #16	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #17	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #18	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #19	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #20	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes:														
User-defined Waste Destinations														
User-defined recycled/reused off-site #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined recycled/reused off-site #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined recycled/reused off-site #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined non-hazardous waste destination #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined non-hazardous waste destination #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined non-hazardous waste destination #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined hazardous waste destination #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined hazardous waste destination #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined hazardous waste destination #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes:														
Off-site Totals				**618.2711**		**67876.27**		**177.7109**		**778.9462**		**13.19279**		**14.89966**

O&M - Intermediate Totals

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Total Grid Electricity Footprint														
On-site grid electricity	MWh	403.84	3.413	1378.306										
Electricity Generation														
Grid electricity	MWh	403.84	6.929	2798.207	1124.3	454037.3	2.2421	905.4497	4.607887	1860.849	0.057518	23.22807	0.210237	84.90215
Resource Extraction for Electricity														
Coal extraction and processing	MWh	24.2304	3.1	73.9948	180.0	4361.472	0.8	18.65741	0.2	3.63456	0.0	0.436147	NP	
Natural gas extraction and processing	MWh	40.384	1.6	65.89861	270.0	10903.68	0.2	7.26912	13.0	524.992	0.0	0.286726	NP	
Nuclear fuel extraction and processing	MWh	8.0768	0.2	1.255716	25.0	201.92	0.2	1.21152	0.5	4.0384	0.0	0.012115	NP	
Oil extraction and processing	MWh	20.192	2.3	46.34872	270.0	5451.84	1.7	34.3264	0.1	1.393248	0.0	0.848064	NP	
Other fuel extraction and processing	MWh	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Electricity Transmission														
Transmission and distribution losses	MWh	403.84	1.0342	417.6513	112.43	45403.73	0.22421	90.54497	0.460789	186.0849	0.005752	2.322807	0.021024	8.490215
Total Grid Electricity Footprint				**4782**		**520360**		**1057**		**2581**		**27**		**93**
Total Fuel Footprints														
Total Gasoline Footprint														
On-site gasoline use - Other	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
On-site gasoline use <25 hp	gal	0	0.124	0	17.48	0	0.037	0	0.00025	0	0.165	0	0.00008	0
On-site gasoline use >25 hp	gal	0	0.124	0	19.93	0	0.032	0	0.00029	0	0.002	0	0.00009	0
Transportation gasoline use	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
Transportation gasoline use - car	gal	0	0.124	0	19.77	0	0.027	0	0.00036	0	0.003	0	0.0067	0
Transportation gasoline use - passenger truck	gal	69.8	0.124	8.6552	19.79	1381.342	0.035	2.443	0.00036	0.025128	0.003	0.2094	0.00661	0.461378
Transportation gasoline use - User Defined	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
Gasoline produced	gal	69.8	0.033	2.3034	2.8	195.44	0.0046	0.32108	0.005	0.349	0.0015	0.1047	0.001	0.0698
Total Gasoline Footprint		**69.8**		**10.9586**		**1576.782**		**2.76408**		**0.374128**		**0.3141**		**0.531178**
Total Diesel Footprint														
On-site diesel use - Other	gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
On-site diesel use <75 hp	gal	0	0.139	0	22.21	0	0.1565	0	0.000145	0	0.0145	0	0.00004	0
On-site diesel use 75<hp<750	gal	0	0.139	0	22.24	0	0.101	0	0.00013	0	0.009	0	0.00004	0
On-site diesel use >750 hp	gal	0	0.139	0	22.24	0	0.149	0	0.00013	0	0.006	0	0.00004	0
Transportation diesel use	gal	25	0.139	3.475	22.5	562.5	0.17	4.25	0.0054	0.135	0.0034	0.085	5.2E-06	0.00013
Transportation diesel use - car	gal	0	0.139	0	22.57	0	0.015	0	0.0002	0	0.003	0	0.00252	0
Transportation diesel use - passenger truck	gal	0	0.139	0	22.545	0	0.0585	0	0.0002	0	0.007	0	0.002605	0
Transportation diesel use - User Defined	gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
Diesel produced	gal	25	0.017	0.425	3.02	75.5	0.0051	0.1275	0.0062	0.155	0.0017	0.0425	0.0011	0.0275
Total Diesel Footprint		**25**		**3.9**		**638**		**4.3775**		**0.29**		**0.1275**		**0.02763**
Total Biodiesel Footprint														
On-site biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
On-site biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Transportation biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Transportation biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Biodiesel produced	gal	0	0.029	0	-16.8	0	0.018	0	0.033	0	0.00082	0	NP	
Total Biodiesel Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**
Total Natural Gas Footprint														
On-site natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Transportation natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Transportation natural gas use - User Defined	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Natural gas produced	ccf	0	0.0052	0	2.2	0	0.0037	0	0.0046	0	0.000072	0	6.1E-06	0
Total Natural Gas Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**
Total Liquified Petroleum Gas Footprint														
On-site liquified petroleum gas use - Other	ccf	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
On-site liquified petroleum gas use	ccf	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
Liquified petroleum gas produced	ccf	0	0.088	0	1.47	0	0.0016	0	0.0024	0	0.0007	0	0.0003	0
Total Natural Gas Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**
Total Compressed Gas Footprint														
On-site compressed gas use - Other	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
On-site compressed gas use	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
Compressed gas produced	ccf	0	19.983	0	343.92	0	0.4732	0	2.1651	0	0.1846	0	0.2895	0
Total Natural Gas Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**

Notes:

Note: Please refer to the "Default Conversions" tab for references for the default conversion factors used on this calculation sheet.

Space below available for notes and calculations:

Non routine Site Visits - On-Site Footprint (Scope 1)

Contributors to Footprints	Units	Usage	Energy		GHG		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
On-Site														
On-site Renewable Energy														
Renewable electricity generated on-site	MWh	0	3.413	0										
Landfill gas combusted on-site for energy use	ccf CH4	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
On-site biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
On-site biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
User-defined on-site renewable energy use #1	gal	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined on-site renewable energy use #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
On-site Renewable Energy Subtotals				**0**		**0**		**0**		**0**		**0**		**0**
Notes:														
On-site Conventional Energy														
On-site grid electricity	MWh	0	3.413	0										
On-site diesel use - Other	Gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
On-site diesel use <75 hp	Gal	0	0.139	0	22.21	0	0.1565	0	0.000145	0	0.0145	0	0.00004	0
On-site diesel use 75<hp<750	Gal	0	0.139	0	22.24	0	0.101	0	0.00013	0	0.009	0	0.00004	0
On-site diesel use >750 hp	Gal	0	0.139	0	22.24	0	0.149	0	0.00013	0	0.006	0	0.00004	0
On-site gasoline use - Other	Gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
On-site gasoline use <25 hp	Gal	0	0.124	0	17.48	0	0.037	0	0.00025	0	0.165	0	0.00008	0
On-site gasoline use >25 hp	Gal	0	0.124	0	19.93	0	0.032	0	0.00029	0	0.002	0	0.00009	0
On-site natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
On-site compressed natural gas use - Other	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
On-site compressed natural gas use	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
On-site liquified petroleum gas use - Other	gal	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
On-site liquified petroleum gas use	gal	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
Other forms of on-site conventional energy use #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Other forms of on-site conventional energy use #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
On-site Conventional Energy Subtotals				**0**		**0**		**0**		**0**		**0**		**0**
Notes:														
Other On-site Emissions														
On-site HAP process emissions	lbs	0											1	0
On-site GHG emissions	lbs CO2e	0			1	0								
On-site carbon storage	lbs CO2e	0			1	0								
GHG avoided by flaring on-site landfill methane	Lbs	0			-262	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Other on-site NOx emissions or reductions	lbs	0					1	0						
Other on-site SOx emissions or reductions	lbs	0							1	0				
Other on-site PM emissions or reductions	lbs	0									1	0		
Notes:														
On-site Totals				**0.00**		**0**		**0**		**0**		**0**		**0**

Non routine Site Visits - Electricity Generation Footprint (Scope 2)

Contributors to Footprints	Units	Usage	Energy		GHG		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Electricity Generation														
Grid electricity	MWh	0	6.929	0	1124.3	0	2.2421	0	4.607887	0	0.057518	0	0.210237	0
Voluntary purchase of renewable electricity	MWh	0												
Voluntary purchase of RECs	MWh	0												

Notes:

Non routine Site Visits - Transportation Footprint (Scope 3a)

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Conventional Energy														
Transportation diesel use	gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
Transportation diesel use - car	gal	0	0.139	0	22.57	0	0.015	0	0.0002	0	0.003	0	0.00252	0
Transportation diesel use - passenger truck	gal	0	0.139	0	22.545	0	0.0585	0	0.0002	0	0.007	0	0.002605	0
Transportation diesel use - User Defined	gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
Transportation gasoline use	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
Transportation gasoline use - car	gal	0	0.124	0	19.77	0	0.027	0	0.00036	0	0.003	0	0.0067	0
Transportation gasoline use - passenger truck	gal	0	0.124	0	19.79	0	0.035	0	0.00036	0	0.003	0	0.00661	0
Transportation gasoline use - User Defined	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
Transportation natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Transportation natural gas use - User Defined	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
User-defined conventional energy transportation #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined conventional energy transportation #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Conventional Energy Subtotals				**0**		**0**		**0**		**0**		**0**		**0**
Notes:														
Renewable Energy														
Transportation biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Transportation biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
User-defined renewable energy transportation #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined renewable energy transportation #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Renewable Energy Subtotals				**0**		**0**		**0**		**0**		**0**		**0**
Notes:														
Transportation Totals				**0**		**0**		**0**		**0**		**0**		**0**

Non routine Site Visits - Off-Site Footprint (Scope 3b)

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Construction Materials														
Aluminum, Rolled Sheet	lb	0	0.0633	0	9.15	0	0.0148	0	0.0283	0	0.0088	0	0.00102	0
Asphalt, mastic	lb	0	0.0412	0	0.85	0	0.00271	0	0.00798	0	0.000766	0	0.00107	0
Asphalt, paving-grade	lb	0	0.5	0	8.58	0	0.0299	0	0.0969	0	0.0091	0	0.0133	0
Ethanol, Corn, 95%	lb	0	0.0318	0	-0.0199	0	0.00425	0	0.00303	0	0.000469	0	8.46E-05	0
Ethanol, Corn, 99.7%	lb	0	0.0324	0	0.0591	0	0.00431	0	0.0031	0	0.000472	0	0.000087	0
Ethanol, Petroleum, 99.7%	lb	0	0.0205	0	1.25	0	0.00199	0	0.00214	0	0.000277	0	5.89E-05	0
Gravel/Sand Mix, 65% Gravel	lb	0	2.48E-05	0	0.0024	0	0.000018	0	4.52E-06	0	2.61E-06	0	3.08E-07	0
Gravel/sand/clay	lb	0	0.000028	0	0.00335	0	1.65E-05	0	0.000015	0	0.000002	0	2.05E-10	0
HDPE	lb	0	0.0332	0	1.94	0	0.00325	0	0.00409	0	0.000439	0	6.41E-05	0
Photovoltaic system (installed)	W	0	0.0336	0	4.47	0	0.015	0	0.032	0	0.00063	0	2.9E-06	0
PVC	lb	0	0.0262	0	2.02	0	0.004	0	0.00274	0	0.000372	0	0.000375	0
Portland cement, US average	lb	0	0.0139	0	1.34	0	0.00654	0	0.0104	0	0.00378	0	0.00097	0
Ready-mixed concrete, 20 MPa	ft3	0	0.217	0	19.5	0	0.0975	0	0.154	0	0.057	0	0.0141	0
Round Gravel	lb	0	2.48E-05	0	0.0024	0	0.000018	0	4.52E-06	0	2.61E-06	0	3.08E-07	0
Sand	lb	0	2.48E-05	0	0.0024	0	0.000018	0	4.52E-06	0	2.61E-06	0	3.08E-07	0
Stainless Steel	lb	0	0.0116	0	3.4	0	0.0075	0	0.012	0	0.0044	0	0.000144	0
Steel	lb	0	0.0044	0	1.1	0	0.0014	0	0.0017	0	0.00056	0	0.000067	0
Other refined construction materials	lb	0	0.01885	0	2.115	0	0.004038	0	0.005133	0	0.001443	0	0.000163	0
Other unrefined construction materials	lb	0	0.000028	0	0.00335	0	1.65E-05	0	0.000015	0	0.000002	0	2.05E-10	0

Notes:

Non routine Site Visits - Off-Site Footprint (Scope 3b)

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Treatment Materials & Chemicals														
Cheese Whey	lbs	0	0.0025	0	0.031	0	0.000062	0	0.000033	0	0.000002	0	NP	
Emulsified vegetable oil	lbs	0	0.0077	0	3.44	0	0.0066	0	0.0019	0	0.000033	0	NP	
Granular activated carbon, primary	lbs	0	0.0356	0	4.82	0	0.0793	0	0.128	0	0.000987	0	0.000657	0
Granular activated carbon, regenerated	lbs	0	0.00873	0	1.7	0	0.00733	0	0.0129	0	0.000886	0	0.000671	0
Hydrogen Peroxide, 50% in H2O	lbs	0	0.00979	0	1.19	0	0.00142	0	0.0024	0	0.000308	0	6.29E-05	0
Iron (II) Sulfate	lbs	0	0.00147	0	0.167	0	0.000316	0	0.000589	0	0.000103	0	0.000023	0
Lime, Hydrated, Packed	lbs	0	0.00206	0	0.762	0	0.000513	0	0.000358	0	0.00013	0	6.57E-06	0
Molasses	lbs	0	0.0044	0	0.48	0	0.0011	0	0.00024	0	4.1E-06	0	NP	
Phosphoric Acid, 70% in H2O	lbs	0	0.0067	0	0.882	0	0.00282	0	0.0294	0	0.00171	0	0.000163	0
Potassium Permanganate	lbs	0	0.00981	0	1.16	0	0.00234	0	0.0032	0	0.000422	0	0.000122	0
Sodium Hydroxide, 50% in H2O	lbs	0	0.00977	0	1.09	0	0.00194	0	0.00352	0	0.000403	0	0.000129	0
Other Treatment Chemicals & Materials	lbs	0	0.015	0	1.67	0	0.003	0	0.0065	0	0.00061	0	0.000016	0
Notes:														
Fuel Processing														
Biodiesel produced	gal	0	0.029	0	-16.8	0	0.018	0	0.033	0	0.00082	0	NP	
Diesel produced	gal	0	0.017	0	3.02	0	0.0051	0	0.0062	0	0.0017	0	0.0011	0
Gasoline produced	gal	0	0.033	0	2.8	0	0.0046	0	0.005	0	0.0015	0	0.001	0
Liquefied Petroleum Gas Produced	gal	0	0.088	0	1.47	0	0.0016	0	0.0024	0	0.0007	0	0.0003	0
Natural Gas - Compressed Produced	ccf	0	19.983	0	343.92	0	0.4732	0	2.1651	0	0.1846	0	0.2895	0
Natural Gas Produced	ccf	0	0.0052	0	2.2	0	0.0037	0	0.0046	0	0.000072	0	6.1E-06	0
Fuel Processing Subtotals				**0**		**0**		**0**		**0**		**0**		**0**
Notes:														
Public water	gal x 1000	0	0.0092	0	5	0	0.0097	0	0.0059	0	0.016	0	0.000015	0
User-defined water resource #1	gal x 1000	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined water resource #2	gal x 1000	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes:														

Non routine Site Visits - Off-Site Footprint (Scope 3b)

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Off-Site Services														
Hazardous waste incineration	lb	0	0.00609	0	2.43	0	0.0016	0	0.00167	0	0.000209	0	0.000087	0
Off-site waste water treatment (POTW)	gal x 1000	0	0.015	0	4.4	0	0.016	0	0.015	0	NP		NP	
Off-site non-hazardous waste landfill	ton	0	0.16	0	25	0	0.14	0	0.075	0	0.4	0	0.0014	0
Off-site hazardous waste landfill	ton	0	0.18	0	27.5	0	0.154	0	0.0825	0	0.44	0	0.00154	0
Off-site Laboratory Analysis - Other	sample	0	0.058071	0	6.853438	0	0.131402	0	0.303876	0	0.04557	0	0.033017	0
Off-site Laboratory Analysis - Metals	sample	0	0.212	0	27.4693	0	0.6423	0	1.5072	0	0.2264	0	0.1643	0
Off-site Laboratory Analysis - Mercury	sample	0	0.073171	0	9.325458	0	0.212744	0	0.49824	0	0.074736	0	0.054233	0
Off-site Laboratory Analysis - Inorganic Anions	sample	0	0.007402	0	0.645948	0	0.006768	0	0.014793	0	0.002202	0	0.001554	0
Off-site Laboratory Analysis - Alkalinity	sample	0	0.01744	0	1.338192	0	0.007011	0	0.01325	0	0.00194	0	0.001283	0
Off-site Laboratory Analysis - Perchlorate	sample	0	0.023885	0	1.871705	0	0.007981	0	0.014154	0	0.002055	0	0.001287	0
Off-site Laboratory Analysis - Nitrogen/Nitrate	sample	0	0.033648	0	4.29897	0	0.095459	0	0.222665	0	0.03351	0	0.024251	0
Off-site Laboratory Analysis - Sulfate	sample	0	0.014122	0	1.472673	0	0.007981	0	0.013602	0	0.00198	0	0.001202	0
Off-site Laboratory Analysis - PCBs	sample	0	0.051277	0	5.224902	0	0.083334	0	0.190477	0	0.028439	0	0.021208	0
Off-site Laboratory Analysis - VOCs	sample	0	0.076204	0	9.016814	0	0.104498	0	0.227074	0	0.033951	0	0.023589	0
Off-site Laboratory Analysis - SVOCs	sample	0	0.07156	0	7.870422	0	0.145945	0	0.337304	0	0.050485	0	0.037258	0
Notes:														
Resource Extraction for Electricity														
Coal extraction and processing	MWh	0	3.1	0	180.0	0	0.8	0	0.2	0	0.0	0	NP	
Natural gas extraction and processing	MWh	0	1.6	0	270.0	0	0.2	0	13.0	0	0.0	0	NP	
Nuclear fuel extraction and processing	MWh	0	0.2	0	25.0	0	0.2	0	0.5	0	0.0	0	NP	
Oil extraction and processing	MWh	0	2.3	0	270.0	0	1.7	0	0.1	0	0.0	0	NP	
Other fuel extraction and processing	MWh	0	0	0	0	0	0	0	0	0	0	0	0	0
Resource Extraction Subtotals				**0**		**0**		**0**		**0**		**0**		**0**
Notes:														
Electricity Transmission														
Transmission and distribution losses	MWh	0	1.0342	0	112.43	0	0.22421	0	0.460789	0	0.005752	0	0.021024	0
Notes:														

Non routine Site Visits - Off-Site Footprint (Scope 3b)

			Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv.		Conv.		Conv.		Conv.		Conv.		Conv.	
Category	**Units**	**Usage**	**Factor**	**MMBtus**	**Factor**	**lbs CO2e**	**Factor**	**lbs**	**Factor**	**lbs**	**Factor**	**lbs**	**Factor**	**lbs**
User-defined Materials														
User-defined material #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #4	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #5	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #6	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #7	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #8	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #9	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #10	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #11	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #12	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #13	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #14	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #15	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #16	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #17	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #18	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #19	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined material #20	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes:														
User-defined Waste Destinations														
User-defined recycled/reused off-site #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined recycled/reused off-site #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined recycled/reused off-site #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined non-hazardous waste destination #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined non-hazardous waste destination #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined non-hazardous waste destination #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined hazardous waste destination #1	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined hazardous waste destination #2	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
User-defined hazardous waste destination #3	TBD	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes:														
Off-site Totals				**0**		**0**		**0**		**0**		**0**		**0**

Non routine Site Visits - Intermediate Totals

Category	Units	Usage	Energy		Greenhouse Gas		NOx		SOx		PM		HAPs	
			Conv. Factor	MMBtus	Conv. Factor	lbs CO2e	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs	Conv. Factor	lbs
Total Grid Electricity Footprint														
On-site grid electricity	MWh	0	3.413	0										
Electricity Generation														
Grid electricity	MWh	0	6.929	0	1124.3	0	2.2421	0	4.607887	0	0.057518	0	0.210237	0
Resource Extraction for Electricity														
Coal extraction and processing	MWh	0	3.1	0	180.0	0	0.8	0	0.2	0	0.0	0	NP	
Natural gas extraction and processing	MWh	0	1.6	0	270.0	0	0.2	0	13.0	0	0.0	0	NP	
Nuclear fuel extraction and processing	MWh	0	0.2	0	25.0	0	0.2	0	0.5	0	0.0	0	NP	
Oil extraction and processing	MWh	0	2.3	0	270.0	0	1.7	0	0.1	0	0.0	0	NP	
Other fuel extraction and processing	MWh	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Electricity Transmission														
Transmission and distribution losses	MWh	0	1.0342	0	112.43	0	0.22421	0	0.460789	0	0.005752	0	0.021024	0
Total Grid Electricity Footprint				**0**		**0**		**0**		**0**		**0**		**0**
Total Fuel Footprints														
Total Gasoline Footprint														
On-site gasoline use - Other	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
On-site gasoline use <25 hp	gal	0	0.124	0	17.48	0	0.037	0	0.00025	0	0.165	0	0.00008	0
On-site gasoline use >25 hp	gal	0	0.124	0	19.93	0	0.032	0	0.00029	0	0.002	0	0.00009	0
Transportation gasoline use	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
Transportation gasoline use - car	gal	0	0.124	0	19.77	0	0.027	0	0.00036	0	0.003	0	0.0067	0
Transportation gasoline use - passenger truck	gal	0	0.124	0	19.79	0	0.035	0	0.00036	0	0.003	0	0.00661	0
Transportation gasoline use - User Defined	gal	0	0.124	0	19.6	0	0.11	0	0.0045	0	0.00054	0	0.000039	0
Gasoline produced	gal	0	0.033	0	2.8	0	0.0046	0	0.005	0	0.0015	0	0.001	0
Total Gasoline Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**
Total Diesel Footprint														
On-site diesel use - Other	gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
On-site diesel use <75 hp	gal	0	0.139	0	22.21	0	0.1565	0	0.000145	0	0.0145	0	0.00004	0
On-site diesel use 75<hp<750	gal	0	0.139	0	22.24	0	0.101	0	0.00013	0	0.009	0	0.00004	0
On-site diesel use >750 hp	gal	0	0.139	0	22.24	0	0.149	0	0.00013	0	0.006	0	0.00004	0
Transportation diesel use	gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
Transportation diesel use - car	gal	0	0.139	0	22.57	0	0.015	0	0.0002	0	0.003	0	0.00252	0
Transportation diesel use - passenger truck	gal	0	0.139	0	22.545	0	0.0585	0	0.0002	0	0.007	0	0.002605	0
Transportation diesel use - User Defined	gal	0	0.139	0	22.5	0	0.17	0	0.0054	0	0.0034	0	5.2E-06	0
Diesel produced	gal	0	0.017	0	3.02	0	0.0051	0	0.0062	0	0.0017	0	0.0011	0
Total Diesel Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**
Total Biodiesel Footprint														
On-site biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
On-site biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Transportation biodiesel use	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Transportation biodiesel use - User Defined	gal	0	0.127	0	22.3	0	0.2	0	0	0	0.00099	0	NP	
Biodiesel produced	gal	0	0.029	0	-16.8	0	0.018	0	0.033	0	0.00082	0	NP	
Total Biodiesel Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**
Total Natural Gas Footprint														
On-site natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Transportation natural gas use	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Transportation natural gas use - User Defined	ccf	0	0.103	0	13.1	0	0.01	0	6.3E-06	0	0.00076	0	8.4E-06	0
Natural gas produced	ccf	0	0.0052	0	2.2	0	0.0037	0	0.0046	0	0.000072	0	6.1E-06	0
Total Natural Gas Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**
Total Liquified Petroleum Gas Footprint														
On-site liquified petroleum gas use - Other	ccf	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
On-site liquified petroleum gas use	ccf	0	NP		12.69	0	0.021	0	0.00013	0	0.001	0	0	0
Liquified petroleum gas produced	ccf	0	0.088	0	1.47	0	0.0016	0	0.0024	0	0.0007	0	0.0003	0
Total Natural Gas Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**
Total Compressed Gas Footprint														
On-site compressed gas use - Other	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
On-site compressed gas use	ccf	0	NP		1957.835	0	16.0325	0	0.023045	0	0.2775	0	0	0
Compressed gas produced	ccf	0	19.983	0	343.92	0	0.4732	0	2.1651	0	0.1846	0	0.2895	0
Total Natural Gas Footprint		**0**		**0**		**0**		**0**		**0**		**0**		**0**

Notes:

Note: Please refer to the "Default Conversions" tab for references for the default conversion factors used on this calculation sheet.

Space below available for notes and calculations:

#REF!

Spreadsheets for Environmental Footprint Analysis (SEFA) Version 3.0, November 2019

Input Workbook

#REF!

	Enter the path name (if not saved in the same directory) and file name of the "Main" workbook for the project.
Path Name:	
Main File Name:	SEFA_main_LAI.xlsm

ERROR: OPEN MAIN FILE

Component	**Remedy Component Names**
Component 1	*#REF!*
Component 2	*#REF!*
Component 3	*#REF!*
Component 4	*#REF!*
Component 5	*#REF!*
Component 6	*#REF!*

Component names are autofilled from the "Main" workbook.

The following color coding applies to cells in the worksheets in this workbook.

	Green cells indicate notes or instructions
	Yellow cells are for manual data input
	Red cells are for manual data input from a drop-down list of selections and are protected
	Blue cells are calculated cells that are protected
	Gray cells are not available and/or not applicable for data entry

Spreadsheets for Environmental Footprint Analysis (SEFA) Version 3.0, November 2019

U.S. Environmental Protection Agency (EPA), Office of Superfund Remediation and Technology Innovation

Input Instructions

1) Overview

The “Input” workbook is used for data entry of site and remedy information. The majority of this data is entered in the “Input” tabs. Additional information may be entered in the “Input Summary”, “Grid Electricity”, “User Defined Factors”, and “Well Material Calculator” tabs.

"Input" Tabs : The user enters information on transportation, materials, equipment, waste, and energy associated with the site and remedy on the "Input" tabs. The user may establish up to 14 "Input" tabs to reflect the site and remedy, and assigns each "Input" tab to one of the 6 Remedy Components. See the section “Adding and Aligning “Input” Tabs” below for information on setting up “Input” tabs, renaming the tabs, and assigning them to Remedy Components. See the “Detailed Notes and Explanations” tab for specifics on entering remedy data into the “Input” tabs.

"Input Summary" Tab : The column headings in the “Input Summary” tab (Row 6) must be updated by the user to reflect the tab names in the following situations: (a) if additional “Input” tabs are set up by the user (regardless of whether they are renamed); and (b) if “Input” tab names are customized or changed.

"Grid Electricity" Tab : If grid electricity is used at the site, the local fuel mix for the grid electricity should be added in this tab. See the instructions on the “Grid Electricity” tab for specifics on data entry for local fuel mix.

"User Defined Factors" Tab : If the remedy requires materials or off-site activities not provided in SEFA, you may add the materials or activities to SEFA. You should research and document the information, then enter it in the “User Defined Factors” tab. See the “User Defined Factors” tab for specifics on adding user defined factors.

"Well Material Calculator" Tab : Data entry is not required in this tab. The Well Material Calculator is provided as a convenience to the user. The Calculator uses a lookup table to calculate the amount of casing material, screen material, cement, and sand/gravel that would be required to build a well, based on specifications entered by the user. See the “Well Material Calculator” tab for specifics on the use of the Calculator.

2) Adding and Aligning "Input" Tabs

You may want to create additional “Input” tabs to help organize your data entry. When you create a new "Input" tab, you will typically want to align it with a Remedy Component. These steps are described below.

Creating Additional "Input" Tabs: To create a new “Input” tab, right-click the tab name of the "Input Template" tab, choose “move or copy”, check the box "create a copy" and then click "OK". You can leave the tab name alone after copying (such as “Input Template (2), Input Template (3)”, etc.), or you can rename each new “Input” tab by right-clicking on the tab, choosing “rename”, and typing the new name. If you rename an “Input” tab, you must also enter that new name on the “Input Summary” tab in the "Input" workbook, for the tab to be included in the footprint analysis. (See instructions below for the “Input Summary” tab for more information on this topic.)

Aligning the "Input" Tabs with the Remedy Components: Each “Input” tab can be considered a subcategory under one of the Remedy Components designated in the “General” tab of the “Main” workbook. In order for each “Input” tab to be included in the footprint analysis, the tab must be aligned with a Remedy Component. To align an “Input” tab, use the drop-down menu in Row 4 of the "Input" tab and choose the Remedy Component that the “Input” tab pertains to. You may select one of six Remedy Components or you may turn the selection "off" so that the tab is not aligned with a Remedy Component. The Remedy Component number will appear in Row 4 on the "Input Summary" tab. (If "off" is chosen, "0" will appear in Row 4.) An example of aligning “Input” tabs to the Remedy Components is illustrated in Item (7) below.

Additional Notes:

(a) You can create any number of “Input” tabs, but you may align a maximum of 14 “Input” tabs to the Remedy Components at any one time.

(b) You may group multiple “Input” tabs under the same Remedy Component.

(c) You may want to allow certain “Input” tabs to remain non-aligned with the Remedy Components in some cases. For example a non-aligned “Input” tab may be used for testing alternative designs or parameters for the remedy. The tab would be turned “off” when not included in the analysis, and would be re-aligned with a Remedy Component to be included in the analysis.

(d) You should reserve the unused (blank) “Input Template” tab, in the event that it becomes necessary to create additional “Input” tabs at a later time.

(e) You may delete an “Input” tab at any time by right-clicking on the tab and choosing “delete”. If an “Input” tab is deleted, you should also remove the name of that tab from the column headings in the “Input Summary” tab.

(f) You can reposition an “Input” tab by left-clicking on the tab and dragging it to the right or left. This will not affect the alignments made between the "Input" tabs and the Remedy Components.

(g) If you run out of space for entries in any of the tables in the "Input" tabs, you may create another "Input" tab to continue entries in the table. Be sure to align the new tab to the correct Remedy Component.

3) Setting Up the "Input Summary" Tab

The “Input Summary” tab displays a summary of 14 “Input” tabs (in Columns C - P) and 6 Remedy Components (in Columns Q - V). The grand total is displayed in Column W.

If you create a new “Input” tab or rename an existing “Input” tab, you must add the new name to the column headings in Row 6 of the “Input Summary” tab. This allows the “Input Summary” tab to collect data from the various “Input” tabs. For example, if you rename the “Input Template” tab, so that it is now called “Site Investigation”, you must also rename the corresponding column heading in Row 6 of the “Input Summary” tab. In this example, Cell C6 would be renamed “Site Investigation”. Additional notes:

(a) The Remedy Component Numbers in Row 4 of the “Input Summary” tab are automatically populated, based on the selections made in Row 4 of the “Input” tabs.

(b) Other than renaming the column headings with “Input” tab names (if necessary), no other data entry is required in the “Input Summary” tab.

(c) You may add the "Input" tab names in any order in Row 6 of the "Input Summary" tab. They need not reflect the order of the tabs in the "Input" workbook.

(d) Be sure to reflect the exact tab name in Row 6 of the "Input Summary" tab, in order for it to be recognized by SEFA.

4) Data Entry in the "Input Template" Tab

The “Input Template” tab contains a variety of data entry tables for flexibility to accommodate a wide range of remedy activities and configurations. You can by-pass any of the data entry tables, and use only those tables that are relevant to the site and remedy at hand. (See EPA's Methodology [www.cluin.org/greenremediation/methodology] for a protocol for screening out inputs that would make minimal contributions to the footprint totals.) Much of the data entry in the “Input Template” tab is self-explanatory. However, please see the “Detailed Notes and Explanations” tab in the "Input" workbook for specifics on the data entry tables in the “Input Template” tab.

5) Using the "Grid Electricity" Tab

On the “Grid Electricity” tab, you can define the fuel mix (mix of energy resources that is used to generate grid electricity) for grid electricity used at your site. SEFA uses this fuel mix to calculate the footprint from generation of the grid electricity. By default, the fuel mix in the “Grid Electricity” tab is set to the U.S. national average from 2016. You are strongly encouraged to change this to a regional or local fuel mix that is more representative of the grid electricity used by the remedy. Specifying the fuel mix from the local provider will often be important for accuracy of the footprint calculations, as the fuel mix can vary substantially at the national, regional, and local levels.

You can set a single fuel mix for all Remedy Components, or you can specify individual fuel mixes for each of the 6 Remedy Components. This allows for flexibility in the event that different grid electricity providers are used for different activities or areas at the site. Please see the “Grid Electricity” tab for specifics on how to set the fuel mix for your site.

6) Using the "User Defined Factors" Tab

SEFA is equipped with default footprint conversion factors for a variety of materials and activities. The conversion factors are used to estimate the amount of energy required for, and the amount of NOx, SOx, PM, HAPs, and greenhouse gas emissions related to, the off-site production of materials or activities. Additional conversion factors are used for energy and air emissions related to the combustion of fuels. These default conversion factors can be viewed in the “Default Conversions” tab of the “Calculations” workbook and are applied automatically in the “Calculations” workbooks.

In the “User Defined Factors” tab, SEFA provides flexibility in establishing conversion factors for materials and activities that are unique to the remedy or site. Unique conversion factors can be established for the following:

(a) Combustion of fuels (both renewable and “conventional”) for transportation and on-site equipment

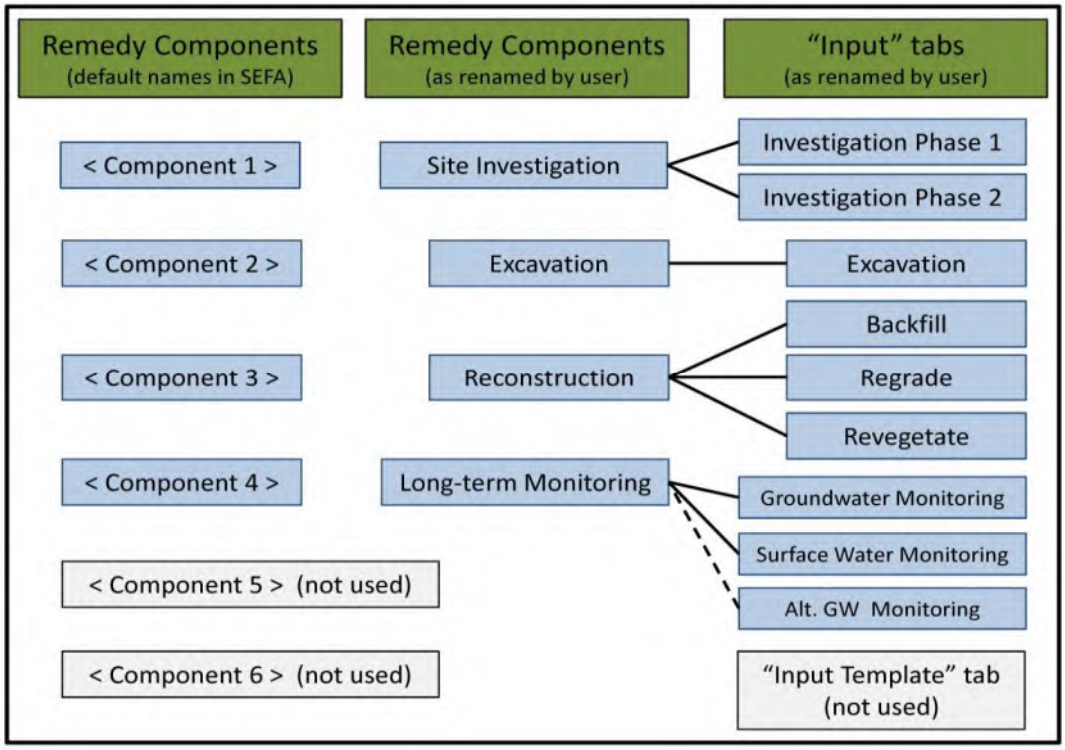
(b) Off-site manufacturing or processing of materials

(c) Off-site management and recycling of wastes

In establishing these unique conversion factors, you should research and document the data, and enter it into the "User Defined Factors" tab. Once entered, SEFA will automatically apply the conversion factors in the "Calculations" workbook. Please see the "User Defined Factors" tab for specifics on establishing unique conversion factors.

7) Example of Aligning "Input" Tabs to Remedy Components

The diagram below illustrates the alignment of "Input" tabs to Remedy Components for a hypothetical site and remedy. In this example, the user renames Remedy Components 1 - 4, according to the four main aspects of the remedy, but does not need Remedy Components 5 and 6. The user makes copies of the blank "Input Template" tab as needed, names them, and links them to the Remedy Components. The user keeps the original blank copy of the "Input Template" tab in reserve in the event that additional copies are needed. The notes below the diagram provide additional explanations for creating, naming, and aligning the "Input" tabs in this example.



Notes:

(a) The user is interested in distinguishing between Phases 1 and 2 during Site Investigation because the Phases will occur six months apart. Therefore, the user creates two copies of the "Input Template" tab, names the copies accordingly, and aligns them with the "Site Investigation" remedy component.

(b) The user views the excavation activities as a single discrete event, and so creates one copy of the "Input Template" tab, names it accordingly, and links it with the "Excavation" remedy component.

(c) The user would like to better understand the footprints for three aspects of Reconstruction to determine which aspects to focus on for footprint reduction measures. Therefore, the user creates three copies of the "Input Template" tab, names the copies accordingly, and aligns them with the "Reconstruction" remedy component.

(d) The user is interested in tracking Groundwater Monitoring and Surface Water Monitoring separately, and so creates two copies of the "Input Template" tab, names the copies accordingly, and aligns them with the "Long-term Monitoring" remedy component.

(e) The user would like to test the environmental footprint from two groundwater monitoring regimes (which are equally effective for monitoring the site). Therefore, the user creates a copy of the "Input Template" tab for the alternative regime, and names it "Alt. GW Monitoring". The user does not align this tab with the "Long-term Monitoring" remedy component, but keeps the tab turned "off". When testing the alternative, the user will align the "Alt. GW Monitoring" with the "Long-term Monitoring" remedy component and will turn the original "Groundwater Monitoring" tab "off".

Spreadsheets for Environmental Footprint Analysis (SEFA) Version 3.0, November 2019

U.S. Environmental Protection Agency (EPA), Office of Superfund Remediation and Technology Innovation

Detailed Notes and Explanations for "Input Template" Tab

Topics Detailed in Sections 1-17 (below)

1) Headings (Rows 1 & 2 on the "Input Template" tab)
2) Alignment with Remedy Components (Rows 4 & 5)
3) Comment Space (Row 7)
4) Personnel Transportation (Row 14)
5) On-Site Equipment Use and Transportation (Row 29)
6) On-Site Electricity Use (Row 43)
7) On-Site Natural Gas Use (Row 43)
8) Landfill Gas Combusted On-Site for Energy Use (Row 53)
9) Materials Use and Transportation (Row 65)
10) Waste Disposal and Transportation (Row 90)
11) Water Use (Row 108)
12) Off-Site Laboratory Analysis (Row 129)
13) Other Energy Use and Air Emissions (Row 129)
14) Other Voluntary Renewable Energy Use (Row 149)
15) Discussion for Selection of Virgin vs Recycled vs Reused Materials
16) Discussion of Miles per Gallon (mpg) vs Gallons per Ton-Mile (gptm)
17) Additional Flexibility for Combustion of Fuels

1) Headings (Rows 1 & 2 on the "Input Template" tab)

An identifier for the SEFA worksheets appears in Row 1. The site and remedy names appear automatically in Row 2, based on information entered in the “General” tab of the “Main” workbook. The name of the “Input” tab also appears automatically in Row 2, based on the name typed by the user on the tab at the bottom of the excel window. These headings are repeated at the top of subsequent pages of the “Input” tab.

2) Alignment with Remedy Components (Rows 4 & 5)

The drop-down menu in Cell E4 is used for alignment of the “Input” tab with a Remedy Component. Please see the “Input Instructions” tab in the “Input” workbook for instructions on aligning “Input” tabs.

3) Comment Space (Row 7)

Space is made available in Row 7 for narrative notes for General Scope, Examples of Items Eliminated through Screening Process, and Other Notes and References. In addition, spaces are left open in the following sections of the “Input Template” tab for notes, references, or supporting calculations:

(a) Selected cells between and among the tables in the main part of the worksheet

(b) All cells beginning in Column X and extending to the right

(c) All cells in Rows 178 - 212

(d) All cells in Rows 213 – 430 (Columns G - W) below the main worksheet

4) Personnel Transportation (Row 14)

Use this table to model personnel transportation to and from the site.

(a) Calculations for Fuel Used in Column K are based on the values or drop-down selections for Number of Roundtrips to Site, Roundtrip Distance to Site, Mode of Transportation, and Fuel Type in Columns C, D, E, and G, respectively. You must make entries or selections in all four columns (C, D, E, and G) in order for the Fuel Used to be calculated.

(b) You may select any combination for Mode of Transportation (Column E) and Fuel Type (Column G). However, SEFA provides Default Fuel Usage Rates (Column I) for only the most common combinations. For combinations for which SEFA does not provide a Default Fuel Usage Rate, the message “NO DATA” will appear in Column I.

(c) You may override the Default Fuel Usage Rate. If you have a specific Fuel Usage Rate for any transportation/fuel combination, you may enter it in Column J. This will override the default value in Column I. You may also use Column J to designate the Fuel Usage Rate when "NO DATA" appears in Column I.

(d) If "Airplane" is selected as Mode of Transportation in Column E, you should select "Diesel" as the Fuel Type in Column G. SEFA contains Default Fuel Usage Rates only for diesel when "Airplane" is selected, based on the assumption that diesel is similar to jet fuel.

(e) If "Electricity" is selected as Fuel Type in Column G, Fuel Used (Column K) will be in units of kilowatt hours (kWh). SEFA assumes that electricity for the vehicle is supplied on-site, so the result in Column K is transferred automatically to Cell G67 of the "On-Site Electricity Use" table. For vehicles which obtain electricity from an off-site source, you may still include that energy usage in the tables beginning on Row 147 of the "Input Template" tab. Please see below for instructions on the use of these tables.

(f) The units for Total Distance (Column H) are dependent on the mode of transportation selected in the drop-down menu in Column E. The units are:

(i) For car or truck, the units are miles.

(ii) For airplane/bus/train, the units are passenger-miles.

(iii) If "Vehicle (other)" is selected in the drop-down menu, the units should be determined by the user.

(g) The units for Default Fuel Usage Rate (Column I) are dependent on the transportation/fuel combination and are noted below. When specifying the Fuel Usage Rate in Column J, the same units must be used. The units are based on gallons for diesel/biodiesel/gasoline and ccf for natural gas. Although some of the combinations are unlikely, the units would be:

(i) For car or truck, the units are miles/gallon or miles/ccf.

(ii) For airplane/bus/train, the units are passenger-miles/gallon or passenger-miles/ccf.

(iii) If "Vehicle (other)" is selected in the drop-down menu, the units should be determined by the user.

(h) When the Fuel Type (Column G) is biodiesel, B20, diesel, or gasoline, the units for Fuel Used (Column K) are gallons. When the Fuel Type is natural gas, the units for Fuel Used are hundreds of cubic feet (ccf). When the Fuel Type is electricity, the units for Fuel Used are kilowatt hours (kWh).

(i) If you do not find the mode of transportation you are looking for in the drop-down menu in Column E, you may add a "User-defined Vehicle" to the drop-down menu. For instructions, please see the "User Defined Factors" tab in the "Input" workbook.

(j) If you are using a transportation fuel that is not provided in the drop-down menu in Column G, you may still include that fuel usage in the tables beginning on Row 147 of the "Input Template" tab. Please see below for instructions on the use of that table.

(k) Open cells are provided in Rows 25 and 26 to allow additional flexibility for transportation/fuel combinations. When using these rows, you must still select the Fuel Type from the drop-down menu in Column G, in order for the fuel usage to be summed in the SEFA worksheets.

5) On-Site Equipment Use and Transportation (Row 29)

Use this table to model on-site equipment that is powered by diesel, biodiesel, gasoline, compressed natural gas, or liquified petroleum gas, and to model the transport of that equipment to and from the site.

Equipment Use

(a) For equipment or processes powered by electricity, use the "On-Site Electricity Use" table beginning on Row 51. If you are using equipment or processes powered by a fuel that is not provided in the drop-down menu in Column E, or in the "On-Site Natural Gas Use" or "On-Site Electricity Use" tables, you may still include that fuel usage in the tables beginning on Row 147 of the "Input Template" tab. Please see below for instructions on the use of these tables.

(b) Calculations for Fuel Used for On-Site Equipment in Column H are based on the values or drop-down selections for Horsepower, Load Factor, Equipment Fuel Type, and Equipment Hours Operated in Columns C, D, E, and G, respectively. You must make entries or selections in all four columns (C, D, E, and G) in order for the Fuel Used for On-Site Equipment to be calculated.

(c) For Horsepower in Column C, you may enter the representative value noted in the drop-down menu (Column A), or a unique value, if known, for the equipment to be used on-site. The horsepower ratings noted in the drop-down menu in Column A are provided for convenience only, as generally representative values that can be used in the absence of more specific information. They are not recognized in the SEFA calculations unless entered in Column C.

(d) The Load Factor (Column D) for a piece of equipment is the ratio of the load that the motor actually draws when it is operating to the maximum load that it could draw. For example, for a motor of 100 HP that drives a constant 75 HP load whenever it is on, the load factor will be 75/100, or 75%. To represent a motor that is running fairly efficiently, it is recommended that a load factor of 75% be used absent other information.

Equipment Transportation

Fuel usage rates for equipment transportation are miles per gallon (mpg) or gallons per ton-mile (gptm). For selecting Mode of Transportation (Column M) and Transport Fuel Type (Column N), and for overriding the Default Fuel Usage Rate (Columns O and P) in the On-site Equipment Use and Transportation table, please see notes beginning on Row 109 below for Materials Transportation.

Other

(a) The use of equipment on-site may be modelled independently from transport of the equipment to the site. For example, if a piece of equipment is used on-site, but transport of the equipment is not applicable (e.g., the equipment is permanently fixed to the site or transport is screened out as a minimal contributor), then fill in Columns A - G, but not Columns I - P. Conversely, if a piece of equipment is being transported to the site, but once on-site is powered by fuel other than those provided in the drop-down menu in Column E, then you would fill in Columns I - P, but not Columns A - G.

(b) If you do not find the mode of transportation you are looking for in the drop-down menu in Column M, you may add a “User-defined Vehicle" to the drop-down menu. For instructions, please see the “User Defined Factors” tab in the “Input” workbook.

(c) If you are using equipment or transportation fuel that is not provided in the drop-down menus in Columns E or N, you may still include that fuel usage in the tables beginning on Row 147 of the “Input Template” tab. Please see below for instructions on the use of these tables.

(d) Open cells are provided in Rows 39 and 40 to provide additional flexibility for equipment/fuel and transportation/fuel combinations. When using these rows, you must still select the Equipment Fuel Type and the Transport Fuel Type from the drop-down menus in Columns E and N, respectively, in order for the fuel usage to be summed in the SEFA worksheets.

6) On-Site Electricity Use (Row 51)

Use this table to model electricity usage on-site, whether the electricity is supplied through the grid, or generated on-site from renewable resources.

(a) You may represent electricity demand in three ways: (1) based on the horsepower rating of equipment in Rows 53 - 56; (2) based on kW rating in Rows 57 - 60; and (3) based on total kWh used in Rows 61 - 64. Please note that all cells shaded yellow must be filled in for each type of data entry selected.

(b) The Load Factor (Column C) for a piece of electrical equipment is the ratio of the load that the motor actually draws when it is operating to the maximum load that it could draw. For example, for a motor of 100 HP that drives a constant 75 HP load whenever it is on, the load factor will be 75/100, or 75%. To represent a motor that is running fairly efficiently, it is recommended that a load factor of 75% be used absent other information.

(c) The Efficiency (Column D) for a piece of electrical equipment is a measure of how well the equipment performs relative to its designed capacity. The lower the efficiency, the more electricity is required by the equipment to complete the task. For efficiency, use either (1) the percent that gets you closest to the expected Electrical Rating or (2) a value of 75% to represent a motor that is running fairly efficiently.

(d) Enter electricity generated on-site from renewable resources in Cell G66. Enter only renewable electricity for which the facility retains the rights to the renewable energy (i.e., does not sell renewable energy certificates associated with the on-site electricity generation). This renewable energy is subtracted from the total energy demand to the grid. Note that if the amount of renewable energy generated on-site is greater than that used on-site, the total Grid Electricity Used in Cell G68 is negative. This represents excess electricity that may be sold to other users or sent back into the grid.

7) On-Site Natural Gas Use (Row 51)

Use this table for combustion of natural gas on-site. For example, natural gas may be used for heating buildings or treatment processes.

(a) If power rating is known, use Rows 53 and 54.

(b) If heat load is known instead of power rating, use Rows 53 and 54, and enter power rating as 125% of heat load and choose 80% for efficiency.

(c) If Energy Required is known, use Row 55.

(d) If Natural Gas Used is known, use Row 56.

(e) The following conversion is used for calculating Natural Gas Used in Column R: 1 ccf = 103,000 Btu.

8) Landfill Gas Combusted On-Site for Energy Use (Row 61)

Use this table for combustion of landfill gas on-site. For example, the landfill gas usage may be in turbines for electricity production, or may be for heating in buildings or treatment processes. If the landfill gas is being flared, you should model this in the "Other Energy Use and Air Emissions" table on Row 147 of the "Input Template" tab.

(a) The greenhouse gas calculations in SEFA account for the avoidance of emissions of landfill methane, in addition to the emissions of CO2e as a result of the combustion process.

(b) SEFA does not account for non-methane gases emitted from the landfill. You can account for these in the "Other Energy Use and Air Emissions" table beginning on Row 147 of the "Input Template" tab.

(c) SEFA accounts for landfill gas combustion for beneficial purposes as "On-site renewable energy use or generation" in the "Summary" tab in the "Main" workbook. However, some entities do not support the claim of landfill gas as a renewable resource. In this case, you may want to use the "Other Energy Use and Air Emissions" table on Row 147 of the "Input Template" tab to adjust the totals for renewable energy in the "Summary" tab.

(d) When landfill gas is used for electricity production, you may decide to characterize the electricity production to be from a "renewable resource". If you characterize the electricity as "renewable", and you retain the renewable energy rights, you should enter the amount of electricity generated in Cell G59 of the "On-Site Electricity Use" table in the "Input Template" tab. You should also use the "Other Energy Use and Air Emissions" table on Row 147 of the "Input Template" tab to avoid double counting for the renewable energy.

9) Materials Use and Transportation (Row 72)

Use this table to model the types and amounts of materials used for the remedy and to model the transport of the materials to the site.

Materials Use

(a) Calculations for the energy and air emissions footprint from off-site manufacturing of materials are based on the values or drop-down selections for Material Type and Quantity in Columns A and D. (The footprint calculations are made automatically in the "Component" tabs in the "Calculations" workbook.) You must make entries or selections in both Columns A and D, and you must select "Yes" in the drop-down menu in Column H, in order for the footprint calculations to be made. Additional notes:

(i) There may be instances in which you do not want the energy and air emissions footprint calculations to be performed on the material, in which case you should choose "No" in Column H. For example, the material may be from a "Reused" source, with no energy or air emissions footprint accruing to the cleanup site.

(ii) If you do not find the material you are looking for in the drop-down menu in Column A, you may add a "User-defined Material" to the drop-down menu. For instructions, please see the "User Defined Factors" tab in the "Input" workbook.

(iii) If you are using a material that is in the drop-down menu in Column A, but you have documented unique footprint conversion factors for that material that are different from the default footprint conversion factors in SEFA, you may add the unique material to the drop-down menu, as a "User-defined Material". For instructions, please see the "User Defined Factors" tab in the "Input" workbook.

(iv) If you are using a material in an aqueous solution, the suggested approach in order to be consistent with EPA's Footprint Methodology (www.cluin.org/greenremediation/methodology) is to first enter the dry weight of the material without transportation and selecting "Yes" for footprint calculation and then enter the material in solution in a different line for transportation and selecting "No" for footprint calculation.

(b) Summation of total tons of refined and unrefined materials, and calculation of % materials from recycled or reused sources, are based on values or drop-down selections made in Columns D, F, and G. (The total tons and %'s are presented in Rows 7 - 10 of the "Summary" tab of the "Main" workbook.) You must make entries or selections in all three Columns (D, F, and G) in order for the materials to be included in the totals tons and %'s. Additional notes:

(i) The distinction between refined and unrefined material (Column F) is described in EPA's Footprint Methodology (www.cluin.org/greenremediation/methodology).

(ii) For background information on the selection in Column G between "Virgin", "Recycled", and "Reused" materials, see the discussion in Section 15 below.

(iii) The selections for “Recycled” and “Reused” materials in Column G are combined in the calculation for “% of (un)refined materials from recycled or reused material” in Rows 8 and 10 in the “Summary” table of the “Main” workbook. The distinction between “Recycled” and “Reused” is retained in the drop-down menu in Column G for the convenience of the user.

(iv) If a material is obtained partly from virgin sources and partly from reused or recycled sources, you may enter the appropriate portions of the material on two separate rows in the "Materials Use and Transportation" table, and identify one portion as “Virgin” and the other portion as “Reused” or “Recycled”. For example, if your site uses 100,000 lbs of cement composed of 8% reused material (with no footprint accruing to the site from the reused portion) you may enter the information in Columns A, D, F, G, and H as follows.

First row (virgin source):	cement, 92000 lbs, refined, virgin, yes
Second row (reused source):	cement, 8000 lbs, refined, reused, no

(c) For materials identified as “Reused” or “Recycled”, you will typically choose “No” in the drop-down menu in Column H to indicate that no energy or air emissions footprint accrues to the cleanup site from production of the material. If you would like to account for the footprint from a “Reused” or “Recycled” material, you may add it as a “User-defined Material” to the drop-down list in Column A. For instructions, please see the “User Defined Materials” tab in the “Input” workbook.

Materials Transportation

(a) Calculations for Fuel Used in Column R are based on the values or drop-down selections for Default One-way Distance, Number of One-way Trips, Mode of Transportation, and Fuel Type in Columns I, K, N, and O, respectively. You must make entries or selections in three of the columns (K, N, and O) in order for the Fuel Used to be calculated. You may override the Default One-way Distance by entering a site-specific One-way Distance in Column J. You may use the Yes/No drop-down menu in Column L to have SEFA automatically include an empty return trip in the fuel calculations. This function simply doubles the total distance transported in Column M, and uses the same one-way distance, number of one-way trips, mode of transportation, transport fuel type, and fuel usage rate (entered in Columns I, J, K, N, O, P, and Q) for the empty return trip as for loaded trip.

(b) You may select any combination for Mode of Transportation (Column N) and Fuel Type (Column O). However, SEFA provides Default Fuel Usage Rates (Column P) for only the most common combinations. For combinations for which SEFA does not provide a Default Fuel Usage Rate, the message “NO DATA” will appear in Column P.

(c) You may override the Default Fuel Usage Rate. If you have a specific Fuel Usage Rate for any transportation/fuel combination, you may enter it in Column Q. This will override the default value in Column P. You may also use Column Q to designate the Fuel Usage Rate when “NO DATA” appears in Column P. When overriding or designating the Fuel Usage Rate in Column Q, you must use the same units as noted in the drop-down menu in Column N.

(d) If “Aircraft” is selected as Mode of Transportation in Column N, you should select “Diesel” as the Fuel Type in Column O. SEFA contains Default Fuel Usage Rates only for diesel when “Aircraft” is selected, based on the assumption that diesel is similar to jet fuel.

(e) The option for electricity is not provided in Column O for materials transport. If electricity is used for transport, and the electricity is provided on-site, you may enter it separately in the "On-Site Electricity Use" table (Row 51). For vehicles which obtain electricity from an off-site source, you may still include that energy usage in the tables beginning on Row 147 of the “Input Template” tab. Please see below for instructions on the use of these tables.

(f) The units for Default Fuel Usage Rate in Column P depend on the Mode of Transportation selected in Column N. If “Truck (mpg)” is selected, the units are Miles per Gallon (mpg). For all other selections (Combination Truck, Truck Single Unit, Aircraft, Barge, and Train), the units are Gallons per Ton-Mile (gptm). For background information on the selection of “Truck (mpg)” vs “Combination Truck (gptm)" and "Truck Single Unit (gptm)”, see the discussion in Section 16 below.

(g) When “Truck (mpg)” has been selected in Column N, you may want to account for empty return trips. When Combination Truck, Truck Single Unit, Aircraft, Barge, or Train have been selected you generally should not model an empty return trip. (For background information on modelling empty return trips, see the discussion in Section 16 below.) In order to account for empty return trips, you may use the Yes/No drop-down menu in Column L. If you prefer not to use the drop-down menu in Column L, or would like to modify the empty return trip (as compared to the loaded trip), you may want to use one of the following options:

(i) Double the Number of Trips in Column K.

(ii) Enter the empty return trips in a separate Row, leaving Columns D, F, G, and H blank. (You may select the material from the drop-down menu in Column A, if desired.) Fill in Columns K, N, and O, and be sure that there is an entry in either Column I or J (or both). Use the override function in Column Q if desired.

Other

(a) The use of materials on-site may be modelled independently from transport of the materials to the site. For example, if a material is used on-site, but transport of the material is not applicable (e.g., the material is transported with the same vehicle used for personnel transportation or transport is screened out as a minimal contributor), then fill in Columns A - H, but not Columns I - R. Conversely, if a material is being transported to the site, but the material is not to be included in any aspect of the footprint (e.g., total tons, % recycled, energy and air emissions footprints), then fill in Columns I - R, but not Columns A - H.

(b) If you do not find the mode of transportation you are looking for in the drop-down menu in Column N, you may add a "User-defined Vehicle" to the drop-down menu. For instructions, please see the "User Defined Factors" tab in the "Input" workbook.

(c) If you are using a transportation fuel that is not provided in the drop-down menu in Column O, you may still include that fuel usage in the tables beginning on Row 147 of the "Input Template" tab. Please see below for instructions on the use of these tables.

(d) Open cells are provided in Rows 90 and 91, to allow additional flexibility for transportation/fuel combinations. When using these rows, you must still select the Fuel Type from the drop-down menu in Column O, in order for the fuel usage to be summed in the SEFA worksheets.

10) Waste Disposal and Transportation (Row 103)

Use this table to model types and amounts of wastes generated by the remedy and to model the transport of wastes from the site.

Waste Disposal

(a) Calculations for the energy and air emissions footprint from management of waste generated on-site are based on the values or drop-down selections for Waste Destination and Quantity in Columns A and D. (The footprint calculations are made automatically in the "Component" tabs in the "Calculations" workbook.) You must make entries or selections in both Columns A and D, in order for the footprint calculations to be made. Additional notes:

(i) SEFA assumes no energy or air emissions footprint from the "Recycled/Reused On-Site" and "Recycled/Reused Off-Site" selections in the drop-down menu in Column A. To include energy or air emissions footprints for recycled or reused waste in the footprint analysis, you may add a "User-defined" item to the drop-down menu. For instructions, please see the "User Defined Factors" tab in the "Input" workbook.

(ii) Aside from reused or recycled wastes, if you do not find the off-site waste management destination or process that you are looking for in the drop-down menu in Column A, you may add a "User-defined" item to the drop-down menu. For instructions, please see the "User Defined Factors" tab in the "Input" workbook.

(iii) If you are using a waste destination or process that is in the drop-down menu in Column A, but you have documented unique footprint conversion factors for that waste destination or process that are different from the default footprint conversion factors in SEFA, you may add the unique waste destination or process to the drop-down menu, as a "User-defined" item. For instructions, please see the "User Defined Factors" tab in the "Input" workbook.

(iv) In cases where waste, such as sludge, has been dewatered prior to transportation and disposal, enter the dry weight of the waste in Column D. If the waste has not been dewatered prior to transportation and disposal, then enter the wet weight in Column D. This ensures that the SEFA calculations will be based on the waste as transported and managed off-site.

(b) Summation of total tons of hazardous and non-hazardous wastes, and calculation of % of waste that is recycled or reused, are based values or drop-down selections made in Columns A and D. (The total tons and %'s are presented in Rows 11 - 14 of the "Summary" tab of the "Main" workbook.) You must make entries or selections in both Columns (A and D) in order for the materials to be included in the totals tons and %'s. Additional notes:

(i) The distinction between hazardous and non-hazardous waste (in the drop-down menu in Column A) may depend on state and local regulations for the location of the site and waste destination. You should make the selection in Column A that best fits the waste at hand.

(ii) For waste that is recycled/reused, no distinction is made in SEFA between hazardous and non-hazardous waste. This conforms with EPA's Footprint Methodology (www.cluin.org/greenremediation/methodology).

(c) Although wastewater sent to a POTW is not strictly speaking a "waste", that item has been included in the "Waste Disposal and Transportation" table (in the drop-down menu in Column A) for the user's convenience.

Waste Transportation

(a) Calculations for Fuel Used in Column O are based on the values or drop-down selections for Default One-way Distance, Number of One-way Trips, Mode of Transportation, and Fuel Type in Columns F, H, K, and L, respectively. You must make entries or selections in three of the columns (H, K, and L) in order for the Fuel Used to be calculated. You may override the Default One-way Distance by entering a site-specific One-way Distance in Column G. You may use the Yes/No drop-down menu in Column I to have SEFA automatically include an empty return trip in the fuel calculations. This function simply doubles the total distance transported in Column J, and uses the same one-way distance, number of one-way trips, mode of transportation, transport fuel type, and fuel usage rate (entered in Columns F, G, H, K, L, M, and N) for the empty return trip as for loaded trip.

(b) The use of Columns F - O in the "Waste Disposal and Transportation" table in Row 90 is parallel to the use of Columns I - R in the "Materials Use and Transportation" table in Row 65. Please see Section 9 above for notes and descriptions for use of this table.

(c) The default footprint conversion factors in SEFA for processing wastewater at a POTW include the typical footprint from transport of the wastewater through municipal lines. Therefore, you should leave Columns F - O blank when modelling "POTW" as a waste destination.

11) Water Use (Row 121)

Use this table to model the types and quantity of water used on-site by the remedy.

(a) To model water used on-site, select the source of water from the drop-down menu in Column A, and enter the quantity of water in Column D. Space for narrative remarks is provided in Columns F, J, N, and S for the convenience of the user. Entering information in Columns F, J, N, and S is optional. Additional notes:

(i) The items selected in the drop-down menu in Column A are summed according to source, and totals for each source are reported in Rows 15 - 21 in the "Summary" tab of the "Main" workbook.

(ii) Narrative remarks in Columns F, J, N, and S are not forwarded to the "Summary" tab in the "Main" workbook, and SEFA will not use information in these Columns for the footprint calculations.

(b) SEFA provides default footprint conversion factors for energy and air emissions only for "Public Water" in the drop-down menu in Column A. These footprint conversion factors include the typical footprint from transport of the public water through municipal lines.

(c) For all other selections in the drop-down menu (besides "Public Water"), SEFA assumes no energy or air emissions footprint. If there are any significant activities related to extracting, reclaiming, collecting, or diverting the other types of water, you may want to model those activities separately in other sections of the "Input Template" tab.

(d) No data entry options are provided in the "Water Use" table for transport of water from off-site suppliers. If water is transported to the site by truck or other vehicle, you may use the "Materials" table on Row 72 to model the transport, and use the notes section in Column S of that table to identify the entry.

(i) If "Truck (mpg)" is being used for transport of the water, leave Columns A - H of the "Materials" table blank, and enter the relevant transport information in Columns I - Q.

(ii) If transport based on gptm is being used for the water, leave Columns A and F - H of the "Materials" table blank. Enter the quantity of water (in tons) in Column D, and relevant transport information in Columns N, O, and Q.

(e) If you do not find the water source you are looking for in the drop-down menu in Column A, or if you are using a public water source that has footprint conversion factors that are different from the default footprint conversion factors in SEFA, you may add a "User-defined Water Resource" to the drop-down menu. For instructions, please see the "User Defined Factors" tab in the "Input" workbook.

12) Off-Site Laboratory Analysis (Row 147)

Use this table to model the types and number of analyses conducted at off-site laboratories.

(a) Select the type of analysis from the drop-down menu in Column M, and enter the number of samples undergoing the analysis in Column Q.

(b) The drop-down menu in Column M allows selection from 10 sample analyses typically found at cleanup sites. The selection "Off-site Laboratory Analysis - Other" from the drop-down menu uses footprint conversion factors based on an average of the other 10 analyses. If you do not find the sample analysis you are looking for in the drop-down menu, use a selection that most closely fits the analysis, and make a note in Column S to describe the analysis being represented.

(c) No data entry options are provided in the "Off-Site Laboratory Analysis" table for transport of samples to off-site laboratories. You may use the "Materials" table on Row 72 to model the transport, and use the notes section in Column S of that table to identify the entry.

13) Other Energy Use and Air Emissions (Row 147)

Use this table to model energy use and air emissions from on-site activities and transportation that have not been covered in any of the other tables in the "Input Template" tab. The "Other Energy Use and Air Emissions" table provides flexibility to include in the footprint analysis unique situations at your cleanup site. In all cases, you must perform your own estimates or calculations for the quantities to be entered in Column F of this table.

(a) Rows 151 and 152: If the remedy at your site uses a conventional (i.e., non-renewable) energy source on-site that is not represented elsewhere in the "Input Template" tab, you may add it as "User-defined on-site conventional energy use" in Rows 151 or 152. For example, you may have a boiler on-site that runs on fuel oil. For instructions, please see the "User Defined Factors" tab in the "Input" workbook.

(b) Row 152: If the remedy at your site results in emissions of on-site hazardous air pollutants (HAPs) that are not represented elsewhere in the "Input Template" tab, you may add them as "On-site HAP process emissions" in Row 152. For example, the treatment system at your site may release fugitive VOC emissions. Enter the quantity of the emissions in lbs in Cell F152, and use the notes space in Cell G152 to describe the source and type of emissions.

(c) Row 153: If the remedy at your site results in greenhouse gas (GHG) emissions that are not represented elsewhere in the "Input Template" tab, you may add them as "On-site GHG emissions" in Row 153. For example, the landfill gas collection system at your site may not be 100% efficient, resulting in fugitive emissions of methane. Enter the quantity of the emissions in lbs CO_2e in Cell F153, and use the notes space in Cell G153 to describe the source and type of emissions.

(d) Row 154: If the remedy at your site results in carbon or greenhouse gas storage, you may add this as "On-site carbon storage" in Row 154. For example, you may have planted trees as part of your remedy, resulting in uptake of CO_2. Enter the quantity of the carbon storage provided by the trees in lbs CO_2e in Cell F154, and use the notes space in Cell G154 to describe the source and type of carbon storage. The quantity in Cell F154 must be entered as a negative number to represent storage.

(e) Row 155: If you are flaring landfill gas at your site, you may add this as "GHG avoided by flaring on-site landfill methane" in Row 155. Enter the quantity of methane flared in ccf CH_4 in Cell F155, and use the notes space in Cell G155 to describe the source and type of GHG storage. Recall that landfill gas is not 100% methane and adjust the amount entered in Cell F155 accordingly. Use Row 155 only for landfill gas that is combusted but not used for energy production. For landfill gas used in energy production, use the "Landfill Gas Combusted On-Site for Energy Use" table on Row 61 of the "Input Template" tab. Additional notes:

(i) The greenhouse gas calculations in SEFA account for the avoidance of emissions of landfill methane, in addition to the emissions of CO_2e as a result of the combustion process.

(ii) SEFA does not account for non-methane gases emitted from the landfill. You can account for these emissions on other rows in the "Other Energy Use and Air Emissions" table.

(f) Rows 156, 157, and 158: If the remedy at your site results in NOx, SOx, or PM emissions or reductions that are not represented elsewhere in the "Input Template" tab, you may add these as "Other on-site NOx/SOx/PM emissions or reductions" in Rows 156, 157, and 158. For example, NOx emissions may occur as a result of fertilizer application during reseeding of disturbed soils. As another example, PM reductions may be achieved through particulate filters on diesel equipment used on-site. Enter the quantity of NOx/SOx/PM emissions or reductions in lbs in Cells F156, F157, and F158, and use the notes spaces in Cells G156, G157, and G158 to describe the items. The quantities must be entered as positive numbers to represent emissions and negative numbers to represent reductions.

(g) Rows 161 and 162: If the remedy at your site uses a conventional (i.e., non-renewable) energy source for transportation that is not represented elsewhere in the "Input Template" tab, you may add it as "User-defined conventional energy transportation" in Rows 161 or 162. For example, you may want to more accurately model the fuel used in rail transport of materials to your site, instead of using the default assumption of diesel fuel. For instructions, please see the "User Defined Factors" tab in the "Input" workbook.

14) Other Voluntary Renewable Energy Use (Row 167)

Use this table to model renewable energy use from on-site activities and transportation that have not been covered in any of the other tables in the "Input Template" tab. The "Other Voluntary Renewable Energy Use" table provides flexibility to include in the footprint analysis unique situations at your cleanup site. In all cases, you must perform your own estimates or calculations for the quantities to be entered in Column F.

(a) Rows 169 and 170: If the remedy at your site uses a renewable energy source on-site that is not represented elsewhere in the "Input Template" tab, you may add it as "User-defined on-site renewable energy use" in Rows 169 or 170. For example, you may have a boiler on-site that runs on biomass. For instructions, please see the "User Defined Factors" tab in the "Input" workbook.

(b) Rows 171 and 172: If the remedy at your site uses a renewable energy source for transportation that is not represented elsewhere in the "Input Template" tab, you may add it as "User-defined renewable energy transportation" in Rows 171 or 172. For example, you may use vehicles that run on ethanol. For instructions, please see the "User Defined Factors" tab in the "Input" workbook.

(c) Rows 173 and 174: Use this space to document voluntary purchases of renewable electricity or Renewable Energy Certificates (RECs). Enter the quantity of the renewable purchases in MWh in Cells F173 and F174. Also fill out the tables beginning in Cells M167 and M171 of the "Input Template" tab with specifics on the renewable purchases. Consistent with the protocol described in EPA's Methodology, SEFA does not include in the footprint analysis any emissions reductions (or "credits") that may be associated with the renewable purchases. However, the MWh amounts for the renewable purchases are included in the "Summary" table of the "Main" workbook. Please refer to EPA's Methodology (www.cluin.org/greenremediation/methodology) for a description of the difference between the two types of renewable purchases, and the reasoning behind the protocol.

15) Discussion for Selection of Virgin vs Recycled vs Reused Materials

For each material added in the "Materials Use and Transportation" table on Row 72, you should select the material source from three options ("Virgin", "Recycled", or "Reused") in the drop-down menu in Column G.

(a) The first option, "Virgin", describes a material that is being used for the first time, that has come directly from the manufacturer or supplier, and is made from raw materials, not recycled or repurposed sources. For this option, you must select "Yes" in Column H in order for the energy and air emissions footprint for the material to be calculated in SEFA.

(b) The second option, "Recycled", describes a material that is created from sources that are being used for a second time or more. A recycled material usually has a smaller footprint than a material from virgin sources. There are several approaches for representing a recycled material in SEFA.

(i) You may select "No" in Column H if the item is assumed to have an insignificant energy and air emissions footprint or if the footprint does not accrue to the site. In this case no energy and air emissions footprint will be calculated for the material.

(ii) You may select "Yes" in Column H if the item is assumed to have an energy and air emissions footprint similar to the footprint of the virgin material. In this case the energy and air emissions footprint will be calculated using the default conversion factors in SEFA for the virgin material.

(iii) You may create a "User-defined Material" in the drop-down list in Column A for a material that has footprint conversion factors different from the default factors in SEFA. (The default conversion factors in SEFA can be found on the "Default Conversions" tab in the "Calculations" workbook. Instructions for creating a "User-defined Material" can be found on the "User Defined Materials" tab in the "Input" workbook.) If you create a "User-defined Material" to represent a recycled material, you must select "Yes" in Column H in order for the energy and air emissions footprint for the material to be calculated using the user-defined conversion factors.

(c) The third option, "Reused", describes a material that is taken from another location and used essentially unchanged. Assuming that there is no energy or air emissions footprint associated with the "Reused" material, or that the footprint does not accrue to the site, you would select "No" in Column H. In this case no energy and air emissions footprint will be calculated for the material. If you find that the "Reused" material does have an energy and air emissions footprint, you may follow the approaches noted above for "Recycled" materials.

16) Discussion of Miles per Gallon (mpg) vs Gallons per Ton-Mile (gptm)

Options for equipment, materials, and waste transportation in the "Input Template" tab include “Truck (mpg)” which represents truck transport based on Miles per Gallon (mpg), and "Combination Truck (gptm)" and “Truck single unit (gptm)” which represent truck transport based on Gallons per Ton-Mile (gptm). The selection for mode of transportation is made in the drop-down menu in the "Equipment" table in Row 29 (Column M), in the “Materials” table in Row 72 (Column N), and in the “Waste” table in Row 103 (Column K). Rules of thumb are noted below for the two options for truck transport (mpg and gptm). However, each cleanup site and remedy is unique, and you should use the mode of transport that is most representative for the situation at hand.

Note that the other modes of transportation in the drop-down menu (aircraft, barge, and train) are based on gptm. The discussion below regarding "Combination Truck (gptm)" and “Truck single unit (gptm)” is also relevant to gptm transport by aircraft, barge, and train.

(a) Truck (mpg): Miles per Gallon is a unit of measure best used to describe the efficiency of a vehicle hauling a single load to a single location, and is determined by how many miles a vehicle can travel on one gallon of fuel. Additional notes:

(i) For mpg, fuel use is calculated based on the one-way distance between the site and supplier (or site and waste destination), number of one-way trips, and type of fuel selected. These items are found in Column I or J, Column L, and Column O, respectively, in the “Materials” table, and in corresponding Columns in the Equipment and Waste tables.

(ii) Typically, truck transport using mpg will most accurately represent short-haul scenarios. These scenarios may include dump trucks hauling clean fill from a nearby borrow site, or hauling waste to a nearby municipal waste landfill.

(iii) Truck transport using mpg often results in an empty return trip. If this is the case at your site, you should model the empty return trip. As an estimation, you may assume the same fuel usage rate (mpg) for the empty return trip, or if you know the fuel usage rate (mpg) is different, you may override it.

(b) Truck freight (gptm): Gallons per Ton-Mile is best used to describe the efficiency of hauling freight on a vehicle that may be carrying multiple loads to multiple locations, and is determined by how many gallons of fuel it takes to haul a ton of freight one mile. Additional notes:

(i) For gptm, fuel use is calculated based on the weight of material or waste being transported, one-way distance between the site and supplier, and type of fuel selected. These items are found in Column E, Column I or J, and Column O, respectively, in the “Materials” table, and in corresponding Columns in the Equipment and Waste tables.

(ii) Typically truck transport using gptm will most accurately represent long-haul scenarios. These scenarios may include transporting steel or treatment chemicals from the manufacturing location to a local distribution yard or to the site.

(iii) The fuel usage rate for truck transport using gptm includes return trips of transport vehicles, based on average transport activities. Therefore, you should not model empty return trips for this type of transport.

17) Additional Flexibility for Combustion of Fuels

SEFA provides additional flexibility for modeling combustion of biodiesel, diesel, gasoline, and natural gas used for on-site equipment and for transportation.

(a) If you are using biodiesel, diesel, gasoline, or natural gas for transportation that has a footprint for combustion that is different from the default footprint in SEFA, you may establish user-defined conversion factors for combustion of that fuel. (See the “Default Conversions” tab in the “Calculations” workbook for the default conversion factors in SEFA.) Note that any user-defined factors established for a fuel type will apply to all forms of transportation using that fuel type (i.e., all types of transportation selected in the "Personnel", "On-site Equipment Use", "Materials Use", and "Waste Disposal" tables in the "Input Template" tab). For instructions on establishing user-defined factors for biodiesel, diesel, gasoline, or natural gas used in transportation, please see the “User Defined Factors” tab in the “Input” workbook.

(b) Similar to the notes above, if you are using biodiesel, diesel, gasoline, or natural gas for on-site equipment that has a footprint for combustion that is different from the default footprint in SEFA, you may establish user-defined conversion factors for combustion of that fuel. (See the “Default Conversions” tab in the “Calculations” workbook for the default conversion factors in SEFA.) Note that any user-defined factors established for a fuel type will apply to all forms of on-site equipment using that fuel type (i.e., all types of equipment selected in Column A in the “On-Site Equipment Use and Transportation” table in the “Input Template” tab). For instructions on establishing user-defined factors for biodiesel, diesel, gasoline, or natural gas used in on-site equipment, please see the “User Defined Factors” tab in the “Input” workbook.

Input Summary

Remedy Component Number →			2	3	4	5	6															
		Column headings in Row 6 must match the name of "Input" tabs in this workbook for Columns C - P in this table to be populated ("0" in Row 4 means "Input" tab is turned Off and will not be grouped to a Remedy Component (Columns Q - V) or used in subsequent calculations)														Remedy Component Subtotals						
Item		n Demobilization	Drilling	Groundwater Monitoring	O&M	Waste Pickup	Input Template (6)	Input Template (7)	Input Template (8)	Input Template (9)	Input Template (10)	Input Template (11)	Input Template (12)	Input Template (13)	Input Template (14)	1	2	3	4	5	6	Total
On-Site																						
On-site Renewable Energy																						
Renewable electricity generated on-site	MWh		0	0	0											0	0	0	0	0	0	0
Landfill gas combusted on-site for energy use	ccf CH_4		0	0	0											0	0	0	0	0	0	0
On-site biodiesel use	gal		0	0	0											0	0	0	0	0	0	0
On-site biodiesel use - Other	gal		0	0	0											0	0	0	0	0	0	0
User-defined on-site renewable energy use #1	TBD		0	0	0											0	0	0	0	0	0	0
User-defined on-site renewable energy use #2	TBD		0	0	0											0	0	0	0	0	0	0
On-Site Conventional Energy																						
Grid electricity	MWh		0	0	403.84											0	0	0	403.84	0	0	403.84
On-site diesel use - Other	Gal		420	0	0											0	420	0	0	0	0	420
On-site diesel use <75 hp	Gal		0	0	0											0	0	0	0	0	0	0
On-site diesel use 75<hp<750	Gal		0	0	0											0	0	0	0	0	0	0
On-site diesel use >750 hp	Gal		0	0	0											0	0	0	0	0	0	0
On-site gasoline use - Other	Gal		0	0.066	0											0	0	0.066	0	0	0	0.066
On-site gasoline use <25 hp	Gal		0	0	0											0	0	0	0	0	0	0
On-site gasoline use >25 hp	Gal		7.751938	0	0											0	7.751938	0	0	0	0	7.751938
On-site natural gas use	ccf		0	0	0											0	0	0	0	0	0	0
On-site compressed natural gas use - Other	ccf		0	0	0											0	0	0	0	0	0	0
On-site compressed natural gas use	ccf		0	0	0											0	0	0	0	0	0	0
On-site liquified petroleum gas use - Other	gal		0	0	0											0	0	0	0	0	0	0
On-site liquified petroleum gas use	gal		0	0	0											0	0	0	0	0	0	0
Other forms of on-site conventional energy use #1	TBD		0	0	0											0	0	0	0	0	0	0
Other forms of on-site conventional energy use #2	TBD		0	0	0											0	0	0	0	0	0	0
Other On-site Emissions																						
On-site HAP process emissions	Lbs		0	0	0											0	0	0	0	0	0	0
On-site GHG emissions	Lbs CO2e		0	0	0											0	0	0	0	0	0	0
On-site carbon storage	Lbs CO2e		0	0	0											0	0	0	0	0	0	0
GHG avoided by flaring on-site landfill methane	ccf CH4		0	0	0											0	0	0	0	0	0	0
Other on-site NOx emissions or reductions	Lbs		0	0	0											0	0	0	0	0	0	0
Other on-site SOx emissions or reductions	Lbs		0	0	0											0	0	0	0	0	0	0
Other on-site PM emissions or reductions	Lbs		0	0	0											0	0	0	0	0	0	0
Electricity Generation																						
Grid electricity	MWh		0	0	403.84											0	0	0	403.84	0	0	403.84
Voluntary purchase of renewable electricity	MWh		0	0	0											0	0	0	0	0	0	0
Voluntary purchase of RECs	MWh		0	0	0											0	0	0	0	0	0	0
Transportation																						
Transportation Fuel Use Breakdown																						
Biodiesel use - Personnel Transport	gal		0	0	0											0	0	0	0	0	0	0
Biodiesel use - Personnel Transport - User Defined	gal		0	0	0											0	0	0	0	0	0	0
Biodiesel use - Equipment Transport	gal		0	0	0											0	0	0	0	0	0	0
Biodiesel use - Equipment Transport - User Defined	gal		0	0	0											0	0	0	0	0	0	0
Biodiesel use - Material Transport	gal		0	0	0											0	0	0	0	0	0	0
Biodiesel use - Material Transport - User Defined	gal		0	0	0											0	0	0	0	0	0	0
Biodiesel use - Waste Transport	gal		0	0	0											0	0	0	0	0	0	0
Biodiesel use - Waste Transport - User Defined	gal		0	0	0											0	0	0	0	0	0	0
Diesel use - Personnel Transport - other vehicles	gal		0	0	0											0	0	0	0	0	0	0
Diesel use - Personnel Transport - car	gal		0	0	0											0	0	0	0	0	0	0
Diesel use - Personnel Transport - passenger truck	gal		0	0	0											0	0	0	0	0	0	0
Diesel use - Personnel Transport - User Defined	gal		0	0	0											0	0	0	0	0	0	0
Diesel use - Equipment Transport	gal		0	36.6	0											0	0	36.6	0	0	0	36.6
Diesel use - Equipment Transport - User Defined	gal		0	0	0											0	0	0	0	0	0	0
Diesel use - Material Transport	gal		90.833	21.667	0											0	90.833	21.667	0	0	0	112.5
Diesel use - Material Transport - User Defined	gal		0	0	0											0	0	0	0	0	0	0
Diesel use - Waste Transport	gal		25	0	25											0	25	0	25	0	0	50
Diesel use - Waste Transport - User Defined	gal		0	0	0											0	0	0	0	0	0	0
Gasoline use - Personnel Transport - other vehicles	gal		6.3	0	0											0	6.3	0	0	0	0	6.3
Gasoline use - Personnel Transport - car	gal		0	0	0											0	0	0	0	0	0	0
Gasoline use - Personnel Transport - passenger truck	gal		17.5	11.6	69.8											0	17.5	11.6	69.8	0	0	98.9
Gasoline use - Personnel Transport - User Defined	gal		0	0	0											0	0	0	0	0	0	0
Gasoline use - Equipment Transport	gal		0	0	0											0	0	0	0	0	0	0
Gasoline use - Equipment Transport - User Defined	gal		0	0	0											0	0	0	0	0	0	0
Natural Gas use - Personnel Transport	ccf		0	0	0											0	0	0	0	0	0	0
Natural Gas use - Personnel Transport - User Defined	ccf		0	0	0											0	0	0	0	0	0	0
Natural Gas use - Equipment Transport	ccf		0	0	0											0	0	0	0	0	0	0

Input Summary

Remedy Component Number →			2	3	4	5	6														
		Column headings in Row 6 must match the name of "Input" tabs in this workbook for Columns C - P in this table to be populated ("0" in Row 4 means "Input" tab is turned Off and will not be grouped to a Remedy Component (Columns Q - V) or used in subsequent calculations)														Remedy Component Subtotals						
Item		n Demobilization	Drilling	Groundwater Monitoring	O&M	Waste Pickup	Input Template (6)	Input Template (7)	Input Template (8)	Input Template (9)	Input Template (10)	Input Template (11)	Input Template (12)	Input Template (13)	Input Template (14)	1	2	3	4	5	6	Total
Conventional Energy																						
Transportation diesel use	gal		115.833	58.267	25											0	115.833	58.267	25	0	0	199.1
Transportation gasoline use	gal		23.8	11.6	69.8											0	23.8	11.6	69.8	0	0	105.2
Transportation natural gas use	ccf		0	0	0											0	0	0	0	0	0	0
User-defined conventional energy transportation #1	TBD		0	0	0											0	0	0	0	0	0	0
User-defined conventional energy transportation #2	TBD		0	0	0											0	0	0	0	0	0	0
Renewable Energy																						
Transportation biodiesel use	gal		0	0	0											0	0	0	0	0	0	0
User-defined renewable energy transportation #1	TBD		0	0	0											0	0	0	0	0	0	0
User-defined renewable energy transportation #2	TBD		0	0	0											0	0	0	0	0	0	0
Off-Site																						
Construction Materials																						
Aluminum, Rolled Sheet	lb		0	0	0											0	0	0	0	0	0	0
Asphalt, mastic	lb		0	0	0											0	0	0	0	0	0	0
Asphalt, paving-grade	lb		0	0	0											0	0	0	0	0	0	0
Ethanol, Corn, 95%	lb		0	0	0											0	0	0	0	0	0	0
Ethanol, Corn, 99.7%	lb		0	0	0											0	0	0	0	0	0	0
Ethanol, Petroleum, 99.7%	lb		0	0	0											0	0	0	0	0	0	0
Gravel/Sand Mix, 65% Gravel	lb		0	0	0											0	0	0	0	0	0	0
Gravel/sand/clay	lb		0	0	0											0	0	0	0	0	0	0
HDPE	lb		0	0	0											0	0	0	0	0	0	0
Photovoltaic system (installed)	W		0	0	0											0	0	0	0	0	0	0
PVC	lb		0	0	0											0	0	0	0	0	0	0
Portland cement, US average	lb		0	0	0																	
Ready-mixed concrete, 20 MPa	ft3		0	0	0											0	0	0	0	0	0	0
Round Gravel	lb		0	0	0											0	0	0	0	0	0	0
Sand	lb		0	0	0											0	0	0	0	0	0	0
Stainless Steel	lb		6200	0	0											0	6200	0	0	0	0	6200
Steel	lb		0	0	0											0	0	0	0	0	0	0
Other refined construction materials	lb		0	500	0											0	0	500	0	0	0	500
Other unrefined construction materials	lb		0	0	0											0	0	0	0	0	0	0
Treatment Materials & Chemicals																						
Cheese Whey	lbs		0	0	0											0	0	0	0	0	0	0
Emulsified vegetable oil	lbs		0	0	0											0	0	0	0	0	0	0
Granular activated carbon, primary	lbs		0	0	0											0	0	0	0	0	0	0
Granular activated carbon, regenerated	lbs		0	0	0											0	0	0	0	0	0	0
Hydrogen Peroxide, 50% in H2O	lbs		0	0	0											0	0	0	0	0	0	0
Iron (II) Sulfate	lbs		0	0	0											0	0	0	0	0	0	0
Lime, Hydrated, Packed	lbs		0	0	0											0	0	0	0	0	0	0
Molasses	lbs		0	0	0											0	0	0	0	0	0	0
Phosphoric Acid, 70% in H2O	lbs		0	0	0											0	0	0	0	0	0	0
Potassium Permanganate	lbs		0	0	0											0	0	0	0	0	0	0
Sodium Hydroxide, 50% in H2O	lbs		0	0	0											0	0	0	0	0	0	0
Other Treatment Chemicals & Materials	lbs		0	0	0											0	0	0	0	0	0	0
Material Type																						
Total Virgin Refined Materials	tons		5.99	0.3	0											0	5.99	0.3	0	0	0	6.29
Total Recycled Refined Materials	tons		0	0	0											0	0	0	0	0	0	0
Total Reused Refined Materials	tons		0	0	0											0	0	0	0	0	0	0
Total Refined Material	tons		5.99	0.3	0											0	5.99	0.3	0	0	0	6.29
Total Virgin Unrefined Materials	tons		0	0	0											0	0	0	0	0	0	0
Total Recycled Unrefined Materials	tons		0	0	0											0	0	0	0	0	0	0
Total Reused Unrefined Materials	tons		0	0	0											0	0	0	0	0	0	0
Total Unrefined Material	tons		0	0	0											0	0	0	0	0	0	0
Fuel Processing																						
Biodiesel produced	gal		0	0	0											0	0	0	0	0	0	0
Diesel produced	gal		535.833	58.267	25											0	535.833	58.267	25	0	0	619.1
Gasoline produced	gal		31.551938	11.666	69.8											0	31.551938	11.666	69.8	0	0	113.01794
Compressed natural gas produced	ccf		0	0	0											0	0	0	0	0	0	0
Liquified petroleum gas produced	gal		0	0	0											0	0	0	0	0	0	0
Natural gas produced	ccf		0	0	0											0	0	0	0	0	0	0
Water Use																						
Public Water Supply	gal x 1000		2	0.2	0											0	2	0.2	0	0	0	2.2
Extracted Groundwater	gal x 1000		0	0	0											0	0	0	0	0	0	0
Surface Water	gal x 1000		0	0	0											0	0	0	0	0	0	0
Reclaimed Water	gal x 1000		0	0	0											0	0	0	0	0	0	0
Collected/Diverted Storm Water	gal x 1000		0	0	0											0	0	0	0	0	0	0
User-defined water resource #1	gal x 1000		0	0	0											0	0	0	0	0	0	0
User-defined water resource #2	gal x 1000		0	0	0											0	0	0	0	0	0	0

Input Summary

Remedy Component Number →			2	3	4	5	6									Remedy Component Subtotals						
		Column headings in Row 6 must match the name of "Input" tabs in this workbook for Columns C - P in this table to be populated ("0" in Row 4 means "Input" tab is turned Off and will not be grouped to a Remedy Component (Columns Q - V) or used in subsequent calculations)																				
Item		n Demobilization	Drilling	Groundwater Monitoring	O&M	Waste Pickup	Input Template (6)	Input Template (7)	Input Template (8)	Input Template (9)	Input Template (10)	Input Template (11)	Input Template (12)	Input Template (13)	Input Template (14)	1	2	3	4	5	6	Total
Waste/Recycle Handling																						
Hazardous waste incineration	lbs		0	0	0											0	0	0	0	0	0	0
Off-site waste water treatment (POTW)	gal x 1000		0	0	0											0	0	0	0	0	0	0
Off-site non-hazardous waste landfill	tons		2	0	1											0	2	0	1	0	0	3
Off-site hazardous waste landfill	tons		0	0	0											0	0	0	0	0	0	0
Recycled/Reused On-Site	tons		0	0	0											0	0	0	0	0	0	0
Recycled/Reused Off-Site	tons		0	0	0											0	0	0	0	0	0	0
Solid Waste Totals																						
Total Non-Hazardous Waste	tons		2	0	1											0	2	0	1	0	0	3
Total Hazardous Waste	tons		0	0	0											0	0	0	0	0	0	0
Total Recycled/Reused	tons		0	0	0											0	0	0	0	0	0	0
Total Waste (all types)	tons		2	0	1											0	2	0	1	0	0	3
Lab Services																						
Off-site Laboratory Analysis - Other	sample		0	0	36											0	0	0	36	0	0	36
Off-site Laboratory Analysis - Metals	sample		20	0	24											0	20	0	24	0	0	44
Off-site Laboratory Analysis - Mercury	sample		0	0	0											0	0	0	0	0	0	0
Off-site Laboratory Analysis - Inorganic Anions	sample		0	0	0											0	0	0	0	0	0	0
Off-site Laboratory Analysis - Alkalinity	sample		0	0	24											0	0	0	24	0	0	24
Off-site Laboratory Analysis - Perchlorate	sample		0	0	0											0	0	0	0	0	0	0
Off-site Laboratory Analysis - Nitrogen/Nitrate	sample		0	0	24											0	0	0	24	0	0	24
Off-site Laboratory Analysis - Sulfate	sample		0	0	0											0	0	0	0	0	0	0
Off-site Laboratory Analysis - PCBs	sample		0	0	0											0	0	0	0	0	0	0
Off-site Laboratory Analysis - VOCs	sample		20	0	24											0	20	0	24	0	0	44
Off-site Laboratory Analysis - SVOCs	sample		0	0	0											0	0	0	0	0	0	0
Resource Extraction for Electricity																						
Coal extraction and processing	MWh		0	0	24.2304											0	0	0	24.2304	0	0	24.2304
Natural gas extraction and processing	MWh		0	0	40.384											0	0	0	40.384	0	0	40.384
Nuclear fuel extraction and processing	MWh		0	0	8.0768											0	0	0	8.0768	0	0	8.0768
Oil extraction and processing	MWh		0	0	20.192											0	0	0	20.192	0	0	20.192
Other fuel extraction and processing	MWh		0	0	0											0	0	0	0	0	0	0
Electricity Transmission																						
Transmission and distribution losses	MWh		0	0	403.84											0	0	0	403.84	0	0	403.84

Input Summary

Remedy Component Number →			2	3	4	5	6															
		Column headings in Row 6 must match the name of "Input" tabs in this workbook for Columns C - P in this table to be populated ("0" in Row 4 means "Input" tab is turned Off and will not be grouped to a Remedy Component (Columns Q - V) or used in subsequent calculations)														Remedy Component Subtotals						
Item		n Demobilization	Drilling	Groundwater Monitoring	O&M	Waste Pickup	Input Template (6)	Input Template (7)	Input Template (8)	Input Template (9)	Input Template (10)	Input Template (11)	Input Template (12)	Input Template (13)	Input Template (14)	1	2	3	4	5	6	Total
Other																						
User-defined material #1	TBD		0	0	0											0	0	0	0	0	0	0
User-defined material #2	TBD		0	0	0											0	0	0	0	0	0	0
User-defined material #3	TBD		0	0	0											0	0	0	0	0	0	0
User-defined material #4	TBD		0	0	0											0	0	0	0	0	0	0
User-defined material #5	TBD		0	0	0											0	0	0	0	0	0	0
User-defined material #6	TBD		0	0	0											0	0	0	0	0	0	0
User-defined material #7	TBD		0	0	0											0	0	0	0	0	0	0
User-defined material #8	TBD		0	0	0											0	0	0	0	0	0	0
User-defined material #9	TBD		0	0	0											0	0	0	0	0	0	0
User-defined material #10	TBD		0	0	0											0	0	0	0	0	0	0
User-defined material #11	TBD		0	0	0											0	0	0	0	0	0	0
User-defined material #12	TBD		0	0	0											0	0	0	0	0	0	0
User-defined material #13	TBD		0	0	0											0	0	0	0	0	0	0
User-defined material #14	TBD		0	0	0											0	0	0	0	0	0	0
User-defined material #15	TBD		0	0	0											0	0	0	0	0	0	0
User-defined material #16	TBD		0	0	0											0	0	0	0	0	0	0
User-defined material #17	TBD		0	0	0											0	0	0	0	0	0	0
User-defined material #18	TBD		0	0	0											0	0	0	0	0	0	0
User-defined material #19	TBD		0	0	0											0	0	0	0	0	0	0
User-defined material #20	TBD		0	0	0											0	0	0	0	0	0	0
User-defined Waste Destinations																						
User-defined recycled/reused on-site #1	TBD		0	0	0											0	0	0	0	0	0	0
User-defined recycled/reused on-site #2	TBD		0	0	0											0	0	0	0	0	0	0
User-defined recycled/reused on-site #3	TBD		0	0	0											0	0	0	0	0	0	0
User-defined recycled/reused off-site #1	TBD		0	0	0											0	0	0	0	0	0	0
User-defined recycled/reused off-site #2	TBD		0	0	0											0	0	0	0	0	0	0
User-defined recycled/reused off-site #3	TBD		0	0	0											0	0	0	0	0	0	0
User-defined non-hazardous waste destination #1	TBD		0	0	0											0	0	0	0	0	0	0
User-defined non-hazardous waste destination #2	TBD		0	0	0											0	0	0	0	0	0	0
User-defined non-hazardous waste destination #3	TBD		0	0	0											0	0	0	0	0	0	0
User-defined hazardous waste destination #1	TBD		0	0	0											0	0	0	0	0	0	0
User-defined hazardous waste destination #2	TBD		0	0	0											0	0	0	0	0	0	0
User-defined hazardous waste destination #3	TBD		0	0	0											0	0	0	0	0	0	0

Input Worksheet for Input Template

Please specify which Remedy Component this Input worksheet is part of: (Select "Off" to exclude this Input worksheet from calculations and results)	Off	This Input worksheet is excluded from calculations and results

General Scope

Example Items Eliminated through Screening Process

Other Notes and References

Personnel Transportation

Participant	Number of Roundtrips to Site	Roundtrip Distance to Site (miles)	Mode of Transportation*	Transport Fuel Type*	Total Distance Transported (miles)	Default Fuel Usage Rate**	Fuel Usage Rate Override**	Fuel Used for Personnel Transport**	Activity or Notes

** See the "Detailed Notes and Explanations" tab for explanation of transport and fuel options.*

*** for biodiesel, B20, diesel, and gasoline, units are gallons for Fuel Used and miles/gallon for Fuel Usage Rate; for natural gas, units are hundreds of cubic feet (ccf) for Fuel Used and ccf/miles for Fuel Usage Rate; for electricity, units are miles/kWh for Fuel Usage Rate and the kWh (Fuel Used) are added to total grid electricity used (cell G69).*

On-Site Equipment Use and Transportation

Equipment Type*	HP*	Load Factor (%)*	Equipment Fuel Type**	Equipment Fuel Usage Rate	Equipment Hours Operated	Fuel Used for On-site Equipment	Equipment weight (tons)	Number of Equipment Roundtrips to Site	Roundtrip Distance to Site (miles)	Total Distance Transported (miles)	Mode of Transportation	Transport Fuel Type***	Default Transport Fuel Usage Rate (gptm or mpg)	Transport Fuel Usage Rate Override (gptm or mpg)	Fuel Used for Equipment Transport (gallons)	Activity or Notes

** HP and Load Factor must be entered by user in Columns C and D. Please see the "Detailed Notes and Explanations" tab for further explanation.*

*** For biodiesel, B20, diesel, gasoline, and liquified petroleum gas, units are gallons for Fuel Used for On-site Equipment and gallons/hr for Equipment Fuel Usage Rate; for compressed natural gas units are ccf (hundreds of cubic feet) for Fuel Used for On-site Equipment and ccf/hr for Equipment Fuel Usage Rate.*

**** Please see the "Detailed Notes and Explanations" tab for instructions on selecting mode of transportation and other aspects of data entry in Columns M, N, and P. Units are gallons for Fuel Used for Equipment Transport and miles/gallon (mpg) or gallons per ton-mile (gptm) for Transport Fuel Usage Rate.*

Input Worksheet for Input Template

Remedy Component that this Input worksheet is part of:	Off	This Input worksheet is excluded from calculations and results

On-Site Electricity Use

Equipment Type	HP	Load Factor (%)	Efficiency (%)	Electrical Rating (kW)	Hours Used	Energy Used (kWh)	Notes
<Equip. with HP, Efficiency, and Hours>							
<Equip. with HP, Efficiency, and Hours>							
<Equip. with HP, Efficiency, and Hours>							
<Equip. with HP, Efficiency, and Hours>							
<Equip. with known kW rating>							
<Equip. with known kW rating>							
<Equip. with known kW rating>							
<Equip. with known kW rating>							
<Equip. with known total Energy Used>							
<Equip. with known total Energy Used>							
<Equip. with known total Energy Used>							
<Equip. with known total Energy Used>							
Estimated Total Electricity Usage Based on Above						0	
Renewable Electricity Generated On-Site*							
Total Electricity Usage Based on Personnel Transportation						0	
Total Grid Electricity Used						0	

**** Electricity generated on-site from renewable resources, for which the facility retains the rights to the renewable energy (i.e., does not sell renewable energy certificates associated with the renewable energy generation).***

On-Site Natural Gas Use

Equipment Type	Power Rating (Btu/hr)	Efficiency (%)	Hours Used	Energy Required (Btu)	Natural Gas Used (ccf)	Notes
					0	
				0		
Totals			0	0	0	

Landfill Gas Combusted On-Site for Energy Use

Equipment Type	Landfill Gas (ccf)	% Methane by volume	Used for electricity?	Landfill Gas Methane Used (ccf)	Notes
				0	
				0	
				0	
Total				0	

Please see the "Detailed Notes and Explanations" tab for instructions on using the two tables above ("On-site Natural Gas Use" and "Landfill Gas Combusted On-Site for Energy Use"). In the two tables above, ccf = hundreds of cubic feet.

Materials Use and Transportation

Material Type*	Unit	Quantity	Tons	Is the Material Refined or Unrefined?**	Material Source: Virgin, Recycled, or Reused?**	Calculate Item Footprint?**	Default One-way Distance to Site (miles)	One-way Distance to Site Override (miles)	Number of One-way Trips to Site	Include Return Trip in Calculations?	Total Distance Transported (miles)	Mode of Transportation***	Transport Fuel Type	Default Transport Fuel Usage Rate (gptm or mpg)	Transport Fuel Usage Rate Override (gptm or mpg)	Fuel Used for Materials Transport (gallons)	Notes and Description of Materials
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														

**** Please see the "Detailed Notes and Explanations" tab for instructions on specifying "User-Defined Materials" in the dropdown menu.***

***** Selections must be made in Columns F - H in order for the footprint calculations to be performed. Please see the "Detailed Notes and Explanations" tab for further information.***

****** Please see the "Detailed Notes and Explanations" tab for instructions on selecting mode of transportation, accounting for empty return trips, and other aspects of data entry in Columns L, N, O, and Q. Units are gallons for Fuel Used for Materials Transport and miles/gallon (mpg) or gallons per ton-mile (gptm) for Transport Fuel Usage Rate.***

Input Worksheet for Input Template

Remedy Component that this Input worksheet is part of:	Off	This Input worksheet is excluded from calculations and results

Waste Disposal and Transportation

Waste Destination*	Unit	Quantity	Tons	Default One-way Distance to Site (miles)	One-way Distance to Site Override (miles)	Number of One-way Trips to Site	Include Return Trip in Calculations?	Total Distance Transported (miles)	Mode of Transportation**	Transport Fuel Type	Default Transport Fuel Usage Rate (gptm or mpg)	Transport Fuel Usage Rate Override (gptm or mpg)	Fuel Used for Waste Transport (gallons)	Notes and Description of Waste
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											

**** No footprint is calculated for the Recycled/Reused On-Site and Off-Site selections. Please see the "Detailed Notes and Explanations" tab for instructions on specifying "User-Defined" selections in the dropdown menu.***

***** Please see the "Detailed Notes and Explanations" tab for instructions on selecting mode of transportation, accounting for empty return trips, and other aspects of data entry in Columns I, K, L, and N. Units are gallons for Fuel Used for Waste Transport and miles/gallon (mpg) or gallons per ton-mile (gptm) for Transport Fuel Usage Rate.***

Type of Water Used

Source of Water Used*	Unit	Quantity	Tons	Source Location/Aquifer (optional)	Quality of Water Used (optional)	Water Uses (optional)	Fate of Used Water (optional)
			0				
			0				
			0				
			0				
			0				
			0				
			0				
			0				
			0				
			0				
			0				

**** Only the "Public Water" selection has an associated footprint. No footprint is calculated for the other water source selections.***

Note: Information entered in Columns F - V (Source/Quality/Use/Fate) is not compiled or reported by SEFA.

Input Worksheet for Input Template

Remedy Component that this Input worksheet is part of:	Off	This Input worksheet is excluded from calculations and results

Other Energy Use and Air Emissions

Item		Units	Quantity	Notes
On-Site				
User-defined on-site conventional energy use #1	*User-Defined	TBD		
User-defined on-site conventional energy use #2	*User-Defined	TBD		
On-site HAP process emissions**		lbs		
On-site GHG emissions**		lbs CO2e		
On-site carbon storage**		lbs CO2e		
Landfill gas flared on-site		ccf CH4		
Other on-site NOx emissions or reductions**		lbs		
Other on-site SOx emissions or reductions**		lbs		
Other on-site PM emissions or reductions**		lbs		
Transportation		Units	Quantity	Notes
User-defined conventional energy transportation #1	*User-Defined	TBD		
User-defined conventional energy transportation #2	*User-Defined	TBD		

**** Enter units and conversion factors on "User Defined Factors" tab***
***** Enter a positive number for emissions and a negative number for reductions, avoidances, or storage***
See the "Detailed Notes and Explanations" tab for use of this table.

Other Voluntary Renewable Energy Use

Item		Units	Quantity	Notes
User-defined on-site renewable energy use #1	*User-Defined	TBD		
User-defined on-site renewable energy use #2	*User-Defined	TBD		
User-defined renewable energy transportation #1	*User-Defined	TBD		
User-defined renewable energy transportation #2	*User-Defined	TBD		
Voluntary purchase of renewable electricity**		MWh		
Voluntary purchase of RECs**		MWh		

**** Enter units and conversion factors on "User Defined Factors" tab***
***** Complete information on provider in the table to the right. No footprint reductions are associated with the voluntary purchases.***
See the "Detailed Notes and Explanations" tab for use of this table

Off-Site Laboratory Analysis

Parameter and Notes	Number of Samples	Comments
Totals	**0**	

Description of purchased renewable electricity (green pricing product or green marketing product)	Provider:	
	Type of product:	
	Type of renewable energy source:	
	Date of renewable system installation:	
Description of purchased RECs	Provider:	
	Type of renewable energy source:	
	Date of renewable system installation:	
	Location of renewable system installation:	

Input Worksheet for Excavation Trenching

Please specify which Remedy Component this Input worksheet is part of: (Select "Off" to exclude this Input worksheet from calculations and results)	**Component 1**	**Define Component**

General Scope

Excavate trenches for the piping runs from desired well location to the groundwater exraction and treatment system. Backfill trenches upon completion.

Example Items Eliminated through Screening Process

Other Notes and References

Personnel Transportation

Participant	Number of Roundtrips to Site	Roundtrip Distance to Site (miles)	Mode of Transportation*	Transport Fuel Type*	Total Distance Transported (miles)	Default Fuel Usage Rate**	Fuel Usage Rate Override**	Fuel Used for Personnel Transport**	Activity or Notes
HRP Personnel	2	110	Light-Duty/Passenger Truck	Gasoline	220	18.9		11.6	Extraction/ Injection Well Trenching
Excavator Operator	2	20	Heavy-Duty Truck	Diesel	40	7.55		5.3	Extraction/ Injection Well Trenching

**** See the "Detailed Notes and Explanations" tab for explanation of transport and fuel options.***

***** for biodiesel, B20, diesel, and gasoline, units are gallons for Fuel Used and miles/gallon for Fuel Usage Rate; for natural gas, units are hundreds of cubic feet (ccf) for Fuel Used and ccf/miles for Fuel Usage Rate; for electricity, units are miles/kWh for Fuel Usage Rate and the kWh (Fuel Used) are added to total grid electricity used (cell G69).***

On-Site Equipment Use and Transportation

Equipment Type*	HP*	Load Factor (%)*	Equipment Fuel Type**	Equipment Fuel Usage Rate	Equipment Hours Operated	Fuel Used for On-site Equipment	Equipment weight (tons)	Number of Equipment Roundtrips to Site	Roundtrip Distance to Site (miles)	Total Distance Transported (miles)	Mode of Transportation	Transport Fuel Type***	Default Transport Fuel Usage Rate (gptm or mpg)	Transport Fuel Usage Rate Override (gptm or mpg)	Fuel Used for Equipment Transport (gallons)	Activity or Notes
Excavator - medium (175 HP)	175	90%	Diesel between 75 and 750 hp	8.653846154	24	207.6923077	49,800	1	20	20	Truck (mpg)	Diesel	6		3.3	Used for trenching/ backfilling

**** HP and Load Factor must be entered by user in Columns C and D. Please see the "Detailed Notes and Explanations" tab for further explanation.***

***** For biodiesel, B20, diesel, gasoline, and liquified petroleum gas, units are gallons for Fuel Used for On-site Equipment and gallons/hr for Equipment Fuel Usage Rate; for compressed natural gas units are ccf (hundreds of cubic feet) for Fuel Used for On-site Equipment and ccf/hr for Equipment Fuel Usage Rate.***

****** Please see the "Detailed Notes and Explanations" tab for instructions on selecting mode of transportation and other aspects of data entry in Columns M, N, and P. Units are gallons for Fuel Used for Equipment Transport and miles/gallon (mpg) or gallons per ton-mile (gptm) for Transport Fuel Usage Rate.***

Input Worksheet for Excavation Trenching

Remedy Component that this Input worksheet is part of:	Component 1	Define Component

On-Site Electricity Use

Equipment Type	HP	Load Factor (%)	Efficiency (%)	Electrical Rating (kW)	Hours Used	Energy Used (kWh)	Notes
<Equip. with HP, Efficiency, and Hours>							
<Equip. with HP, Efficiency, and Hours>							
<Equip. with HP, Efficiency, and Hours>							
<Equip. with HP, Efficiency, and Hours>							
<Equip. with known kW rating>							
<Equip. with known kW rating>							
<Equip. with known kW rating>							
<Equip. with known kW rating>							
<Equip. with known total Energy Used>							
<Equip. with known total Energy Used>							
<Equip. with known total Energy Used>							
<Equip. with known total Energy Used>							
Estimated Total Electricity Usage Based on Above						0	
Renewable Electricity Generated On-Site*							
Total Electricity Usage Based on Personnel Transportation						0	
Total Grid Electricity Used						0	

**** Electricity generated on-site from renewable resources, for which the facility retains the rights to the renewable energy (i.e., does not sell renewable energy certificates associated with the renewable energy generation).***

On-Site Natural Gas Use

Equipment Type	Power Rating (Btu/hr)	Efficiency (%)	Hours Used	Energy Required (Btu)	Natural Gas Used (ccf)	Notes
					0	
				0		
Totals			0	0	0	

Landfill Gas Combusted On-Site for Energy Use

Equipment Type	Landfill Gas (ccf)	% Methane by volume	Used for electricity?	Landfill Gas Methane Used (ccf)	Notes
				0	
				0	
				0	
Total				0	

Please see the "Detailed Notes and Explanations" tab for instructions on using the two tables above ("On-site Natural Gas Use" and "Landfill Gas Combusted On-Site for Energy Use"). In the two tables above, ccf = hundreds of cubic feet.

Materials Use and Transportation

Material Type*	Unit	Quantity	Tons	Is the Material Refined or Unrefined?**	Material Source: Virgin, Recycled, or Reused?**	Calculate Item Footprint?**	Default One-way Distance to Site (miles)	One-way Distance to Site Override (miles)	Number of One-way Trips to Site	Include Return Trip in Calculations?	Total Distance Transported (miles)	Mode of Transportation***	Transport Fuel Type	Default Transport Fuel Usage Rate (gptm or mpg)	Transport Fuel Usage Rate Override (gptm or mpg)	Fuel Used for Materials Transport (gallons)	Notes and Description of Materials
Gravel/Sand Mix, 65% Gravel	lb	10,000	5	Unrefined	Reused	No	25	25		No	25	Truck (gptm)	Diesel	0.015337423		1.917	Trenching for piping runs
HDPE	lb	200	0.1	Refined	Virgin	Yes	500	500		No	500	Truck (mpg)	Diesel	6		83.333	HDPE piping runs to extraction system
PVC	lb	200	0.1	Refined	Virgin	No	500	500		No	500	Truck (mpg)	Diesel	6		83.333	PVC piping runs to extraction system
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														

**** Please see the "Detailed Notes and Explanations" tab for instructions on specifying "User-Defined Materials" in the dropdown menu.***

***** Selections must be made in Columns F - H in order for the footprint calculations to be performed. Please see the "Detailed Notes and Explanations" tab for further information.***

****** Please see the "Detailed Notes and Explanations" tab for instructions on selecting mode of transportation, accounting for empty return trips, and other aspects of data entry in Columns L, N, O, and Q. Units are gallons for Fuel Used for Materials Transport and miles/gallon (mpg) or gallons per ton-mile (gptm) for Transport Fuel Usage Rate.***

Input Worksheet for Excavation Trenching

Remedy Component that this Input worksheet is part of:	Component 1	Define Component

Waste Disposal and Transportation

Waste Destination*	Unit	Quantity	Tons	Default One-way Distance to Site (miles)	One-way Distance to Site Override (miles)	Number of One-way Trips to Site	Include Return Trip in Calculations?	Total Distance Transported (miles)	Mode of Transportation**	Transport Fuel Type	Default Transport Fuel Usage Rate (gptm or mpg)	Transport Fuel Usage Rate Override (gptm or mpg)	Fuel Used for Waste Transport (gallons)	Notes and Description of Waste
Recycled/reused on-site	tons	10,000	10000	0		1	No	0	Truck (mpg)	Diesel	6		0.0	Backfill of trenches
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											

**** No footprint is calculated for the Recycled/Reused On-Site and Off-Site selections. Please see the "Detailed Notes and Explanations" tab for instructions on specifying "User-Defined" selections in the dropdown menu.***

***** Please see the "Detailed Notes and Explanations" tab for instructions on selecting mode of transportation, accounting for empty return trips, and other aspects of data entry in Columns I, K, L, and N. Units are gallons for Fuel Used for Waste Transport and miles/gallon (mpg) or gallons per ton-mile (gptm) for Transport Fuel Usage Rate.***

Type of Water Used

Source of Water Used*	Unit	Quantity	Tons	Source Location/Aquifer (optional)	Quality of Water Used (optional)	Water Uses (optional)	Fate of Used Water (optional)
			0				
			0				
			0				
			0				
			0				
			0				
			0				
			0				
			0				
			0				
			0				

**** Only the "Public Water" selection has an associated footprint. No footprint is calculated for the other water source selections.***

Note: Information entered in Columns F - V (Source/Quality/Use/Fate) is not compiled or reported by SEFA.

Input Worksheet for Excavation Trenching

Remedy Component that this Input worksheet is part of:	Component 1	Define Component

Other Energy Use and Air Emissions

Item		Units	Quantity	Notes
On-Site				
User-defined on-site conventional energy use #1	*User-Defined	TBD		
User-defined on-site conventional energy use #2	*User-Defined	TBD		
On-site HAP process emissions**		lbs		
On-site GHG emissions**		lbs CO2e		
On-site carbon storage**		lbs CO2e		
Landfill gas flared on-site		ccf CH4		
Other on-site NOx emissions or reductions**		lbs		
Other on-site SOx emissions or reductions**		lbs		
Other on-site PM emissions or reductions**		lbs		
Transportation		**Units**	**Quantity**	**Notes**
User-defined conventional energy transportation #1	*User-Defined	TBD		
User-defined conventional energy transportation #2	*User-Defined	TBD		

**** Enter units and conversion factors on "User Defined Factors" tab***
***** Enter a positive number for emissions and a negative number for reductions, avoidances, or storage***
See the "Detailed Notes and Explanations" tab for use of this table.

Other Voluntary Renewable Energy Use

Item		Units	Quantity	Notes
User-defined on-site renewable energy use #1	*User-Defined	TBD		
User-defined on-site renewable energy use #2	*User-Defined	TBD		
User-defined renewable energy transportation #1	*User-Defined	TBD		
User-defined renewable energy transportation #2	*User-Defined	TBD		
Voluntary purchase of renewable electricity**		MWh		
Voluntary purchase of RECs**		MWh		

**** Enter units and conversion factors on "User Defined Factors" tab***
***** Complete information on provider in the table to the right. No footprint reductions are associated with the voluntary purchases.***
See the "Detailed Notes and Explanations" tab for use of this table

Off-Site Laboratory Analysis

Parameter and Notes	Number of Samples	Comments
Totals	**0**	

Description of purchased renewable electricity (green pricing product or green marketing product)	Provider:	Community Energy
	Type of product:	Electrical Supply
	Type of renewable energy source:	60% wind, 40% small hydrologic
	Date of renewable system installation:	May-12
Description of purchased RECs	Provider:	
	Type of renewable energy source:	
	Date of renewable system installation:	
	Location of renewable system installation:	

Input Worksheet for Drilling

Please specify which Remedy Component this Input worksheet is part of: (Select "Off" to exclude this Input worksheet from calculations and results)	**Component 2**	**Define Component**

General Scope

Drilling of new wells, or maintenance of exisiting wells.

Example Items Eliminated through Screening Process

Other Notes and References

Personnel Transportation

Participant	Number of Roundtrips to Site	Roundtrip Distance to Site (miles)	Mode of Transportation*	Transport Fuel Type*	Total Distance Transported (miles)	Default Fuel Usage Rate**	Fuel Usage Rate Override**	Fuel Used for Personnel Transport**	Activity or Notes
HRP Personnel	3	110	Light-Duty/Passenger Truck	Gasoline	330	18.9		17.5	Drilling/ Well Installation
NY State Licensed Driller	3	20	Heavy-Duty Truck	Gasoline	60	9.45		6.3	Drilling/ Well Installation

**** See the "Detailed Notes and Explanations" tab for explanation of transport and fuel options.***

***** for biodiesel, B20, diesel, and gasoline, units are gallons for Fuel Used and miles/gallon for Fuel Usage Rate; for natural gas, units are hundreds of cubic feet (ccf) for Fuel Used and ccf/miles for Fuel Usage Rate; for electricity, units are miles/kWh for Fuel Usage Rate and the kWh (Fuel Used) are added to total grid electricity used (cell G69).***

On-Site Equipment Use and Transportation

Equipment Type*	HP*	Load Factor (%)*	Equipment Fuel Type**	Equipment Fuel Usage Rate	Equipment Hours Operated	Fuel Used for On-site Equipment	Equipment weight (tons)	Number of Equipment Roundtrips to Site	Roundtrip Distance to Site (miles)	Total Distance Transported (miles)	Mode of Transportation	Transport Fuel Type***	Default Transport Fuel Usage Rate (gptm or mpg)	Transport Fuel Usage Rate Override (gptm or mpg)	Fuel Used for Equipment Transport (gallons)	Activity or Notes
Drilling - medium rig (150 HP)	150	90%	Diesel	6.75	40	270	40,000									
Water truck (400 HP)	400	75%	Diesel	15	10	150	85,000									
Grout pump (20 HP)	20	50%	Gasoline >25 hp	0.775193798	10	7.751937984	50									

**** HP and Load Factor must be entered by user in Columns C and D. Please see the "Detailed Notes and Explanations" tab for further explanation.***

***** For biodiesel, B20, diesel, gasoline, and liquified petroleum gas, units are gallons for Fuel Used for On-site Equipment and gallons/hr for Equipment Fuel Usage Rate; for compressed natural gas units are ccf (hundreds of cubic feet) for Fuel Used for On-site Equipment and ccf/hr for Equipment Fuel Usage Rate.***

****** Please see the "Detailed Notes and Explanations" tab for instructions on selecting mode of transportation and other aspects of data entry in Columns M, N, and P. Units are gallons for Fuel Used for Equipment Transport and miles/gallon (mpg) or gallons per ton-mile (gptm) for Transport Fuel Usage Rate.***

Input Worksheet for Drilling

Remedy Component that this Input worksheet is part of:	Component 2	Define Component

On-Site Electricity Use

Equipment Type	HP	Load Factor (%)	Efficiency (%)	Electrical Rating (kW)	Hours Used	Energy Used (kWh)	Notes
<Equip. with HP, Efficiency, and Hours>							
<Equip. with HP, Efficiency, and Hours>							
<Equip. with HP, Efficiency, and Hours>							
<Equip. with HP, Efficiency, and Hours>							
<Equip. with known kW rating>							
<Equip. with known kW rating>							
<Equip. with known kW rating>							
<Equip. with known kW rating>							
<Equip. with known total Energy Used>							
<Equip. with known total Energy Used>							
<Equip. with known total Energy Used>							
<Equip. with known total Energy Used>							
Estimated Total Electricity Usage Based on Above						0	
Renewable Electricity Generated On-Site*							
Total Electricity Usage Based on Personnel Transportation						0	
Total Grid Electricity Used						0	

**** Electricity generated on-site from renewable resources, for which the facility retains the rights to the renewable energy (i.e., does not sell renewable energy certificates associated with the renewable energy generation).***

On-Site Natural Gas Use

Equipment Type	Power Rating (Btu/hr)	Efficiency (%)	Hours Used	Energy Required (Btu)	Natural Gas Used (ccf)	Notes
					0	
				0		
Totals			0	0	0	

Landfill Gas Combusted On-Site for Energy Use

Equipment Type	Landfill Gas (ccf)	% Methane by volume	Used for electricity?	Landfill Gas Methane Used (ccf)	Notes
				0	
				0	
				0	
Total				0	

Please see the "Detailed Notes and Explanations" tab for instructions on using the two tables above ("On-site Natural Gas Use" and "Landfill Gas Combusted On-Site for Energy Use"). In the two tables above, ccf = hundreds of cubic feet.

Materials Use and Transportation

Material Type*	Unit	Quantity	Tons	Is the Material Refined or Unrefined?**	Material Source: Virgin, Recycled, or Reused?**	Calculate Item Footprint?**	Default One-way Distance to Site (miles)	One-way Distance to Site Override (miles)	Number of One-way Trips to Site	Include Return Trip in Calculations?	Total Distance Transported (miles)	Mode of Transportation***	Transport Fuel Type	Default Transport Fuel Usage Rate (gptm or mpg)	Transport Fuel Usage Rate Override (gptm or mpg)	Fuel Used for Materials Transport (gallons)	Notes and Description of Materials
Stainless steel	lb	6200	3.1	Refined	Virgin	Yes	500	500	1	No	500	Truck (mpg)	Diesel	6		83.333	
Portland cement, US average	lb	5000	2.5	Refined	Virgin	No	25	25	1	No	25	Truck (mpg)	Diesel	6		4.167	
Other refined construction materials	lb	780	0.39	Refined	Virgin	No	500	20	1	No	20	Truck (mpg)	Diesel	6		3.333	
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														

**** Please see the "Detailed Notes and Explanations" tab for instructions on specifying "User-Defined Materials" in the dropdown menu.***

***** Selections must be made in Columns F - H in order for the footprint calculations to be performed. Please see the "Detailed Notes and Explanations" tab for further information.***

****** Please see the "Detailed Notes and Explanations" tab for instructions on selecting mode of transportation, accounting for empty return trips, and other aspects of data entry in Columns L, N, O, and Q. Units are gallons for Fuel Used for Materials Transport and miles/gallon (mpg) or gallons per ton-mile (gptm) for Transport Fuel Usage Rate.***

Input Worksheet for Drilling

Remedy Component that this Input worksheet is part of:	Component 2	Define Component

Waste Disposal and Transportation

Waste Destination*	Unit	Quantity	Tons	Default One-way Distance to Site (miles)	One-way Distance to Site Override (miles)	Number of One-way Trips to Site	Include Return Trip in Calculations?	Total Distance Transported (miles)	Mode of Transportation**	Transport Fuel Type	Default Transport Fuel Usage Rate (gptm or mpg)	Transport Fuel Usage Rate Override (gptm or mpg)	Fuel Used for Waste Transport (gallons)	Notes and Description of Waste
Off-site non-hazardous waste landfill	tons	2	2	25	150	1	No	150	Truck (mpg)	Diesel	6		25.0	Disposal of IDW
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											

**** No footprint is calculated for the Recycled/Reused On-Site and Off-Site selections. Please see the "Detailed Notes and Explanations" tab for instructions on specifying "User-Defined" selections in the dropdown menu.***

***** Please see the "Detailed Notes and Explanations" tab for instructions on selecting mode of transportation, accounting for empty return trips, and other aspects of data entry in Columns I, K, L, and N. Units are gallons for Fuel Used for Waste Transport and miles/gallon (mpg) or gallons per ton-mile (gptm) for Transport Fuel Usage Rate.***

Type of Water Used

Source of Water Used*	Unit	Quantity	Tons	Source Location/Aquifer (optional)	Quality of Water Used (optional)	Water Uses (optional)	Fate of Used Water (optional)
Public Water	gal x 1000	2	8.34	Fire Hydrant (Town of Brookhaven)	Public Utilities	Re-circulation	Returned to Aquifer
			0				
			0				
			0				
			0				
			0				
			0				
			0				
			0				
			0				
			0				

**** Only the "Public Water" selection has an associated footprint. No footprint is calculated for the other water source selections.***

Note: Information entered in Columns F - V (Source/Quality/Use/Fate) is not compiled or reported by SEFA.

Input Worksheet for Drilling

Remedy Component that this Input worksheet is part of:	Component 2	Define Component

Other Energy Use and Air Emissions

Item		Units	Quantity	Notes
On-Site				
User-defined on-site conventional energy use #1	*User-Defined	TBD		
User-defined on-site conventional energy use #2	*User-Defined	TBD		
On-site HAP process emissions**		lbs		
On-site GHG emissions**		lbs CO2e		
On-site carbon storage**		lbs CO2e		
Landfill gas flared on-site		ccf CH4		
Other on-site NOx emissions or reductions**		lbs		
Other on-site SOx emissions or reductions**		lbs		
Other on-site PM emissions or reductions**		lbs		
Transportation		**Units**	**Quantity**	**Notes**
User-defined conventional energy transportation #1	*User-Defined	TBD		
User-defined conventional energy transportation #2	*User-Defined	TBD		

**** Enter units and conversion factors on "User Defined Factors" tab***
***** Enter a positive number for emissions and a negative number for reductions, avoidances, or storage***
See the "Detailed Notes and Explanations" tab for use of this table.

Other Voluntary Renewable Energy Use

Item		Units	Quantity	Notes
User-defined on-site renewable energy use #1	*User-Defined	TBD		
User-defined on-site renewable energy use #2	*User-Defined	TBD		
User-defined renewable energy transportation #1	*User-Defined	TBD		
User-defined renewable energy transportation #2	*User-Defined	TBD		
Voluntary purchase of renewable electricity**		MWh		
Voluntary purchase of RECs**		MWh		

**** Enter units and conversion factors on "User Defined Factors" tab***
***** Complete information on provider in the table to the right. No footprint reductions are associated with the voluntary purchases.***
See the "Detailed Notes and Explanations" tab for use of this table

Off-Site Laboratory Analysis

Parameter and Notes	Number of Samples	Comments
Off-site Laboratory Analysis - VOCs	20	Targeting select intervals near water table
Off-site Laboratory Analysis - Metals	20	Targeting select intervals near water table
Totals	**40**	

Description of purchased renewable electricity (green pricing product or green marketing product)	Provider:	Community Energy
	Type of product:	Electrical Supply
	Type of renewable energy source:	60% wind, 40% small hydrologic
	Date of renewable system installation:	12-May
Description of purchased RECs	Provider:	
	Type of renewable energy source:	
	Date of renewable system installation:	
	Location of renewable system installation:	

Input Worksheet for Groundwater Monitoring

Please specify which Remedy Component this Input worksheet is part of: (Select "Off" to exclude this Input worksheet from calculations and results)	**Component 3**	**Define Component**

General Scope

5/4 quarter comprehensive groundwater sampling and guaging of all wells onsite.

Example Items Eliminated through Screening Process

Other Notes and References

Personnel Transportation

Participant	Number of Roundtrips to Site	Roundtrip Distance to Site (miles)	Mode of Transportation*	Transport Fuel Type*	Total Distance Transported (miles)	Default Fuel Usage Rate**	Fuel Usage Rate Override**	Fuel Used for Personnel Transport**	Activity or Notes
FTS Technician	1	110	Light-Duty/Passenger Truck	Gasoline	110	18.9		5.8	Groundwater Monitoring (2 Personnel)
FTS Technician	1	110	Light-Duty/Passenger Truck	Gasoline	110	18.9		5.8	Groundwater Monitoring (2 Personnel)

** See the "Detailed Notes and Explanations" tab for explanation of transport and fuel options.*

*** for biodiesel, B20, diesel, and gasoline, units are gallons for Fuel Used and miles/gallon for Fuel Usage Rate; for natural gas, units are hundreds of cubic feet (ccf) for Fuel Used and ccf/miles for Fuel Usage Rate; for electricity, units are miles/kWh for Fuel Usage Rate and the kWh (Fuel Used) are added to total grid electricity used (cell G69).*

On-Site Equipment Use and Transportation

Equipment Type*	HP*	Load Factor (%)*	Equipment Fuel Type**	Equipment Fuel Usage Rate	Equipment Hours Operated	Fuel Used for On-site Equipment	Equipment weight (tons)	Number of Equipment Roundtrips to Site	Roundtrip Distance to Site (miles)	Total Distance Transported (miles)	Mode of Transportation	Transport Fuel Type***	Default Transport Fuel Usage Rate (gptm or mpg)	Transport Fuel Usage Rate Override (gptm or mpg)	Fuel Used for Equipment Transport (gallons)	Activity or Notes
Generator - HP varies	5.5	75%	Gasoline	0.000825	40	0.033	0.1	1	110	110	Truck (mpg)	Diesel	6		18.3	
Generator - HP varies	5.5	75%	Gasoline	0.000825	40	0.033	0.1	1	110	110	Truck (mpg)	Diesel	6		18.3	

** HP and Load Factor must be entered by user in Columns C and D. Please see the "Detailed Notes and Explanations" tab for further explanation.*

*** For biodiesel, B20, diesel, gasoline, and liquified petroleum gas, units are gallons for Fuel Used for On-site Equipment and gallons/hr for Equipment Fuel Usage Rate; for compressed natural gas units are ccf (hundreds of cubic feet) for Fuel Used for On-site Equipment and ccf/hr for Equipment Fuel Usage Rate.*

**** Please see the "Detailed Notes and Explanations" tab for instructions on selecting mode of transportation and other aspects of data entry in Columns M, N, and P. Units are gallons for Fuel Used for Equipment Transport and miles/gallon (mpg) or gallons per ton-mile (gptm) for Transport Fuel Usage Rate.*

Input Worksheet for Groundwater Monitoring

Remedy Component that this Input worksheet is part of:	Component 3	Define Component

On-Site Electricity Use

Equipment Type	HP	Load Factor (%)	Efficiency (%)	Electrical Rating (kW)	Hours Used	Energy Used (kWh)	Notes
<Equip. with HP, Efficiency, and Hours>							
<Equip. with HP, Efficiency, and Hours>							
<Equip. with HP, Efficiency, and Hours>							
<Equip. with HP, Efficiency, and Hours>							
<Equip. with known kW rating>							
<Equip. with known kW rating>							
<Equip. with known kW rating>							
<Equip. with known kW rating>							
<Equip. with known total Energy Used>							
<Equip. with known total Energy Used>							
<Equip. with known total Energy Used>							
<Equip. with known total Energy Used>							
Estimated Total Electricity Usage Based on Above						0	
Renewable Electricity Generated On-Site*							
Total Electricity Usage Based on Personnel Transportation						0	
Total Grid Electricity Used						0	

**** Electricity generated on-site from renewable resources, for which the facility retains the rights to the renewable energy (i.e., does not sell renewable energy certificates associated with the renewable energy generation).***

On-Site Natural Gas Use

Equipment Type	Power Rating (Btu/hr)	Efficiency (%)	Hours Used	Energy Required (Btu)	Natural Gas Used (ccf)	Notes
					0	
				0		
Totals			0	0	0	

Landfill Gas Combusted On-Site for Energy Use

Equipment Type	Landfill Gas (ccf)	% Methane by volume	Used for electricity?	Landfill Gas Methane Used (ccf)	Notes
				0	
				0	
				0	
Total				0	

Please see the "Detailed Notes and Explanations" tab for instructions on using the two tables above ("On-site Natural Gas Use" and "Landfill Gas Combusted On-Site for Energy Use"). In the two tables above, ccf = hundreds of cubic feet.

Materials Use and Transportation

Material Type*	Unit	Quantity	Tons	Is the Material Refined or Unrefined?**	Material Source: Virgin, Recycled, or Reused?**	Calculate Item Footprint?**	Default One-way Distance to Site (miles)	One-way Distance to Site Override (miles)	Number of One-way Trips to Site	Include Return Trip in Calculations?	Total Distance Transported (miles)	Mode of Transportation***	Transport Fuel Type	Default Transport Fuel Usage Rate (gptm or mpg)	Transport Fuel Usage Rate Override (gptm or mpg)	Fuel Used for Materials Transport (gallons)	Notes and Description of Materials
HDPE	lb	100	0.05	Refined	Virgin	No	500	30	1	No	30	Truck (mpg)	Diesel	6		5.000	Tubing for GW sampling
Other refined construction materials	lb	500	0.25	Refined	Virgin	Yes	500	100		Yes	100	Truck (mpg)	Diesel	6		16.667	Compressed Air (transport)
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														

**** Please see the "Detailed Notes and Explanations" tab for instructions on specifying "User-Defined Materials" in the dropdown menu.***

***** Selections must be made in Columns F - H in order for the footprint calculations to be performed. Please see the "Detailed Notes and Explanations" tab for further information.***

****** Please see the "Detailed Notes and Explanations" tab for instructions on selecting mode of transportation, accounting for empty return trips, and other aspects of data entry in Columns L, N, O, and Q. Units are gallons for Fuel Used for Materials Transport and miles/gallon (mpg) or gallons per ton-mile (gptm) for Transport Fuel Usage Rate.***

Input Worksheet for Groundwater Monitoring

Remedy Component that this Input worksheet is part of:	Component 3	Define Component

Waste Disposal and Transportation

Waste Destination*	Unit	Quantity	Tons	Default One-way Distance to Site (miles)	One-way Distance to Site Override (miles)	Number of One-way Trips to Site	Include Return Trip in Calculations?	Total Distance Transported (miles)	Mode of Transportation**	Transport Fuel Type	Default Transport Fuel Usage Rate (gptm or mpg)	Transport Fuel Usage Rate Override (gptm or mpg)	Fuel Used for Waste Transport (gallons)	Notes and Description of Waste
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											

**** No footprint is calculated for the Recycled/Reused On-Site and Off-Site selections. Please see the "Detailed Notes and Explanations" tab for instructions on specifying "User-Defined" selections in the dropdown menu.***

***** Please see the "Detailed Notes and Explanations" tab for instructions on selecting mode of transportation, accounting for empty return trips, and other aspects of data entry in Columns I, K, L, and N. Units are gallons for Fuel Used for Waste Transport and miles/gallon (mpg) or gallons per ton-mile (gptm) for Transport Fuel Usage Rate.***

Type of Water Used

Source of Water Used*	Unit	Quantity	Tons	Source Location/Aquifer (optional)	Quality of Water Used (optional)	Water Uses (optional)	Fate of Used Water (optional)
Public Water	gal x 1000	0.2	0.834	Fire Hydrant (Town of Brookhaven)	Public Utilities	Decontamination procedures	Returned to Aquifer
			0				
			0				
			0				
			0				
			0				
			0				
			0				
			0				
			0				
			0				

**** Only the "Public Water" selection has an associated footprint. No footprint is calculated for the other water source selections.***

Note: Information entered in Columns F - V (Source/Quality/Use/Fate) is not compiled or reported by SEFA.

Input Worksheet for Groundwater Monitoring

Remedy Component that this Input worksheet is part of:	Component 3	Define Component

Other Energy Use and Air Emissions

Item		Units	Quantity	Notes
On-Site				
User-defined on-site conventional energy use #1	*User-Defined	TBD		
User-defined on-site conventional energy use #2	*User-Defined	TBD		
On-site HAP process emissions**		lbs		
On-site GHG emissions**		lbs CO2e		
On-site carbon storage**		lbs CO2e		
Landfill gas flared on-site		ccf CH4		
Other on-site NOx emissions or reductions**		lbs		
Other on-site SOx emissions or reductions**		lbs		
Other on-site PM emissions or reductions**		lbs		
Transportation		Units	Quantity	Notes
User-defined conventional energy transportation #1	*User-Defined	TBD		
User-defined conventional energy transportation #2	*User-Defined	TBD		

**** Enter units and conversion factors on "User Defined Factors" tab***
***** Enter a positive number for emissions and a negative number for reductions, avoidances, or storage***
See the "Detailed Notes and Explanations" tab for use of this table.

Other Voluntary Renewable Energy Use

Item		Units	Quantity	Notes
User-defined on-site renewable energy use #1	*User-Defined	TBD		
User-defined on-site renewable energy use #2	*User-Defined	TBD		
User-defined renewable energy transportation #1	*User-Defined	TBD		
User-defined renewable energy transportation #2	*User-Defined	TBD		
Voluntary purchase of renewable electricity**		MWh		
Voluntary purchase of RECs**		MWh		

**** Enter units and conversion factors on "User Defined Factors" tab***
***** Complete information on provider in the table to the right. No footprint reductions are associated with the voluntary purchases.***
See the "Detailed Notes and Explanations" tab for use of this table

Off-Site Laboratory Analysis

Parameter and Notes	Number of Samples	Comments
Totals	**0**	

Description of purchased renewable electricity (green pricing product or green marketing product)	Provider:	Community Energy
	Type of product:	Electrical Supply
	Type of renewable energy source:	60% wind, 40% small hydrologic
	Date of renewable system installation:	May-12
Description of purchased RECs	Provider:	
	Type of renewable energy source:	
	Date of renewable system installation:	
	Location of renewable system installation:	

Input Worksheet for O&M

Please specify which Remedy Component this Input worksheet is part of: (Select "Off" to exclude this Input worksheet from calculations and results)	**Component 4**	**Define Component**

General Scope

Montly O&M for both GWE&T systems. Both visits completed in a single trip.

Example Items Eliminated through Screening Process

Other Notes and References

Personnel Transportation

Participant	Number of Roundtrips to Site	Roundtrip Distance to Site (miles)	Mode of Transportation*	Transport Fuel Type*	Total Distance Transported (miles)	Default Fuel Usage Rate**	Fuel Usage Rate Override**	Fuel Used for Personnel Transport**	Activity or Notes
FTS Technician	12	110	Light-Duty/Passenger Truck	Gasoline	1320	18.9		69.8	Montly O&M

** See the "Detailed Notes and Explanations" tab for explanation of transport and fuel options.*

*** for biodiesel, B20, diesel, and gasoline, units are gallons for Fuel Used and miles/gallon for Fuel Usage Rate; for natural gas, units are hundreds of cubic feet (ccf) for Fuel Used and ccf/miles for Fuel Usage Rate; for electricity, units are miles/kWh for Fuel Usage Rate and the kWh (Fuel Used) are added to total grid electricity used (cell G69).*

On-Site Equipment Use and Transportation

Equipment Type*	HP*	Load Factor (%)*	Equipment Fuel Type**	Equipment Fuel Usage Rate	Equipment Hours Operated	Fuel Used for On-site Equipment	Equipment weight (tons)	Number of Equipment Roundtrips to Site	Roundtrip Distance to Site (miles)	Total Distance Transported (miles)	Mode of Transportation	Transport Fuel Type***	Default Transport Fuel Usage Rate (gptm or mpg)	Transport Fuel Usage Rate Override (gptm or mpg)	Fuel Used for Equipment Transport (gallons)	Activity or Notes

** HP and Load Factor must be entered by user in Columns C and D. Please see the "Detailed Notes and Explanations" tab for further explanation.*

*** For biodiesel, B20, diesel, gasoline, and liquified petroleum gas, units are gallons for Fuel Used for On-site Equipment and gallons/hr for Equipment Fuel Usage Rate; for compressed natural gas units are ccf (hundreds of cubic feet) for Fuel Used for On-site Equipment and ccf/hr for Equipment Fuel Usage Rate.*

**** Please see the "Detailed Notes and Explanations" tab for instructions on selecting mode of transportation and other aspects of data entry in Columns M, N, and P. Units are gallons for Fuel Used for Equipment Transport and miles/gallon (mpg) or gallons per ton-mile (gptm) for Transport Fuel Usage Rate.*

Input Worksheet for O&M

Remedy Component that this Input worksheet is part of:	Component 4	Define Component

On-Site Electricity Use

Equipment Type	HP	Load Factor (%)	Efficiency (%)	Electrical Rating (kW)	Hours Used	Energy Used (kWh)	Notes
<Equip. with HP, Efficiency, and Hours>							
<Equip. with HP, Efficiency, and Hours>							
<Equip. with HP, Efficiency, and Hours>							
<Equip. with HP, Efficiency, and Hours>							
<Equip. with known kW rating>							
<Equip. with known kW rating>							
<Equip. with known kW rating>							
<Equip. with known kW rating>							
OMP O&M System						303840	Total based on monthly electrical bills.
LAI GWE&T System						100000	Total based on monthly electrical bills.
<Equip. with known total Energy Used>							
<Equip. with known total Energy Used>							
					Estimated Total Electricity Usage Based on Above	403840	
					Renewable Electricity Generated On-Site*		
					Total Electricity Usage Based on Personnel Transportation	0	
					Total Grid Electricity Used	403840	

**** Electricity generated on-site from renewable resources, for which the facility retains the rights to the renewable energy (i.e., does not sell renewable energy certificates associated with the renewable energy generation).***

On-Site Natural Gas Use

Equipment Type	Power Rating (Btu/hr)	Efficiency (%)	Hours Used	Energy Required (Btu)	Natural Gas Used (ccf)	Notes
					0	
				0		
			Totals	0	0	0

Landfill Gas Combusted On-Site for Energy Use

Equipment Type	Landfill Gas (ccf)	% Methane by volume	Used for electricity?	Landfill Gas Methane Used (ccf)	Notes
				0	
				0	
				0	
			Total	0	

Please see the "Detailed Notes and Explanations" tab for instructions on using the two tables above ("On-site Natural Gas Use" and "Landfill Gas Combusted On-Site for Energy Use"). In the two tables above, ccf = hundreds of cubic feet.

Materials Use and Transportation

Material Type*	Unit	Quantity	Tons	Is the Material Refined or Unrefined?**	Material Source: Virgin, Recycled, or Reused?**	Calculate Item Footprint?**	Default One-way Distance to Site (miles)	One-way Distance to Site Override (miles)	Number of One-way Trips to Site	Include Return Trip in Calculations?	Total Distance Transported (miles)	Mode of Transportation* **	Transport Fuel Type	Default Transport Fuel Usage Rate (gptm or mpg)	Transport Fuel Usage Rate Override (gptm or mpg)	Fuel Used for Materials Transport (gallons)	Notes and Description of Materials
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														

**** Please see the "Detailed Notes and Explanations" tab for instructions on specifying "User-Defined Materials" in the dropdown menu.***

***** Selections must be made in Columns F - H in order for the footprint calculations to be performed. Please see the "Detailed Notes and Explanations" tab for further information.***

****** Please see the "Detailed Notes and Explanations" tab for instructions on selecting mode of transportation, accounting for empty return trips, and other aspects of data entry in Columns L, N, O, and Q. Units are gallons for Fuel Used for Materials Transport and miles/gallon (mpg) or gallons per ton-mile (gptm) for Transport Fuel Usage Rate.***

Input Worksheet for O&M

Remedy Component that this Input worksheet is part of:	Component 4	Define Component

Waste Disposal and Transportation

Waste Destination*	Unit	Quantity	Tons	Default One-way Distance to Site (miles)	One-way Distance to Site Override (miles)	Number of One-way Trips to Site	Include Return Trip in Calculations?	Total Distance Transported (miles)	Mode of Transportation**	Transport Fuel Type	Default Transport Fuel Usage Rate (gptm or mpg)	Transport Fuel Usage Rate Override (gptm or mpg)	Fuel Used for Waste Transport (gallons)	Notes and Description of Waste
Off-site non-hazardous waste landfill	tons	1	1	25	150	1	No	150	Truck (mpg)	Diesel	6		25.0	Spent Carbon (Annual)
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											

**** No footprint is calculated for the Recycled/Reused On-Site and Off-Site selections. Please see the "Detailed Notes and Explanations" tab for instructions on specifying "User-Defined" selections in the dropdown menu.***

***** Please see the "Detailed Notes and Explanations" tab for instructions on selecting mode of transportation, accounting for empty return trips, and other aspects of data entry in Columns I, K, L, and N. Units are gallons for Fuel Used for Waste Transport and miles/gallon (mpg) or gallons per ton-mile (gptm) for Transport Fuel Usage Rate.***

Type of Water Used

Source of Water Used*	Unit	Quantity	Tons	Source Location/Aquifer (optional)	Quality of Water Used (optional)	Water Uses (optional)	Fate of Used Water (optional)
			0				
			0				
			0				
			0				
			0				
			0				
			0				
			0				
			0				
			0				
			0				
			0				

**** Only the "Public Water" selection has an associated footprint. No footprint is calculated for the other water source selections.***

Note: Information entered in Columns F - V (Source/Quality/Use/Fate) is not compiled or reported by SEFA.

Input Worksheet for O&M

Remedy Component that this Input worksheet is part of:	Component 4	Define Component

Other Energy Use and Air Emissions

Item		Units	Quantity	Notes
On-Site				
User-defined on-site conventional energy use #1	*User-Defined	TBD		
User-defined on-site conventional energy use #2	*User-Defined	TBD		
On-site HAP process emissions**		lbs		
On-site GHG emissions**		lbs CO2e		
On-site carbon storage**		lbs CO2e		
Landfill gas flared on-site		ccf CH4		
Other on-site NOx emissions or reductions**		lbs		
Other on-site SOx emissions or reductions**		lbs		
Other on-site PM emissions or reductions**		lbs		
Transportation		**Units**	**Quantity**	**Notes**
User-defined conventional energy transportation #1	*User-Defined	TBD		
User-defined conventional energy transportation #2	*User-Defined	TBD		

**** Enter units and conversion factors on "User Defined Factors" tab***
***** Enter a positive number for emissions and a negative number for reductions, avoidances, or storage***
See the "Detailed Notes and Explanations" tab for use of this table.

Other Voluntary Renewable Energy Use

Item		Units	Quantity	Notes
User-defined on-site renewable energy use #1	*User-Defined	TBD		
User-defined on-site renewable energy use #2	*User-Defined	TBD		
User-defined renewable energy transportation #1	*User-Defined	TBD		
User-defined renewable energy transportation #2	*User-Defined	TBD		
Voluntary purchase of renewable electricity**		MWh		
Voluntary purchase of RECs**		MWh		

**** Enter units and conversion factors on "User Defined Factors" tab***
***** Complete information on provider in the table to the right. No footprint reductions are associated with the voluntary purchases.***
See the "Detailed Notes and Explanations" tab for use of this table

Off-Site Laboratory Analysis

Parameter and Notes	Number of Samples	Comments
Off-site Laboratory Analysis - VOCs	24	Monthly O&M (LAI & OMP)
Off-site Laboratory Analysis - Metals	24	Monthly O&M (LAI & OMP)
Off-site Laboratory Analysis - Alkalinity	24	Monthly O&M (LAI & OMP)
Off-site Laboratory Analysis - Nitrogen/Nitrate	24	Monthly O&M (LAI & OMP)
Off-site Laboratory Analysis - Other	24	Monthly O&M (LAI & OMP)
Off-site Laboratory Analysis - Other	12	OMP Air Samples
Totals	**132**	

Description of purchased renewable electricity (green pricing product or green marketing product)	Provider:	Community Energy
	Type of product:	Electrical Supply
	Type of renewable energy source:	60% wind, 40% small hydrologic
	Date of renewable system installation:	May-12
Description of purchased RECs	Provider:	
	Type of renewable energy source:	
	Date of renewable system installation:	
	Location of renewable system installation:	

Input Worksheet for Non routine Site Visits

Please specify which Remedy Component this Input worksheet is part of: (Select "Off" to exclude this Input worksheet from calculations and results)	**Component 5**	**Define Component**

General Scope

Sub-contractor bid-walks, markouts, client meetings etc.

Example Items Eliminated through Screening Process

Other Notes and References

Personnel Transportation

Participant	Number of Roundtrips to Site	Roundtrip Distance to Site (miles)	Mode of Transportation*	Transport Fuel Type*	Total Distance Transported (miles)	Default Fuel Usage Rate**	Fuel Usage Rate Override**	Fuel Used for Personnel Transport**	Activity or Notes
HRP Personnel	6	110	Light-Duty/Passenger Truck	Gasoline	660	18.9		34.9	Sub-contractor bid-walks, markouts, client meetings etc.

** See the "Detailed Notes and Explanations" tab for explanation of transport and fuel options.*

*** for biodiesel, B20, diesel, and gasoline, units are gallons for Fuel Used and miles/gallon for Fuel Usage Rate; for natural gas, units are hundreds of cubic feet (ccf) for Fuel Used and ccf/miles for Fuel Usage Rate; for electricity, units are miles/kWh for Fuel Usage Rate and the kWh (Fuel Used) are added to total grid electricity used (cell G69).*

On-Site Equipment Use and Transportation

Equipment Type*	HP*	Load Factor (%)*	Equipment Fuel Type**	Equipment Fuel Usage Rate	Equipment Hours Operated	Fuel Used for On-site Equipment	Equipment weight (tons)	Number of Equipment Roundtrips to Site	Roundtrip Distance to Site (miles)	Total Distance Transported (miles)	Mode of Transportation	Transport Fuel Type***	Default Transport Fuel Usage Rate (gptm or mpg)	Transport Fuel Usage Rate Override (gptm or mpg)	Fuel Used for Equipment Transport (gallons)	Activity or Notes

** HP and Load Factor must be entered by user in Columns C and D. Please see the "Detailed Notes and Explanations" tab for further explanation.*

*** For biodiesel, B20, diesel, gasoline, and liquified petroleum gas, units are gallons for Fuel Used for On-site Equipment and gallons/hr for Equipment Fuel Usage Rate; for compressed natural gas units are ccf (hundreds of cubic feet) for Fuel Used for On-site Equipment and ccf/hr for Equipment Fuel Usage Rate.*

**** Please see the "Detailed Notes and Explanations" tab for instructions on selecting mode of transportation and other aspects of data entry in Columns M, N, and P. Units are gallons for Fuel Used for Equipment Transport and miles/gallon (mpg) or gallons per ton-mile (gptm) for Transport Fuel Usage Rate.*

Input Worksheet for Non routine Site Visits

Remedy Component that this Input worksheet is part of:	Component 5	Define Component

On-Site Electricity Use

Equipment Type	HP	Load Factor (%)	Efficiency (%)	Electrical Rating (kW)	Hours Used	Energy Used (kWh)	Notes
<Equip. with HP, Efficiency, and Hours>							
<Equip. with HP, Efficiency, and Hours>							
<Equip. with HP, Efficiency, and Hours>							
<Equip. with HP, Efficiency, and Hours>							
<Equip. with known kW rating>							
<Equip. with known kW rating>							
<Equip. with known kW rating>							
<Equip. with known kW rating>							
<Equip. with known total Energy Used>							
<Equip. with known total Energy Used>							
<Equip. with known total Energy Used>							
<Equip. with known total Energy Used>							
Estimated Total Electricity Usage Based on Above						0	
Renewable Electricity Generated On-Site*							
Total Electricity Usage Based on Personnel Transportation						0	
Total Grid Electricity Used						0	

**** Electricity generated on-site from renewable resources, for which the facility retains the rights to the renewable energy (i.e., does not sell renewable energy certificates associated with the renewable energy generation).***

On-Site Natural Gas Use

Equipment Type	Power Rating (Btu/hr)	Efficiency (%)	Hours Used	Energy Required (Btu)	Natural Gas Used (ccf)	Notes
					0	
				0		
Totals			0	0	0	

Landfill Gas Combusted On-Site for Energy Use

Equipment Type	Landfill Gas (ccf)	% Methane by volume	Used for electricity?	Landfill Gas Methane Used (ccf)	Notes
				0	
				0	
				0	
Total				0	

Please see the "Detailed Notes and Explanations" tab for instructions on using the two tables above ("On-site Natural Gas Use" and "Landfill Gas Combusted On-Site for Energy Use"). In the two tables above, ccf = hundreds of cubic feet.

Materials Use and Transportation

Material Type*	Unit	Quantity	Tons	Is the Material Refined or Unrefined?**	Material Source: Virgin, Recycled, or Reused?**	Calculate Item Footprint?**	Default One-way Distance to Site (miles)	One-way Distance to Site Override (miles)	Number of One-way Trips to Site	Include Return Trip in Calculations?	Total Distance Transported (miles)	Mode of Transportation***	Transport Fuel Type	Default Transport Fuel Usage Rate (gptm or mpg)	Transport Fuel Usage Rate Override (gptm or mpg)	Fuel Used for Materials Transport (gallons)	Notes and Description of Materials
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														
			0														

**** Please see the "Detailed Notes and Explanations" tab for instructions on specifying "User-Defined Materials" in the dropdown menu.***

***** Selections must be made in Columns F - H in order for the footprint calculations to be performed. Please see the "Detailed Notes and Explanations" tab for further information.***

****** Please see the "Detailed Notes and Explanations" tab for instructions on selecting mode of transportation, accounting for empty return trips, and other aspects of data entry in Columns L, N, O, and Q. Units are gallons for Fuel Used for Materials Transport and miles/gallon (mpg) or gallons per ton-mile (gptm) for Transport Fuel Usage Rate.***

Input Worksheet for Non routine Site Visits

Remedy Component that this Input worksheet is part of:	Component 5	Define Component

Waste Disposal and Transportation

Waste Destination*	Unit	Quantity	Tons	Default One-way Distance to Site (miles)	One-way Distance to Site Override (miles)	Number of One-way Trips to Site	Include Return Trip in Calculations?	Total Distance Transported (miles)	Mode of Transportation**	Transport Fuel Type	Default Transport Fuel Usage Rate (gptm or mpg)	Transport Fuel Usage Rate Override (gptm or mpg)	Fuel Used for Waste Transport (gallons)	Notes and Description of Waste
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											
			0											

**** No footprint is calculated for the Recycled/Reused On-Site and Off-Site selections. Please see the "Detailed Notes and Explanations" tab for instructions on specifying "User-Defined" selections in the dropdown menu.***

***** Please see the "Detailed Notes and Explanations" tab for instructions on selecting mode of transportation, accounting for empty return trips, and other aspects of data entry in Columns I, K, L, and N. Units are gallons for Fuel Used for Waste Transport and miles/gallon (mpg) or gallons per ton-mile (gptm) for Transport Fuel Usage Rate.***

Type of Water Used

Source of Water Used*	Unit	Quantity	Tons	Source Location/Aquifer (optional)	Quality of Water Used (optional)	Water Uses (optional)	Fate of Used Water (optional)
			0				
			0				
			0				
			0				
			0				
			0				
			0				
			0				
			0				
			0				
			0				

**** Only the "Public Water" selection has an associated footprint. No footprint is calculated for the other water source selections.***

Note: Information entered in Columns F - V (Source/Quality/Use/Fate) is not compiled or reported by SEFA.

Input Worksheet for Non routine Site Visits

Remedy Component that this Input worksheet is part of:	Component 5	Define Component

Other Energy Use and Air Emissions

Item		Units	Quantity	Notes
On-Site				
User-defined on-site conventional energy use #1	*User-Defined	TBD		
User-defined on-site conventional energy use #2	*User-Defined	TBD		
On-site HAP process emissions**		lbs		
On-site GHG emissions**		lbs CO2e		
On-site carbon storage**		lbs CO2e		
Landfill gas flared on-site		ccf CH4		
Other on-site NOx emissions or reductions**		lbs		
Other on-site SOx emissions or reductions**		lbs		
Other on-site PM emissions or reductions**		lbs		
Transportation		**Units**	**Quantity**	**Notes**
User-defined conventional energy transportation #1	*User-Defined	TBD		
User-defined conventional energy transportation #2	*User-Defined	TBD		

**** Enter units and conversion factors on "User Defined Factors" tab***
***** Enter a positive number for emissions and a negative number for reductions, avoidances, or storage***
See the "Detailed Notes and Explanations" tab for use of this table.

Other Voluntary Renewable Energy Use

Item		Units	Quantity	Notes
User-defined on-site renewable energy use #1	*User-Defined	TBD		
User-defined on-site renewable energy use #2	*User-Defined	TBD		
User-defined renewable energy transportation #1	*User-Defined	TBD		
User-defined renewable energy transportation #2	*User-Defined	TBD		
Voluntary purchase of renewable electricity**		MWh		
Voluntary purchase of RECs**		MWh		

**** Enter units and conversion factors on "User Defined Factors" tab***
***** Complete information on provider in the table to the right. No footprint reductions are associated with the voluntary purchases.***
See the "Detailed Notes and Explanations" tab for use of this table

Off-Site Laboratory Analysis

Parameter and Notes	Number of Samples	Comments
Totals	**0**	

Description of purchased renewable electricity (green pricing product or green marketing product)	Provider:	Community Energy
	Type of product:	Electrical Supply
	Type of renewable energy source:	60% wind, 40% small hydrologic
	Date of renewable system installation:	May-12
Description of purchased RECs	Provider:	
	Type of renewable energy source:	
	Date of renewable system installation:	
	Location of renewable system installation:	

Fuel Mix for Grid Electricity

Please Select One Option for Fuel Mix --> | **Use Different Fuel Mixes**

Mix per Remedy Component	1	2	3	4	5	6	*Default Fuel Mix
Type of Fuel	% of Total	% of Total	% of Total	% of Total	% of Total	% of Total	% of Total
Coal	30.5%	6.0%	6.0%	6.0%	6.0%	6.0%	30.5%
Natural Gas	33.9%	10.0%	10.0%	10.0%	10.0%	10.0%	33.9%
Oil	0.7%	5.0%	5.0%	5.0%	5.0%	5.0%	0.7%
Nuclear	19.8%	2.0%	2.0%	2.0%	2.0%	2.0%	19.8%
Biomass	1.7%	66.0%	66.0%	66.0%	66.0%	66.0%	1.7%
Geothermal	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%
Hydro	6.4%	11.0%	11.0%	11.0%	11.0%	11.0%	6.4%
Solar	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%
Wind	5.6%	0.0%	0.0%	0.0%	0.0%	0.0%	5.6%
Other (enter information in table below)	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	100%

U.S. national average fuel mix from 2016 is noted in Column N, and is populated as the default fuel mix in Column B.
For use of this worksheet, please see instructions at the end of the worksheet.

**** The Default Fuel Mix noted in Column N is a simplified representation of the U.S. national average fuel mix from 2016. Column B is also populated with the default fuel mix. The default fuel mix is taken from EPA's "eGRID2016 - Year 2016 Summary Tables", created February 2018.***

Item or Service Used	Unit	User Defined Conversion Factors for "Other" Fuel Type in Fuel Mix table (above) Parameters Used, Extracted, Emitted, or Generated: Energy (MMBtu/MWh)	GHG (lbs CO2e/MWh)	NOx (lbs/MWh)	SOx (lbs/MWh)	PM (lbs/MWh)	Air Toxics (lbs/MWh)	Ref
Electricity generation with "Other" fuel	MWh							
Fuel extraction & processing for "Other" fuel	MWh							

"MMBtu" = millions of Btus

"MWh" = megawatt hours (i.e., thousands of kilowatt-hours or millions of Watt-hours)

Please fill in all yellow cells in the User Defined Conversion Factors table above

Notes and References

Instructions for "Grid Electricity" tab

Overview of Grid Electricity

Use this worksheet to define the fuel mix for grid electricity used at your site. The fuel mix is the percentage of the various energy sources (natural gas, coal, nuclear, hydro, etc.) used to generate the grid electricity. SEFA uses this fuel mix to calculate the footprint from generation of the grid electricity. SEFA provides a default fuel mix for grid electricity in Rows 9 - 19 (Column B) of on this worksheet. This fuel mix is an average for the U.S. in 2016. The fuel mix for grid electricity can vary greatly from locale to locale. The fuel mix for the grid electricity at your site may have a footprint significantly larger or smaller than this average. If you have high electricity demand at your site, you should research the local grid supplier to determine its fuel mix. Fuel mixes for local grid electricity providers can often be found on the web pages of the providers. Once you determine the fuel mix of the local grid supplier, you may enter it in the table above. Be sure to document the source of information for the local grid mix in the space provided on Row 33.

Notes for Use of this Worksheet

(1) On the "Grid Electricity" tab of the "Input" workbook, you may either (a) enter one fuel mix and specify that it applies to all six of the Remedy Components, or (b) enter unique fuel mixes for each Remedy Component.

(a) To set a single fuel mix for all Remedy Components, choose “Use a Single Fuel Mix” from the drop-down menu in Cell L5, and enter the fuel mix in Column B. This fuel mix will be carried forward to all Remedy Components.

(b) To specify the fuel mix individually for each of 6 (or fewer) Remedy Components, choose “Use Different Fuel Mixes” from the drop-down menu in Cell L5, and enter the specific fuel mix for each of the Remedy Components in Columns B - L (depending on how many Remedy Components are used in the analysis).

(c) The entry for each fuel type must be less than 100% and the sum of all entries in each of the Columns B - L must add to 100%.

(d) Note that the default fuel mix (U.S. average in 2016) is also documented in Column N. This allows you to recover this information in the event that you override the default mix originally located in Column B.

(2) When specifying the fuel mix, you have the option to enter an "Other" type of fuel (Row 18 above). If “Other” fuel is specified, then the table on Row 23 above must be filled in to represent the footprint from electricity generation and resource extraction for the “Other” fuel. These entries would be based on research that you conduct. When the table on Row 23 is filled in, it will apply to "Other" fuel sources entered for all Remedy Components (Columns B - L). If the table on Row 23 is not filled in then the footprint from the “Other” portion of the fuel mix will be zero in the SEFA calculations.

(3) Based on the values entered in the tables above, SEFA automatically calculates the footprint conversion factors for the grid electricity (in the “Grid Electricity Conversions” tab in the “Calculations” workbook), and automatically applies the footprint conversion factors (in the “Components” tabs in the “Calculations” workbook). The footprint conversion factors are applied to the electricity usage that you enter in the “Input Template” tab of the “Input” workbook. Specifically, they are applied to the total grid electricity usage found in Cell G68 of the “Input Template” tab.

For use of this worksheet, please see instructions at the end of the worksheet

User Defined Activity, Material, or Service	Unit	Tons per Unit*	User Defined Conversion Factors — Parameters Used, Extracted, Emitted, or Generated: Energy (MMBtu/unit)	GHG (lbs CO2e/unit)	NOx (lbs NOx/unit)	SOx (lbs SOx/unit)	PM (lbs PM/unit)	HAPs (lbs HAPs/unit)	Ref.	Use this row only for:
User-defined emissions for biodiesel on-site equipment	gal									User-defined emissions for biodiesel on-site equipment
User-defined emissions for diesel on-site equipment	gal									User-defined emissions for diesel on-site equipment
User-defined emissions for gasoline on-site equipment	gal									User-defined emissions for gasoline on-site equipment
User-defined emissions for compressed natural gas on-site eq	ccf									User-defined emissions for compressed natural gas on-site
User-defined emissions for liquified petroleum gas on-site eq	gal									User-defined emissions for liquified petroleum gas on-site
User-defined emissions for natural gas on-site equipment	ccf									User-defined emissions for natural gas on-site equipment
User-defined emissions for biodiesel transportation	gal									User-defined emissions for biodiesel transportation
User-defined emissions for diesel transportation	gal									User-defined emissions for diesel transportation
User-defined emissions for gasoline transportation	gal									User-defined emissions for gasoline transportation
User-defined emissions for natural gas transportation	ccf									User-defined emissions for natural gas transportation

Note: Entering user-defined emission conversion factors in Rows 7 - 16 will override default conversion factors for all emissions calculations of the same fuel/use throughout the SEFA workbooks.

User-defined material #1	TBD	TBD								User-defined material #1
User-defined material #2	TBD	TBD								User-defined material #2
User-defined material #3	TBD	TBD								User-defined material #3
User-defined material #4	TBD	TBD								User-defined material #4
User-defined material #5	TBD	TBD								User-defined material #5
User-defined material #6	TBD	TBD								User-defined material #6
User-defined material #7	TBD	TBD								User-defined material #7
User-defined material #8	TBD	TBD								User-defined material #8
User-defined material #9	TBD	TBD								User-defined material #9
User-defined material #10	TBD	TBD								User-defined material #10
User-defined material #11	TBD	TBD								User-defined material #11
User-defined material #12	TBD	TBD								User-defined material #12
User-defined material #13	TBD	TBD								User-defined material #13
User-defined material #14	TBD	TBD								User-defined material #14
User-defined material #15	TBD	TBD								User-defined material #15
User-defined material #16	TBD	TBD								User-defined material #16
User-defined material #17	TBD	TBD								User-defined material #17
User-defined material #18	TBD	TBD								User-defined material #18
User-defined material #19	TBD	TBD								User-defined material #19
User-defined material #20	TBD	TBD								User-defined material #20

Item or Service Used	Unit	Tons per Unit*	Energy (MMBtu/unit)	GHG (lbs CO2e/unit)	NOx (lbs NOx/unit)	SOx (lbs SOx/unit)	PM (lbs PM/unit)	HAPs (lbs HAPs/unit)	Ref.	Use this row only for:
User-defined recycled/reused on-site #1	TBD	TBD								User-defined recycled/reused on-site #1
User-defined recycled/reused on-site #2	TBD	TBD								User-defined recycled/reused on-site #2
User-defined recycled/reused on-site #3	TBD	TBD								User-defined recycled/reused on-site #3
User-defined recycled/reused off-site #1	TBD	TBD								User-defined recycled/reused off-site #1
User-defined recycled/reused off-site #2	TBD	TBD								User-defined recycled/reused off-site #2
User-defined recycled/reused off-site #3	TBD	TBD								User-defined recycled/reused off-site #3
User-defined non-hazardous waste destination #1	TBD	TBD								User-defined non-hazardous waste destination #1
User-defined non-hazardous waste destination #2	TBD	TBD								User-defined non-hazardous waste destination #2
User-defined non-hazardous waste destination #3	TBD	TBD								User-defined non-hazardous waste destination #3
User-defined hazardous waste destination #1	TBD	TBD								User-defined hazardous waste destination #1
User-defined hazardous waste destination #2	TBD	TBD								User-defined hazardous waste destination #2
User-defined hazardous waste destination #3	TBD	TBD								User-defined hazardous waste destination #3

Item or Service Used	Unit	Tons per Unit*	Energy (MMBtu/unit)	GHG (lbs CO2e/unit)	NOx (lbs/unit)	SOx (lbs/unit)	PM (lbs/unit)	HAPs (lbs/unit)	Ref.	Use this row only for:
User-defined on-site conventional energy use #1	TBD									User-defined on-site conventional energy use #1
User-defined on-site conventional energy use #2	TBD									User-defined on-site conventional energy use #2
User-defined conventional energy transportation #1	TBD									User-defined conventional energy transportation #1
User-defined conventional energy transportation #2	TBD									User-defined conventional energy transportation #2
User-defined on-site renewable energy use #1	TBD									User-defined on-site renewable energy use #1
User-defined on-site renewable energy use #2	TBD									User-defined on-site renewable energy use #2
User-defined renewable energy transportation #1	TBD									User-defined renewable energy transportation #1
User-defined renewable energy transportation #2	TBD									User-defined renewable energy transportation #2
User-defined water resource #1	gal x 1000									User-defined water resource #1
User-defined water resource #2	gal x 1000									User-defined water resource #2

** "Tons per unit" refers to how many tons there are per unit of the material (e.g., 1 pound is 1/2000 of a ton or 0.0005 tons per unit)*

"MMBtu" = millions of Btus

Fuel Usage Rate							
User Defined Vehicles in Mode of Personnel Transportation	B20 mpg or pmpg	Biodiesel mpg or pmpg	Diesel mpg or pmpg	Electricity mpkWh	Gasoline mpg	Natural Gas mpccf	Ref.
User Defined Vehicle #1							
User Defined Vehicle #2							
User Defined Vehicle #3							
User Defined Vehicle #4							
User Defined Vehicle #5							

User Defined Vehicle #1	User Defined Vehicle #1
User Defined Vehicle #2	User Defined Vehicle #2
User Defined Vehicle #3	User Defined Vehicle #3
User Defined Vehicle #4	User Defined Vehicle #4
User Defined Vehicle #5	User Defined Vehicle #5

"mpg" = miles per gallon; "pmpg" = passenger miles per gallon; "mpkWh" = miles per kilowatt hour; "mpccf" = miles per 100 cubic feet"

Fuel Usage Rate				
User Defined Vehicles in Mode of Transportation for Equipment, Materials, and Waste	B20 mpg or gptm	Biodiesel mpg or gptm	Diesel mpg or gptm	Ref.
User Defined Vehicle #1				
User Defined Vehicle #2				
User Defined Vehicle #3				
User Defined Vehicle #4				
User Defined Vehicle #5				

User Defined Vehicle #1	User Defined Vehicle #1
User Defined Vehicle #2	User Defined Vehicle #2
User Defined Vehicle #3	User Defined Vehicle #3
User Defined Vehicle #4	User Defined Vehicle #4
User Defined Vehicle #5	User Defined Vehicle #5

Instructions for "User Defined Factors" tab

Overview of User Defined Factors

Use this worksheet for user-defined footprint conversion factors for materials and activities that are unique to your site, and are not already provided in the "Input Template" tab of the "Input" workbook. Unique conversion factors can be established for the following:

(a) Combustion of fuels (both conventional and renewable) for transportation and on-site equipment

(b) Manufacturing or processing of materials

(c) Management and recycling of wastes

(d) Use of conventional and renewable energy

(e) Water resources

(f) Vehicles for personnel transportation

(g) Vehicles for equipment, materials, and waste transportation

In establishing these unique conversion factors, you must research and document the data, and enter it into the tables as follows:

(a) For the tables in Rows 4 - 71, enter the item name in Column A, the units you would like to use for the item in Column B, the factor for converting the specified units to tons in Column C. Enter the footprint conversion factors in Columns D - N.

(b) For the tables in Rows 75 - 89, enter the item name in Column A and fuel usage rates in Columns C - L. You need enter fuel usage rates only for those types of fuel that pertain to the vehicles entered in Column A. SEFA will apply default footprint conversion factors for combustion of fuels associated with user-defined vehicles in Rows 75 - 89.

After you have entered an item and its conversion factors or fuel usage rate, you may select (or view) the item in the corresponding table on the "Input Template" tabs in the "Input" workbook. Once you enter the quantity of the item in an "Input Template" tab, SEFA will include the item in the footprint analysis, and will automatically apply the conversion factors or fuel usage rates in the "Calculations" workbook.

For the tables in Rows 4 - 71, the conversion factors in Column D - N represent the amount of energy required for, and the amount of GHG, NOx, SOx, PM, and HAPs air emissions related to, the combustion of fuels, the off-site production of materials, the off-site management of waste, the use of energy, and the provision of water resources. Note that SEFA is equipped with default footprint conversion factors for a variety of materials and activities. These default conversion factors can be viewed in the "Default Conversions" tab of the "Calculations" workbook and are applied automatically in the "Calculations" workbook. You may want to view these default conversion factors before deciding whether to create a user-defined item with unique conversion factors.

How to Set Up User Defined Factors on This Worksheet

This section describes the general approach for setting up user defined factors. See the next four sections for specific examples for each type of user-defined factor.

(1) Column A: You are encouraged to enter descriptive names for the fuels, materials, waste processes, energy usage, water resources, or vehicles in Column A. Once entered, the new names will appear in the respective drop-down menus or data entry cell in the "Input" tab.

(2) Columns B and C: Entries in Columns B and C depend on the item being represented.

(a) For materials and wastes (Rows 18-37), you must enter the units for the item in Column B, and the conversion factor for tons in Column C.
Additional notes:

(i) Conversion to tons is necessary for summing of diverse materials or wastes (performed automatically in the SEFA workbooks) to arrive at the total materials usage or waste generation reported in the "Summary" tab in the "Main" workbook.

(ii) Conversion to tons is also necessary for calculations of fuel required for transport of materials or waste (performed automatically in the SEFA workbooks), when transport using units of "Gallons per Ton-Mile" is selected in the "Input Template" tab.

(b) For combustion of fuels (Rows 7 - 16), you must enter the units for the item in Column B, but you are not required to enter a conversion factor in Column C. The conversions for tons/gal and tons/ccf for these fuels are standard values set by default in SEFA.

(c) For energy (Rows 54 - 61), you must enter the units for the item in Column B, but you are not required to enter a conversion factor in Column C. The conversion for tons per unit is not needed in the SEFA calculations, because the items do not directly affect the amounts of materials or wastes, or the calculations of fuel used for transport.

(d) For water resources (Rows 62 & 63, units are "gallons x 1000" as shown in Column B. You are not required to enter a conversion factor in Column C.

(3) Column D: Entries in Column D depend on the item being represented.

(a) For materials, waste, energy usage, and water resources (Rows 18 - 63) enter in Column D the amount of energy (in Btus/unit), associated with the item.

(b) For combustion of fuels (Rows 7 - 16), you are not required to enter the amount of energy (in Btu/unit) in Column D. The energy content in Btu/gal and Btu/ccf for these fuels are standard values set by default in SEFA.

(4) Columns F - N: For fuels, materials, waste, energy usage, and water resources (Rows 7 - 63 fill in new row numbers), enter the footprint conversion factors for GHG, NOx, SOx, PM, and HAPs in Column F - N. These are footprint conversion factors that you have obtained through your own research. The conversion factors must be based on the units in Column B.

(5) Column O: Provide a reference number in Column O. (Reference numbers should be placed in Column N and Column H for vehicles in the tables beginning on Rows 68 and 77, respectively.) Full references for footprint conversion factors or fuel usage rates can be added in the open space below the table.

(6) Columns P - T: The entries in these columns reiterate the original text in Column A, to document the purpose of each of the rows. (The original entry in Column A disappears once you enter a unique item in that Column.) Do not use any row in this table for a purpose other than that described in Columns P - T. For example, do not enter a fuel combustion item in Rows 16 - 35 (designated for materials manufacturing) or Rows 38 - 49 (designated for waste management). (These entries are found in Columns N - P and Columns H - L for vehicles in the tables beginning on Rows 68 and 77, respectively.)

Examples for Rows 18 - 37 (Manufacturing or processing of materials)

You may want to add to the footprint analysis a material not found in SEFA. You should first check the drop-down menu in Column A of the “Materials Use and Transportation” table on Row 65 of the “Input Template” tab in the “Input” workbook. If the material is not already in the drop-down menu, you may add the material name and its footprint conversion factors in Rows 16 - 35 in the "User Defined Factors" tab (above). You may also want to add a user-defined material to provide unique (more accurate) footprint conversion factors for a material already included in the drop-down menu.

(1) For example, composite siding is not found in the drop-down menu. If composite siding is used on-site (e.g., for weatherproofing buildings), you may want to add it to the drop-down menu. To do this, enter “Composite siding” in Column A above. Column B might be “lbs” (of the siding) and Column C would be “0.0005”, the conversion factor from lbs to tons. The footprint conversion factors in Columns D - N would represent the energy required, and the GHG, NOx, SOx, PM, and HAPs emissions to air, associated with the off-site manufacture of the composite siding. The entry in Column D would be in units of MMBtu/lb (that is, MMBtu energy required per lb composite siding manufactured), Column F would be in units of lbs CO2e/lb (that is, lbs CO2e emissions per lb composite siding manufactured), Column H would be lbs NOx/lb, etc.

(2) As another example, instead of using “Other treatment chemicals & materials” from the drop-down menu, you may want to add to the drop-down menu a unique treatment chemical used at your site. To do this, you would enter the name of the treatment chemical in Column A above. Column B might be “gallons” (of treatment chemical) and Column C might be 0.004 tons per gallons (depending on the density of the treatment chemical). The footprint conversion factors in Columns D - N would represent the energy required, and the GHG, NOx, SOx, PM, and HAPs emissions to air, associated with the production of the treatment chemical. The entry in Column D would be in units of MMBtu/gallon (that is, MMBtu energy required per gallon treatment chemical produced), the entry in Column F would be in units of lbs CO2e/gallon (that is, lbs CO2e emissions per gallon treatment chemical produced), Column H would be lbs NOx/gallon, etc.

Once the user-defined material has been entered above, you may return to the “Materials Use and Transportation” table in the "Input Template" tab, select the newly added material from the drop-down menu in Column A, and enter the quantity of the material used at your site. All entries made in Rows 18 - 37 above are considered in SEFA as part of the off-site footprint.

Examples for Rows 39 - 51 (Management and recycling of wastes)

You may want to add to the footprint analysis a waste management or recycling process not found in SEFA. You should first check the drop-down menu in Column A of the “Waste Disposal and Transportation” table on Row 90 of the “Input Template” tab in the “Input” workbook. If the waste or recycling process is not already in the drop-down menu, you may add the process and its footprint conversion factors in Rows 39 - 51 in the "User Defined Factors" tab (above). You may also want to add a user-defined waste destination to provide unique (more accurate) footprint conversion factors for a waste destination or process already included in the drop-down

(1) For example, anaerobic digestion is not found in the drop-down menu. If waste from your site is being sent to an off-site anaerobic digester, you may want to add it to the drop-down menu. To do this, enter “Anaerobic digester” in Column A above. Column B might be “tons” (of waste) and Column C would be “1”, the conversion factor from tons to tons. The footprint conversion factors in Columns D - N would represent the energy required, and the GHG, NOx, SOx, PM, and HAPs emissions to air, associated with anaerobic digestion of the waste. The entry in Column D would be in units of MMBtu/ton (that is, MMBtu energy required per ton of waste undergoing anaerobic digestion), Column F would be in units of lbs CO2e/ton (that is, lbs CO2e emissions per ton of waste undergoing anaerobic digestion), Column H would be lbs NOx/ton, etc.

(2) As another example, instead of using “Non-hazardous waste landfill” from the drop-down menu, you may want to add to the drop-down menu a local landfill that uses energy-saving processes and equipment. To do this, you would enter the name of the landfill in Column A above. Column B might be “tons” (of waste) and Column C would be “1”, the conversion factor from tons to tons. The footprint conversion factors in Columns D - N would represent the energy required, and the GHG, NOx, SOx, PM, and HAPs emissions to air, associated with the managing the waste at the landfill. The entry in Column D would be in units of MMBtu/ton (that is, MMBtu energy required per ton of waste managed), the entry in Column F would be in units of lbs CO2e/ton (that is, lbs CO2e emissions per ton of waste managed), Column H would be lbs NOx/ton, etc.

Once the user-defined waste destination has been entered above, you may return to the “Waste Disposal and Transportation” table in the "Input Template" tab, select the newly added waste destination or process from the drop-down menu in Column A, and enter the quantity of the waste sent to the waste disposal or recycling location. Entries made in Rows 40 - 42 above are considered in SEFA as part of the on-site footprint. Entries in Rows 43 - 51 are part of the off-site footprint.

Examples for Rows 54 - 61 (Use of conventional and renewable energy)

You may want to add to the footprint analysis an energy usage not found in SEFA. Inputs for energy usages are found in the tables in Rows 14 - 174 of the "Input Template" tab in the "Input" workbook. If an energy usage at your site is not available in these tables, you may add the name of the energy usage and its footprint conversion factors in Rows 54 - 61 above.

(1) For example, your site may burn fuel oil in a boiler (a conventional fuel used on-site). SEFA does not include this type of energy usage in Rows 14 - 174 of the "Input Template" tab. To model the energy usage of the boiler, use Row 54 or 55 in the table above. Enter the name of the activity in Column A, the units in Column B (for example, gallons of fuel oil), and the footprint conversion factors in Columns D - N. Once the fuel oil usage has been entered above, you may return to the “Input Template” tab, and find the new item represented in Row 150 or 151. Enter the quantity of fuel oil in Cell F150 of F151 of the “Input Template” tab. SEFA will automatically apply the new conversion factors to this item only.

(2) As another example, your site may use personnel transportation vehicles that run on bio-based ethanol (a renewable fuel used in transportation). SEFA does not include this type of energy usage in Rows 14 - 174 of the "Input Template" tab. To model the ethanol vehicles, use Row 60 or 61 in the table above. Enter the name of the activity in Column A, the units in Column B (for example, gallons of ethanol), and the footprint conversion factors in Columns D - N. Once the ethanol usage has been entered above, you may return to the “Input Template” tab, and find the new item represented in Row 171 or 172. Enter the quantity of ethanol in Cell F171 or F172 of the “Input Template” tab. SEFA will automatically apply the new conversion factors to this item only.

(3) In both the examples above, the footprint conversion factors in Columns D - N would represent the energy required, and the GHG, NOx, SOx, PM, and HAPs emissions to air, associated with the combustion of the fuel (either fuel oil or bio-based ethanol). The entry in Column D would be in units of MMBtu/gallon (that is, MMBtu energy per gallon of fuel oil or ethanol combusted), Column F would be in units of lbs CO2e/gallon (that is, lbs CO2e emissions per gallon of fuel oil or ethanol combusted), Column H would be lbs NOx/gallon, etc.

(4) Entries made in Rows 54, 55, 58, and 59 above are considered in SEFA as part of the on-site footprint. Entries made in Rows 56, 57, 60, and 61 above are considered in SEFA as part of the transportation footprint.

(5) SEFA does not provide for separate modelling of the production (e.g., resource extraction or processing of fuel oil or ethanol) of a unique energy source that may be added in Rows 54 - 61 above. Instead, SEFA will use default footprint conversion factors for the fuel type.

Examples for Rows 7 - 16 (Combustion of fuels for transportation and on-site equipment)

You may want to add to the footprint analysis unique conversion factors for combustion of fuels already found in SEFA (such as gasoline, diesel, or biodiesel). This may be of interest if the default conversion factors in SEFA do not accurately represent emissions from equipment or vehicles in use at your site. Default conversion factors are found in the "Default Conversions" tab in the "Calculations" workbook. To include in the analysis unique footprint conversion factors for combustion of fuels (either conventional or renewable) for transportation and on-site equipment, you may add the name of the fuel name and its footprint conversion factors in Rows 7 - 14 .

(1) For example, your site may use on-site diesel equipment that has been retrofitted with particulate filters.. To model the emissions from this equipment, use Row 8 in the table above. Enter the name of the fuel combustion situation in Column A, the units in Column B (for example, gallons of diesel), and the footprint conversion factors in Columns F - N. Once you enter unique conversion factors for this situation in the table above, the factors will override the default conversion factors in SEFA, and SEFA will automatically apply the new factors to all on-site diesel combustion. In this example, the unique footprint conversion factors will be applied to all on-site diesel equipment that you enter into the “Input Template” tab.

(2) As another example, your site may use ultra-low sulfur diesel fuel for transport of materials and waste. To model the emissions from this transportation fuel, use Row 12 in the table above. Enter the name of the fuel combustion situation in Column A, the units in Column B (for example, gallons of diesel), and the footprint conversion factors in Columns F - N. Once you enter unique conversion factors for this situation in the table above, the factors will override the default conversion factors in SEFA, and SEFA will automatically apply the new factors to all transportation diesel usage. In this example, the unique footprint conversion factors will be applied to all diesel transportation (personnel, equipment, materials, and waste) that you enter into the “Input Template” tab.

(3) In both examples above, the footprint conversion factors in Columns F - N would represent the GHG, NOx, SOx, PM, and HAPs emissions to air, associated with the combustion of the fuel. The entry in Column F would be in units of lbs CO2e/gallon (that is, lbs CO2e emissions per gallon diesel combusted), Column H would be lbs NOx/gallon, etc. If natural gas is used, the units would be lbs CO2e/ccf, lbs NOx/ccf, etc.

(4) Entries made in Rows 7 - 12 above are considered in SEFA as part of the on-site footprint. Entries made in Rows 13 - 16 above are considered in SEFA as part of the transportation footprint.

(5) SEFA does not provide for separate modelling of the production (e.g., resource extraction or processing of ultra-low sulfur diesel) of the unique fuel that may be added in Rows 7 - 16 above. Instead, SEFA will used default footprint conversion factors for the fuel type.

Well Material Calculator - 1

Use this tool to calculate the amount of material required for a well of specified type, depth, and diameter. This page is a calculator only and not linked to the "Input" tabs. The user must manually enter the results from the "Materials Required" table below into the appropriate "Input" tab.

Notes on Well Material Calculations - 1:

Well Details - 1	
Type of Well	**Flush-Mount**
Well Casing Material	**SCH 80 Steel Casing**
Total Depth of Well in Feet (from ground surface to bottom of well, including screen)	**220**
Screen Length in Feet	**20**
Well Casing Diameter in Inches	**6-inch**
Stick-up Height in Feet (if applicable)	
Number of Wells	**1**

Materials Required - 1		
Casing Material	**5714**	Pounds
Screen Material	**571**	Pounds
Grout for Annulus (Cement)	**5000**	Pounds
Water for Annulus (to mix cement)	**319**	Gallons
Sand Pack Material (Gravel/Sand)	**780**	Pounds
Soil Cuttings for Disposal	**13420**	Pounds
Grout to Abandon Well(s)	**3080**	Pounds
Water for Grout to Abandon Well(s)	**197**	Gallons

Well Construction Material Factors

	Pounds per Foot of Well Length								
Well Diameter	**SCH 40 PVC Casing**	**SCH 80 PVC Casing**	**SCH 40 Steel Casing**	**SCH 80 Steel Casing**	**USER DEFINED Casing**	**Grout for Annulus**	**Grout to Abandon Well**	**Sand for Annulus**	**Drill Cuttings for Disposal**
2-inch	0.69	0.94	3.65	5.02		13	2	19	22
4-inch	2.03	2.82	10.79	14.98		19	6	29	39
6-inch	3.58	5.38	18.97	28.57		25	14	39	61
8-inch	5.39	8.18	28.55	43.39		32	25	48	87
10-inch	7.64	12.1	40.48	64.43		38	40	58	119
12-inch	10.1	16.7	53.52	88.63		45	57	68	155

Source: Most of the information in the above table is from EPA's "Methodology for Understanding and Reducing a Project's Environmental Footprint," February 2012. Additional material weight factors for Schedule 80 PVC, Schedule 40 Steel, and Schedule 80 Steel, are from "Groundwater and Wells, Second Edition", by Johnson Filtration Systems Inc., 1986.

Note on User Defined Casing: *The "User Defined Casing" feature can be used to calculate the amount of material required for a well constructed of a material or size (schedule) other than the four options provided. To use this feature, select "User Defined Casing" in the "Well Casing Material" drop-down menu in the "Well Details" table, then add the appropriate "pounds per foot of well length" factor to the "User Defined Casing" column of the "Well Construction Materials Factors" table, in the row that corresponds to the well diameter. You must find or develop the unique "pounds per foot of well length" factor for the specific material, schedule, and diameter of pipe. The Well Material Calculator will use this factor to calculate Casing Material required and total Screen Material required. Note that if you select a material for the well casing that is not already included in the library of materials in SEFA, you must also develop emissions factors for the material's production and add these values to the "User Defined Factors" tab. (See the "User Defined Factors" tab for specifics.)*

Notes on Calculations:
- Calculation for screened pipe assumes that the weight of screened pipe is equal to weight of casing.
- Calculations for Grout Material, Sand Pack Material, and Soil Cuttings for Disposal assume annulus around casing has a diameter that is 4 inches larger than the casing.
- Grout values are for weight of unmixed cement, assuming 6 gallons of water is mixed with 94 pounds of neat cement with a blended density of 15 pounds per gallon (generally typical of engineering specifications).
- Drill cutting volume does not include drilling mud for mud rotary drilling.

Well Material Calculator - 2

Use this tool to calculate the amount of material required for a well of specified type, depth, and diameter. This page is a calculator only and not linked to the "Input" tabs. The user must manually enter the results from the "Materials Required" table below into the appropriate "Input" tab.

Notes on Well Material Calculations - 2:

Well Details - 2	
Type of Well	
Well Casing Material	
Total Depth of Well in Feet (from ground surface to bottom of well, including screen)	
Screen Length	
Well Casing Diameter in Inches	
Stick-up Height in Feet (if applicable)	
Number of Wells	

Materials Required - 2		
Casing Material		Pounds
Screen Material		Pounds
Grout for Annulus (Cement)		Pounds
Water for Annulus (to mix cement)		Gallons
Sand Pack Material (Gravel/Sand)		Pounds
Soil Cuttings for Disposal		Pounds
Grout to Abandon Well(s)		Pounds
Water for Grout to Abandon Well(s)		Gallons

Well Construction Material Factors

	Pounds per Foot of Well Length								
Well Diameter	SCH 40 PVC Casing	SCH 80 PVC Casing	SCH 40 Steel Casing	SCH 80 Steel Casing	USER DEFINED Casing	Grout for Annulus	Grout to Abandon Well	Sand for Annulus	Drill Cuttings for Disposal
2-inch	0.69	0.94	3.65	5.02		13	2	19	22
4-inch	2.03	2.82	10.79	14.98		19	6	29	39
6-inch	3.58	5.38	18.97	28.57		25	14	39	61
8-inch	5.39	8.18	28.55	43.39		32	25	48	87
10-inch	7.64	12.1	40.48	64.43		38	40	58	119
12-inch	10.1	16.7	53.52	88.63		45	57	68	155

Source: Most of the information in the above table is from EPA's "Methodology for Understanding and Reducing a Project's Environmental Footprint," February 2012. Additional material weight factors for Schedule 80 PVC, Schedule 40 Steel, and Schedule 80 Steel, are from "Groundwater and Wells, Second Edition", by Johnson Filtration Systems Inc., 1986.

Note on User Defined Casing: *The "User Defined Casing" feature can be used to calculate the amount of material required for a well constructed of a material or size (schedule) other than the four options provided. To use this feature, select "User Defined Casing" in the "Well Casing Material" drop-down menu in the "Well Details" table, then add the appropriate "pounds per foot of well length" factor to the "User Defined Casing" column of the "Well Construction Materials Factors" table, in the row that corresponds to the well diameter. You must find or develop the unique "pounds per foot of well length" factor for the specific material, schedule, and diameter of pipe. The Well Material Calculator will use this factor to calculate Casing Material required and total Screen Material required. Note that if you select a material for the well casing that is not already included in the library of materials in SEFA, you must also develop emissions factors for the material's production and add these values to the "User Defined Factors" tab. (See the "User Defined Factors" tab for specifics.)*

Notes on Calculations:
- Calculation for screened pipe assumes that the weight of screened pipe is equal to weight of casing.
- Calculations for Grout Material, Sand Pack Material, and Soil Cuttings for Disposal assume annulus around casing has a diameter that is 4 inches larger than the casing.
- Grout values are for weight of unmixed cement, assuming 6 gallons of water is mixed with 94 pounds of neat cement with a blended density of 15 pounds per gallon (generally typical of engineering specifications).
- Drill cutting volume does not include drilling mud for mud rotary drilling.

Well Material Calculator - 3

Use this tool to calculate the amount of material required for a well of specified type, depth, and diameter. This page is a calculator only and not linked to the "Input" tabs. The user must manually enter the results from the "Materials Required" table below into the appropriate "Input" tab.

Notes on Well Material Calculations - 3:

Well Details - 3	
Type of Well	
Well Casing Material	
Total Depth of Well in Feet (from ground surface to bottom of well, including screen)	
Screen Length	
Well Casing Diameter in Inches	
Stick-up Height in Feet (if applicable)	
Number of Wells	

Materials Required - 3		
Casing Material		Pounds
Screen Material		Pounds
Grout for Annulus (Cement)		Pounds
Water for Annulus (to mix cement)		Gallons
Sand Pack Material (Gravel/Sand)		Pounds
Soil Cuttings for Disposal		Pounds
Grout to Abandon Well(s)		Pounds
Water for Grout to Abandon Well(s)		Gallons

Well Construction Material Factors

	Pounds per Foot of Well Length								
Well Diameter	SCH 40 PVC Casing	SCH 80 PVC Casing	SCH 40 Steel Casing	SCH 80 Steel Casing	USER DEFINED Casing	Grout for Annulus	Grout to Abandon Well	Sand for Annulus	Drill Cuttings for Disposal
2-inch	0.69	0.94	3.65	5.02		13	2	19	22
4-inch	2.03	2.82	10.79	14.98		19	6	29	39
6-inch	3.58	5.38	18.97	28.57		25	14	39	61
8-inch	5.39	8.18	28.55	43.39		32	25	48	87
10-inch	7.64	12.1	40.48	64.43		38	40	58	119
12-inch	10.1	16.7	53.52	88.63		45	57	68	155

Source: Most of the information in the above table is from EPA's "Methodology for Understanding and Reducing a Project's Environmental Footprint," February 2012. Additional material weight factors for Schedule 80 PVC, Schedule 40 Steel, and Schedule 80 Steel, are from "Groundwater and Wells, Second Edition", by Johnson Filtration Systems Inc., 1986.

Note on User Defined Casing: *The "User Defined Casing" feature can be used to calculate the amount of material required for a well constructed of a material or size (schedule) other than the four options provided. To use this feature, select "User Defined Casing" in the "Well Casing Material" drop-down menu in the "Well Details" table, then add the appropriate "pounds per foot of well length" factor to the "User Defined Casing" column of the "Well Construction Materials Factors" table, in the row that corresponds to the well diameter. You must find or develop the unique "pounds per foot of well length" factor for the specific material, schedule, and diameter of pipe. The Well Material Calculator will use this factor to calculate Casing Material required and total Screen Material required. Note that if you select a material for the well casing that is not already included in the library of materials in SEFA, you must also develop emissions factors for the material's production and add these values to the "User Defined Factors" tab. (See the "User Defined Factors" tab for specifics.)*

Notes on Calculations:
- Calculation for screened pipe assumes that the weight of screened pipe is equal to weight of casing.
- Calculations for Grout Material, Sand Pack Material, and Soil Cuttings for Disposal assume annulus around casing has a diameter that is 4 inches larger than the casing.
- Grout values are for weight of unmixed cement, assuming 6 gallons of water is mixed with 94 pounds of neat cement with a blended density of 15 pounds per gallon (generally typical of engineering specifications).
- Drill cutting volume does not include drilling mud for mud rotary drilling.

Lookup Table *Spreadsheets for Environmental Footprint Analysis (SEFA) Version 3.0, November 2019*

The "Lookup" worksheet is for reference only, and is not intended for user input.

Tables 1, 2, and 3 are provided to convert transportation and equipment use into fuel use. Data is obtained from Climate Leaders documents, US Department of Energy[1], and EPA's 2017 Life Cycle Inventory Report[2], and is consistent with the February 2012 EPA footprint methodology. Where fuel efficiencies are provided for biodiesel, B20, or natural gas, the following assumptions are made:

- diesel has a higher heating value of 0.139 MMBtu per gallon
- biodiesel has a higher heating value of 0.127 MMBtu per gallon
- natural gas has a higher heating value of 0.103 MMBtu per hundred cubic feet
- B20 is 20% biodiesel and 80% diesel
- fuel efficiencies scale approximately with higher heating value (e.g., biodiesel fuel efficiency in miles per gallon = 0.127/0.139 x diesel fuel efficiency).

Table 1. Mode of Transport. For Personnel	B20 mpg or pmpg	Biodiesel mpg or pmpg	Diesel mpg or pmpg	Electricity mpkWh	Gasoline mpg	Natural Gas mpccf
Airplane	NO DATA	NO DATA	45	NO DATA	NO DATA	NO DATA
Bus	94	88	96	NO DATA	NO DATA	71
Car	28	26	28.4	2.82	25	21
Heavy-Duty Truck	7.4	6.9	7.55	NO DATA	9.45	5.6
Light-Duty/Passenger Truck	15	14	15.1	NO DATA	18.9	11
Train	NO DATA	NO DATA	59	NO DATA	NO DATA	NO DATA
User Defined Vehicle #1	ENTER DATA	ENTER DATA	ENTER DATA	ENTER DATA	ENTER DATA	ENTER DATA
User Defined Vehicle #2	ENTER DATA	ENTER DATA	ENTER DATA	ENTER DATA	ENTER DATA	ENTER DATA
User Defined Vehicle #3	ENTER DATA	ENTER DATA	ENTER DATA	ENTER DATA	ENTER DATA	ENTER DATA
User Defined Vehicle #4	ENTER DATA	ENTER DATA	ENTER DATA	ENTER DATA	ENTER DATA	ENTER DATA
User Defined Vehicle #5	ENTER DATA	ENTER DATA	ENTER DATA	ENTER DATA	ENTER DATA	ENTER DATA

- Fuel usage for buses, airplanes, and trains are for passenger miles per gallon (pmpg). Airplane/jet fuel calculated as diesel for simplicity and due to similarities between kerosene and diesel.
- Electric car efficiencies are from US Department of Energy [1] and take into account an estimated 96% charger-battery system efficiency, per ENERGY STAR information [3].
- Diesel airplane, bus, and train efficiencies from converting average CO2 emissions in Climate Leaders from Commuting, Business Travel and Product Transport to diesel usage assuming Climate Leaders value of 22.3 lbs of CO2 per gallon of diesel. Diesel and gasoline efficiencies for car and light-duty/passenger truck are from Table 20 of EPA's Life-Cycle Inventory Report [2].
- Gasoline mpg for heavy-duty truck is assumed to be 50% of a light-duty truck to represent a light-duty truck towing a trailer

Table 2. Fuel Type for Equip. Use	Units	Units per HP-hr
B20	gal	0.051
Biodiesel	gal	0.055
Compressed natural gas	ccf	0.0005
Diesel	gal	0.050
Diesel between 75 and 750 hp	gal	0.055
Diesel greater than 750 hp	gal	0.053
Diesel less than 75 hp	gal	0.061
Gasoline	gal	0.0002
Gasoline <25 hp	gal	0.1316
Gasoline >25 hp	gal	0.078
Liquified petroleum gas	gal	0.096

-Brake Specific Fuel Consumption (BSFC) values are consistent with 7,000 Btu/HP-hr (as used by EPA AP-42, Compilation of Air Pollutant Emission Factors, Chapter 3) and fuel higher heating values of 0.127 MMBtu for biodiesel (per February 2012 EPA footprint methodology). Diesel, gasoline, liquified petroleum gas, and compressed natural gas values are are from Table 20 of EPA's Life-Cycle Inventory Report [2]. 'Based on correspodence with ORD (authors of the Life-Cycle Inventory Report), tthe value for "Gasoline < 25 hp" was incorrect in Table 20 of the Report. It should be 7.6 hp-hr/gal and not 0.0002 hp-hr/gal. The entry for "Gasoline < 25 hp" in the table above reflects this correction.

Table 3. Equipment Type and Representative Horsepower
Asphalt paver (150 HP)
Backhoe (100 HP)
Concrete paving machine (200 HP)
Dozer - large (200 HP)
Dozer - small (100 HP)
Drilling - direct push (60 HP)
Drilling - large rig (500 HP)
Drilling - medium rig (150 HP)
Dump truck (400 HP)
Excavator - large (250 HP)
Excavator - medium (175 HP)
Excavator/hoe - small (75 HP)
Generator - HP varies
Grader (175 HP)
Grout pump (20 HP)
Hydroseeder (20 HP)
Integrated tool carrier (100 HP)
Loader (200 HP)
Loader - small (75 HP)
Mobile laboratory (25 HP)
Mowers (5 HP)
Other - HP varies
Riding trencher (55 HP)
Roller (100 HP)
Rotary-screw air compressor - 250 cfm (60 HP)
Skid-steer - small (60 HP)
Telescopic handler (60 HP)
Tractor mower (25 HP)
Water truck (400 HP)

Equipment types are available with various engine sizes. Specific equipment sizes should be used when available. The above "representative sizes" are provided as general guides in the absence of other information

Lookup Table (continued)

Table 4. Materials		Units	Conv. to tons	Default One-Way Distance from Source to Site (miles)*
Aluminum, Rolled Sheet		lb	0.0005	500
Asphalt, mastic		lb	0.0005	25
Asphalt, paving-grade		lb	0.0005	25
Ethanol, Corn, 95%		lb	0.0005	500
Ethanol, Corn, 99.7%		lb	0.0005	500
Ethanol, Petroleum, 99.7%		lb	0.0005	500
Gravel/Sand Mix, 65% Gravel		lb	0.0005	25
Gravel/sand/clay		lb	0.0005	25
HDPE		lb	0.0005	500
Photovoltaic system (installed)		W	0.000125	1000
PVC		lb	0.0005	500
Portland cement, US average		lb	0.0005	25
Ready-mixed concrete, 20 MPa		ft3	0.0375	25
Round Gravel		lb	0.0005	25
Sand		lb	0.0005	25
Stainless steel		lb	0.0005	500
Steel		lb	0.0005	500
Other refined construction materials		lb	0.0005	500
Other unrefined construction materials		lb	0.0005	25
Cheese Whey		lb	0.0005	1000
Emulsified vegetable oil		lb	0.0005	1000
Granular activated carbon, primary		lb	0.0005	500
Granular activated carbon, regenerated		lb	0.0005	500
Hydrogen Peroxide, 50% in H2O		lb	0.0005	500
Iron (II) Sulfate		lb	0.0005	500
Lime, Hydrated, Packed		lb	0.0005	500
Molasses		lb	0.0005	1000
Phosphoric Acid, 70% in H2O		lb	0.0005	500
Potassium Permanganate		lb	0.0005	500
Sodium Hydroxide, 50% in H2O		lb	0.0005	500
Other Treatment Chemicals & Materials		lb	0.0005	500
User-defined material #1		TBD	TBD	500
User-defined material #2		TBD	TBD	500
User-defined material #3		TBD	TBD	500
User-defined material #4		TBD	TBD	500
User-defined material #5		TBD	TBD	500
User-defined material #6		TBD	TBD	500
User-defined material #7		TBD	TBD	500
User-defined material #8		TBD	TBD	500
User-defined material #9		TBD	TBD	500
User-defined material #10		TBD	TBD	500
User-defined material #11		TBD	TBD	500
User-defined material #12		TBD	TBD	500

Table 5. Mode of Transport. For Equipment and Materials (Usage Rate)	B20	Biodiesel	Diesel
Aircraft (gptm)	NO DATA	NO DATA	0.15
Barge (gptm)	0.0048	0.0051	0.0047
Combination Truck (gptm)	0.0157	0.0170	0.0153
Train (gptm)	0.0022	0.0024	0.002
Truck (mpg)	5.9	5.5	6
Truck single unit (gptm)	0.0328	0.035	0.0323
User Defined Vehicle #1	ENTER DATA	ENTER DATA	ENTER DATA
User Defined Vehicle #2	ENTER DATA	ENTER DATA	ENTER DATA
User Defined Vehicle #3	ENTER DATA	ENTER DATA	ENTER DATA
User Defined Vehicle #4	ENTER DATA	ENTER DATA	ENTER DATA
User Defined Vehicle #5	ENTER DATA	ENTER DATA	ENTER DATA

mpg = miles per gallon, gptm = gallons per ton-mile

- Airplane/jet fuel calculated as diesel for simplicity and due to similarities between kerosene and diesel

- Diesel fuel efficiencies for aircraft, barge, and truck (mpg) are obtained by from converting average CO2 emissions reported in Climate Leaders: Commuting, Business Travel and Product Transport (EPA430-R-08-006) to diesel usage assuming Climate Leaders value of 22.3 lbs of CO2 per gallon of diesel. The source for fuel usage rate for combination truck, train, and truck single unit is Table 20 of EPA's Life-Cycle Inventory Report [2] .

** Default distance is one-way distance from site to disposal facility that can be used in absence of other information.*

Table 6. Waste Facility	Units	Conv. to tons	Default Distance*
Hazardous waste incineration	lb	0.0005	1000
Off-site waste water treatment (POTW)	gal x 1000	4.17	50
Recycled/reused on-site	tons	1	0
Recycled/reused off-site	tons	1	50
Off-site non-hazardous waste landfill	tons	1	25
Off-site hazardous waste landfill	tons	1	500
User-defined recycled/reused on-site #1	TBD	TBD	0
User-defined recycled/reused on-site #2	TBD	TBD	0
User-defined recycled/reused on-site #3	TBD	TBD	0
User-defined recycled/reused off-site #1	TBD	TBD	50
User-defined recycled/reused off-site #2	TBD	TBD	50
User-defined recycled/reused off-site #3	TBD	TBD	50
User-defined non-hazardous waste destination #1	TBD	TBD	25
User-defined non-hazardous waste destination #2	TBD	TBD	25
User-defined non-hazardous waste destination #3	TBD	TBD	25
User-defined hazardous waste destination #1	TBD	TBD	500
User-defined hazardous waste destination #2	TBD	TBD	500
User-defined hazardous waste destination #3	TBD	TBD	500

Table 7. Water Source	Units	Conv. to tons
Public Water	gal x 1000	4.17
Extracted Groundwater	gal x 1000	4.17
Surface Water	gal x 1000	4.17

Spreadsheets for Environmental Footprint Analysis (SEFA) Version 3.0, November 2019
Main Workbook

Site Name	***Lawrence Avaiton Facility***
Remedy	***Groundwater Extraction and Treatment System***
	Identify the site name and remedy name in the spaces above. These names will be populated on all of the worksheets for the project.

	Enter the path name (if not saved in same directory) and file name of the "Calculations" workbook for the project.
Path Name:	
Calculations File Name:	SEFA_calculations_LAI.xlsm

Component	**Remedy Component Names***
Component 1	Excavation/ Trenching
Component 2	Drilling
Component 3	Groundwater Monitoring
Component 4	O&M
Component 5	Non routine Site Visits
Component 6	< Component 6 >
	***Fill in unique names for Remedy Components (optional). These names will be populated on all of the worksheets for the project.**

The following color coding applies to cells in the worksheets in this workbook.

	Green cells indicate notes or instructions
	Yellow cells are for manual data input
	Blue cells are calculated cells that are protected
	Gray cells are not available and/or not applicable for data entry
	Orange cells are calculated metrics that are forwarded to the "Summary" tab

Overview

A Feasibility Study (FS) was completed in July 2006 by CDM Smith on behalf of EPA and presented remedial alternatives for groundwater, soil, surface water, and sediment. The ROD for the site was signed on September 29, 2006, and addressed both soil and groundwater. The soil and sediment remedies were completed in March 2011 and included excavation and removal of approximately 550 tons of contaminated material from the site. The groundwater remedy included the installation of two GWE&T systems: one at the LAI main facility and one at OMP, and in situ chemical oxidation (ISCO) injections at the LAI onsite source area. Two separate groundwater pump and treat (P&T) systems are currently operating at the Site. The first groundwater P&T system was installed at the Site and began operating in 2010; operation and maintenance of the system is currently ongoing. The P&T system extracts water from two extraction wells located in the hydraulically downgradient portion of the Site and reinjects the treated water in a series of injection wells located hydraulically upgradient of the Site. The system is intended to establish hydraulic containment, limit downgradient migration of mass, and remove groundwater contaminated with CVOCs. Operation of a second series of extraction wells located north of the Site in the downgradient portion of the plume began in 2011 and is intended to limit contaminant discharge to the Port Jefferson Harbor. Treated groundwater is discharged to the surface water in Old Mill Pond.

The objective for operation of the remediation systems (GWE&T) at the Sites is to restore the Site to pre-disposal conditions to the extent feasible. At a minimum, the remedies discussed above shall eliminate or mitigate all significant threats to public health and the environment presented by the contamination identified at the Site through the proper application of scientific and engineering principles. The criteria for Site closure will be determined by the NYSDEC based on the future monitoring data.

Spreadsheets for Environmental Footprint Analysis (SEFA) Version 3.0, November 2019

U.S. Environmental Protection Agency (EPA), Office of Superfund Remediation and Technology Innovation

Introduction to SEFA

Purpose: SEFA is a set of workbooks designed to assist EPA in conducting environmental footprint analyses for site cleanups, as described in EPA's supporting Methodology for Understanding and Reducing a Project's Environmental Footprint (EPA 542-R-12-002). SEFA is intended for estimating footprints during key phases of a cleanup project, such as evaluation of alternative remedies, development of remedy designs, and optimization of remedies but may also be applied to other phases. Although originally developed for EPA's internal use, EPA is making SEFA available to the public for the benefit of others wishing to estimate the environmental footprint of site cleanups. *The SEFA workbooks do not individually or collectively represent EPA guidance or requirements nor is their use required by EPA.*

Structure: SEFA is comprised of three interlinked Excel workbooks (files) to be saved by users in a single directory. Each workbook contains multiple worksheets (tabs) as described in the sections below. The tabs in each workbook are categorized with the following color-coding:
Yellow: tab contains required or optional user data entry
Green: tab contains notes, instructions, or explanations
Blue: tab provides outputs
Gray: tab not set up for user data entry

Instructions: SEFA is equipped with full instructions and notes located in designated tabs in each workbook. Also, abbreviated instructions and notes regarding certain key aspects of data entry are located throughout the other tabs in SEFA. For a full description of assumptions in SEFA and the approach for conducting a footprint analysis, see the supporting methodology.

"Main" Workbook: Starting and end points of analysis. No data entry by user, except for minimal (and optional) input on "General" and "Summary" tabs.

- ***Intro to SEFA*** : Purpose, structure, and logistics of using SEFA
- ***General*** : Site information and custom names for remedy components (data input by user to this tab is optional)
- ***Instructions*** : General instructions pertaining to linkage of the three workbooks and overall approach to SEFA input
- ***Summary*** : Overall results of analysis in tabular format (data input by user to this tab is optional)
- ***Totals by Scope and Component*** : Auto-filled column and pie charts that graphically organize results by remedy component and by scope for energy and air emissions footprints
- ***Energy & Air 1 - 6*** and ***All Energy & Air (7 worksheets)*** : Energy and air results imported automatically from the "Calculations" workbook

"Input" Workbook: Data entry by user for all remedy activities, including input for energy consumption, materials usage, waste generation, personnel transport, and operation of equipment. Tabs for user data entry are indicated below.

- ***General*** : Auto fills site, remedy, and component names from the "Main" workbook
- ***Input Instructions*** : Instructions for setting up data entry tabs in the "Input" workbook, and notes on features in the "Input" workbook that provide flexibility for the footprint analysis
- ***Detailed Notes and Explanations*** : Notes and explanations for each table in the "Input Template" tab
- ***Input Summary*** : Overall summary of input information is compiled automatically from the "Input" tabs and exported to the "Calculations" workbook
- ***Input Template*** : The majority of user data entry in SEFA occurs in this tab, including data entry for energy, materials, waste, transportation, and equipment. A blank template worksheet is provided. Multiple copies of the “Input Template” tab can be created by the user as needed. See the "Input" workbook for specific notes and instructions on setting up input tabs and entering data.
- ***Grid Electricity*** : Optional user input for fuel mix for local grid electricity
- ***User Defined Factors*** : Optional user input on footprint conversion factors for user-specified materials and activities
- ***Well Material Calculator*** : An optional tool for estimating the amount of materials required to construct a well of specified type, material, and size
- ***Lookup*** : Reference tables on typical rates of energy consumption and material conversion factors that are used in the "Input Template" tab

"Calculations" Workbook: Automatically applies footprint conversion factors for energy use and air emissions for individual remedy components, and summarizes results. No data entry by user, but supplemental calculations can be made by the user in some of the tabs.

- ***General*** : Auto fills site, remedy, and component names from the "Main" workbook

Notes : Notes on the features in the "Calculations" workbook

Components 1 - 6 (6 worksheets) : Calculations made automatically for energy and air emissions based on results from the "Input" workbook, with useful subtotals at the bottom of each worksheet

All Components : Total energy use and air emissions (i.e., summation of values in the individual "Component" tabs), with useful subtotals at the bottom of the worksheet

Default Conversions : Built-in footprint conversion factors used to calculate energy and air emissions associated with common remediation materials and activities

Grid Electricity Conversions : Footprint conversion factors for grid electricity are calculated automatically based on fuel mix in the "Grid Electricity" tab in the "Input" workbook

Explanation of Grid Electricity : Explains how electricity conversion factors are developed and provides an example

Transfer 1 - 3 (3 worksheets) : Intermediate data exchange

Programming Details of SEFA

Data Exchange : All (three) workbooks must be open simultaneously to enable automated data exchanges. SEFA will generally process inputs faster if running off a hard drive rather than a server.

Color Coding : The "General" tab of each workbook provides a legend for cell color coding used to distinguish functions such as manual input, imported/exported data, and automated calculations.

Locks : Data cells with formulas (or data to be exported to other workbooks) are equipped with "hard locks."

Data Sources : Origination of values in cells with imported data (whether previously populated or calculated) can be identified by clicking on the cell of interest.

SEFA Version History

SEFA was originally released in April 2012, with minor corrections in January 2013. In August 2014, SEFA was updated with improvements for ease of use and flexibility of application, and with corrections and adjustments affecting footprint results. This November 2018 update (Version 3.0) provides updated footprint conversion factors for materials processing, fuel consumption, and laboratory analysis. Any future updates will be posted at www.cluin.org/greenremediation/SEFA, where Version 3.0 is available for dowloading.

Technical Assistance

EPA technical support in using SEFA is available only within the Agency. Individuals or organizations outside EPA who are interested in using SEFA may wish to obtain technical assistance from qualified environmental, engineering, or other suitable professionals. Selected examples of footprint analyses conducted using SEFA and the supporting methodology are posted at www.cluin.org/greenremediation/footprintassessment. Suggestions for SEFA enhancements may be forwarded to Carlos Pachon, EPA Office of Superfund Remediation and Technology Innovation (pachon.carlos@epa.gov).

Original development of SEFA was funded by EPA OSRTI under Contract No. EP-W-07-078 to Tetra Tech. Technical lead was provided by Karen Scheuermann of EPA Region 9. Appreciation is extended to Doug Sutton, Rob Greenwald, Mike Pavarini, and Nikolaos Fytilis for significant contributions in developing and updating the spreadsheets. For related information on green remediation, visit www.cluin.org/greenremediation or contact Carlos Pachon at pachon.carlos@epa.gov.



EPA is making SEFA available to the public as a means of disseminating useful information about environmental footprint analysis. The Agency is not responsible for adaptation of this workbook model by other organizations or associated analytical results.

Spreadsheets for Environmental Footprint Analysis (SEFA) Version 3.0, November 2019

U.S. Environmental Protection Agency (EPA), Office of Superfund Remediation and Technology Innovation

Instructions

1) Setting Up the Workbooks

SEFA consists of the "Main", "Input", and "Calculations" workbooks (.xlsx files). All three files must be open at the same time while working in SEFA. This allows the workbooks to communicate and calculate footprints.
For simplest use, the three workbooks should all be saved in the same directory, in which case the "Path Name" can be left blank in the "General" tab of each workbook. Alternatively, if you would like to save the workbooks in different directories, you must fill in the "Path Name" on the "General" tab of each workbook using the following format: *DriveLetter*:*FolderName**FolderName*\ Be sure to include final backslash.
On the "General" tab of each workbook, you must enter the "File Name" of one of the other workbooks (as indicated in each workbook) using the following format: *WorkbookName*.*FileExtension*
The file extension is ".xlsx" for all three workbooks.
You may want to change the file names for the "Main", "Input", and "Calculations" workbooks to reflect the site, remedy, and date. For example, the new name for the "Main" workbook may be "main_SiteName_Nov2018.xlsx". If you change the names of the workbooks, you must update the file names on the "General" tabs in each workbook in order for the workbooks to exchange data. Note that the file names may be changed unintentionally when the files are copied or downloaded, and should be readjusted for proper functioning of the SEFA workbooks.

2) Setting Up Site and Remedy Names

In the "General" tab in the "Main" workbook, you may replace default labels with site-specific labels for site name and remedy name. These will be automatically updated in all the workbooks. You may also provide a narrative overview of the site and remedy at the bottom of the "General" tab in the "Main" workbook.

3) Setting Up Remedy Components

On the "General" tab in the "Main" workbook, you have the option of customizing the names of the six "Remedy Components", and those customized names will automatically be updated in all the workbooks. If not customized, the default names <Component 1> to <Component 6> will be used by SEFA. Note that the names of the six "Remedy Components" may not fit the legend in the charts on the "Totals by Scope and Component" tab in the "Main" workbook, even if the names fit in the data entry cells on the "General" tab in the "Main" workbook.
Customizing the Remedy Components allows you to reflect any delineation that will be relevant to the site and remedy. For example, the Remedy Components may be spatial in nature, representing different geographical areas of the cleanup site (e.g., North Quadrant, South Quadrant, West Quadrant). Or the Remedy Components may be functional in nature, representing different operations or activities at the site (e.g., Site Investigation, Excavation, Waste Hauling, Backfilling, Long-term Monitoring). As another example, the Remedy Components may be temporal in nature, representing different time segments for the remedy (e.g., Year 1, Year 2, Year 3).

4) Entering Data

"Input" Workbook: The majority of site and remedy data is entered in the "Input" tabs in the "Input" workbook. See the "Input Instructions" tab in the "Input" workbook for specifics on this data entry. Additional data may be entered in the "Input Summary", "Grid Electricity", "User Defined Factors", and "Well Material Calculator" tabs. See the instructions on each of those tabs for specifics on the functions provided in the tabs.
"Main" Workbook: In the "Summary" tab in the "Main" workbook (Row 37), you may provide a qualitative description of activities at the site related to Land & Ecosystems.
"Calculations" Workbook: No data entry is required by the user in the "Calculations" workbook. However, space is provided in the tabs of this workbook for user-specific calculations and subtotals.

5) Processing Data and Accessing Outputs

Processing Data: The SEFA worksheets automatically process the data entered by the user, apply footprint conversion factors, and compile the results. You have access to all worksheets where the data processing and compilation occurs. However, those portions of the worksheets are "locked" so that the data links and formulas cannot be altered.

Accessing Outputs: The final outputs of the SEFA worksheets are located in the "Main" workbook. The outputs are available in tabular format in the "Summary" tab, and in chart format in the "Totals by Scope and Component" tab. All output presentations are populated automatically. The user may customize and format the charts on the "Totals by Scope and Component" tab in the "Main" workbook to accommodate longer "Remedy Component" names or to copy and paste individual charts.

Accessing Intermediate Results : The user has access to intermediate results throughout the SEFA workbooks. Intermediate results that may be of particular interest are located in the “Energy & Air” tabs in the “Main” workbook, the “Input Summary” tab in the “Input” workbook, and the “Component” tabs in the “Calculations” workbook.

6) Miscellaneous

General Formatting : Although you cannot alter cells in the worksheets that are used for processing data, some general formatting functions are available in all the worksheets. These include adjusting decimal places, adjusting width of columns or row, shading cells, etc. Most of the worksheets also contain blank spaces which are available for making notes or supporting calculations.

Naming, Adjusting, and Adding Tabs : You should not rename the original tabs in the SEFA workbooks, except for the “Input Template” tab in the "Input" workbook (as noted in the "Input Instructions" tab in the "Input" workbook). Renaming other tabs may disrupt the exchange of data among the workbooks. However, you may relocate tabs within each workbook. You may also add new tabs to the workbooks, for example to provide references and calculations in support of the data entry, or user-designed charts and tables for presenting the results.

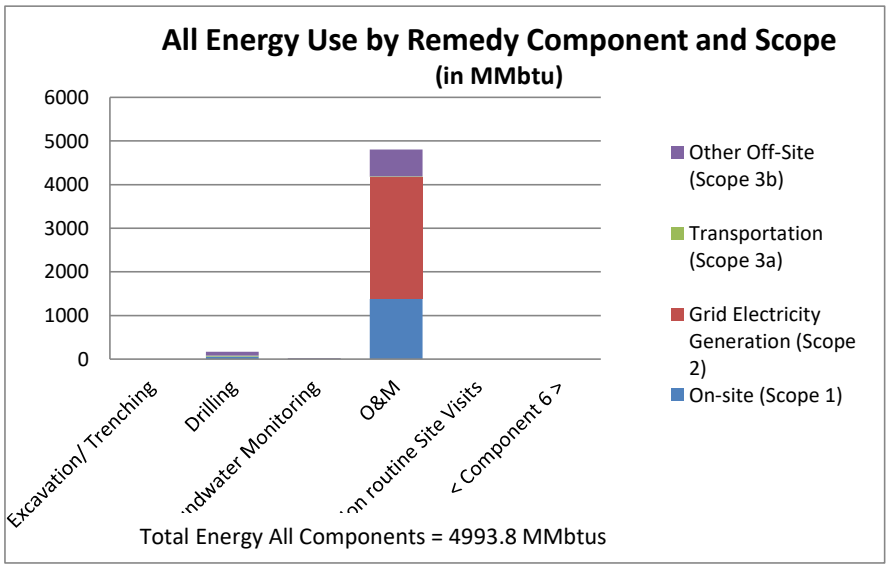
Environmental Footprint Summary

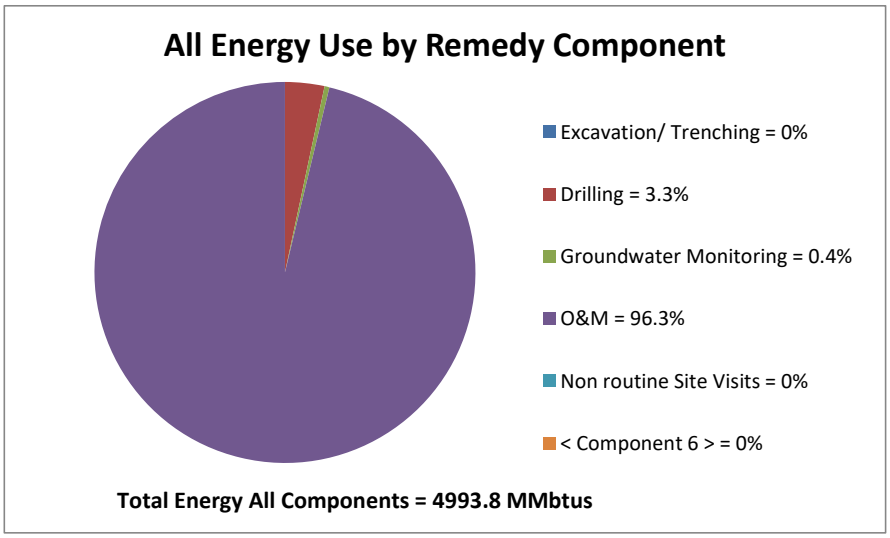
Core Element	Metric		Unit of Measure	Footprint						
				Excavation/ Trenching	Drilling	Groundwater Monitoring	O&M	Non routine Site Visits	< Component 6 >	Total
Materials & Waste	M&W-1	Refined materials used on-site	Tons	0.0	6.0	0.3	0.0	0.0	0.0	6.3
	M&W-2	% of refined materials from recycled or reused material	%		0.0%	0.0%				0.0%
	M&W-3	Unrefined materials used on-site	Tons	0.000	0.000	0.000	0.000	0.000	0.000	0.0
	M&W-4	% of unrefined materials from recycled or reused material	%							
	M&W-5	On-site hazardous waste disposed of off-site	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-6	On-site non-hazardous waste disposed of off-site	Tons	0.0	2.0	0.0	1.0	0.0	0.0	3.0
	M&W-7	Recycled or reused waste	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-8	% of total potential waste recycled or reused	%		0.0%		0.0%			0.0%
Water (used on-site)	W-1	Public water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-2	Groundwater use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-3	Surface water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-4	Reclaimed water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-5	Storm water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-6	User-defined water resource #1	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-7	User-defined water resource #2	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-8	Wastewater generated	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy	E-1	Total energy used (on-site and off-site)	MMBtu	0.0	166.6	20.3	4,806.9	0.0	0.0	4,993.8
	E-2	Energy voluntarily derived from renewable resources								
	E-2A	On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-2B	Voluntary purchase of renewable electricity	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-3	Voluntary purchase of RECs	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-4	On-site grid electricity use	MWh	0.000	0.000	0.000	403.840	0.000	0.000	403.8
Air	A-1	On-site NOx, SOx, and PM emissions	Pounds	0.0	75.4	0.0	0.0	0.0	0.0	75.4
	A-2	On-site HAP emissions	Pounds	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	A-3	Total NOx, SOx, and PM emissions	Pounds	0.0	309.1	17.1	3,766.5	0.0	0.0	4,092.7
	A-3A	Total NOx emissions	Pounds	0.0	157.3	12.7	1,089.9	0.0	0.0	1,259.8
	A-3B	Total SOx emissions	Pounds	0.0	115.7	3.3	2,640.0	0.0	0.0	2,758.9
	A-3C	Total PM emissions	Pounds	0.0	36.2	1.1	36.7	0.0	0.0	74.0
	A-4	Total HAP emissions	Pounds	0.0	5.4	0.2	100.3	0.0	0.0	105.9
	A-5	Total greenhouse gas emissions	Tons CO2e*	0.0	18.1	1.4	261.9	0.0	0.0	281.5
Land & Ecosystems	Qualitative Description									

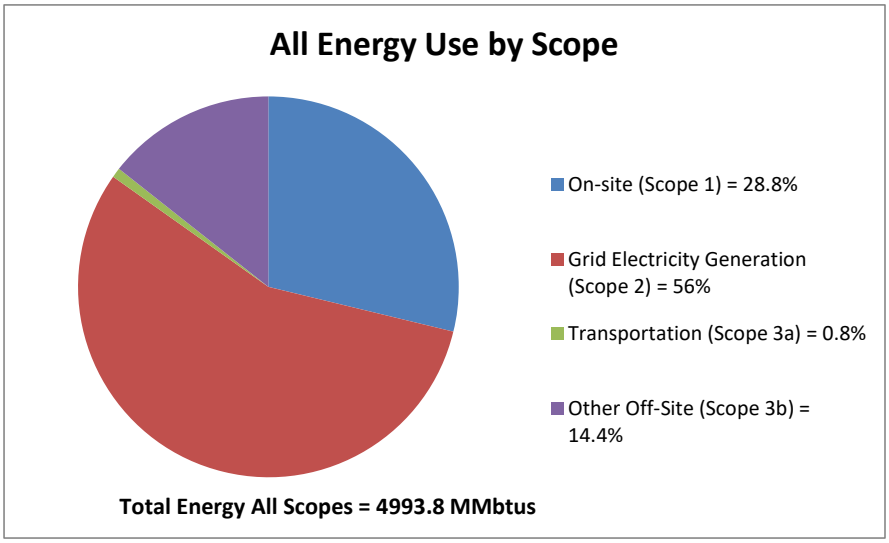
** Total greenhouse gases emissions (in CO2e) include consideration of CO2, CH4, and N2O (Nitrous oxide) emissions.*
"MMBtu" = millions of Btus
"MG" = millions of gallons
"CO2e" = carbon dioxide equivalents of global warming potential
"MWh" = megawatt hours (i.e., thousands of kilowatt-hours or millions of Watt-hours)
"Tons" = short tons (2,000 pounds)

The above metrics are consistent with EPA's Methodology for Understanding and Reducing a Project's Environmental Footprint (EPA 542-R-12-002), February 2012

Notes:


All Energy Use by Remedy Component and Scope
(in MMbtu)
6000
5000
4000
3000
2000
1000
0
Excavation/ Trenching
Drilling
Groundwater Monitoring
O&M
Non routine Site Visits
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
Total Energy All Components = 4993.8 MMbtus


All Energy Use by Remedy Component
Excavation/ Trenching = 0%
Drilling = 3.3%
Groundwater Monitoring = 0.4%
O&M = 96.3%
Non routine Site Visits = 0%
< Component 6 > = 0%
Total Energy All Components = 4993.8 MMbtus


All Energy Use by Scope
On-site (Scope 1) = 28.8%
Grid Electricity Generation (Scope 2) = 56%
Transportation (Scope 3a) = 0.8%
Other Off-Site (Scope 3b) = 14.4%
Total Energy All Scopes = 4993.8 MMbtus

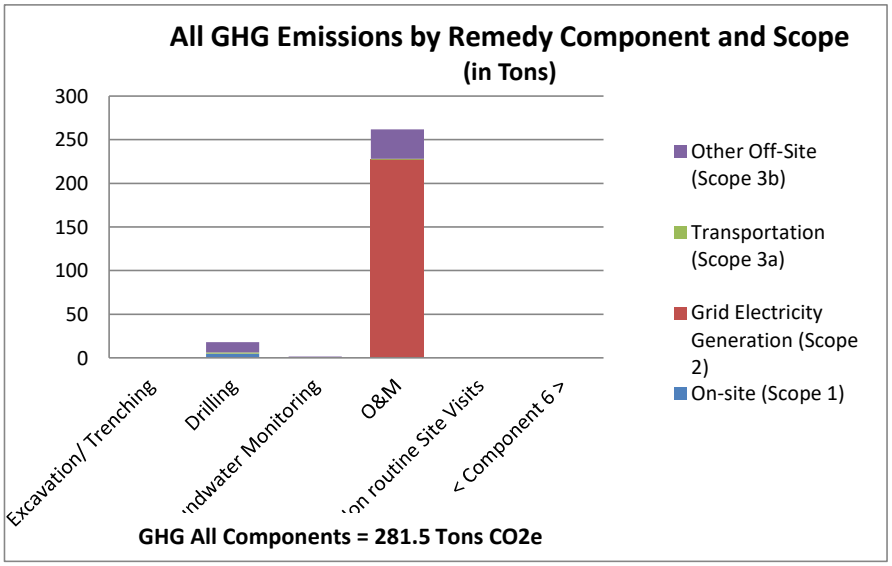
Total Energy
MMbtus

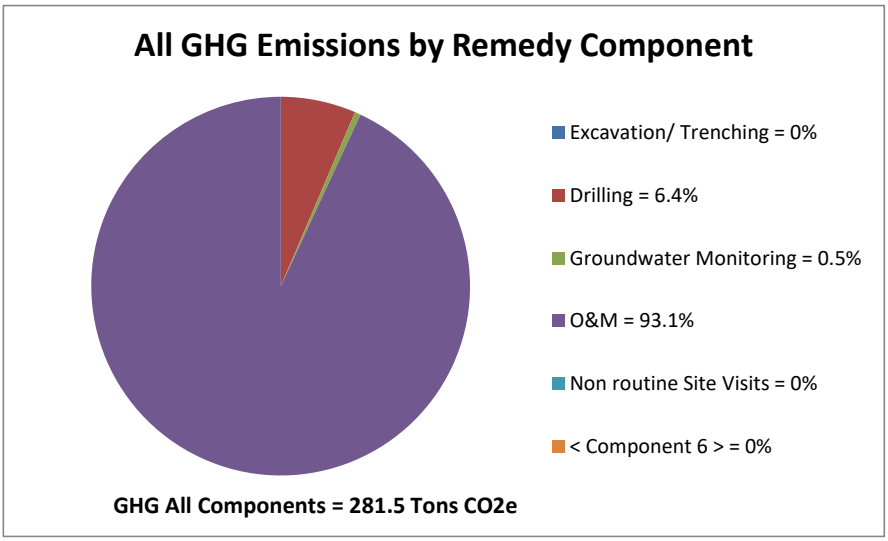
	Excavation	Drilling	Groundwa	O&M	Non routin	< Compone	Total	
On-site (Scope 1)	0.0	59.3	0.0	1,378.3	0.0	0.0	1,437.7	
Generation (Scope 2)	0.0	0.0	0.0	2,798.2	0.0	0.0	2,798.2	d Electricity
nsportation (Scope 3a)	0.0	19.1	9.5	12.1	0.0	0.0	40.7	Trar
ner Off-Site (Scope 3b)	0.0	88.2	10.8	618.3	0.0	0.0	717.2	Oth
Total	0.0	166.6	20.3	4,806.9	0.0	0.0	4,993.8	

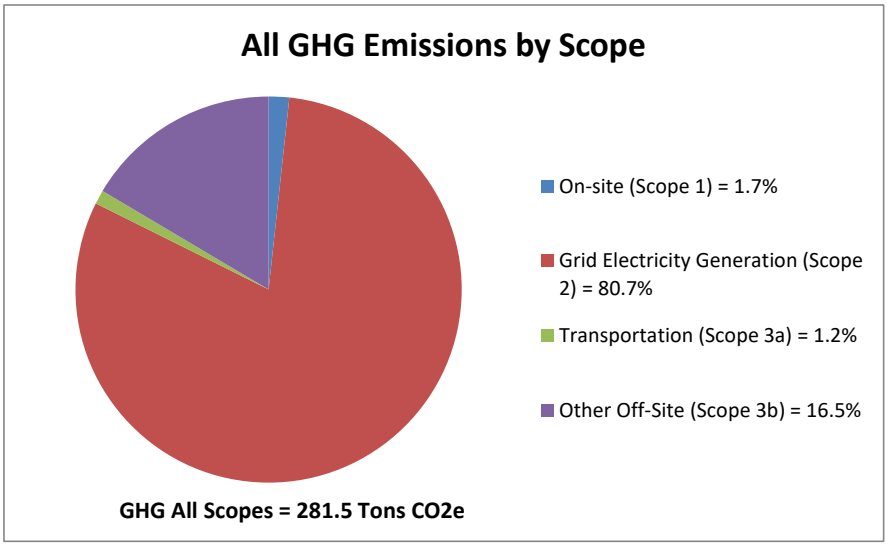
Excavation/ Trenching = 0%
Drilling = 3.3%
Groundwater Monitoring = 0.4%
O&M = 96.3%
Non routine Site Visits = 0%
< Component 6 > = 0%

On-site (Scope 1) = 28.8%
Grid Electricity Generation (Scope 2) = 56%
Transportation (Scope 3a) = 0.8%
Other Off-Site (Scope 3b) = 14.4%

Total Energy All Components = 4993.8 MMbtus
Total Energy All Scopes = 4993.8 MMbtus


All GHG Emissions by Remedy Component and Scope
(in Tons)
300
250
200
150
100
50
0
Excavation/ Trenching
Drilling
ndwater Monitoring
O&M
on routine Site Visits
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
GHG All Components = 281.5 Tons CO2e


All GHG Emissions by Remedy Component
Excavation/ Trenching = 0%
Drilling = 6.4%
Groundwater Monitoring = 0.5%
O&M = 93.1%
Non routine Site Visits = 0%
< Component 6 > = 0%
GHG All Components = 281.5 Tons CO2e

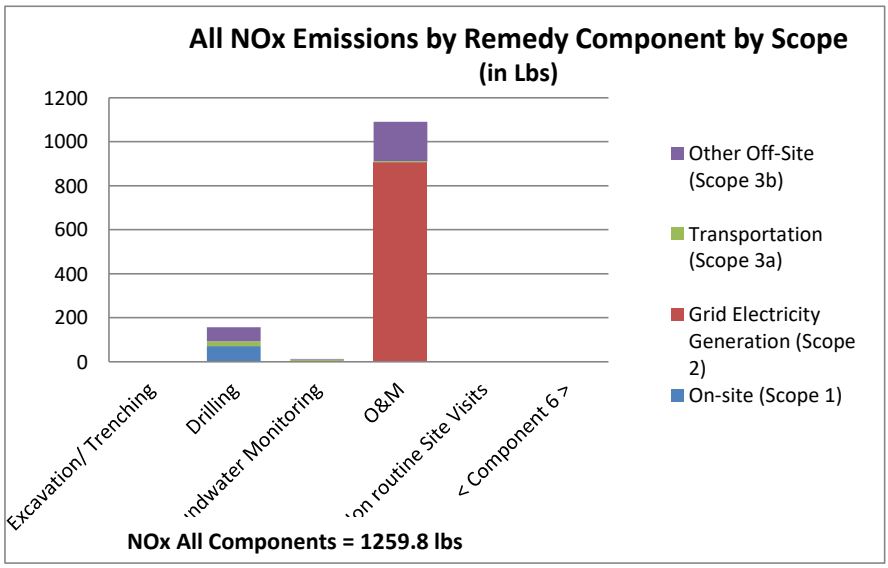

All GHG Emissions by Scope
On-site (Scope 1) = 1.7%
Grid Electricity Generation (Scope 2) = 80.7%
Transportation (Scope 3a) = 1.2%
Other Off-Site (Scope 3b) = 16.5%
GHG All Scopes = 281.5 Tons CO2e

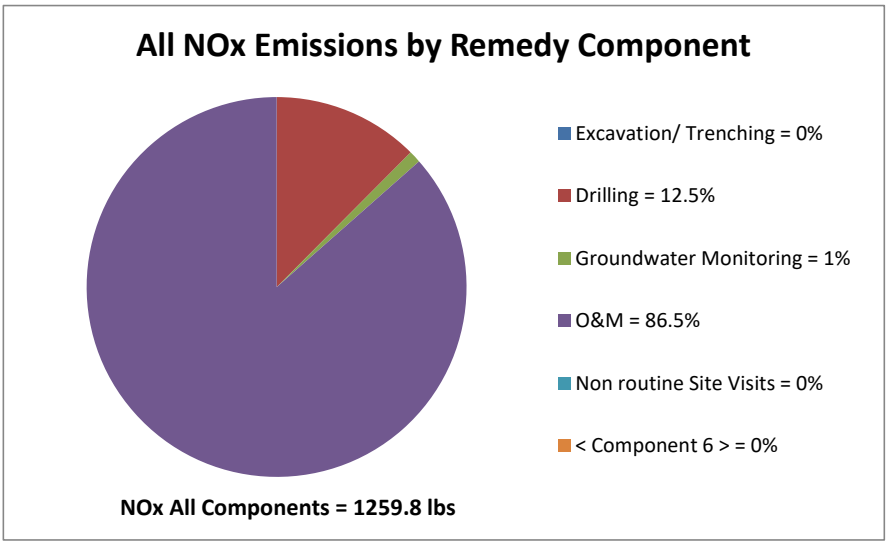
GHG Tons CO2e	Excavation	Drilling	Groundwa	O&M	Non routin	< Compon	Total	
On-site (Scope 1)	0.0	4.8	0.0	0.0	0.0	0.0	4.8	
Generation (Scope 2)	0.0	0.0	0.0	227.0	0.0	0.0	227.0	d Electricity
nsportation (Scope 3a)	0.0	1.5	0.8	1.0	0.0	0.0	3.3	Trar
ner Off-Site (Scope 3b)	0.0	11.8	0.6	33.9	0.0	0.0	46.4	Oth
Total	0.0	18.1	1.4	261.9	0.0	0.0	281.5	

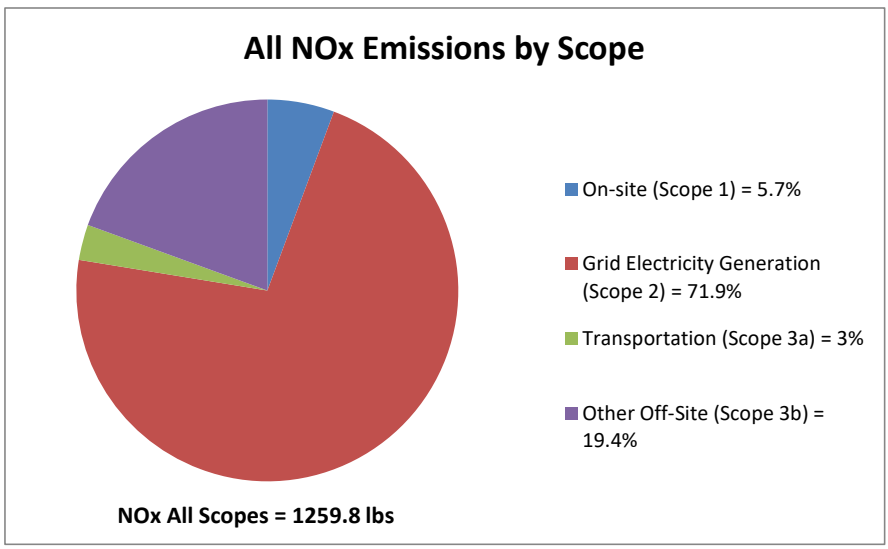
Excavation/ Trenching = 0%
Drilling = 6.4%
Groundwater Monitoring = 0.5%
O&M = 93.1%
Non routine Site Visits = 0%
< Component 6 > = 0%

On-site (Scope 1) = 1.7%
Grid Electricity Generation (Scope 2) = 80.7%
Transportation (Scope 3a) = 1.2%
Other Off-Site (Scope 3b) = 16.5%

GHG All Components = 281.5 Tons CO2e
GHG All Scopes = 281.5 Tons CO2e


All NOx Emissions by Remedy Component by Scope
(in Lbs)
1200
1000
800
600
400
200
0
Excavation/ Trenching
Drilling
Groundwater Monitoring
O&M
Non routine Site Visits
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
NOx All Components = 1259.8 lbs


All NOx Emissions by Remedy Component
Excavation/ Trenching = 0%
Drilling = 12.5%
Groundwater Monitoring = 1%
O&M = 86.5%
Non routine Site Visits = 0%
< Component 6 > = 0%
NOx All Components = 1259.8 lbs

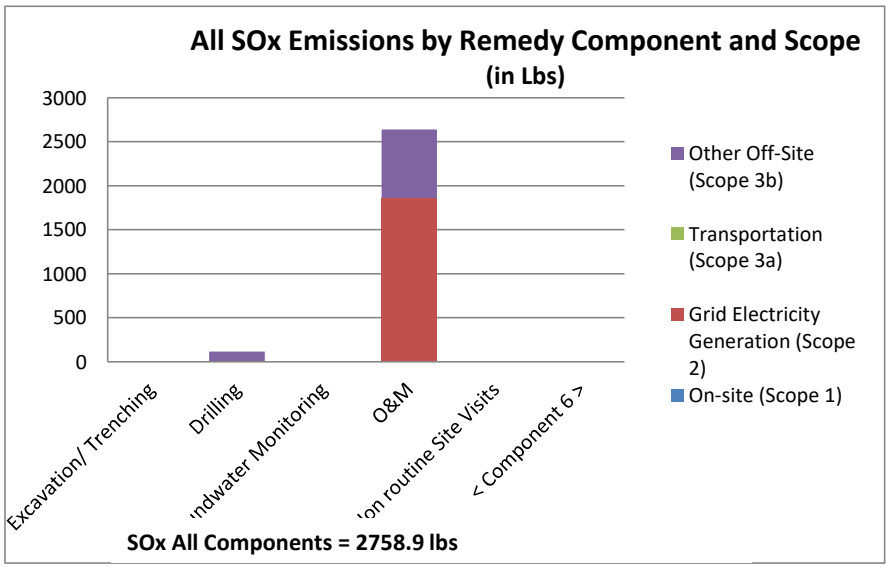

All NOx Emissions by Scope
On-site (Scope 1) = 5.7%
Grid Electricity Generation (Scope 2) = 71.9%
Transportation (Scope 3a) = 3%
Other Off-Site (Scope 3b) = 19.4%
NOx All Scopes = 1259.8 lbs

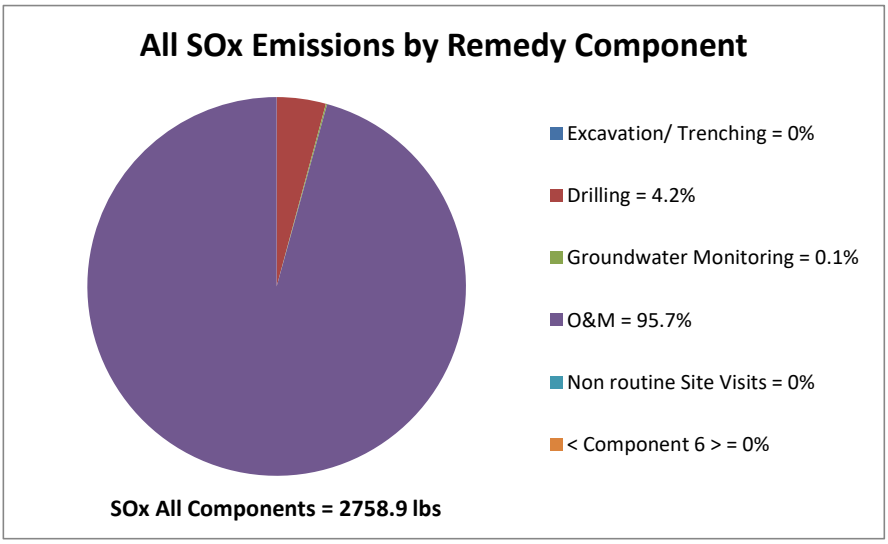
NOx lbs	Excavation	Drilling	Groundwa	O&M	Non routin	< Compon	Total	
On-site (Scope 1)	0.0	71.6	0.0	0.0	0.0	0.0	71.7	
Generation (Scope 2)	0.0	0.0	0.0	905.4	0.0	0.0	905.4	d Electricity
nsportation (Scope 3a)	0.0	21.0	10.3	6.7	0.0	0.0	38.0	Trar
ner Off-Site (Scope 3b)	0.0	64.6	2.4	177.7	0.0	0.0	244.7	Oth
Total	0.0	157.3	12.7	1,089.9	0.0	0.0	1,259.8	

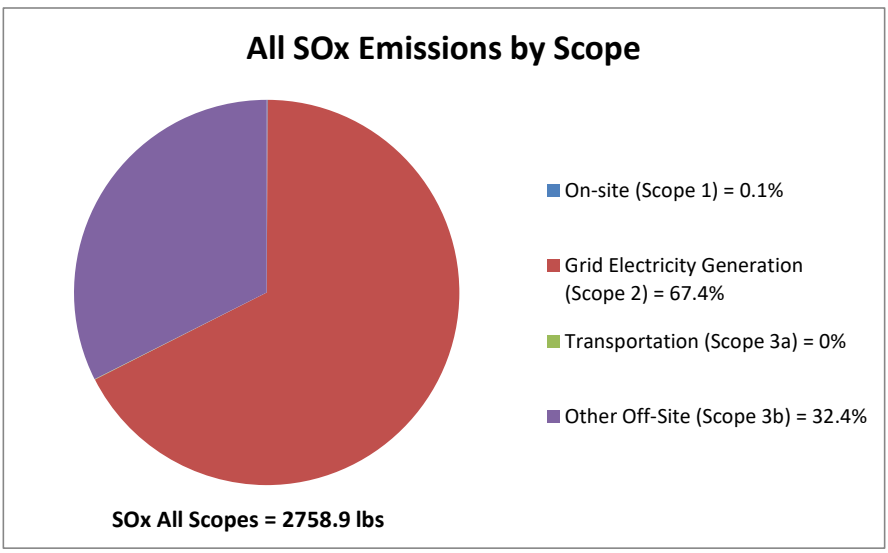
Excavation/ Trenching = 0%
Drilling = 12.5%
Groundwater Monitoring = 1%
O&M = 86.5%
Non routine Site Visits = 0%
< Component 6 > = 0%

On-site (Scope 1) = 5.7%
Grid Electricity Generation (Scope 2) = 71.9%
Transportation (Scope 3a) = 3%
Other Off-Site (Scope 3b) = 19.4%

NOx All Components = 1259.8 lbs
NOx All Scopes = 1259.8 lbs


All SOx Emissions by Remedy Component and Scope
(in Lbs)
3000
2500
2000
1500
1000
500
0
Excavation/ Trenching
Drilling
O&M
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
SOx All Components = 2758.9 lbs


All SOx Emissions by Remedy Component
Excavation/ Trenching = 0%
Drilling = 4.2%
Groundwater Monitoring = 0.1%
O&M = 95.7%
Non routine Site Visits = 0%
< Component 6 > = 0%
SOx All Components = 2758.9 lbs

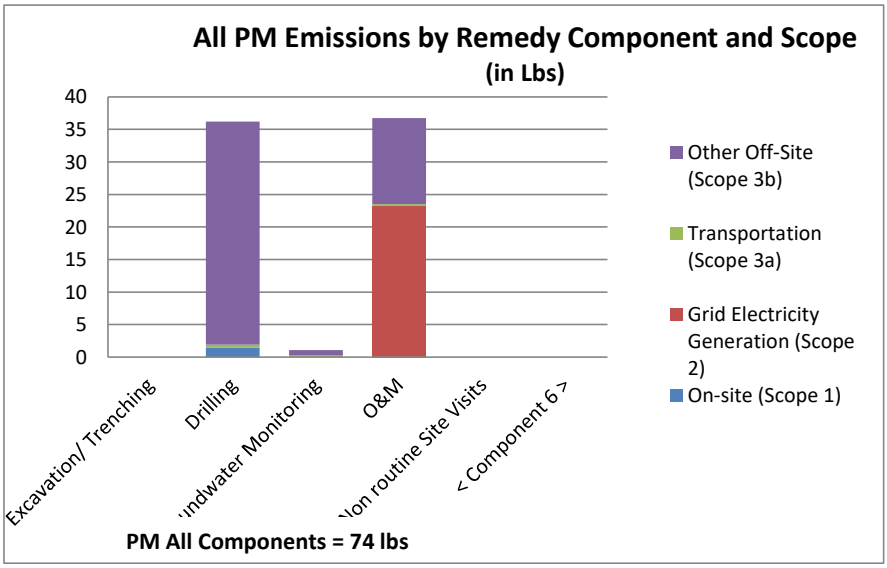

All SOx Emissions by Scope
On-site (Scope 1) = 0.1%
Grid Electricity Generation (Scope 2) = 67.4%
Transportation (Scope 3a) = 0%
Other Off-Site (Scope 3b) = 32.4%
SOx All Scopes = 2758.9 lbs

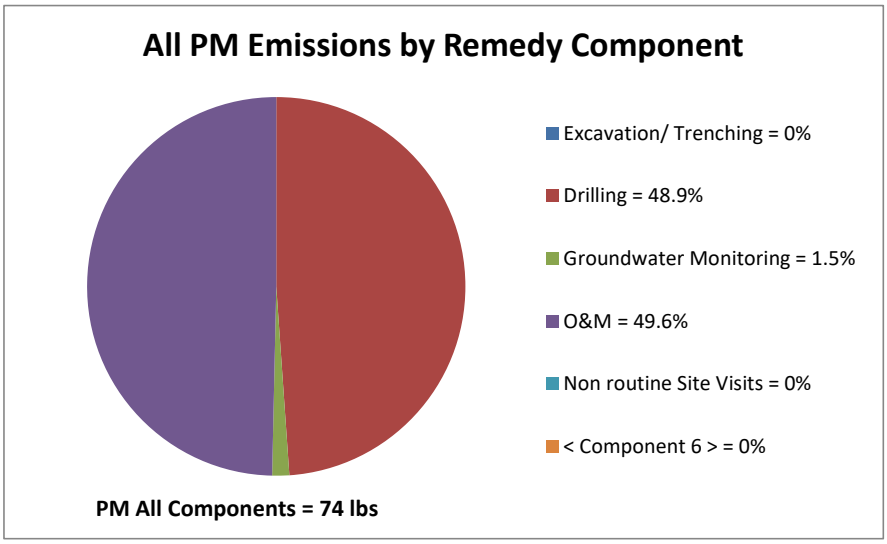
SOx lbs	Excavation	Drilling	Groundwa	O&M	Non routin	< Compon	Total	
On-site (Scope 1)	0.0	2.3	0.0	0.0	0.0	0.0	2.3	
Generation (Scope 2)	0.0	0.0	0.0	1,860.8	0.0	0.0	1,860.8	d Electricity
nsportation (Scope 3a)	0.0	0.7	0.3	0.2	0.0	0.0	1.1	Trar
ner Off-Site (Scope 3b)	0.0	112.7	3.0	778.9	0.0	0.0	894.7	Oth
Total	0.0	115.7	3.3	2,640.0	0.0	0.0	2,758.9	

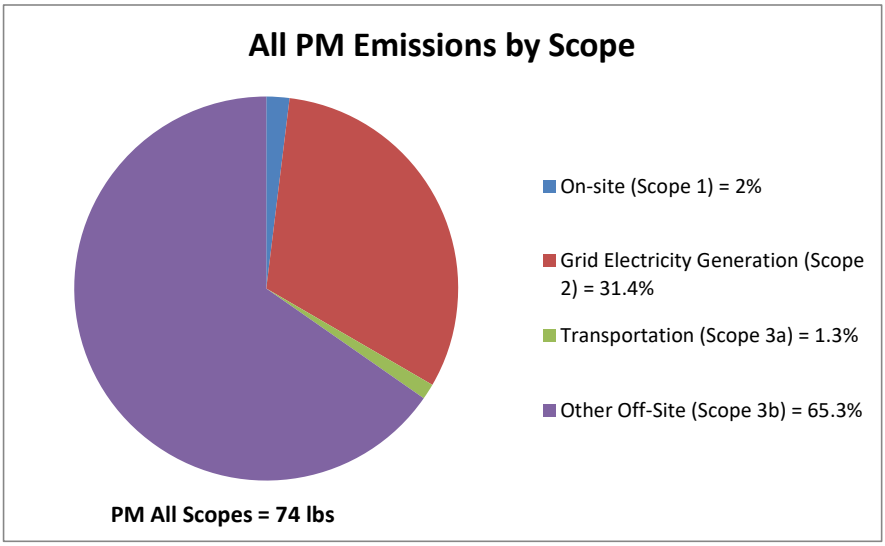
Excavation/ Trenching = 0%
Drilling = 4.2%
Groundwater Monitoring = 0.1%
O&M = 95.7%
Non routine Site Visits = 0%
< Component 6 > = 0%

SOx All Components = 2758.9 lbs
SOx All Scopes = 2758.9 lbs

On-site (Scope 1) = 0.1%
Grid Electricity Generation (Scope 2) = 67.4%
Transportation (Scope 3a) = 0%
Other Off-Site (Scope 3b) = 32.4%


All PM Emissions by Remedy Component and Scope
(in Lbs)
40
35
30
25
20
15
10
5
0
Excavation/ Trenching
Drilling
Groundwater Monitoring
O&M
Non routine Site Visits
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
PM All Components = 74 lbs


All PM Emissions by Remedy Component
Excavation/ Trenching = 0%
Drilling = 48.9%
Groundwater Monitoring = 1.5%
O&M = 49.6%
Non routine Site Visits = 0%
< Component 6 > = 0%
PM All Components = 74 lbs


All PM Emissions by Scope
On-site (Scope 1) = 2%
Grid Electricity Generation (Scope 2) = 31.4%
Transportation (Scope 3a) = 1.3%
Other Off-Site (Scope 3b) = 65.3%
PM All Scopes = 74 lbs

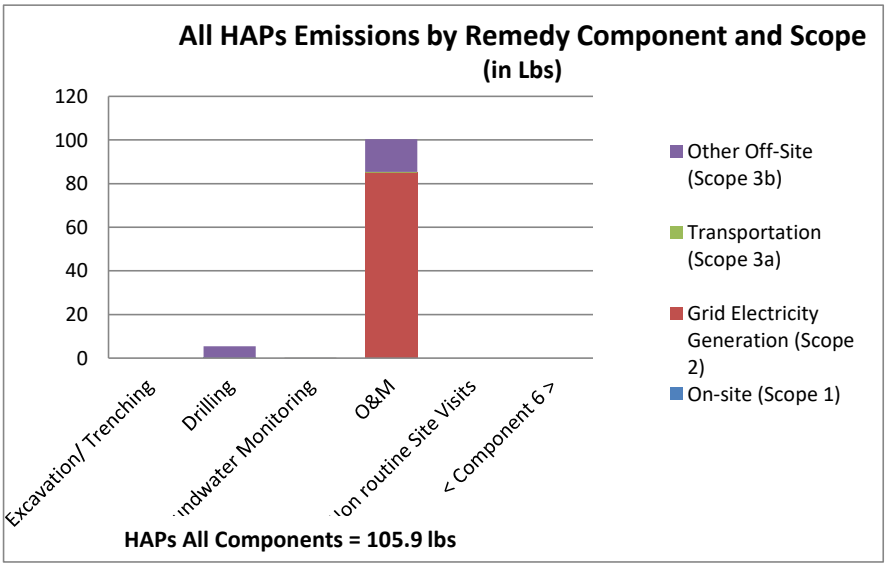
PM lbs

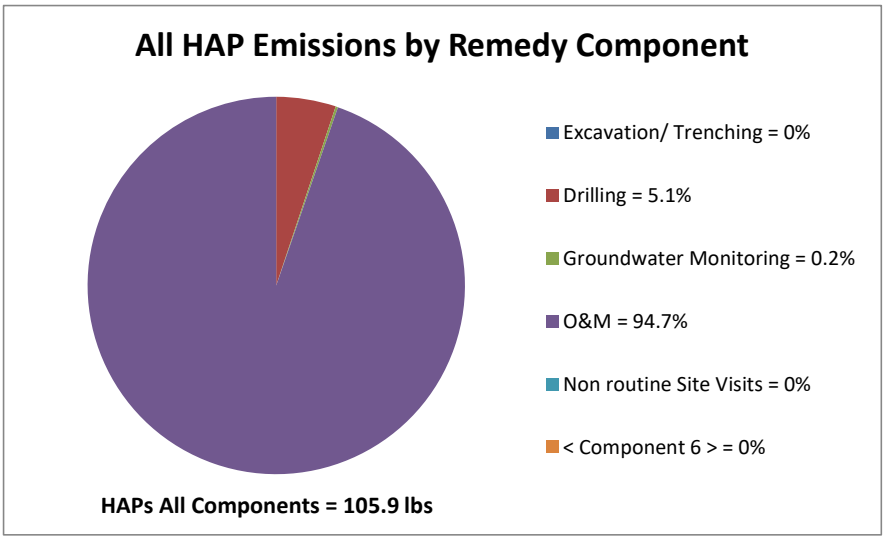
	Excavation	Drilling	Groundwa	O&M	Non routin	< Compon	Total	
On-site (Scope 1)	0.0	1.4	0.0	0.0	0.0	0.0	1.4	
Generation (Scope 2)	0.0	0.0	0.0	23.2	0.0	0.0	23.2	d Electricity
nsportation (Scope 3a)	0.0	0.4	0.2	0.3	0.0	0.0	1.0	Trar
ner Off-Site (Scope 3b)	0.0	34.3	0.8	13.2	0.0	0.0	48.3	Oth
Total	0.0	36.2	1.1	36.7	0.0	0.0	74.0	

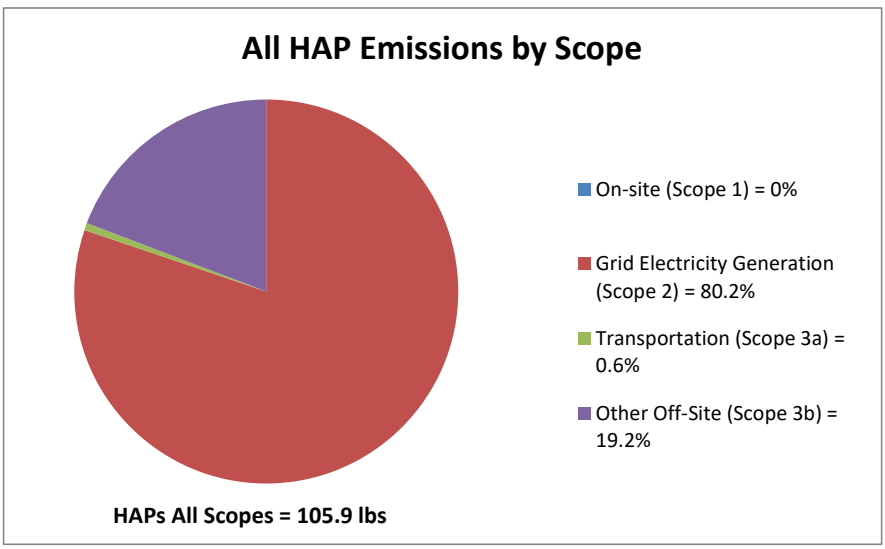
Excavation/ Trenching = 0%
Drilling = 48.9%
Groundwater Monitoring = 1.5%
O&M = 49.6%
Non routine Site Visits = 0%
< Component 6 > = 0%

PM All Components = 74 lbs
PM All Scopes = 74 lbs

On-site (Scope 1) = 2%
Grid Electricity Generation (Scope 2) = 31.4%
Transportation (Scope 3a) = 1.3%
Other Off-Site (Scope 3b) = 65.3%


All HAPs Emissions by Remedy Component and Scope
(in Lbs)
120
100
80
60
40
20
0
Excavation/ Trenching
Drilling
Groundwater Monitoring
O&M
Non routine Site Visits
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
HAPs All Components = 105.9 lbs


All HAP Emissions by Remedy Component
Excavation/ Trenching = 0%
Drilling = 5.1%
Groundwater Monitoring = 0.2%
O&M = 94.7%
Non routine Site Visits = 0%
< Component 6 > = 0%
HAPs All Components = 105.9 lbs


All HAP Emissions by Scope
On-site (Scope 1) = 0%
Grid Electricity Generation (Scope 2) = 80.2%
Transportation (Scope 3a) = 0.6%
Other Off-Site (Scope 3b) = 19.2%
HAPs All Scopes = 105.9 lbs

HAPs
lbs

	Excavation	Drilling	Groundwa	O&M	Non routin	< Compon	Total
On-site (Scope 1)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Generation (Scope 2)	0.0	0.0	0.0	84.9	0.0	0.0	84.9
nsportation (Scope 3a)	0.0	0.1	0.1	0.5	0.0	0.0	0.7
ner Off-Site (Scope 3b)	0.0	5.3	0.2	14.9	0.0	0.0	20.3
Total	0.0	5.4	0.2	100.3	0.0	0.0	105.9

Excavation/ Trenching = 0%
Drilling = 5.1%
Groundwater Monitoring = 0.2%
O&M = 94.7%
Non routine Site Visits = 0%
< Component 6 > = 0%

HAPs All Components = 105.9 lbs
HAPs All Scopes = 105.9 lbs

On-site (Scope 1) = 0%
Grid Electricity Generation (Scope 2) = 80.2%
Transportation (Scope 3a) = 0.6%
Other Off-Site (Scope 3b) = 19.2%

Excavation/ Trenching - Energy & Air Compiled Results

Category	Total Energy	GHG	NOx	SOx	PM	NOx + SOx + PM	HAPs
	MMbtus	lbs CO2e	lbs	lbs	lbs	lbs	lbs
On-site (Scope 1)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Grid Electricity Generation (Scope 2)	**0.000**	**0**	**0**	**0**	**0**	**0**	**0**
Transportation (Scope 3a)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Other Off-Site (Scope 3b)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Remedy Totals	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Values that are forwarded to the "Summary" tab are indicated in orange.

Voluntary Renewable Energy Use	Unit	Quantity	
On-site renewable energy generation or use	MMBtu	**0**	
On-site biodiesel use	MMBtu	**0**	
Biodiesel and other renewable resource use for transportation	MMBtu	**0**	
On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	**0**	*(This value is the sum of the three rows above)*
Voluntary purchase of renewable electricity	MWh	**0**	
Voluntary purchase of RECs	MWh	**0**	

This worksheet is not intended for user input. Values on this worksheet are obtained from the following file: SEFA_calculations_LAI.xlsm

Drilling - Energy & Air Compiled Results

Category	Total Energy	GHG	NOx	SOx	PM	NOx + SOx + PM	HAPs
	MMbtus	lbs CO2e	lbs	lbs	lbs	lbs	lbs
On-site (Scope 1)	**59**	**9,604**	**72**	**2**	**1**	**75**	**0**
Grid Electricity Generation (Scope 2)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Transportation (Scope 3a)	**19**	**3,076**	**21**	**1**	**0**	**22**	**0**
Other Off-Site (Scope 3b)	**88**	**23,576**	**65**	**113**	**34**	**212**	**5**
Remedy Totals	**167**	**36,257**	**157**	**116**	**36**	**309**	**5**

Values that are forwarded to the "Summary" tab are indicated in orange.

Voluntary Renewable Energy Use	Unit	Quantity	
On-site renewable energy generation or use	MMBtu	**0**	
On-site biodiesel use	MMBtu	**0**	
Biodiesel and other renewable resource use for transportation	MMBtu	**0**	
On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	**0**	*(This value is the sum of the three rows above)*
Voluntary purchase of renewable electricity	MWh	**0**	
Voluntary purchase of RECs	MWh	**0**	

This worksheet is not intended for user input. Values on this worksheet are obtained from the following file: SEFA_calculations_LAI.xlsm

Groundwater Monitoring - Energy & Air Compiled Results

Category	Total Energy	GHG	NOx	SOx	PM	NOx + SOx + PM	HAPs
	MMbtus	lbs CO2e	lbs	lbs	lbs	lbs	lbs
On-site (Scope 1)	**0**	**1**	**0**	**0**	**0**	**0**	**0**
Grid Electricity Generation (Scope 2)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Transportation (Scope 3a)	**10**	**1,541**	**10**	**0**	**0**	**11**	**0**
Other Off-Site (Scope 3b)	**11**	**1,267**	**2**	**3**	**1**	**6**	**0**
Remedy Totals	**20**	**2,809**	**13**	**3**	**1**	**17**	**0**

Values that are forwarded to the "Summary" tab are indicated in orange.

Voluntary Renewable Energy Use	Unit	Quantity	
On-site renewable energy generation or use	MMBtu	**0**	
On-site biodiesel use	MMBtu	**0**	
Biodiesel and other renewable resource use for transportation	MMBtu	**0**	
On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	**0**	*(This value is the sum of the three rows above)*
Voluntary purchase of renewable electricity	MWh	**0**	
Voluntary purchase of RECs	MWh	**0**	

This worksheet is not intended for user input. Values on this worksheet are obtained from the following file: SEFA_calculations_LAI.xlsm

O&M - Energy & Air Compiled Results

Category	Total Energy	GHG	NOx	SOx	PM	NOx + SOx + PM	HAPs
	MMbtus	lbs CO2e	lbs	lbs	lbs	lbs	lbs
On-site (Scope 1)	**1,378**	**0**	**0**	**0**	**0**	**0**	**0**
Grid Electricity Generation (Scope 2)	**2,798**	**454,037**	**905**	**1,861**	**23**	**2,790**	**85**
Transportation (Scope 3a)	**12**	**1,944**	**7**	**0**	**0**	**7**	**0**
Other Off-Site (Scope 3b)	**618**	**67,876**	**178**	**779**	**13**	**970**	**15**
Remedy Totals	**4,807**	**523,857**	**1,090**	**2,640**	**37**	**3,767**	**100**

Values that are forwarded to the "Summary" tab are indicated in orange.

Voluntary Renewable Energy Use	Unit	Quantity	
On-site renewable energy generation or use	MMBtu	**0**	
On-site biodiesel use	MMBtu	**0**	
Biodiesel and other renewable resource use for transportation	MMBtu	**0**	
On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	**0**	*(This value is the sum of the three rows above)*
Voluntary purchase of renewable electricity	MWh	**0**	
Voluntary purchase of RECs	MWh	**0**	

This worksheet is not intended for user input. Values on this worksheet are obtained from the following file: SEFA_calculations_LAI.xlsm

Non routine Site Visits - Energy & Air Compiled Results

Category	Total Energy	GHG	NOx	SOx	PM	NOx + SOx + PM	HAPs
	MMbtus	lbs CO2e	lbs	lbs	lbs	lbs	lbs
On-site (Scope 1)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Grid Electricity Generation (Scope 2)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Transportation (Scope 3a)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Other Off-Site (Scope 3b)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Remedy Totals	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Values that are forwarded to the "Summary" tab are indicated in orange.

Voluntary Renewable Energy Use	Unit	Quantity	
On-site renewable energy generation or use	MMBtu	**0**	
On-site biodiesel use	MMBtu	**0**	
Biodiesel and other renewable resource use for transportation	MMBtu	**0**	
On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	**0**	*(This value is the sum of the three rows above)*
Voluntary purchase of renewable electricity	MWh	**0**	
Voluntary purchase of RECs	MWh	**0**	

This worksheet is not intended for user input. Values on this worksheet are obtained from the following file: SEFA_calculations_LAI.xlsm

APPENDIX L

REMEDIAL SYSTEM OPTIMIZATION TABLE OF CONTENTS

REMEDIAL SYSTEM OPTIMIZATION FOR THE LAWRENCE AVIATION INDUSTRIES SITE

TABLE OF CONTENTS

- 1.0 INTRODUCTION
  - 1.1 SITE OVERVIEW
  - 1.2 PROJECT OBJECTIVES AND SCOPE OF WORK
  - 1.3 REPORT OVERVIEW
- 2.0 REMEDIAL ACTION DESCRIPTION
  - 2.1 SITE LOCATION AND HISTORY
  - 2.2 REGULATORY HISTORY AND REQUIREMENTS
  - 2.3 CLEAN-UP GOALS AND SITE CLOSURE CRITERIA
  - 2.4 PREVIOUS REMEDIAL ACTIONS
  - 2.5 DESCRIPTION OF EXISTING REMEDY
    - 2.5.1 System Goals and Objectives
    - 2.5.2 System Description
    - 2.5.3 Operation and Maintenance Program
- 3.0 FINDINGS AND OBSERVATIONS
  - 3.1 SUBSURFACE PERFORMANCE
  - 3.2 TREATMENT SYSTEM PERFORMANCE
  - 3.3 REGULATORY COMPLIANCE
  - 3.4 MAJOR COST COMPONENTS OR PROCESSES
  - 3.5 SAFETY RECORD
- 4.0 RECOMMENDATIONS
  - 4.1 RECOMMENDATIONS TO ACHIEVE OR ACCELERATE SITE CLOSURE
    - 4.1.1 Source Reduction/Treatment
    - 4.1.2 Sampling
    - 4.1.3 Conceptual Site Model (Risk Assessment)
  - 4.2 RECOMMENDATIONS TO IMPROVE PERFORMANCE
    - 4.2.1 Maintenance Improvements
    - 4.2.2 Monitoring Improvements
    - 4.2.3 Process Modifications
  - 4.3 RECOMMENDATIONS TO REDUCE COSTS
    - 4.3.1 Supply Management
    - 4.3.2 Process Improvements or Changes
    - 4.3.3 Optimize Monitoring Program
    - 4.3.4 Maintenance and Repairs
  - 4.4 RECOMMENDATIONS FOR IMPLEMENTATION