CHEM-TROL
ERIE COUNTY

HAMBURG, NEW YORK

SITE MANAGEMENT PLAN

NYSDEC Site Number: 915015

USEPA ID # NYD980531180

Prepared for:

SC Holdings, Inc.

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Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

JUNE 2026

CERTIFICATION STATEMENT

I, Rosaura Andújar-McNeil, P.E., certify that I am currently a NYS registered professional engineer 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).

097844

NYS PROFESSIONAL ENGINEER #

SIGNATURE

JUNE 19, 2026

DATE

TABLE OF CONTENTS

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HAMBURG, NEW YORK

SITE MANAGEMENT PLAN

Table of Contents

ES Executive Summary 10
1.0 Introduction 12
1.1 General 12
1.2 Revisions and Alterations 13
1.3 Notifications 14
2.0 Summary of Previous Investigations and Remedial Actions 17
2.1 Site Location and Description 17
2.2 Physical Setting 17
2.2.1 Land Use 17
2.2.2 Geology 18
2.2.3 Hydrogeology 19
2.2.4 Hydrology 20
2.3 Investigation and Remedial History 21
2.4 Remediation Goals 25
2.5 Remaining Contamination 25
2.5.1 Soil 25
2.5.2 Sediment 27
2.5.3 Groundwater 28
3.0 Institutional and Engineering Controls 30
3.1 General 30
3.2 Institutional Controls 30

3.3 Engineering Controls 32
3.3.1 Cover (or Cap) 32
3.3.2 Soil Vapor Extraction (SVE) System 32
3.3.3 Groundwater Collection and Treatment System 33
3.3.4 Monitoring Wells Associated with Source Removal 34
3.3.5 Leachate Collection 34
3.3.6 Fencing/Access Control 34
3.4 Criteria for Completion of Remediation/Termination of Remedial Systems 34
3.4.1 Cover (or Cap) 35
3.4.2 Soil Vapor Extraction System (SVE) System 35
3.4.3 Groundwater Collection and Treatment System 36
3.4.4 Monitoring Wells associated with Source Removal 36
3.4.5 Leachate Collection 37
3.4.6 Fencing/Access Control 37
4.0 Monitoring and Sampling Plan 37
4.1 General 37
4.2 Site-wide Inspection 38
4.3 Treatment System Monitoring and Sampling 40
4.3.1 Remedial System Monitoring 40
4.3.2 Remedial System Sampling 43
4.4 Post-Remediation Media Monitoring and Sampling 45
4.4.1 Groundwater Level Monitoring 45
4.4.2 Groundwater Sampling 46
4.4.3 Monitoring and Sampling Protocol 48
5.0 Operation and Maintenance Plan 49
5.1 General 49
5.2 Remedial Systems Performance Criteria 49
5.3 Operation and Maintenance of the SVE System 50
5.4 Operation and Maintenance of the Groundwater Collection and Treatment System 50
5.4.1 System Start-Up 51
5.4.2 Wells/Piping/Valves 51
5.4.3 Treatment 52
5.4.4 Routine System Operation and Maintenance 52
5.4.5 Non-Routine Operation and Maintenance 53

5.4.6 System Monitoring Devices and Alarms 54
5.4.7 Fire Safety 54
5.5 Cap Maintenance 54
6.0 Periodic Assessments/Evaluations 55
6.1 Climate Change Vulnerability Assessment 55
6.2 Green Remediation Evaluation 57
6.2.1 Timing of Green Remediation Evaluations 58
6.2.2 Remedial Systems 58
6.2.3 Building Operations 58
6.2.4 Frequency of System Checks, Sampling and Other Periodic Activities 58
6.2.5 Metrics and Reporting 59
6.3 Remedial System Optimization 59
7.0. Reporting Requirements 61
7.1 Site Management Reports 61
7.2 Periodic Review Report 63
7.2.1 Certification of Institutional and Engineering Controls 67
7.3 Corrective Measures Work Plan 68
7.4 Remedial System Optimization Report 69
8.0 References 70

TABLE OF CONTENTS (Continued)

List of Tables

Table 1 - Notifications
Table 2 - Groundwater Elevation Data (October 29, 2025)
Table 3 - 1995 FS Table 1 Site Soils RAOs
Table 4 - 1995 FS Table 2 Floodplain Sediment RAOs
Table 5 - 1995 FS Table 3 On-site Tributary Sediments RAOs
Table 6 - 1995 FS Table 4 Groundwater RAOs
Table 7 - SVE System Monitoring Requirements and Schedule
Table 8 - Groundwater Collection and Treatment System Monitoring Requirements and Schedule
Table 9 - Remedial System Sampling Requirements and Schedule
Table 10 - Post Remediation Sampling Requirements and Schedule
Table 11 - Monitoring Well Construction Details
Table 12 - Groundwater Treatment System Effluent Discharge Limitations
Table 13 - Summary and Schedule of Routine Maintenance
Table 14 - Schedule of Interim Monitoring/Inspection Reports

List of Figures

Figure 1 - Site Location
Figure 2 - Site Plan
Figure 3 - Erie County Tax Map
Figure 4A - Geological Cross-Section Location
Figure 4B - 1994 RI Figure 7 Geologic Cross Section
Figure 5 - Bedrock Groundwater Contours (October 29, 2025)
Figure 6 - 1994 RI Figure 3 Monitoring Well and Piezometer Location Map
Figure 7 - 1994 RI Figure 4 Sediment and Surface Water Sample Locations
Figure 8 - 1994 RI Figure 5 Soil Sample Locations
Figure 9 - 1995 FS Figure 2 Site Plan
Figure 10 - 1995 FS Figure 4 Extent of Affected Soils

Figure 11 - 1995 FS Figure 7 Extent of Affected Groundwater
Figure 12 - 2006 SVI Study Figure 2 Soil Gas Study Plan
Figure 13 - Hot Spot Soil and Sediment Removal Locations
Figure 14 - 2024 Groundwater Analytical Results
Figure 15 - Final Site Plan and Cover System
Figure 16 - Final Record Plan and SVE Laterals
Figure 17 - Groundwater Treatment System Layout

List of Appendices

A Declaration of Covenants and Restrictions
B List of Site Contacts
C Monitoring Well Boring and Construction Logs
D Excavation Work Plan
E Health and Safety Plan
F Operations and Maintenance Manuals
G Quality Assurance Project Plan
H Site Management Forms
I Permit or Permit Equivalents
J Field Activities Plan
K SEFA Summary
L Remedial System Optimization Table of Contents

List of Acronyms

CAMP	Community Air Monitoring Plan
CFR	Code of Federal Regulation
COC	Certificate of Completion
CP	Commissioner Policy
DNAPL	Dense non-aqueous phase liquid
DER	Division of Environmental Remediation
DUSR	Data Usability Summary Report
EC	Engineering Control
ECL	Environmental Conservation Law
ES	Engineering Science
EWP	Excavation Work Plan
FEMA	Federal Emergency Management Agency
FS	Feasibility Study
gpd	Gallons per day
gpm	Gallons per minute
HASP	Health and Safety Plan
HDPE	High density polyethylene
HRS	Hazard Ranking System
IC	Institutional Control
IRM	Interim Remedial Measure
mg/kg	milligram per kilogram
mg/L	milligrams per liter
µg/L	micrograms per liter
NYCRR	New York Codes, Rules and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSEG	New York State Electric and Gas
O&M	Operation and Maintenance
OM&M	Operation, Maintenance and Monitoring
PAHs	Polycyclic aromatic hydrocarbons
PCBs	Polychlorinated biphenyls
P.E. or PE	Professional Engineer
PID	Photoionization detector
PLC	Process logic controller
ppb	parts per billion
ppm	parts per million
PRR	Periodic Review Report
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QEP	Qualified Environmental Professional
RAO	Remedial Action Objective
RI/FS	Remedial Investigation/Feasibility Study

ROD	Record of Decision
RSO	Remedial System Optimization
SCG	Standards, Criteria and Guidelines
SEFA	Spreadsheets for Environmental Footprint Analysis
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SVE	Soil Vapor Extraction
SVI	Soil Vapor Intrusion
SVOC	Semi-volatile Organic Compound
TAGM	Technical and Administrative Guidance Memorandum
TDS	Total dissolved solids
TSS	Total suspended solids
VFD	Variable frequency drive
VOC	Volatile Organic Compound

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:

Site Identification: 915015 Chem-Trol, 4818 Lake Avenue, Hamburg, NY 14075

Institutional Controls:	1. The property may be used for industrial or commercial use.
	2. Groundwater Use; Monitoring Plan; O&M Plan; Land Use; Building Use.
	3. All ECs must be inspected at a frequency and in a manner defined in the SMP.
Engineering Controls:	1. Cover System; Soil Vapor Extraction System; Groundwater Containment; Groundwater Treatment System; Monitoring Wells; Fencing/Access Control

Inspections:	Frequency
1. Cover inspection	Annually
2. Fencing/Access Control	Annually
3. Groundwater Extraction & Treatment System	Monthly
Monitoring:	
1. Groundwater Treatment System Influent/Effluent	6x/year (Odd numbered months)
2. Measure and record water levels in groundwater extraction wells and groundwater monitoring wells	Semi-annually
3. Sample Groundwater Monitoring Wells MW-3S, MW-7R, MW-8R, MW-9R, MW-13R and MW-15R	Biennially (even numbered years)
Maintenance:	
1. Cover system	As needed
2. Fencing/Access Control	As needed

Site Identification: 915015 Chem-Trol, 4818 Lake Avenue, Hamburg, NY 14075

3. Groundwater Extraction & Treatment System	As needed
4. Air Stripper Cleaning	Every other month or as needed
Reporting:	
1. Groundwater Extraction and Treatment System Data	Semi-annually
2. Periodic Review Report	Annually

Further descriptions of the above requirements are provided in detail in the latter sections of this Site Management Plan.

1.0 INTRODUCTION

1.1 General

This Site Management Plan (SMP) is a required element of the remedial program for the Chem-Trol site located in Hamburg, New York (hereinafter referred to as the "Site"). See Figure 1. The Site is currently in the New York State (NYS) Inactive Hazardous Waste Disposal Site Remedial Program, Site No. 915015, which is administered by New York State Department of Environmental Conservation (NYSDEC or Department).

SCA Services, Inc. entered into an Order on Consent on October 15, 1992 with the NYSDEC to remediate the Site. A figure showing the Site location and boundaries of this Site is provided in Figure 2. The boundaries of the Site are more fully described in the metes and bounds site description that is part of the Declaration of Covenants and Restrictions provided in Appendix A.

After completion of the remedial work, some contamination was still present at this Site, which is hereafter referred to as "remaining contamination." Institutional and Engineering Controls (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. A Declaration of Covenants and Restrictions recorded with the Erie County Clerk, requires compliance ECs and ICs placed on the site.

This SMP was prepared to manage remaining contamination at the Site until such time as SCA Services, Inc., can certify that reliance upon such covenants and restrictions is no longer required to protect the public health or environment. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Declaration of Covenants and Restrictions and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

It is important to note that:

- This SMP details the site-specific implementation procedures that are intended to support the requirements of the Declaration of Covenants and Restrictions; and;

- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6 New York Codes, Rules, and Regulations (NYCRR) Part 375 and the Order on Consent (Index #B9-0226-88-07; Site #915015) for the Site, and thereby subject to applicable penalties.

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

This SMP was prepared by AECOM USA, Inc., on behalf of SC Holdings, Inc., in accordance with the requirements of the NYSDEC's Division of Environmental Remediation (DER)-10 ("Technical Guidance for Site Investigation and Remediation"), dated May 2010 (including errata dated Sep. 2015, Nov. 2017, and April 2019), and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and/or ECs that are required for the Site.

1.2 Revisions and Alterations

Revisions and alterations to this plan will be proposed in writing to the NYSDEC's project manager. The 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 shutdown 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 New York State Professional Engineer. In accordance with the Declaration of Covenants and Restrictions for the Site, the NYSDEC 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 the NYSDEC, as needed, in accordance with NYSDEC's DER-10 for the following reasons:

1. 60-day advance notice of any proposed changes in site use that are required under the terms of the Order on Consent, 6 NYCRR Part 375 and/or Environmental Conservation Law.

2. 7-day advance notice of any field activity associated with the remedial program, inclusive of required routine monthly visits.

3. 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan. 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 damage or defect to the foundation, structures 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 7 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 the 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:

8. At least 60 days prior to the change, the 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 Order on Consent, and all approved work plans and reports, including this SMP.

9. 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 the 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****
Bradley Demo, NYSDEC Project Manager	716-851-7139 bradley.demo@dec.ny.gov	Notifications 4 through 9
Megan Kuczka, NYSDEC Project Manager Supervisor	716-842-2175 megan.kuczka@dec.ny.gov	Notifications 4 through 9
NYSDEC Site Control	DERSiteControl@dec.ny.gov	Notifications 1 and 8
Megan Rivera, NYSDOH Project Manager	518-402-7877 megan.rivera@health.ny.gov	Notifications 4, 6, and 7

* 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 the Town of Hamburg, Erie County, New York and is identified as Section 151.02 Block 1 and Lot 14.1 on the Erie County Tax Map (see Figure 3). The Site is an approximately 17.5-acre area and is bounded by a tributary to the South Branch of Smokes Creek and commercial/industrial properties to the north, Lake Avenue and commercial properties to the south, a private residence and commercial property to the east, and the South Branch of Smokes Creek and residential properties to the west (see Figure 2 – Site Plan). The boundaries of the Site are more fully described in Appendix A – Declaration of Covenants and Restrictions. The owner of the Site parcel at the time of issuance of this SMP is:

SC Holdings, Inc.

600 New Ludlow Road

South Hadley, MA 01075

2.2 Physical Setting

2.2.1 Land Use

The Site consists of 2 small on-site buildings: a groundwater treatment building, and soil vapor extraction building, both of which are one story and less than 350 square feet. The Site is zoned commercial and is currently vacant (undeveloped) outside of the previously noted treatment buildings. The Site is dominated either by grassy vegetation, or dense forested areas. Prior to 1972, the South Branch of Smokes Creek followed a meandering path across the western portion of the Site. In 1972, the alignment of the creek was shifted to the west and currently runs in a straight channel along the western boundary of the property. A floodplain exists between the former and present channels of the creek. The elevation of the creek is approximately twenty feet lower than the rest of the Site, which is relatively flat. There are no Site occupants.

The properties adjoining the Site and in the neighborhood surrounding the Site primarily include vacant land, commercial, and residential properties. The properties immediately south of the Site include commercial properties; the properties immediately north of the Site include vacant land and commercial properties; the properties immediately east of the Site include commercial properties; and the properties to the west of the Site include residential properties, across the South Branch of Smokes Creek.

2.2.2 Geology

Most of the natural soils near the Site were formed by glacial activity during the Pleistocene epoch, roughly 10,000 to 15,000 years ago. To the north, the soil belongs to the Lake Erie plain and were largely deposited by glacial lakes; they typically consist of layered clay, silt, and fine sand. South of the Site, the terrain shifts to the Allegheny Plateau, where soils are composed of unsorted glacial till containing dense mixtures of silt, clay, sand, and gravel. Groundwater wells installed in these materials reportedly produce less than 10 gallons per minute (gpm). The bedrock unit in the vicinity of the Site is the Ludlowville Formation of the Hamilton Group which consists primarily of shale with occasional limestone and sandstone seams. Literature on geologic conditions indicates that the Ludlowville formation is 65 to 130 feet thick. Groundwater within the shale generally occurs along the thin vertical and horizontal openings (joints and bedding planes), rather than through the rock mass. Water yields from wells within the bedrock have been reported to range from nearly zero to about 40 gpm where limestone is present. In general, based on a NYSDEC study, bedrock well water yields range from about 10 to 15 gpm (LaSala, 1968).

The subsurface materials at the Site consist of topsoil overlying miscellaneous fill or glacial deposits followed by bedrock. Three types of fill were encountered at the Site during previous investigations including a slag-like material, a white-gray chalky material, and soil fill. Glacial deposits consist primarily of silt and clay with varying amounts of sand and gravel. In general, the sand and gravel content of the till tends to increase with depth. Near the bedrock contact, the soils contained a greater sand and gravel fraction with lesser amounts of silt and clay (McMahon & Mann, 1995).

As previously stated, the bedrock underlying the Site is part of the Ludlowville Formation. Rock core samples from the Site collected during previous investigations were generally described as gray, medium to hard, slightly to moderately weathered shale with very thin to thin bedding (i.e., breaks along bedding planes spaced from less than 2 inches to about 2 feet). The Ludlowville Formation is reportedly 130 feet thick in the vicinity of the Site and consists of the Wanakah and Ledyard Members (Kloc, 1983). A geophysical survey done across the Site suggested that the upper 25 to 30 feet of the shale was more weathered (GZA, 1991).

A geologic cross section location is shown in Figure 4A, and the cross section is provided in Figure 4B. The stratigraphic cross section location is shown in Figure 2. Site specific boring logs are provided in Appendix C.

2.2.3 Hydrogeology

Groundwater flow at and in the area surrounding the Site is controlled by the topography and the soil and rock conditions. These materials include surficial soils such as topsoil and/or miscellaneous fill; glacial till soils; the weathered shale; and the more competent shale below.

Based on previously completed subsurface explorations, groundwater flow generally occurs within the lower, more granular glacial till soils, the weathered shale, and the competent shale. Previously completed investigations note that the shallow/local groundwater flow at the Site is generally the result of recharge within the South Branch of Smokes Creek watershed to the southeast of the Site. Previous investigations indicate that the creek is the discharge point for groundwater in the watershed to the east and west of the creek based on the topography of the area. The subsurface data indicates that the groundwater flow at the Site discharges to the South Branch of Smokes Creek. Recharge to the groundwater system occurs as vertical infiltration through the surficial soils and glacial till. As the recharging infiltration reaches the lower glacial till, it flows along the top of rock to vertical fractures where it enters the more permeable weathered shale (McMahon & Mann, 1995). It is believed that the groundwater flow direction in the weathered shale is primarily horizontal due to its higher hydraulic conductivity relative to

the overlying till and the underlying competent shale. Flow is towards the South Branch of Smokes Creek. Flow in the weathered shale is believed to be the primary flow path across the Site due to its relatively higher permeability. Based on the hydraulic gradients previously observed at the Site and the hydraulic conductivity of the weathered shale, it is estimated that more than 80 percent of the water that passes across the site originates as upgradient flow in the weathered shale (GZA, 1994).

Based on a review of the NYSDEC Water Well Search Application website (https://appfactory.dec.ny.gov/WaterWell/WaterWellData), no registered water wells exist within 0.5 miles of the Site. Water at the Site is supplied by the Erie County Water Authority.

Installation of a groundwater collection trench (also composed of three extraction wells) along the western edge of the Site was required as part of the March 1996 Record of Decision (ROD, [NYSDEC, 1996]). Previous investigations and remedial history are further described in Section 2.3. Implementation of the groundwater collection system and extraction wells results in the depressed water levels in the trench below natural groundwater levels in that area of the Site. The resulting depression in the groundwater table creates local groundwater flow toward the collection trench (AECOM, 2025).

A groundwater contour map is shown in Figure 5. Groundwater elevation data for 2025 is provided in Table 2. Groundwater monitoring well construction logs are provided in Appendix C.

2.2.4 Hydrology

Two surface water bodies are located on the Site, including the South Branch of Smokes Creek and the unnamed on-site tributary to the South Branch of Smokes Creek (Figure 2). The South Branch of Smokes Creek originates near the Village of Orchard Park, approximately 4 miles southeast of the Site. NYSDEC has classified the South Branch of Smokes Creek as a Class C surface water indicating a best usage as "suitable for fishing and all other uses except as a source of drinking water." The on-site tributary to the South

Branch of Smokes Creek generally flows from east to west through the northern portion of the Site (McMahon & Mann, 1995).

2.3 Investigation and Remedial History

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.

Chem-Trol Pollution Services (Chem-Trol) purchased the Site in October 1969 and began operations as a waste chemical processing facility in the Spring of 1970. These operations included chemical recovery, storage and neutralization. Wastes that were accepted at the facility for processing included capacitors, insecticides, pesticides, oil sludges, paint sludges, pickle liquors, phenolic resins, spent solvents, and chemical processing wastewater. These wastes were staged in drums, lagoons, or large (approximately 5,000 gallon) above ground storage tanks on the Site prior to being distilled or incinerated. Operations at the Site were terminated in early 1972 and the associated chemical waste inventory and processing equipment were relocated to a new facility in Model City, New York. A major fire occurred at the facility in July 1972. Water from the firefighting efforts was ponded in the floodplain, behind a temporary dike that had been placed along the eastern shoreline of the South Branch of Smokes Creek. Chem-Trol was acquired by SCA Services, Inc. in October 1973. In 1977 SCA Services, Inc. completed the following closure actions at the facility as part of an interim remedial measure (IRM): (1) removal of approximately 95 cubic yards of contaminated soil from the lagoons, (2) placement of a clean soil cover over the excavation area (approximately 2 feet of soil), and (3) seeding of the area to establish a vegetative cover. An October 3, 1977 letter from the Erie County Department of Health to Chem-Trol states that the Site had been inspected and was found to be covered, graded and seeded (McMahon & Mann, 1995). SCA Services, Inc. merged into SC Holdings, Inc. in 1999.

A Phase I investigation of the Site was completed by Engineering-Science in association with Dames & Moore in 1988 for NYSDEC. The investigation included a site

visit, a literature review, and a preliminary application of the Hazard Ranking System (HRS). The potential impact of the Site on the environment and human heath was initially evaluated by the application of the HRS during the Phase I investigation. However, the Phase I investigation indicated that additional data was necessary to characterize the Site (Engineering Science, 1988).

A Phase II investigation was completed at the Site between 1990 and 1991. The Phase II included a literature review, topographic mapping, site reconnaissance, air monitoring, a geophysical survey, and environmental sampling. Eight piezometers (P-1S, P-2S, P-2R, P-3S, P-3R, P-4S, P-5S, and P-5R) and nine monitoring wells (MW-1S, MW-1R, MW-2S, MW-3S, MW-4S, MW-4R, MW-5S, MW-6S, MW-6R) were installed as part of the Phase II study. Samples were collected from the former surface impoundments, flood plain sediments, drum remnant locations, soil cuttings from piezometer and monitoring well installations, and surface water sediment; as well as surface water, overburden groundwater and bedrock groundwater. Locations of monitoring wells/piezometers and surface water, sediment, and soil samples from the Phase II investigation are shown on Figure 6 and Figure 7, respectively. Based on the results of the Phase II investigation, the Site was assigned a hazardous waste site classification of 2 by NYSDEC. This classification indicates that the Site poses a significant threat to public health and/or the environment and that action in the form of further investigations and remediation is required in the form of a Remedial Investigation/Feasibility Study (RI/FS [GZA, 1991]).

The RI, completed between October 1992 and June 1994, included the installation of test borings and monitoring wells, hydraulic conductivity testing, auger probes to collect soils, completion of test pits, and various environmental sampling activities. Monitoring well/piezometer locations, sediment and surface water sampling locations, and soil sampling locations are presented on Figures 6 through 8, respectively. Results indicated that sources of contamination at the Site included soils in and around the impoundments used for waste treatment (Figure 9) as well as soils which may have been mixed throughout the Site during earthwork activities. Compounds detected in samples from the affected Site soils included: methylene chloride (0.002 mg/kg [milligram per kilogram] to 8.9 mg/kg), 1,1,1-trichloroethane (0.004 mg/kg to 8.8 mg/kg), trichloroethene (0.002 mg/kg to 8.7

nig/kg), phenol (0.051 mg/kg), benzo(a)pyrene (0.23 mg/kg to 3.0 mg/kg) and polychlorinated biphenyls (PCBs, [0.85 mg/kg to 13.9 mg/kg]).

Water samples from overburden wells contained a range of volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs), likely originating from leaching of contaminated soils. Halogenated aliphatic VOCs were most common due to their higher mobility, while SVOCs appeared mainly near well MW-3S. Neither surface water nor sediment samples showed evidence of contamination within the South Branch of Smokes Creek at the time of the RI, however, RI sampling identified an area of affected sediments along the on-site tributary to the South Branch of Smokes Creek. This area extends from sample location SWS-8 to SWS-6 and was primarily impacted by PCBs and low concentrations of VOCs and SVOCs.

Bedrock groundwater contained similar contaminants but at higher concentrations, especially in wells west of the suspected source areas (i.e., former surface impoundments). This pattern aligns with the Site's hydrogeologic model and indicates that contaminants may have migrated westward from the former surface impoundments. Past erosion may have transported contaminated sediments, but current transport is limited by the soil cover installed during Site closure. While some polycyclic aromatic hydrocarbons (PAHs), phthalates, and pesticides were found in surface-water sediments, the highest concentrations occurred upstream of the Site, suggesting that the Site is not a significant contributor (GZA, 1994). Compounds detected in groundwater included 1,1,1-trichlorethane, 1,1-dichlorethene, 1,1-dichloroethane, chloroethane, trichloroethene, 1,2-dichlorethene, vinyl chloride, chloroform, methylene chloride, and chlorotoluene. Observations made during the RI indicated the presence of dense non-aqueous phase liquid (DNAPL) in MW-3S during sampling performed in 1993. The DNAPL was analyzed for volatile organic compounds and found to contain 960,000 micrograms per liter (µg/L) chlorotoluene. The extent of affected soil and groundwater as identified by the RI are shown on Figure 10 and Figure 11, respectively.

Surface water testing showed exceedances for one organic compound (bis(2-ethylhexyl)phthalate), certain metals, and cyanide, largely driven by a single seep sample.

Some downstream sediment samples exceeded regulatory criteria for PAHs, PCBs, and metals but similar or higher concentrations upstream suggest contamination may not be site-related, except possibly for PCBs. Finally, ecological risk evaluation indicated exceedances for select SVOCs and metals in surface water, and for several SVOCs, pesticides, and metals in sediments, with PCBs being the most plausible site-related ecological concern (GZA, 1994).

Remedial action objectives (RAOs) for the Site as developed by the 1995 Feasibility Study (FS) are provided as Table 3 through Table 6. The complete RI report can be found at the NYSDEC Environmental Remediation Database Site Record (NYSDEC, 2026). NYSDEC selected a remedial design based upon the results of the RI/FS for the Site.

The selected remedy, as defined by the 1996 ROD issued by the NYSDEC (NYSDEC, 1996), included excavation of contaminated soils and sediments from select areas of the Site, installation of a groundwater collection trench and treatment system along the western edge of the Site (eastern bank of the South Branch of Smokes Creek), improvement of the existing soil cover over the former waste chemical processing area, and installation of a soil vapor extraction (SVE) system in the former waste chemical processing area. The selected remedy for site soils and sediments was completed in 1998, while construction of the groundwater collection trench and treatment system was completed in 2001. In December 2004, the Site was re-classified to a Class 4 Site by NYSDEC indicating that remedial actions taken at the Site to eliminate significant threats to public health and the environment have been properly constructed and implemented, and long-term operation, maintenance, and monitoring of the in-place remedial system is necessary to assure remedy effectiveness.

In September 2006 SC Holdings, Inc. installed two temporary soil vapor intrusion (SVI) probes at the Site (Figure 12) and sampled them in accordance with New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion in the State of New York. The purpose of the SVI evaluation was to determine whether VOCs from the Site were migrating in soil vapor beyond the western property boundary of the

Site. The results of the SVI assessment indicated that vapor intrusion into residential homes west of the Site is not a concern (McMahon & Mann, 2006).

In 2010 SC Holdings, Inc. completed an evaluation of the SVE system when operating in a passive mode (i.e., air was not actively being pumped through mechanical means from the system). The results of the evaluation indicated that the passive operation of the SVE system was effective at venting soil vapors containing VOCs. Based upon these results, it was recommended that active operation of the SVE system permanently cease and that passive operation of the SVE system continue in the future. NYSDEC agreed with this recommendation in a letter dated March 29, 2011.

2.4 Remediation Goals

The Remediation Goals (RGs) for the Site as listed in the Record of Decision dated March 29, 1996, are as follows:

- Reduce and, when feasible, remove chemical contamination in the soils, sediments and groundwater at the site,
- Eliminate the potential for direct human or animal contact with the contaminated soils, sediments, and groundwaters at the site,
- Prevent migration of contaminants in the on-site soils into groundwater,
- Prevent off-site migration of contaminated groundwater, and mitigate the impacts of contaminated groundwater to the environment, and
- Provide for attainment of SCGs for groundwater quality to the extent practicable.

2.5 Remaining Contamination

2.5.1 Soil

The RI sampling results indicated the presence of a variety of VOC, and to a lesser extent SVOC, analytes in soil, as well as pesticide and metal compounds. As shown on

Figure 10, the extent of affected soils identified at the time of the RI covered an approximately 2-acre area and varied in depth from 5 to 8 feet. Compounds detected in soils exceeding then-applicable NYSDEC Technical and Administrative Guidance Memorandum No. 4046 (NYSDEC TAGM 4046 [NYSDEC, 1994]) criteria included methylene chloride (0.002 mg/kg to 8.9 mg/kg), 1,1,1-trichlorethane (0.004 mg/kg to 8.8 mg/kg), trichloroethene (0.002 mg/kg to 8.7 mg/kg), phenol (0.051 mg/kg), benzo(a)pyrene (0.23 mg/kg to 3.0 mg/kg), and PCBs (0.85 mg/kg to 13.9 mg/kg).

One “hot spot” was identified in the area of sample location SSI-2 (4 to 5 feet, [Figure 8]) and contained elevated concentrations of VOCs (40 mg/kg), SVOCs (461 mg/kg), pesticides (50 mg/kg), and PCBs (1,820 mg/kg). As part of the remedial design field studies completed in 1997 (McMahon & Mann, 1997), samples were collected at four locations to estimate the extent of impacted soils in the “hot spot” area. One soil sample was collected approximately 10 to 20 feet north, south, east, and west from the SSI-2 location between depths of 4 and 5 feet using a stainless steel hand auger and analyzed for PCBs. PCB concentrations in each of the four samples were below the applicable TAGM 4046 criteria of 10 mg/kg. “Hot spot” soils from the SSI-2 location were removed in accordance with the design plans and specifications for the source control elements as detailed in “Source Control Elements, SCA, Chem-Trol Site Remedial Design, Hamburg, New York,” by Rust Environment & Infrastructure, August 1998 (Rust Environment & Infrastructure, 1998). The hot spot soils were excavated and transported off-site for disposal at CWM Chemical Services, LLC’s Model City, New York facility. The removal location is identified as SSI-2 on Figure 13.

The extent of the Site soil cover with pre-construction and final grade elevations is presented on Figure 16. There is no demarcation layer associated with the soil cover system. The extent of affected soils identified during the RI are shown on Figure 10; however, “hot spot” soils associated with SSI-2 were removed as part of the Site remedy completed between fall 1998 and summer 1999. Soils not removed during SSI-2 hot spot excavation activities remain on-site below the soil cover system.

The soil cover may be breached and remaining contamination encountered during excavation work to complete repairs or improvements to existing on-site subsurface utilities or associated infrastructure (e.g., discharge lines and electrical conduits associated with the groundwater treatment system or water supply lines). The locations of these subsurface utilities as presented on Figure 17 are largely outside of the limits of affected soils identified during the RI. Electricity is provided to the Site via overhead powerlines, and the Site is not connected to the sanitary sewer system, therefore no excavation associated with repairs or improvements to these utilities is expected. Future excavation work within the limits of the Site will be conducted in accordance with the Excavation Work Plan (Appendix D).

2.5.2 Sediment

RI sampling identified an area of affected sediments along the on-site tributary to the South Branch of Smokes Creek which extended from sample location SWS-8 to SWS-6 (Figure 10). Samples from this area primarily contained PCBs and low concentrations of VOCs and SVOCs. Compounds detected include PCBs (0.94 mg/kg to 2.8 mg/kg), acetone (0.011 mg/kg to 0.53 mg/kg), bis(2-ethythexyl)phthalate (0.1 mg/kg to 0.88 mg/kg), and benzo(a)pyrene (0.07 mg/kg to 1.1 mg/kg).

Floodplain sediment samples were collected from FPS-1 and FPS-2 in 1990, from FPS-3 through FPS-6 in 1992 as part of the RI, and from FPS-7 through FPS-12 in 1997 as part of remedial design field studies (McMahon & Mann, 1997). Samples of the floodplain sediments generally contained low levels of SVOCs, PAHs, pesticides, PCBs, and metals below NYSDEC TAGM 4046 criteria (NYSDEC, 1994) applicable at the time of sampling.

“Hot spot” sediments were removed in accordance with the design plans and specifications for the source control elements as detailed in “Source Control Elements, SCA, Chem-Trol Site Remedial Design, Hamburg, New York,” by Rust Environment & Infrastructure, August 1998 (Rust Environment & Infrastructure, 1998). The “hot spot” sediments were excavated and transported off-site for disposal at CWM Chemical Services,

LLC's Model City, New York facility. Removal locations are identified as SWS-6, SD-1 (SWS-7), SWS-8, FPS-8, and FPS-9 identified on Figure 13.

2.5.3 Groundwater

As previously noted, the extent of affected groundwater as identified during the RI is shown on Figure 11. The RI data indicated that the vertical extent of impacted groundwater is limited to the upper 25 to 30 feet of weathered shale bedrock. Compounds detected at the time of the RI included the following (in parts per million [ppm]):

Compound	Range of Detection (ppm)
1,1,1-trichloroethane	Non-detect (ND) to 2.80
1,1-dichloroethene	ND to 0.27
1,1-dichloroethane	ND to 0.86
chloroethane	ND to 0.20
trichloroethene	ND to 1.50
1,2-dichloroethene	ND to 0.026
vinyl chloride	ND to 0.003
chloroform	ND to 0.26
methylene chloride	ND to 0.026
o-chlorotoluene	ND to 130

Groundwater samples were collected in October 2002 following installation of the groundwater extraction and treatment system from post-remediation monitoring wells MW-3S, MW-7R, MW-8R, MW-9R, MW-13R, and MW-15R. VOC compounds detected at the time of the October 2002 sampling event included the following (maximum detected concentrations identified at the time of sampling are shown in parentheses): 1,1,1-trichloroethane (2.8 ppm), 1,1,2, trichloro-1,2,2-trifluoroethane (0.0078 ppm), 1,1-dichloroethane (1.0 ppm), 1,1-dichloroethene (0.27 ppm), 1,2-dichloroethene (0.009 ppm), 1-chloro-2-methylethyl benzene (1.1 ppm), acetone (0.058 ppm), benzene (0.024 ppm), carbon disulfide (0.026 ppm), chlorobenzene (0.022 ppm), chloroethane (0.076 ppm), chloroform (0.26 ppm), cis-1,2-dichloroethene (0.032 ppm), cyclohexane (0.18 ppm), ethylbenzene (0.017 ppm), isopropylbenzene (0.0031 ppm), methylcyclohexane (0.11 ppm), methylene chloride (0.001 ppm), o-chlorotoluene (130 ppm), tetrachloroethene (0.0005 ppm), toluene (0.17 ppm), total xylenes (0.17 ppm), trichloroethene (0.66 ppm), and vinyl chloride (0.002 ppm).

Groundwater conditions as of the most recent sampling completed in September 2024, are shown on Figure 14. Analytical results show that only o-chlorotoluene, 1,1,1-trichloroethane, and 1,1-dichloroethane exceeded current applicable class GA groundwater standards or guidance values listed in NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1, as amended, protection for a source of drinking water (NYSDEC, 1998). The highest concentration of o-chlorotoluene was detected at overburden monitoring well MW-3S. It is expected that contaminant concentrations at this location will continue to decrease as groundwater flows from the overburden to the upper weathered shale bedrock where it is conveyed to the groundwater collection trench. Groundwater elevation data show that the groundwater collection system continues to contain groundwater contaminants and creates a gradient toward the groundwater collection wells and away from the South Branch of Smokes Creek.

3.0 INSTITUTIONAL AND ENGINEERING CONTROLS

3.1 General

Since remaining contamination exists at the Site, Institutional Controls (ICs) and Engineering Controls (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 covenants and restrictions set forth in the Declaration of Covenants and Restrictions;
- 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 Excavation Work Plan (EWP) (as provided in Appendix D) 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 or industrial uses only. Adherence to these ICs on the Site is required and will be implemented under this SMP. ICs identified in this SMP may not be discontinued without an amendment to or extinguishment of the Declaration of Covenants and Restrictions. The IC boundaries are shown on Figure 2. These ICs, as initially listed as covenants and restrictions in the Declaration of Covenants and Restrictions, include but are not limited to the following:

- The owner of the Property shall maintain the cap covering the Property by maintaining its grass cover, or after obtaining written approval from the Relevant Agency (NYSDEC), by capping the Property with another material.

- The property is prohibited from being used for purposes other than for industrial or commercial use, excluding use for day care, child care and medical care, without the written expressed waiver of such prohibition by the Relevant Agency.

- The use of groundwater underlying the Property is prohibited without treatment to render it safe for drinking water or industrial purposes, as appropriate, unless the user first obtains permission from the Relevant Agency, except that the groundwater may be reasonably used as necessary to conduct tests to monitor contamination levels of the groundwater as directed and approved by the Relevant Agency.

- The owner of the Property shall continue in full force and effect any institutional and engineering controls the Department required the Respondent put into place and maintain unless the owner first obtains permission to discontinue such controls from the Relevant Agency.

- The Declaration of Covenants and Restrictions is and shall be deemed a covenant that shall run with the land and shall be binding upon all future owners of the Property which shall provide that the owner and its successors and assigns consents to the enforcement by the Relevant Agency.

- The Property owner may make such use of the property as it wishes so long as such use is in compliance with applicable law including 6 NYCRR Part 375 and does not violate any of the institutional controls, restrictions or other terms of the Declaration of Covenants and Restrictions.

3.3 Engineering Controls

3.3.1 Cover (or Cap)

Exposure to remaining contamination at the Site is prevented by a cover system placed over the Site. This cover system is comprised of a minimum of 1.5 feet of imported fill and 0.5 feet of topsoil, upon which a grass cover is maintained. Figure 15 presents the location of the cover system. The Excavation Work Plan (EWP) provided in Appendix D outlines the procedures required to be implemented in the event the cover system is breached, compromised, penetrated or temporarily removed. Procedures for the inspection of this cover are provided in the Monitoring and Sampling Plan included in Section 4.0 of this SMP. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) and associated Community Air Monitoring Plan (CAMP) prepared for the Site and provided in Appendix D. Any breach of the Site's cover system must be overseen by a Professional Engineer (PE) who is licensed and registered in New York State or a qualified person who directly reports to a PE who is licensed and registered in New York State.

3.3.2 Soil Vapor Extraction (SVE) System

The SVE system was installed in the eastern portion of the former chemical waste processing facility. The system began operation in late 1999 and it was intended to draw soil vapor through the soil beneath the Site removing VOCs via mechanical means (e.g. blower). It is composed of perforated lateral pipes buried within the soil on Site including a header pipe and eight subsurface laterals installed in a linear array within the area of remediated soils. The location of the SVE laterals is shown on Figure 16. The pipes are designed to have a vacuum imposed on them by blowers contained in the SVE building.

Vapors are drawn through the piping system into the building where the vapors are passed through a tank to remove any condensate before being discharged.

SC Holdings submitted a work plan to NYSDEC on October 22, 2009, proposing conversion of the active system to a passive venting system. NYSDEC authorized the conversion to a passive system. The SVE treatment system was converted from active to passive operation in January 2010. Additional details on the SVE are provided in Section 4.3.1.

Procedures for operating and maintaining the SVE system are documented in the Operation and Maintenance Plan (Section 5.0 of this SMP). As-built drawings, signed and sealed by a PE who is licensed and registered in New York State, are included in Appendix F – Operations and Maintenance Manual.

3.3.3 Groundwater Collection and Treatment System

The groundwater collection system is defined in the ROD as a system that intercepts, removes and prevents contaminated groundwater from flowing from the Site. The system also collects contaminated groundwater found adjacent to and west of the Site by inducing an eastward flow from this area, back towards a collection and removal trench. The system includes a blast-fractured bedrock trench in which three groundwater collection wells (EW-1, EW-2, and EW-3) are installed, conveyance piping, and a shallow tray air stripper that removes VOCs from the collected groundwater. The treated groundwater is discharged through a pipe to the South Branch of Smokes Creek. The groundwater collection and treatment system began operation in December 2001. The groundwater collection and treatment system design is illustrated on Figure 17.

Procedures for operating and maintaining the groundwater collection and treatment system are documented in the Operation and Maintenance Plan (Section 5.0 of this SMP). As-built drawings, signed and sealed by a PE who is licensed and registered in New York State, are included in Appendix F – Operations and Maintenance Manual.

3.3.4 Monitoring Wells Associated with Source Removal

Groundwater monitoring/pumping wells associated with source removal include the 41 wells presented on Table 2. Water levels from each of these monitoring wells are measured and recorded on a semi-annual basis as described in Section 4.0. Six of these monitoring wells (MW-3S, MW-7R, MW-8R, MW-9R, MW-13R, and MW-15R) are sampled on a biennial even-numbered year schedule as described in Section 4.0. Monitoring wells/extraction wells are assessed to determine groundwater conditions of the pumping wells, wells located at the center, east, and west of the cover/cap, wells located west of the collection trench, and wells west of South Branch of Smokes Creek.

3.3.5 Leachate Collection

As the Site is not a landfill and no waste is present in the soil, there is no leachate at this Site.

3.3.6 Fencing/Access Control

Access to the Site is restricted via 6-foot-high chain link fencing along the southern and eastern property boundaries and portions of the western property boundary to reduce potential exposure to the Site contaminants. A locked vehicle gate is located along the southern property boundary (along Lake Avenue) and serves as the main Site entrance and access route to the treatment buildings. Access to the Site from areas without fencing is limited by natural site features such as wooded areas, the South Branch of Smokes Creek parallel to the western property boundary and the unnamed on-site tributary to the South Branch of Smokes Creek running east to west through the northern portion of the Site.

3.4 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered completed when monitoring indicates that the remedy has achieved the remedial action objectives 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 the NYSDEC, confirmation samples of applicable environmental media are required before terminating

any remedial actions at the site. Confirmation samples require Category B deliverables and a Data Usability Summary Report (DUSR).

As discussed below, the 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 Commissioner Policy (CP)-43.

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 and United States Army Corps of Engineers regulations and guidance. Also, the remedial party will ensure that no ongoing erosion is occurring on the Site.

3.4.1 Cover (or Cap)

The cover system is a permanent control, and the quality and integrity of this system will be inspected at defined, regular intervals in accordance with this SMP in perpetuity.

3.4.2 Soil Vapor Extraction System (SVE) System

The passive operation of the SVE system will not be discontinued unless prior written approval is granted by the NYSDEC project manager. In the event that environmental monitoring data indicates that the SVE system may no longer be required, a proposal to discontinue passive operation of the system will be submitted by the remedial party to the NYSDEC project manager. Conditions that may warrant discontinuing passive operation of the SVE system include contaminant concentrations in groundwater and/or soil that: (1) reach levels that are consistently below ambient water quality standards or the site SCGs, as appropriate; (2) have become asymptotic to a low level over an extended period of time, as accepted by the NYSDEC; or (3) the NYSDEC has determined that the SVE 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.

3.4.3 Groundwater Collection and Treatment System

The groundwater collection and treatment 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 groundwater collection and treatment 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 groundwater collection and treatment system include contaminant concentrations in groundwater that: (1) reach levels that are consistently below ambient water quality standards or the site SCGs as appropriate, (2) have become asymptotic to a low level over an extended period of time as accepted by the NYSDEC; or (3) the NYSDEC has determined that the groundwater collection and treatment 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.

3.4.4 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 ambient water quality standards, 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 the NYSDEC, additional source removal, treatment and/or control measures will be evaluated.

3.4.5 Leachate Collection

See Section 3.3.5.

3.4.6 Fencing/Access Control

The fencing/access control is a permanent control, and the quality and integrity of this system will be inspected at defined, regular intervals in accordance with this SMP in perpetuity. Access to the Site will remain restricted via the fenced areas to personnel required to operate and maintain remedial elements of the ROD. The Site gate will remain locked at all times outside of periods when required personnel are present on-site. The fence will remain in place and operational until permission to discontinue their use is granted in writing by the NYSDEC project manager.

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 Quality Assurance Project Plan (QAPP) provided in Appendix G.

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

- Sampling and analysis of all appropriate media (e.g., groundwater);
- Assessing compliance with applicable NYSDEC standards, criteria and guidance (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 at least 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 New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State. 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 Periodic Review Report. 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 Declaration of Covenants and Restrictions;
- 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 5 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 7 days of the event that 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 the 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

Soil Vapor Extraction System

As previously described, the SVE treatment system was converted from active to passive operation in January 2010. After a year of monitoring, SC Holdings submitted a report describing the monitoring results as indicating that passive operation of the SVE system provides similar and possibly improved effectiveness as active operation of the SVE system in venting soil vapors. Water level data in the passive vent risers indicated that passive venting might also contribute to generally lower water levels in the laterals for a longer period of time over the course of the year and therefore provide a greater opportunity to vent soil vapors.

It was recommended that active operation of the SVE system permanently cease and that passive operation of the SVE system laterals continue. In addition, it was recommended that continued monitoring of the SVE system laterals for water levels and VOCs be eliminated. NYSDEC agreed with these recommendations in a letter to Mr. Mark Snyder dated March 29, 2011 (see Appendix I).

Monitoring of the passive SVE system will be performed on a routine basis, as identified in Table 7 SVE 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 New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State. 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 passive SVE system has been reported or an emergency occurs that is deemed likely to affect the operation of the system. SVE

system components to be monitored include, but are not limited to, the components included in Table 7 below.

Table 7 – SVE System Monitoring Requirements and Schedule

Remedial System Component	Monitoring Parameter	Operating Range	Visual Monitoring Schedule
Passive lateral riser pipes	Examined for damage	Not applicable (system operates passively)	Monthly

Groundwater Collection and Treatment System

Monitoring of the groundwater collection and treatment system will be performed on a routine basis, as identified in Table 8 Groundwater Collection and Treatment 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 New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State. 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 groundwater collection and treatment system has been reported or an emergency occurs that is deemed likely to affect the operation of the system. Groundwater collection and treatment system components to be monitored include, but are not limited to, the components included in Table 8 below.

Table 8 – Groundwater Collection and Treatment System Monitoring Requirements and Schedule

Remedial System Component	Monitoring Parameter	Current Operating Range	Monitoring Schedule
Extraction Well 1 (EW-1)	Pumping Rate Water Level Above Transducer	0.1 - 5 GPM 0 – 250 Inches	Monthly
Extraction Well 2 (EW-2)	Pumping Rate Water Level Above Transducer	0.1 - 5 GPM 0 – 250 Inches	Monthly
Extraction Well 3 (EW-3)	Pumping Rate Water Level Above Transducer	0.1 - 5 GPM 0 – 250 Inches	Monthly
Total Flow Meter	Total System Flow	Not applicable	Monthly

Sources: Groundwater Control Elements SCA, Chem-Trol Site, Remedial Design, Hamburg, NY, Earth Tech, Inc., 1999; Operations & Maintenance Manual for Lee Supply Company Earth Tech/Chemtrol, EPG Companies Inc., 2001; Post-Remedial Operation and Maintenance Plan, Record Drawings and Final Engineering Report, Volume III, McMahon & Mann Consulting Engineers, P.C., 2002.

Total system flow is monitored via a total influent system flow meter located within the groundwater treatment building. Total system flow is recorded during each sampling or service visit. To determine individual wells pumping rates, the service team isolates individual extraction wells and monitors the total flow meter to estimate each individual well flow.

In October 2020, a Sensaphone remote monitoring system was installed for the groundwater treatment system. The Sensaphone system automatically sends the AECOM Project Manager and SC Holdings Project Manager electronic mail notification when power to the Site is lost. The AECOM Project Manager confirms receipt of the notification with the SC Holdings Project Manager and a service visit is scheduled promptly to address the notification and minimize downtime of the system.

A complete list of components to be inspected is provided in the Inspection Checklist, provided in Appendix H – 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 Operation and Maintenance Plan, is required immediately. Periodic service events of the system (e.g., service of the air stripper) are described in Section 5.0.

4.3.2 Remedial System Sampling

Samples shall be collected from the groundwater collection and treatment system influent and effluent on a routine basis. Sampling locations, required analytical parameters and schedule are provided in Table 9 – Remedial System Sampling Requirements and Schedule below. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager.

Effluent from the groundwater collection and treatment system (air stripper) discharges into the South Branch of Smokes Creek via an air stripper surface water discharge pipe. In addition to the effluent sample, one trip blank for VOCs is submitted for quality assurance/quality control purposes (QA/QC).

Table 9 – Remedial System Sampling Requirements and Schedule

Sampling Location	**Analytical Parameters**				**Schedule**
	VOCs (EPA Method 624.1)	Total Iron (EPA Method 200.7)	TSS (SM 2540D)	pH (SM 4500 H+ B)	

Groundwater treatment system influent (from sample port on influent header inside treatment building)	X	X	X	X	Every other month (odd numbered months)
Groundwater treatment system effluent (at the outlet of the discharge pipe in the vicinity of South Branch of Smokes Creek)	X	X	X	X	Every other month (odd numbered months)

Treated water discharge effluent criteria for flow volume, pH, Total Dissolved Solids (TDS), TSS, ten VOCs (toluene, chlorobenzene, cis-1,2-dichlorethene, benzene, 1,1,1-trichlorethane, chloroethane, 1,1-dichloroethane, 1,1-dichloroethene, trichloroethene, and o-chlorotoluene), and six total metals (aluminum, boron, iron, lead, manganese, and zinc) were established in March 2001 (see Appendix I). A request to modify effluent criteria based on initial operating data was submitted to NYSDEC by McMahon & Mann Consulting Engineers, PC (consultant to SC Holdings at the time) in December 2004. NYSDEC responded to the request in July 2007 approving a modification of effluent criteria for iron (increased from 700 parts per billion [ppb] to 3,000 ppb), and

discontinuation of monitoring for TDS, aluminum, boron, lead, manganese, and zinc (see Appendix I).

Pursuant to the May 2023 NYSDEC-approved revisions to sampling and reporting requirements, analytical test results for the aqueous effluent samples are to be submitted semi-annually, with the first six months of the year being submitted to NYSDEC in a dedicated semi-annual Operation, Maintenance and Monitoring (OM&M) Report and the second six months of the year to be submitted to NYSDEC with the annual Periodic Review Report (PRR). Detailed sample collection and analytical procedures and protocols are provided in Appendix J – Field Activities Plan and Appendix G – Quality Assurance Project Plan.

The remedial party will properly dispose of all wastes generated by the remedial system at off-site 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: municipal solid waste (e.g., nitrile gloves used during maintenance events and general refuse), and water and iron precipitate generated during maintenance of the air stripper and effluent piping. Municipal solid waste is disposed of off-site as needed. Water and iron fouling precipitate, collected from the post-treatment side of the treatment system and therefore do not adversely impact the Site, are disposed of on-site by dispersing the precipitate to the ground surface of the Site cap. Routine service of the air stripper is further described in Section 5.0.

4.4 Post-Remediation Media Monitoring and Sampling

4.4.1 Groundwater Level Monitoring

Groundwater levels shall be collected from 41 groundwater extraction and monitoring wells on a semi-annual basis (twice per year). Groundwater levels shall be collected from extraction wells EW-1 through EW-3, monitoring wells east of the site cover (from north to south: MW-6S, MW-6R, P-1S, MW-1R, MW-1S, MW-7S, and MW-7R), monitoring wells from the center of the site cover (from north to south: P-5S, P-5R, MW-5S, P-2R, P-2S, MW-2S), monitoring wells from the west of the site cover (from

north to south: MW-4S, MW-4R, P-4S, MW-3S, P-3R, P-3S, OW-3R), monitoring wells from west of the groundwater collection trench (from north to south: OW-1FR, P97-5, MW-10S, MW-10R, P97-4, MW-8S, MW-8R, P97-3, MW-9RD, MW-9R, MW-9S, OW-2FR, P97-2, P97-1, MW-12R, MW-12S), and monitoring wells west of Smokes Creek (from north to south: MW-13R and MW-14R). Semi-annual water level forms are provided in Appendix H.

4.4.2 Groundwater Sampling

Samples shall be collected from the six selected monitoring wells (MW-3S, MW-7R, MW-8R, MW-9R, MW-13R, and MW-15R) on a routine basis. Sampling locations, required analytical parameters, and schedule are provided in Table 10 – Post Remediation Sampling Requirements and Schedule below. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager.

Pursuant to the May 2023 NYSDEC-approved revisions to sampling and reporting requirements, groundwater sample collection from the six groundwater monitoring wells is completed on a biennial even-numbered year schedule. One trip blank and one field duplicate sample are submitted for QA/QC purposes.

Table 10 – Post Remediation Sampling Requirements and Schedule

Sampling Location	Analytical Parameters	Schedule
	VOCs (EPA Method SW846 8260C)	
MW-3S, MW-7R, MW-8R, MW-9R, MW-13R, and MW-15R	X	Biennially (even-numbered years)

Detailed sample collection and analytical procedures and protocols are provided in Appendix J – Field Activities Plan and Appendix G – Quality Assurance Project Plan.

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

The monitoring well network includes two sentinel wells that monitor off-site plume migration. The monitoring well network for this site includes the following sentinel wells: MW-7S and MW-15R.

Table 11 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, one (1) monitoring well located west of the site cover (MW-3S), one (1) monitoring well located east of the site cover (MW-7R), two (2) monitoring wells located west of the groundwater collection trench (MW-8R and MW-9R), and two (2) monitoring wells located west of Smokes Creek (MW-13R and MW-15R) are sampled to evaluate the effectiveness of the remedial system. The remedial party will measure depth to the water table for each monitoring well in the network before sampling (see Section 4.4.1). Monitoring well construction logs are included in Appendix C of this document.

If biofouling or silt accumulation occurs in the on-site and/or off-site 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 Periodic Review Report. 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.

4.4.3 Monitoring and Sampling Protocol

All sampling activities will be recorded in a field book and associated sampling log as provided in Appendix H – 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 J of this document.

5.0 OPERATION AND MAINTENANCE PLAN

5.1 General

This Operation and Maintenance 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 Operation and Maintenance Plan:

- Includes the procedures necessary to allow individuals unfamiliar with the site to operate and maintain the passive SVE and groundwater collection and treatment systems;

- Will be updated periodically to reflect changes in site conditions or the manner in which the passive SVE and groundwater collection and treatment systems are operated and maintained.

Further detail regarding the Operation and Maintenance of the passive SVE and groundwater collection and treatment systems is provided in Appendix F – Operation and Maintenance Manual. A copy of this Operation and Maintenance Manual, along with the complete SMP, is to be maintained at the site. This Operation and Maintenance Plan is not to be used as a stand-alone document, but as a component document of this SMP.

5.2 Remedial Systems Performance Criteria

Performance of the passive SVE will be based on the integrity of the readily visible elements of the passive SVE. The integrity of these elements will be assessed by visual observations on a periodic basis as outlined in Section 4.3.1 Remedial System Monitoring, Soil Vapor Extraction System, Table 7.

The performance of the groundwater collection and treatment system is monitored via the collection of effluent groundwater from the system as previously described in Section 4.3.2. Updated treated water discharge effluent criteria for flow volume, pH, TSS, total iron, and ten VOCs (toluene, chlorobenzene, cis-1,2-dichlorethene, benzene, 1,1,1-trichlorethane, chloroethane, 1,1-dichloroethane, 1,1-dichloroethene, trichloroethene, and

o-chlorotoluene) were established in July 2007 (see Appendix I). Groundwater treatment system effluent discharge limitations are provided in the table below.

Table 12 – Groundwater Treatment System Effluent Discharge Limitations

Parameter	Discharge Limitations	Units
Flow	144,000	Gallons per day (gpd)
pH	6.8 to 8.5	Standard units
TSS	20	mg/L (milligrams per liter)
Iron - Total	3,000	µg/L
Toluene	5	µg/L
Chlorobenzene	10	µg/L
cis-1,2-dichlorethene	10	µg/L
Benzene	5	µg/L
1,1,1-trichlorethane	10	µg/L
Chloroethane	10	µg/L
1,1-dichloroethane	10	µg/L
1,1-dichloroethene	10	µg/L
Trichloroethene	10	µg/L
o-chlorotoluene	10	µg/L

5.3 Operation and Maintenance of the SVE System

Passive operation of the SVE system laterals continues per a letter dated March 29, 2011, to Mr. Mark Snyder from NYSDEC (see Appendix I). Cut-sheets and as-built drawings for the SVE system are provided in Appendix F – Operations and Maintenance Manual.

5.4 Operation and Maintenance of the Groundwater Collection and Treatment System

The following sections provide a description of the operations and maintenance of the groundwater collection and treatment system. Cut-sheets and as-built drawings for the groundwater collection and treatment system are provided in Appendix F – Operations and Maintenance Manual.

The groundwater treatment system collects and treats groundwater from beneath the Site. Controlled blasting was utilized to fracture bedrock beneath the Site in a line from north to south. The fractured rock zone simulates a trench without having any open excavations. Groundwater tends to collect in the fractured rock. Three extraction wells (EW-1, EW-2 and EW-3) are installed into the fractured rock zone at intervals over its length. Each well contains a pump that moves collected water to a treatment building via 2-inch high-density polyethylene (HDPE) pipes placed in an underground trench. The water enters the building and flows into an air stripper that removes volatile organic compounds from the water. Treated water is discharged to the South Branch of Smokes Creek.

5.4.1 System Start-Up

The system is placed into operation by turning the blower switch to the "on" position. The process logic controller (PLC) is programmed to energize the variable frequency drive (VFD) pumps at pre-set speeds to deliver the required flow rate. Each pump can also be turned on or off at the control panel located adjacent to each well location.

5.4.2 Wells/Piping/Valves

Each well contains a variable speed pump and pressure transducer. The pumps move the water to the treatment building at preset flow rates. Pressure transducers in the wells measure the water level in each well and send electrical signals to the treatment building for readout and data storage. The PLC in the water treatment building transforms these electrical signals into water level measurements that can be monitored from the control panel. The water from each well is piped to the treatment building through a 2-inch HDPE pipe that is connected to each well by a pitless connection. The 2-inch HDPE pipes run from each well through a common trench to the treatment building. An 8-foot diameter manhole is located approximately halfway between the groundwater collection trench and the treatment building. The manhole contains cleanout ports and gate valves for each HDPE line to allow maintenance as required. Each pipe enters the treatment building separately and flows through a ball valve, a check valve and a flow measurement transducer before entering a common header pipe. The ball and check valves allow each pipe to be

closed off so that the flow meter transducers may be serviced. The three flow meters are equipped to send electrical signals to a flow totalizer that computes the flow rate and total gallons pumped through the system for each well.

5.4.3 Treatment

Groundwater was previously treated via an HDPE Carbtrol Groundwater Treatment System which consisted of a Counterflow Plate Stripper with two plates (CPS-100-600). This air stripper, which had been in place since 2001, was replaced in June 2021. During the first week of June 2021, AECOM subcontractor Matrix Environmental Technologies, Inc. (Matrix) performed planned upgrade maintenance on the treatment system which included replacing the HDPE air stripper with a QED Model EZ-12.6HF (EZ-TRAY™) stainless steel air stripper, replacing the blower, replacing constricted effluent piping between the air stripper and the cleanout outside the treatment building, and adding a cleanout for the new effluent piping. With the new stainless steel air stripper, acid washes are no longer appropriate to clean the air stripper trays. The trays are now periodically removed from the air stripper unit and cleaned using mechanical methods (i.e., scraping, pressure washing). System cleanings are routinely scheduled every other month (even-numbered months). Some system piping may still require a cleaning periodically to remove accumulated precipitates. Treated water accumulates at the bottom of the air stripper by gravity before discharge to the South Branch of Smokes Creek.

5.4.4 Routine System Operation and Maintenance

The air stripper is serviced on a periodic schedule (even-numbered months) to remove mineral accumulation (iron fouling) from the air stripper trays. The trays are removed from the system and the mineral deposits are removed using mechanical means (scrubbing, re-drilling holes to full diameter, etc.). The naturally occurring mineral deposits are dispersed to the ground surface within the secure limits of site within the fence line. The trays are returned to the air stripper unit, and the system is restarted and checked for

proper operation prior to service crew leaving site. The EZ-TRAY™ air stripper operations manual and design specifications are provided in Appendix F.

Periodic line jetting cleaning of the treated groundwater effluent discharge line from the treatment building to Smokes Creek is completed as needed to remove iron fouling in the discharge line. Sediment generated during the line cleaning process is collected and placed on the on-site soil cap. Table 13 provides a summary and schedule of routine maintenance.

Table 13 – Summary and Schedule of Routine Maintenance

Routine Maintenance	Schedule
Air Stripper Cleaning	Every other month or as needed
Effluent Discharge Line Cleaning	As needed

5.4.5 Non-Routine Operation and Maintenance

Non-routine maintenance will be completed in accordance with the groundwater extraction and treatment system, as needed in general conformance with the applicable portion of the Operation and Maintenance Manuals (Appendix F). Non-routine maintenance may include but is not limited to troubleshooting and repair of extraction wells, submersible pumps, conveyance piping, valves, flow meter, or automated controls. Work may also involve replacing worn or damaged components, clearing blockages, and restoring proper operation of the air stripper.

In addition, non-routine maintenance may be required to address power supply issues, sensor malfunctions, communication failures within the control system, or loss of performance due to iron fouling. Any occurrence of non-routine maintenance will be conveyed to the NYSDEC project manager via email within 48 hours and will also be included in the Periodic Review Report to be prepared for that reporting period.

5.4.6 System Monitoring Devices and Alarms

Water level measurements are utilized to trigger high- and low-level alarms according to pre-programmed set points. The PLC will turn pumps on and/or off to adjust to high or low water levels in each well. Alarms will be triggered to stop system operations if water levels within the plate stripper become too high, too low or create high backpressure in the air blower

The groundwater collection and treatment system has a warning device to indicate that the system has lost power. In October 2020, a Sensaphone remote monitoring system was installed for the groundwater treatment system. The Sensaphone system automatically sends the AECOM Project Manager and SC Holdings Project Manager electronic mail notification when power to the site is lost. The AECOM Project Manager confirms receipt of the notification with the SC Holdings Project Manager and a service visit is scheduled promptly to address the notification and minimize downtime of the system. In the event that warning device is activated, applicable maintenance and repairs will be conducted, as specified in the Operation and Maintenance Plan(s), and the groundwater collection and treatment system will be restarted. Operational problems will be noted in the Periodic Review Report to be prepared for that reporting period.

5.4.7 Fire Safety

The remedial party will notify the local fire chief and/or fire suppression team if “hot work” is planned for the site. The notification 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 contact information.

5.5 Cap Maintenance

The grass cover of the cap will be mowed once annually after August 15 to allow for the departure of juvenile ground nesting birds.

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 engineering controls to severe storms/weather events and associated flooding. This section also identifies vulnerability assessment updates that will be conducted for the site in Periodic Review Reports.

- Flood Plain: Federal Emergency Management Agency (FEMA) flood map services indicate that portions of the Site east and west of the South Branch of Smokes Creek lie within a regulatory floodway indicated as Zone AE. This designation identifies there is at least a 1% chance of flooding annually. The South Branch of Smokes Creek must be reserved to discharge the 100-year flood without causing a rise in flood elevations.

- Sea Level Rise: Not considered a current vulnerability. The Site is not located near a coastal shoreline and at an elevation of approximately 632 feet above sea level, the Site is not susceptible to sea level rise or storm surge events.

- Site Drainage and Storm Water Management: The Site is primarily vegetated and comprised of grass covered and wooded areas. The southern portion of the Site generally slopes to the north and west towards the South Branch of Smokes Creek and the unnamed tributary. The ground surface on the western side of the Site drops toward the South Branch of Smokes Creek and to a low lying wooded

area. The ground surface in the area north of the tributary generally slopes to the south and west towards the tributary. Intense, severe rain events may result in localized, temporary shallow ponding, but would not be expected to be of extended duration primarily due to the presence of substantial vegetative cover. Indications of drainage issues will be monitored in the annual site inspections.

- Erosion: The Site has a low slope (less than 5%) and is highly vegetated. As such, stormwater is unlikely to generate erosional velocity. Indications of erosional issues will be monitored in the annual site inspections.

- High Wind: Not considered a current vulnerability. The Site is located in a developed area with frequent tree line in its vicinity.

- Drought: Not considered a current vulnerability. Although periods of "abnormally dry" or "moderate drought" conditions may arise in the region in summer months, it is not expected these conditions will impact the remedial strategy.

- Electricity: Electrical services at the Site are provided by New York State Electric and Gas (NYSEG). As previously noted, the Sensaphone system automatically sends the AECOM Project Manager and SC Holdings Project Manager electronic mail notification when power to the site is lost. The AECOM Project Manager confirms receipt of the notification with the SC Holdings Project Manager and a service visit is scheduled promptly to address the notification and minimize downtime of the system.

- Spill/Contaminant Release: Not considered a current vulnerability. There are no remedial systems installed at the Site which could generate a spill.

- Wildfires: Not considered a current vulnerability. The on-site grass cover is regularly managed and the risk of wildfires in the area is low. The grass cover of the cap will be mowed once annually after August 15 to allow for the departure of juvenile ground nesting birds.

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.

A sustainability assessment was performed in support of the SMP. For this Site, environmental factors were quantified for the long-term operation, maintenance and monitoring (OM&M) phase using the United States Environmental Protection Agency Spreadsheets for Environmental Footprint Analysis (SEFA). The SEFA summary is contained in Appendix K.

Green remediation concepts applied to this Site include (but are not limited to):

- Scheduling monitoring programs in advance to avoid overnight shipping costs;
- Manually delivering samples to the nearby laboratory or to an out-of-town laboratory's courier;
- Minimizing sampling and inspection events to the minimum required to verify contaminant containment at the Site;
- Carpooling staff to Site when possible;
- Combining monitoring, sampling, and OM&M events;
- Use of rechargeable field monitoring equipment to avoid use of disposable batteries;
- Recycling routine single-use items;

- Implementing idling restrictions on all field vehicles on the Site limiting engine idling time to less than three minutes in any sixty-minute period.

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 Remedial System Optimization (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 operation and maintenance 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 use of reagents (as warranted) and consumables. Spent materials will be sent for recycling, as appropriate.

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.

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.

6.2.5 Metrics and Reporting

As discussed in Section 7.0 and as shown in Appendix H – 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

A Remedial System Optimization (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 remedial actions 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 principals are to be considered when performing the RSO.

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 H. 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 New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State.

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 the NYSDEC in accordance with the requirements of Table 14 and summarized in the Periodic Review Report.

Table 14: Schedule of Interim Monitoring/Inspection Reports

Task/Report	Reporting Frequency*
Semi-Annual Operation, Maintenance, and Monitoring Report	Semi-annually
Periodic Review Report	Annually, or as otherwise determined by the NYSDEC

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

All interim 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., groundwater, system influent and effluent samples);
- 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 the NYSDEC. Currently, data is to be 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.

7.2 Periodic Review Report

The Periodic Review Report (PRR) will continue to be submitted annually 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 - Declaration of Covenants and Restrictions. 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 Periodic Review Report. 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 the NYSDEC. Currently, data is 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.

- A site evaluation, which includes the following:

  - The compliance of the remedy with the requirements of the site-specific ROD;

  - 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 H.

- 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 ROD; 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 contaminant mass removed during the certification period;

  - 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 affecting the function of the groundwater treatment and extraction system that are not able to be resolved during routine monthly site visits;

  - 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 Professional Engineer licensed to practice and registered in New York State will prepare, and include in the Periodic Review Report, 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 institutional control 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 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;*

- *Use of the site is compliant with the Declaration of Covenants and Restrictions;*
- *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*
- *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/Remedial Party or Owner's/Remedial Party's Designated Site Representative]."

If NYSDEC DER-10 requires a Professional Engineering certification, add the following certification:

"I certify that the New York State Education Department has granted a Certificate of Authorization to provide Professional Engineering services to the firm that prepared this Periodic Review Report."

The Periodic Review Report will be submitted, in electronic format, to the NYSDEC project manager and the NYSDOH project manager. The Periodic Review Report 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 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 (see Section 6.3), upon completion of an RSO, an RSO report must be submitted to the NYSDEC project manager for approval. A sample 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 the 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.

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Rust Environment & Infrastructure, 1998. “Source Control Elements, SCA, Chem-Trol Site Remedial Design, Hamburg, New York.” August, 1998.

TABLES

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Table 2
Chem-Trol 2025 Semi-Annual Water Levels

Pumping Wells		2Q Date 5/6/2025		4Q Date 10/29/2025	
Well ID	Monitoring Point (TIC)	Depth To Water (ft)	1st Quarter Elevation (ft)	Depth To Water (ft)	3rd Quarter Elevation (ft)
EW-1	624.07	16.15	607.92	16.82	607.25
EW-2	622.16	10.82	611.34	12.82	609.34
EW-3	621.10	15.40	605.70	11.76	609.34

East of Cap (North to South)

Well ID	Monitoring Point (TIC)	Depth To Water (ft)	1st Quarter Elevation (ft)	Depth To Water (ft)	3rd Quarter Elevation (ft)
MW-6S	638.54	6.48	632.06	13.98	624.56
MW-6R	638.64	16.56	622.08	17.87	620.77
P-1S	642.80	4.38	638.42	7.70	635.10
MW-1R	645.36	6.34	639.02	9.49	635.87
MW-1S	645.40	4.36	641.04	9.48	635.92
MW-7S	642.85	3.39	639.46	>11.39	<631.46
MW-7R	642.28	4.62	637.66	7.60	634.68

Center of Cap (North to South)

Well ID	Monitoring Point (TIC)	Depth To Water (ft)	1st Quarter Elevation (ft)	Depth To Water (ft)	3rd Quarter Elevation (ft)
P-5S	637.54	7.30	630.24	13.72	623.82
P-5R	637.88	18.65	619.23	19.32	618.56
MW-5S	636.28	10.15	626.13	14.05	622.23
P-2R	646.96	7.47	639.49	15.02	631.94
P-2S	646.44	7.68	638.76	10.96	635.48
MW-2S	644.85	5.18	639.67	8.91	635.94

West of Cap (North to South)

Well ID	Monitoring Point (TIC)	Depth To Water (ft)	1st Quarter Elevation (ft)	Depth To Water (ft)	3rd Quarter Elevation (ft)
MW-4S	637.18	12.23	624.95	>15.64	<621.54
MW-4R	637.02	24.72	612.30	27.01	610.01
P-4S	636.54	13.94	622.60	15.88	620.66
MW-3S	637.64	16.05	621.59	18.06	619.58
P-3R	639.92	19.70	620.22	19.63	620.29
P-3S	639.46	18.20	621.26	19.91	619.55
OW-3R	638.78	22.44	616.34	23.78	615.00

West of Trench (North to South)

Well ID	Monitoring Point (TIC)	Depth To Water (ft)	1st Quarter Elevation (ft)	Depth To Water (ft)	3rd Quarter Elevation (ft)
OW-1FR	620.42	7.95	612.47	10.20	610.22
P97-5	613.65	1.85	611.80	3.99	609.66
MW-10S	615.15	2.31	612.84	4.22	610.93
MW-10R	615.47	3.30	612.17	4.91	610.56
P97-4	614.8	2.56	612.24	4.90	609.90
MW-8S	617.28	5.20	612.08	>7.25	<610.03
MW-8R	617.38	5.19	612.19	7.60	609.78
P97-3	617.66	5.01	612.65	7.52	610.14
MW-9RD	619.13	5.70	613.43	6.32	612.81
MW-9R	619.17	6.05	613.12	8.97	610.20
MW-9S	619.91	6.40	613.51	9.75	610.16
OW-2FR	624.14	10.66	613.48	13.88	610.26
P97-2	619.07	5.76	613.31	8.18	610.89
P97-1	619.97	6.18	613.79	8.21	611.76
MW-12R	621.59	7.52	614.07	10.18	611.41
MW-12S	621.17	3.43	617.74	5.92	615.25

West of Smokes Creek (North to South)

Well ID	Monitoring Point (TIC)	Depth To Water (ft)	1st Quarter Elevation (ft)	Depth To Water (ft)	3rd Quarter Elevation (ft)
MW-13R	615.14	3.90	611.24	6.21	608.93
MW-14R	618.55	4.93	613.62	6.03	612.52

> [value] = groundwater not present at max measured depth

SMP Table 3

TABLE 1
Chem-Trol Feasibility Studies
Site Soils Remedial Action Objectives

Parameter	NYSDEC TAGM #4046		USEPA Superfund PCB Cleanup	Method detection Limit (MDL)	Cleanup objective
	Soil Cleanup Objective to Protect GW Quality	USEPA Health Based Criteria for Direct Contact			
VOCs (mg/kg)					
Methylene Chloride	0.10	93.0		0.005	0.100
Chloroform	0.30	114.0		0.005	0.300
Tetrachloroethene	1.40	14.0		0.005	1.400
1,1,1-Trichloroethane	0.76	7,000		0.005	0.760
Trichloroethene	0.70	64.0		0.005	0.700
Total Xylenes	1.20	200,000		0.005	1.200
SVOCs (mg/kg)	500 (total)				500 (total)
Phenol	0.03	50,000		0.330	0.330
2-Methylphenol	0.10			0.330	0.330
4-Methylphenol	0.90	4,000		0.330	0.900
Hexachlorobenzene	1.40	0.410		0.330	0.410
PAHs (mg/kg)					
Benzo (a)Anthracene	3.0	0.224		0.330	3.0
Chrysene	0.40			0.330	0.40
Benzo (b)Fluoranthene	1.10			0.330	1.1
Benzo (k)Fluoranthene	1.10			0.330	1.1
Benzo (a)Pyrene	11.0	0.061		0.330	11.0
Dibenzo (a,h)Anthracene	165,000	0.014		0.330	165,000
Pesticides(mg/kg)	10.0 (total)				10 (total)
delta-BHC	0.30			0.008	0.300
gamma-BHC	0.06	5.4		0.008	0.060
PCBs (mg/kg)	10.0 (total)	1.0 (total)	10.0 (total)		10 (total)
Aroclor-1242				0.160	
Aroclor-1248				0.160	
Aroclor-1254				0.160	
Aroclor-1260				0.160	
Metals (mg/kg)					
Aluminum	16,653			20	16,653
Arsenic	8			1	8
Beryllium		0.16		0.5	0.5
Cadmium	0.77			0.5	0.77
Calcium	72,865			500	72,865
Chromium	26			1	26
Copper	55			2.5	55
Iron	31,337			10	31,337
Magnesium	7,938			500	7,938
Manganese	902			1.5	902
Silver	0.12			1	1
Sodium	381			500	500

Notes:

1. Referance NYSDEC TAGM # 4046: Determination of Soil Cleanup Objectives and Cleanup Levels, HWR-94-4046, January 24,1994.

2.Referance MDL: Analytical Services Protocol (ASP) 91 for New York State Department of Environmental Conservation. "Low Soil/ Sediment" MDLs are shown, actual detection limits are highly matrix dependant and the values shown may not always be achievable.

SMP Table 4

TABLE 2
Chem-Trol Feasibility Studies
Floodplain Sediment Remedial Action Objectives

Parameter	NYSDEC TAGM #4046		USEPA Superfund PCB Cleanup	Method detection Limit (MDL)	Cleanup objective
	Soil Cleanup Objective to Protect GW Quality	USEPA Health Based Criteria for Direct Contact			
SVOCs (mg/kg)	500 (total)				500 (total)
Phenol	0.03	50,000		0.33	0.33
2,4-Dinitrophenol	0.20	200		1.60	1.60
Hexachlorobenzene	1.40	0.41		0.33	1.40
PAHs (mg/kg)					
Benzo (a)Anthracene	3.0	0.224		0.33	3.0
Chrysene	0.40			0.33	0.40
Benzo (b)Fluoranthene	1.10			0.33	1.10
Benzo (k)Fluoranthene	1.10			0.33	1.10
Benzo (a)Pyrene	11.0	0.061		0.33	11.0
Dibenzo (a,h)Anthracene	165,000	0.014		0.33	165,000
Pesticides(mg/kg)	10.0 (total)				10.0 (total)
delta-BHC	0.30			0.008	0.30
Heptaclor Epoxide	0.02	0.077		0.008	0.02
Endrin	0.10	20.0		0.008	0.10
PCBs (mg/kg)	10.0 (total)	1.0 (total)	10.0 (total)		10.0 (total)
Aroclor-1248				0.08	
Aroclor-1254				0.16	
Aroclor-1260				0.16	
Metals (mg/kg)					
Beryllium		0.16		0.5	0.5
Cadmium	0.77			0.5	0.77
Chromium	26			1	26
Copper	55			2.5	55
Sodium	381			500	500

Notes:

1. Referance NYSDEC TAGM # 4046: Determination of Soil Cleanup Objectives and Cleanup Levels, HWR-94-4046, January 24,1994.
2. Referance MDL: Analytical Services Protocol (ASP) 91 for New York State Department of Environmental Conservation. "Low Soil/ Sediment" MDLs are shown, actual detection limits are highly matrix dependant and the values shown may not always be achievable.

SMP Table 5

TABLE 3
Chem-Trol Feasibility Studies
On-Site Tributary Sediments Remedial Action Objectives

Parameter	NYSDEC TAGM #4046		USEPA Superfund PCB Cleanup	Environmental Based Criteria			Method detection Limit (MDL)	Cleanup objective
	Soil Cleanup Objective to Protect GW Quality	USEPA Health Based Criteria for Direct Contact		Aquatic Toxicity	Human Health Residue	Wildlife Residue		
PCBs (mg/kg)								
Aroclor-1242							0.08	
Aroclor-1248							0.08	
Aroclor-1254							0.16	
Aroclor-1260							0.16	
Total PCBs	10.0	1.0	0.19	2.76	0.00008	0.195		0.19

Notes:

1. Reference NYSDEC TAGM # 4046: Determination of Soil Cleanup Objectives and Cleanup Levels, HWR-94-4046, January 24,1994.

2. Reference MDL: Analytical Services Protocol (ASP) 91 for New York State Department of Environmental Conservation. "Low Soil/ Sediment" MDLs are shown, actual detection limits are highly matrix dependent and the values shown may not always be achievable.

SMP Table 6

Table 4
Chem-Trol Feasibility Studies
Groundwater Remedial Action Objectives

Parameter	NYS Class GA Standard	USEPA MCL	USEPA MCLG	USEPA Health Advisories			MDL	Remedial Action Objective
				Child one-day	Child long-term	Adult lifetime		
VOCs (ug/l)								
Chloroethane	5						10	10
Methylene Chloride	5	5	0	10,000			5	5
Acetone	50				10	200	10	10
1,1-Dichloroethane	5						5	5
1,1,Dichloroethene	5	7	7	2,000	1,000	7	5	5
Total 1,2 Dichlorethenes	5	70	70	20,000	2,000	100	5	5
Chloroform	7	100		4,000	100		5	7
1,1,1-Trichloroethane	5	200	200	100,000	40,000	200	5	5
Trichloroethene	5	5	0				5	5
Benzene	0.7	5	0	200			5	5
Toluene	5	1000	1000	20,000	2,000	1,000	5	5
Vinyl Chloride	2	2		3,000	10		10	10
Chlorotoluene	5			2,000	2,000	100		5
SVOCs (ug/l)								
4-Chloro-3-methylphenol	5						10	10
METALS (ug/l) see note 2								
Aluminum	100						200	5,460
Iron	500						100	7,180
Magnesium	35,000						5,000	37,900
Manganese	500		200				15	500
Sodium	20,000						5,000	54,000
Inorganics (ug/l)								
Sulfate	250,000							250,000

Notes:

1. Reference MDL: Analytical Services Protocol (ASP) 91 for New York State Department of Environmental Conservation. "Low Soil/ Sediment" MDLs are shown, actual detection limits are highly matrix dependent and the values shown may not always be achievable.

2. Cleanup objectives for metals are based upon maximum upgradient concentrations measured in monitoring wells MW-7R and MW-11R.

TABLE 11
MONITORING WELL CONSTRUCTION INFORMATION
CHEM-TROL SITE, HAMBURG, NY
EPA SITE ID: NYD980531180
NY Site ID: HW915015

Location ID	Well Location	Install Date	Well Diameter (Inches)	Total Depth (ft bgs)	Screened Interval (ft bgs)	Northing	Easting	Ground Elevation (ft msl)	Top of Riser Elevation (ft msl)	Screen Top Elevation (ft msl)	Screen Bottom Elevation (ft msl)
EW-1	Pumping Well	12/4/2000	6	37	12-37	1019380.72	440967.98	621.30	624.07	609.30	584.30
EW-2	Pumping Well	11/30/2000	6	34.5	9.5-34.5	1019475.84	440966.89	619.40	622.16	609.90	584.90
EW-3	Pumping Well	11/28/2000	6	31.2	6.2-31.2	1019573.15	440966.61	618.00	621.10	611.80	586.80
MW-1S	East of Cap	7/17/1990	2	13.4	10.4-13.4	1019439.05	441470.90	641.44	645.40	631.04	628.04
MW-1R	East of Cap	7/21/1990	3	30.8	19.4-30.8	1019445.19	441470.32	641.32	645.36	621.92	610.52
MW-2S	Center of Cap	7/20/1990	2	15.3	13.3-15.3	1019334.97	441305.41	640.78	644.85	627.48	625.48
MW-3S	West of Cap	7/20/1990	2	18.2	13.2-18.2	1019497.09	441058.42	635.54	637.64	622.34	617.34
MW-4S	West of Cap	7/19/1990	2	13.7	8.7-13.7	1019608.84	441051.19	635.20	637.18	626.50	621.50
MW-4R	West of Cap	7/21/1990	3	32.1	18.9-32.1	1019600.68	441054.53	635.54	637.02	616.64	603.44
MW-5S	Center of Cap	7/20/1990	2	13.6	8.6-13.6	1019697.14	441160.55	634.14	636.28	625.54	620.54
MW-6S	East of Cap	7/18/1990	2	12.7	7.7-12.7	1019723.42	441387.53	637.00	638.54	629.30	624.30
MW-6R	East of Cap	7/21/1990	3	29	18.8-29	1019720.44	441372.97	637.24	638.64	618.44	608.24
MW-7S	East of Cap	10/20/1992	2	9.8	4.8-9.8	1019144.24	441409.31	640.37	642.85	635.57	630.57
MW-7R	East of Cap	11/6/1992	3	36.2	16-36.2	1019138.52	441410.89	640.46	642.28	624.46	604.26
MW-8S	West of Trench	10/26/1992	2	5	4-5	1019498.48	440768.72	613.97	617.28	609.97	608.97
MW-8R	West of Trench	10/27/1992	3	19.3	9.8-19.3	1019490.12	440771.14	614.27	617.38	604.47	594.97
MW-9S	West of Trench	10/29/1992	2	8	4-8	1019265.67	440936.96	617.12	619.91	613.12	609.12
MW-9R	West of Trench	10/28/1992	3	23.4	13-23.4	1019274.49	440939.50	616.98	619.17	603.98	593.58
MW-9RD	West of Trench	5/25/1994	1.5	68	48-68	1019282.55	440942.55	616.70	619.13	568.70	548.70
MW-10S[1]	West of Trench	10/28/1992	2	4.8	3.3-4.8	1019674.60	440922.41	612.39	615.15	609.09	607.59
MW-10R	West of Trench	10/28/1992	3	20.9	10.6-20.9	1019667.99	440916.44	612.37	615.47	601.77	591.47
MW-11R	North of Cap	11/4/1992	3	24.5	14.5-24.5	1019855.06	441250.56	632.62	634.73	618.12	608.12
MW-12S	West of Trench	5/23/1994	2	6.9	5.9-6.9	1019147.46	440927.02	618.97	621.17	613.07	612.07
MW-12R	West of Trench	5/16/1994	3	24.1	13.2-24.1	1019148.16	440935.52	619.83	621.59	606.63	595.73
MW-13R	West of Smokes Creek	5/20/1994	3	20.7	10-20.7	1019564.18	440697.82	613.39	615.14	603.39	592.69
MW-14R	West of Smokes Creek	5/23/1994	3	26.3	12-26.3	1019165.44	440699.08	616.63	618.55	604.63	590.33
MW-15R	West of Smokes Creek	2/17/1999	2	24	14-24	1020210.57	440225.07	607.74	610.13	593.74	583.74
MW-16R	West of Smokes Creek	2/18/1999	2	39.4	29.4-39.4	1019709.89	440418.35	636.55	636.50	607.15	597.15
OW-1FR	West of Trench	12/1/2000	2	32	7-32	-	-	617.00	620.42	610.00	585.00
OW-2FR	West of Trench	12/6/2000	2	34	9-34	-	-	620.60	624.14	611.60	586.60
OW-3R	West of Cap	12/7/2000	2	34	24-34	-	-	-	638.78	-	-
P-1S	East of Cap	3/28/1990	0.75	14.2	9.2-14.2	1019552.79	441481.81	640.66	642.80	631.46	626.46
P-2S	Center of Cap	3/29/1990	0.75	15.5	11.5-15.5	1019439.02	441330.52	640.52	646.44	629.02	625.02
P-2R	Center of Cap	3/30/1990	0.75	31	26-31	1019448.75	441328.29	640.87	646.96	614.87	609.87
P-3S	West of Cap	3/28/1990	0.75	19	14-19	1019412.22	441068.44	637.18	639.46	623.18	618.18
P-3R	West of Cap	4/2/1990	0.75	34.1	29.1-34.1	1019418.41	441079.52	637.88	639.92	608.78	603.78
P-4S	West of Cap	4/3/1990	0.75	14	9-14	1019585.49	441037.93	634.42	636.54	625.42	620.42
P-5S	Center of Cap	3/30/1990	0.75	11.9	6.9-11.9	1019716.71	441227.87	635.38	637.54	628.48	623.48
P-5R	Center of Cap	4/2/1990	0.75	29.5	24.5-29.5	1019717.21	441245.38	635.82	637.88	611.32	606.32
P97-1	West of Trench	7/7/1997	1	29.5	9.5-29.5	1019146.38	440835.78	617.80	619.97	608.30	588.30
P97-2	West of Trench	7/8/1997	1	32.5	12.5-32.5	1019217.09	440846.68	616.80	619.07	604.30	584.30
P97-3	West of Trench	7/9/1997	1	32	12-32	1019379.20	440856.93	614.90	617.66	602.90	582.90
P97-4	West of Trench	7/10/1997	1	29.8	9.8-29.8	1019529.32	440883.51	612.80	614.79	603.00	583.00
P97-5	West of Trench	7/11/1997	1	29.7	9.7-29.7	1019709.97	440835.92	611.40	613.65	601.70	581.70

Notes: 1 - Well Replaced in 2016

Locations referenced to North American Datum (NAD) 1927 State Plane New York West, US Feet .

Vertical datum - National Geodetic Vertical Datum (NGVD) 1929.

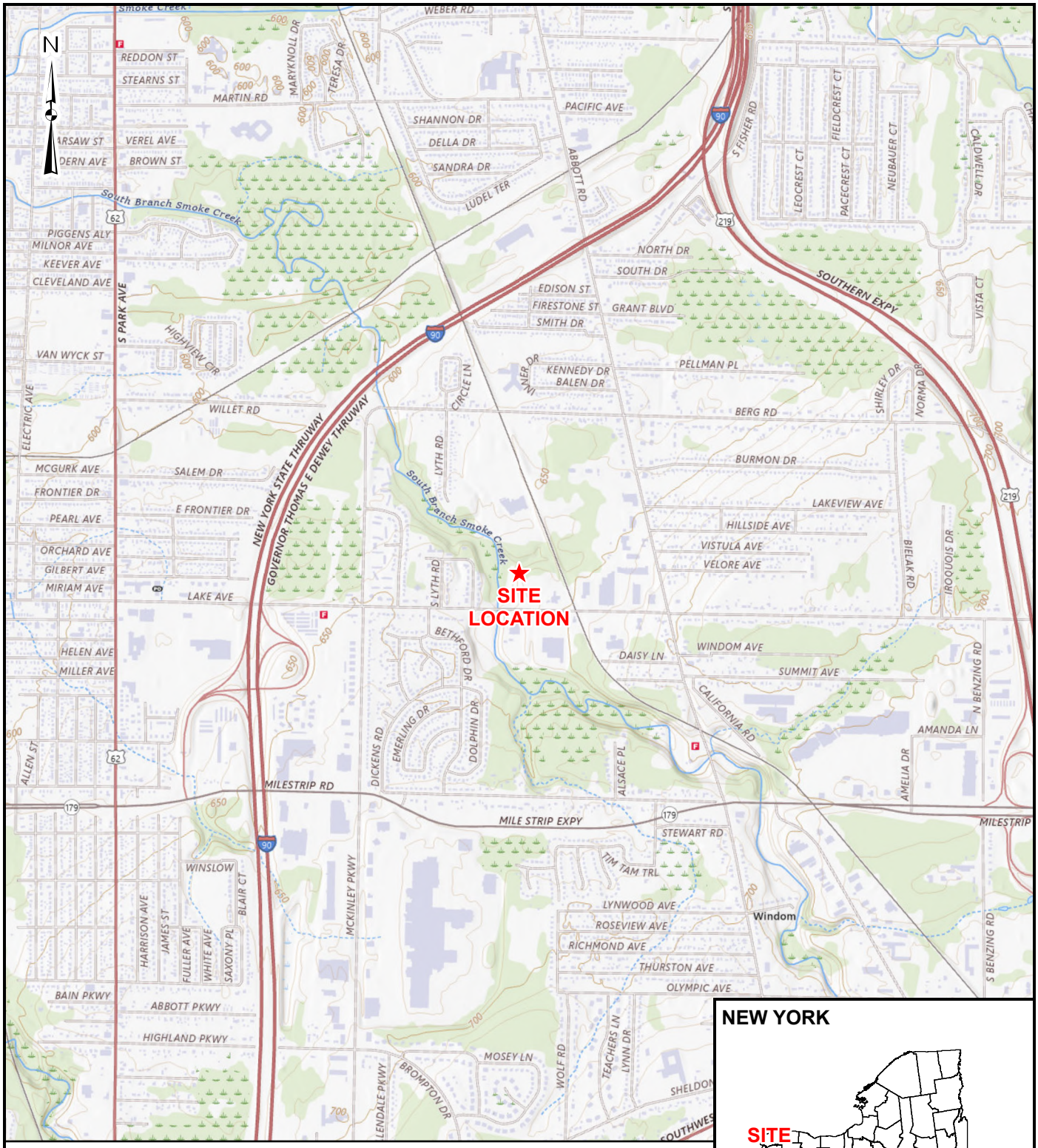
ft bgs - feet below ground surface (W) - West

ft msl - feet mean sea level (E) - East

"-" - Data could not be located following review of available historical records.

FIGURES

.

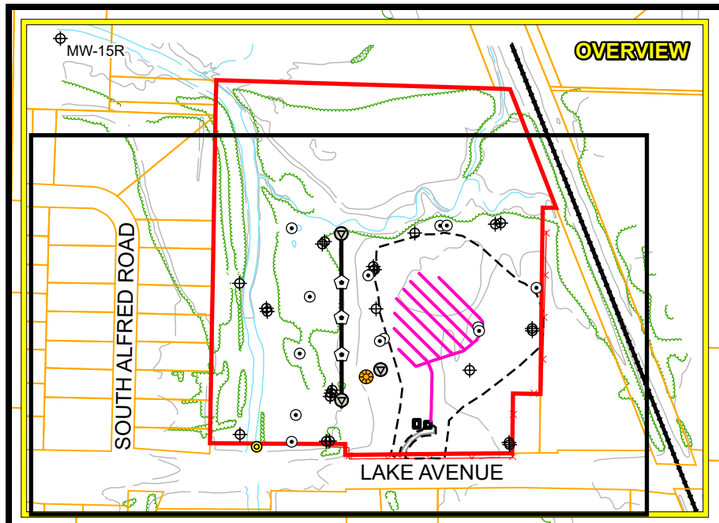


File Path: L:\DCS\Projects\60526520_ChmTrl2017\900-CAD-GIS\920-GIS or Graphics\APRX\ChemTrol\ChemTrol_SMP.aprx Date: 02/26/26 Layout: 01 SITE LOCATION

AECOM

CHEM-TROL
SITE LOCATION

FIGURE 1



N

ON SITE TRIBUTARY OF SMOKES CREEK

SOUTH BRANCH OF SMOKES CREEK

P97-5
MW-10S
MW-10R
OW-1FR
MW-5S
P-5S
P-5R
MW-6S
MW-6R
MW-4S
MW-4R
P-4S
MW-13R
EW3
P97-4
P-1S
MW-8S
MW-8R
MW-3S
EW2
P-2R
P-2S
MW-1R
MW-1S
P-3R
P-3S
P97-3
EW1
OW-3R
MW-2S
MW-9RD
MW-9R
MW-9S
GROUNDWATER COLLECTION TRENCH
OW-2FR
P97-2
GROUNDWATER TREATMENT BUILDING
6' HIGH CHAIN LINK FENCE
SOIL VAPOR EXTRACTION BUILDING
MW-14R
P97-1
MW-12R
MW-12S
GRAVEL DRIVEWAY
MW-7S
MW-7R
SITE ENTRANCE
LAKE AVENUE
SOUTH ALFRED ROAD

610 620 630 640

Legend

- Extraction Well
- Monitoring Well
- Observation Well
- Piezometer
- Groundwater Extraction System Manhole
- Effluent Sampling Location
- Edge of Water
- Existing Ground Elevation Contour
- SVE System Lateral
- Site Cover Limit
- Site Boundary
- Tax Parcel Boundary

100 0 100 Feet

CHEM-TROL SITE PLAN

AECOM

FIGURE 2

File Path: L:\DCS\Projects\60526520_ChmTrl2017\900-CAD-GIS\920-GIS or Graphics\APRX\ChemTrol\ChemTrol_SMP.aprx Date: 03/17/26 Layout: 02 SITE PLAN (2026)

Erie County On-Line Mapping Application

Legend

- Parcels
- Site

Chem-Trol
Erie County Tax Map
Figure 3

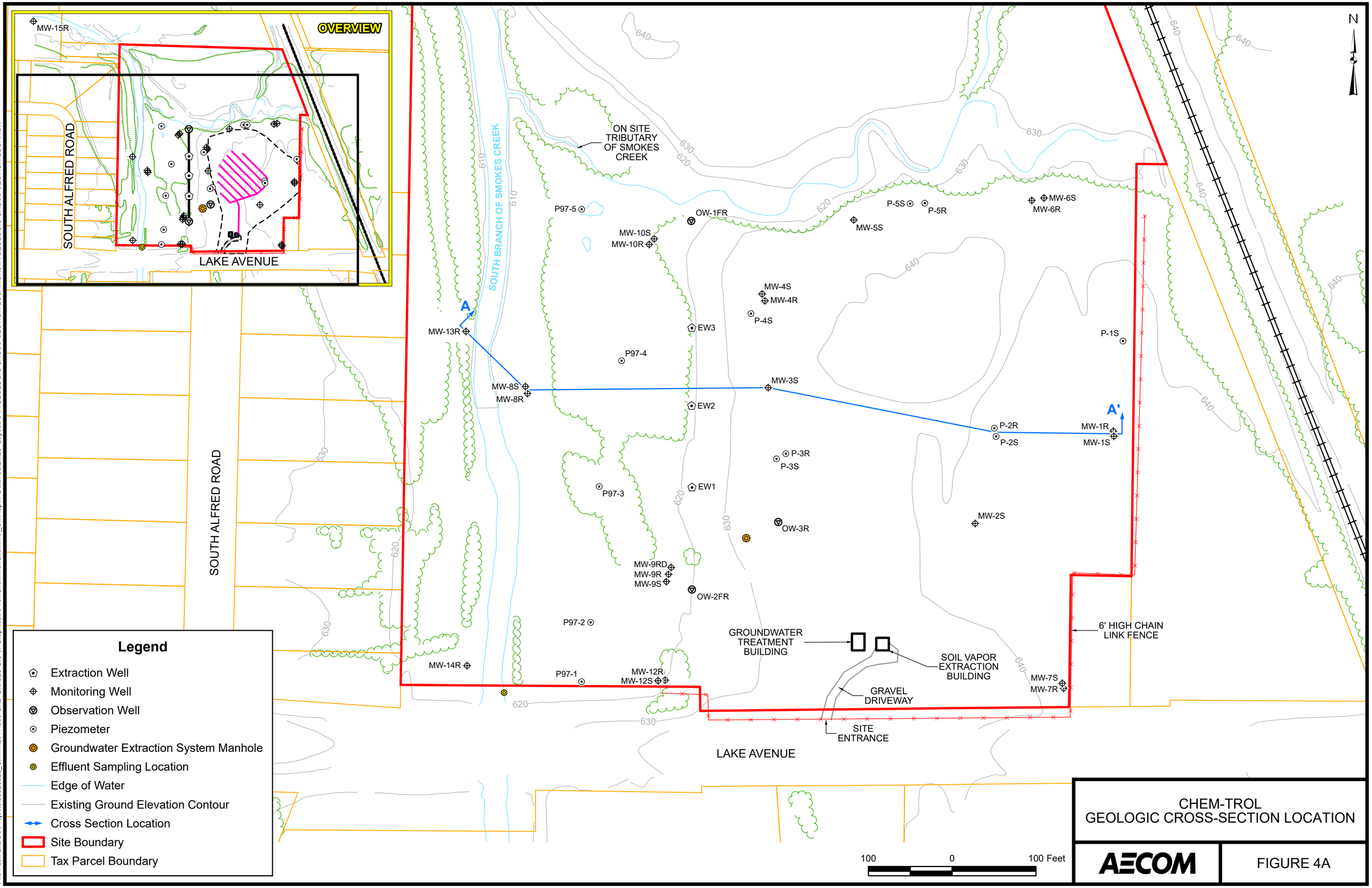
0 0.07 0.1 Miles

WGS_1984_Web_Mercator_Auxiliary_Sphere
THIS MAP IS NOT TO BE USED FOR NAVIGATION

ERIE COUNTY
DEPARTMENT OF ENVIRONMENT & PLANNING
OFFICE OF GIS

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

1: 4,514



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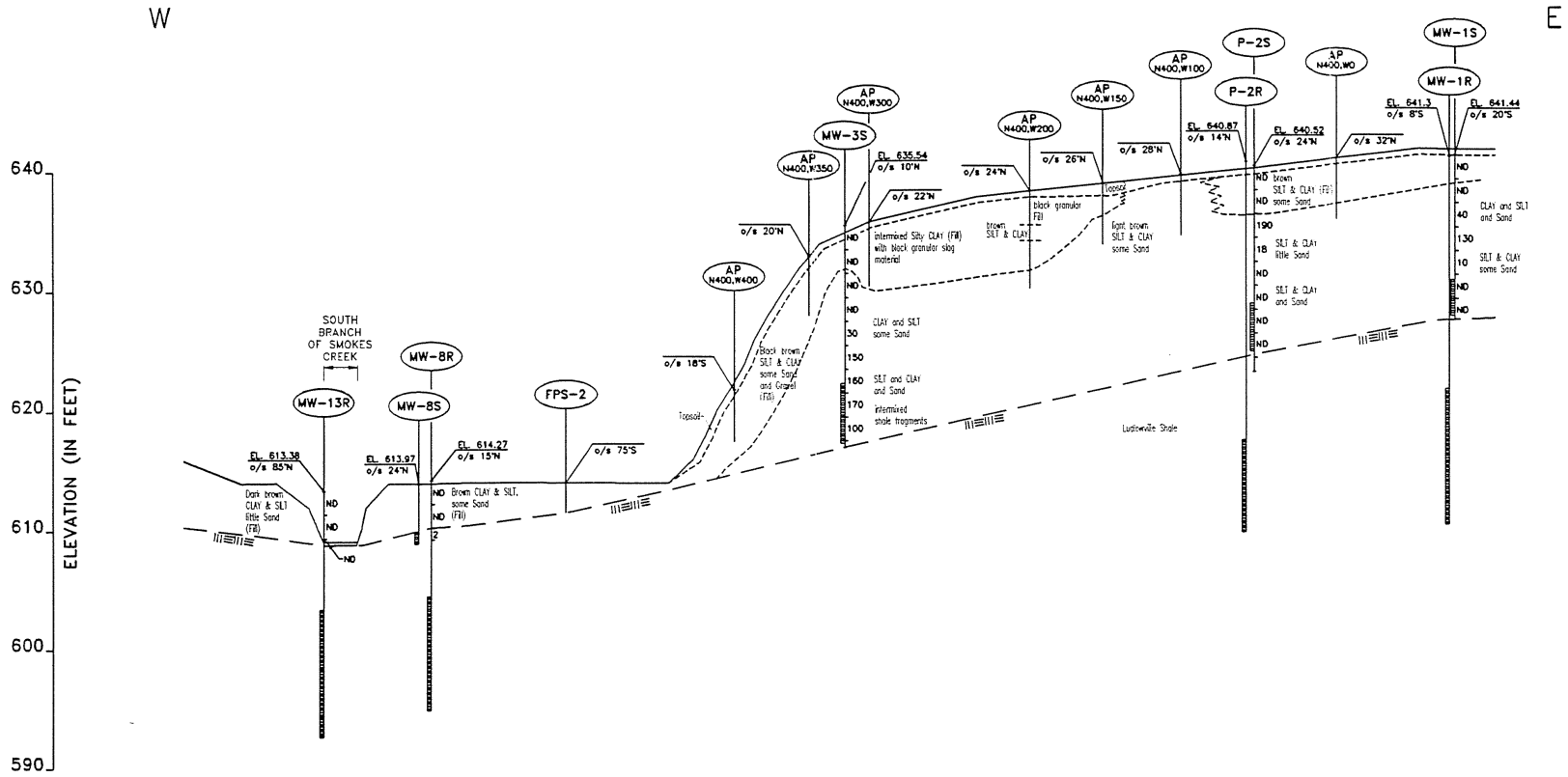
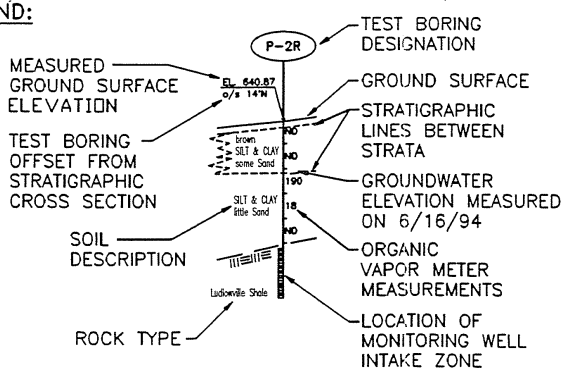


NOTES:

1. SEE FIGURE 2 FOR STRATIGRAPHIC CROSS SECTION LOCATION.
2. THE STRATIFICATION LINES ARE BASED UPON INTERPOLATION BETWEEN WIDELY-SPACED TEST BORINGS AND REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL AND ROCK TYPES. THE ACTUAL TRANSITIONS MAY VARY FROM THOSE SHOWN.
3. THE CROSS SECTIONS ARE INTENDED TO SHOW GENERAL GEOLOGICAL TRENDS TO ILLUSTRATE INTERPRETATIONS OF THE SUBSURFACE CONDITIONS. THE ACTUAL SUBSURFACE CONDITIONS MAY VARY FROM THOSE SHOWN.
4. FLUCTUATIONS IN GROUNDWATER LEVELS MAY OCCUR DUE TO VARIATIONS IN PRECIPITATION, BAROMETRIC PRESSURE AND OTHER FACTORS.
5. THE DEPTH OF BEDROCK WEST OF THE SOUTH BRANCH OF SMOKES CREEK WAS ASSESSED BY DRIVING PIPEING THROUGH OVERBURDEN TO REFUSAL. REFUSAL WAS ASSUMED TO BE TOP OF BEDROCK.

LEGEND:



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REV No.	DESCRIPTION	BY	DATE

DRAWN BY: DEW
DATE: SEPTEMBER 1994

GZA GeoEnvironmental of New York

SCALE IN FEET
HORIZONTAL 0 40 80 160
VERTICAL 0 5 10 20

CHEM-TROL REMEDIAL INVESTIGATION/FEASABILITY STUDY
HAMBURG, NEW YORK

SECTION A-A

PROJECT No. 5945

FIGURE No. 7

SMP Figure 4B

N

SOUTH ALFRED ROAD

ON SITE TRIBUTARY OF SMOKES CREEK

SOUTH BRANCH OF SMOKES CREEK

P97-5, 609.66

OW-1FR, 610.22

MW-10R, 610.56

MW-4R, 610.01

MW-13R, 608.93

EW3, 609.34

P97-4, 609.90

MW-8R, 609.78

EW2, 609.34

P97-3, 610.14

EW1, 607.25

MW-9R, 610.20

GROUNDWATER COLLECTION TRENCH

OW-2FR, 610.26

P97-2, 610.89

MW-14R, 612.52

P97-1, 611.76

MW-12R, 611.41

P-5R, 618.56

MW-6R, 620.77

P-2R, 631.94

P-3R, 620.29

OW-3R, 615.00

MW-1R, 635.87

MW-7R, 634.68

WATER TREATMENT BUILDING

SOIL VAPOR EXTRACTION BUILDING

LAKE AVENUE

608 610 612 614 616 618 620 622 624 626 628 630 632 634

610 620 630 640

Legend

- Extraction Well
- Monitoring Well
- Observation Well
- Piezometer
- Groundwater Flow Direction
- Edge of Water
- Existing Ground Elevation Contour
- Site Boundary
- Tax Parcel Boundary

MW-6R, 620.77
Location ID — Groundwater Elevation

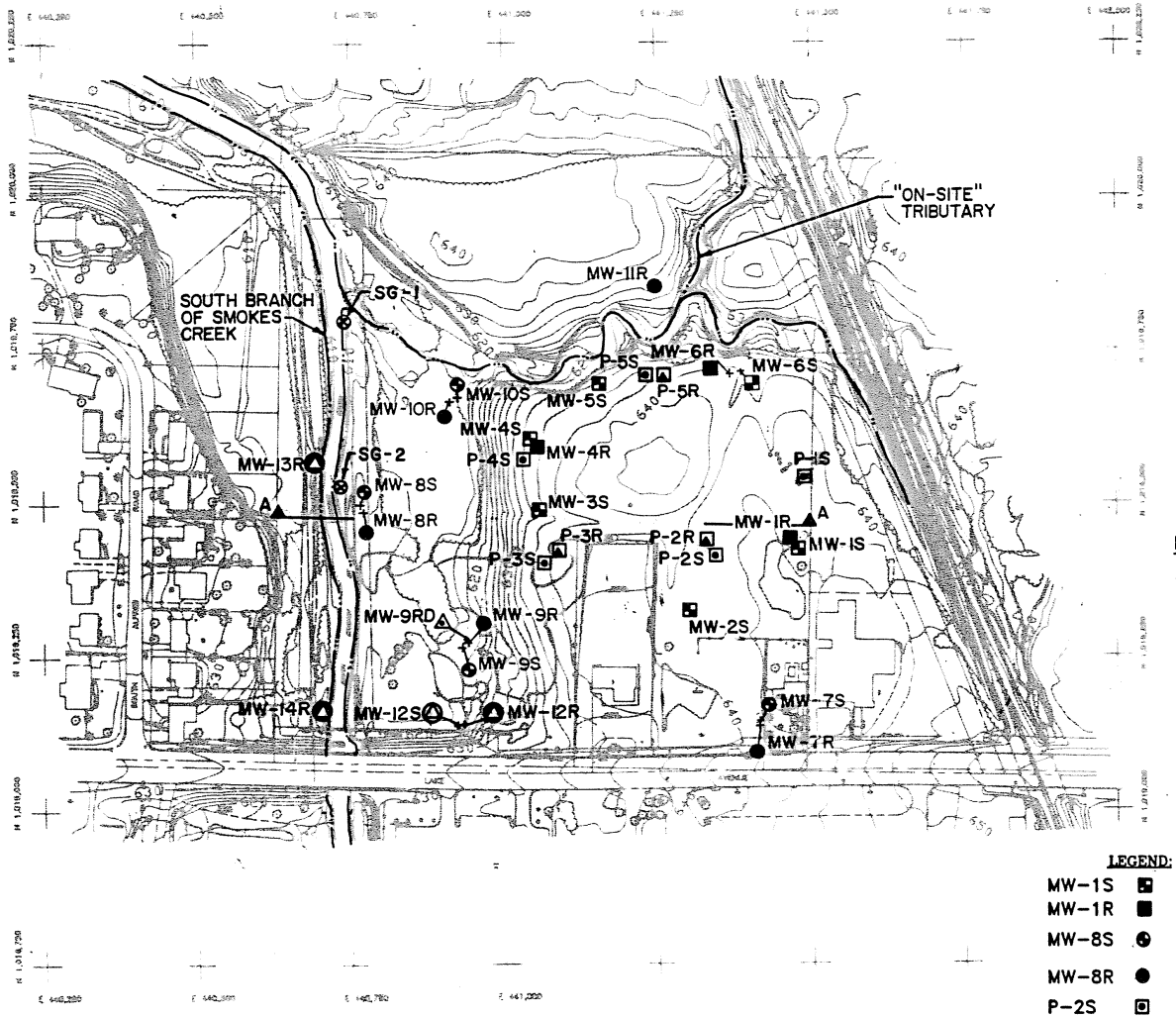
100 0 100 Feet

CHEM-TROL
BEDROCK GROUNDWATER CONTOURS
OCTOBER 29, 2025

AECOM

FIGURE 5

File Path: L:\DCS\Projects\60526520_ChmTrl2017\900-CAD-GIS\920-GIS or Graphics\APRX\ChemTrol\ChemTrol_PRR.aprx Date: 02/26/26 Layout: BEDROCK GW CONTOURS (20251029)



NOTES:

1. BASE MAP ADAPTED FROM A PLAN PREPARED BY MCINTOSH AND MCINTOSH, P.C. ENTITLED "TOPOGRAPHIC MAP OF PART OF LOT 445, BUFFALO CREEK RESERVATION, TWP-10, R-7, HOLLAND PURCHASE" DATED MARCH 13, 1990.
2. MONITORING WELL AND PIEZOMETER LOCATIONS WERE MEASURED BY MCINTOSH AND MCINTOSH RELATIVE TO THE COORDINATE SYSTEM SHOWN, USING OPTICAL SURVEY METHODS AND PLOTTED ON THIS FIGURE BY GZA. LOCATIONS SHOULD BE CONSIDERED ACCURATE TO THE DEGREE IMPLIED BY THE METHOD USED.

LEGEND:

MW-1S	OVERBURDEN MONITORING WELL INSTALLED JULY 1990
MW-1R	BEDROCK MONITORING WELL INSTALLED JULY 1990
MW-8S	OVERBURDEN (OR TOP OF ROCK INTERFACE) MONITORING WELL INSTALLED OCTOBER - NOVEMBER 1992
MW-8R	BEDROCK MONITORING WELL INSTALLED OCTOBER - NOVEMBER 1992
P-2S	OVERBURDEN PIEZOMETER INSTALLED MARCH - APRIL 1990
P-2R	BEDROCK PIEZOMETER INSTALLED MARCH 1990
SG-1	STORM GAUGE INSTALLED DECEMBER 1993
MW-12S	OVERBURDEN MONITORING WELL INSTALLED MAY 1994
MW-12R	BEDROCK MONITORING WELL INSTALLED MAY 1994
MW-9RD	DEEP BEDROCK MONITORING WELL INSTALLED MAY 1994

REV No.	DESCRIPTION	BY	DATE

SCALE IN FEET: 0, 100, 200, 400

DRAWN BY: DEW

DATE: SEPTEMBER 1994

GZA GeoEnvironmental of New York

CHEM-TROL REMEDIAL INVESTIGATION/FEASIBILITY STUDY
HAMBURG, NEW YORK

MONITORING WELL AND PIEZOMETER LOCATION MAP

PROJECT No. 5945

FIGURE No. 3

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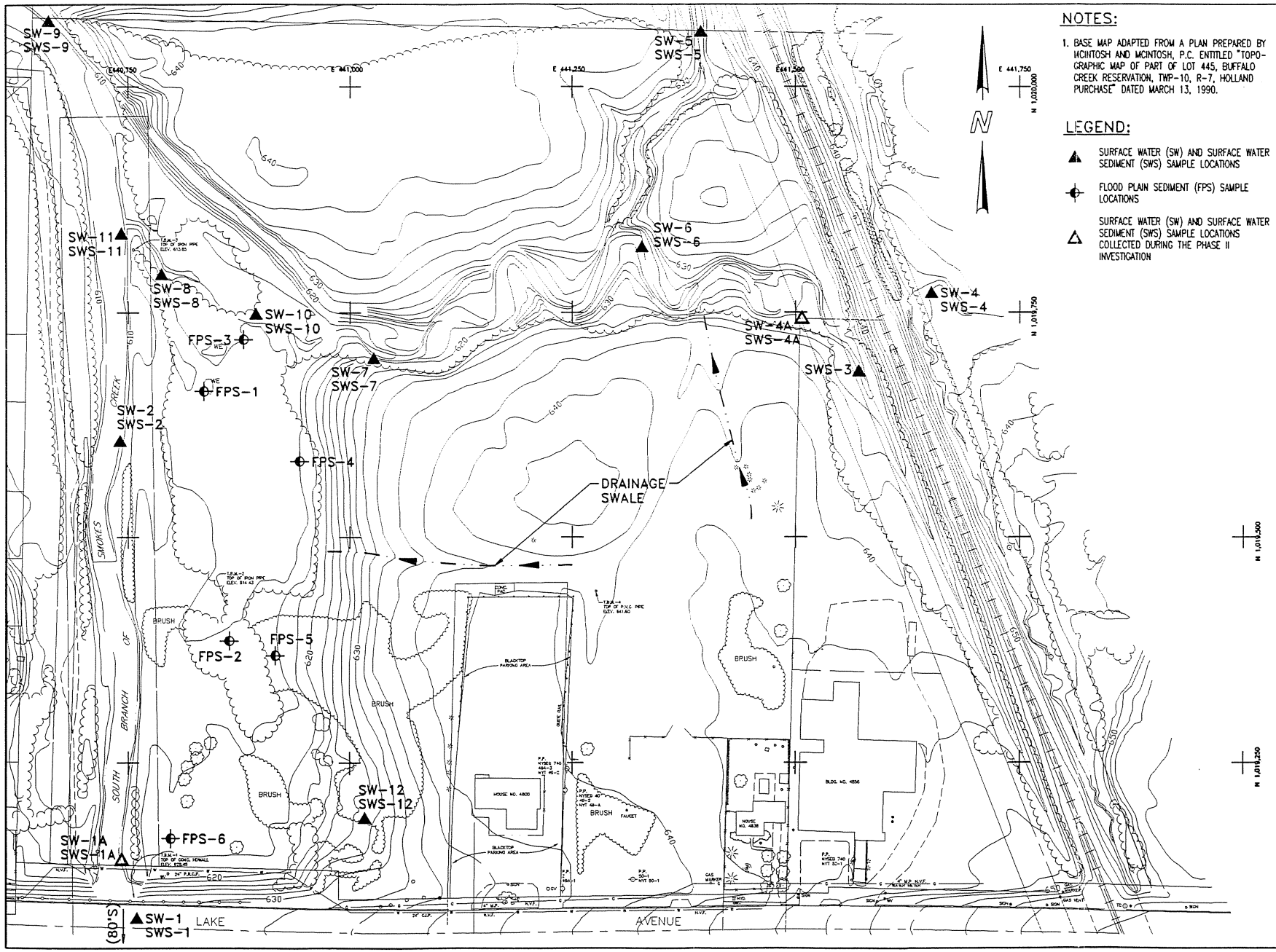
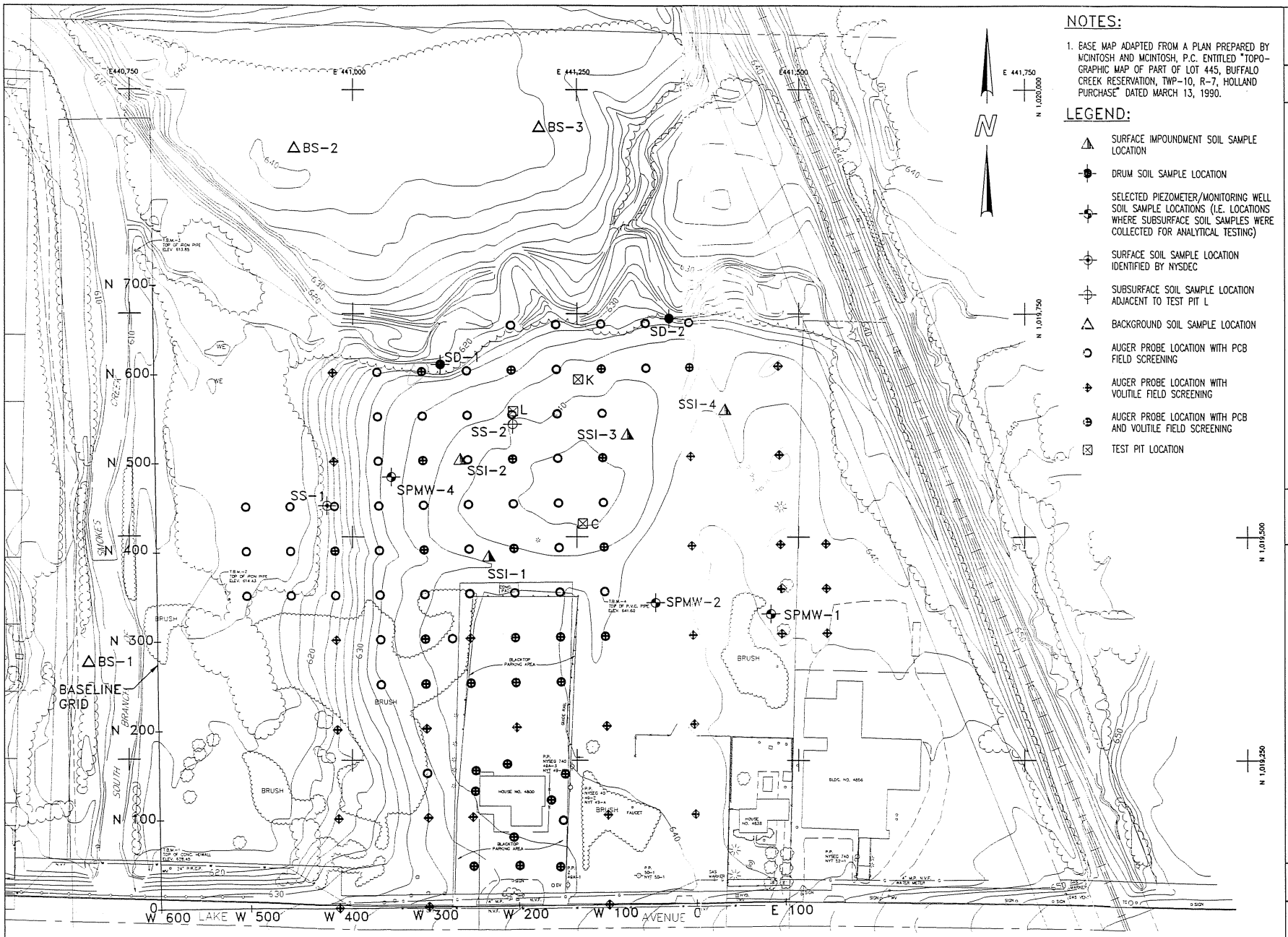
SMP Figure 6



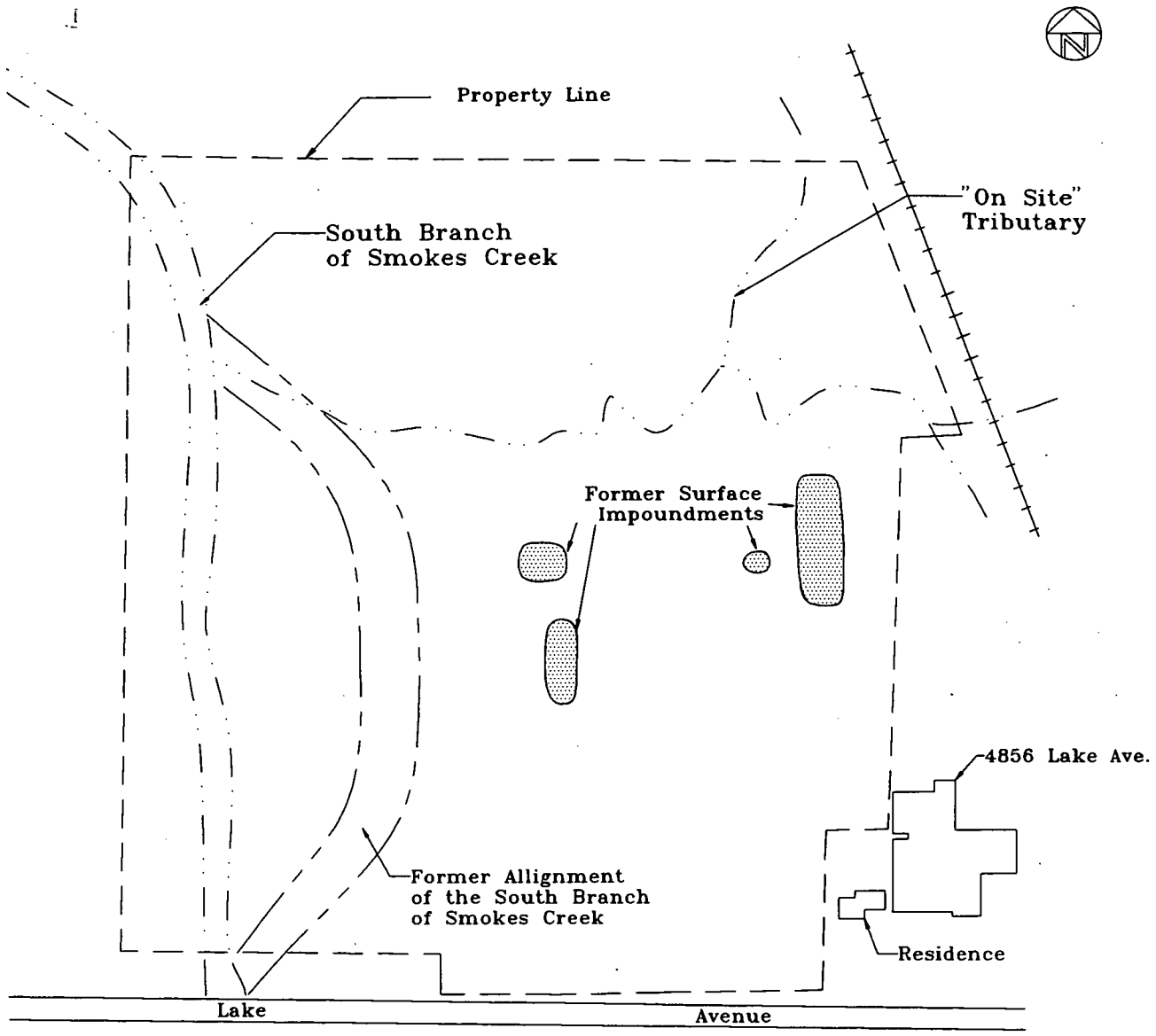
© 1994 GZA GeoEnvironmental of New York

SMP Figure 7



© 1994 GZA GeoEnvironmental of New York

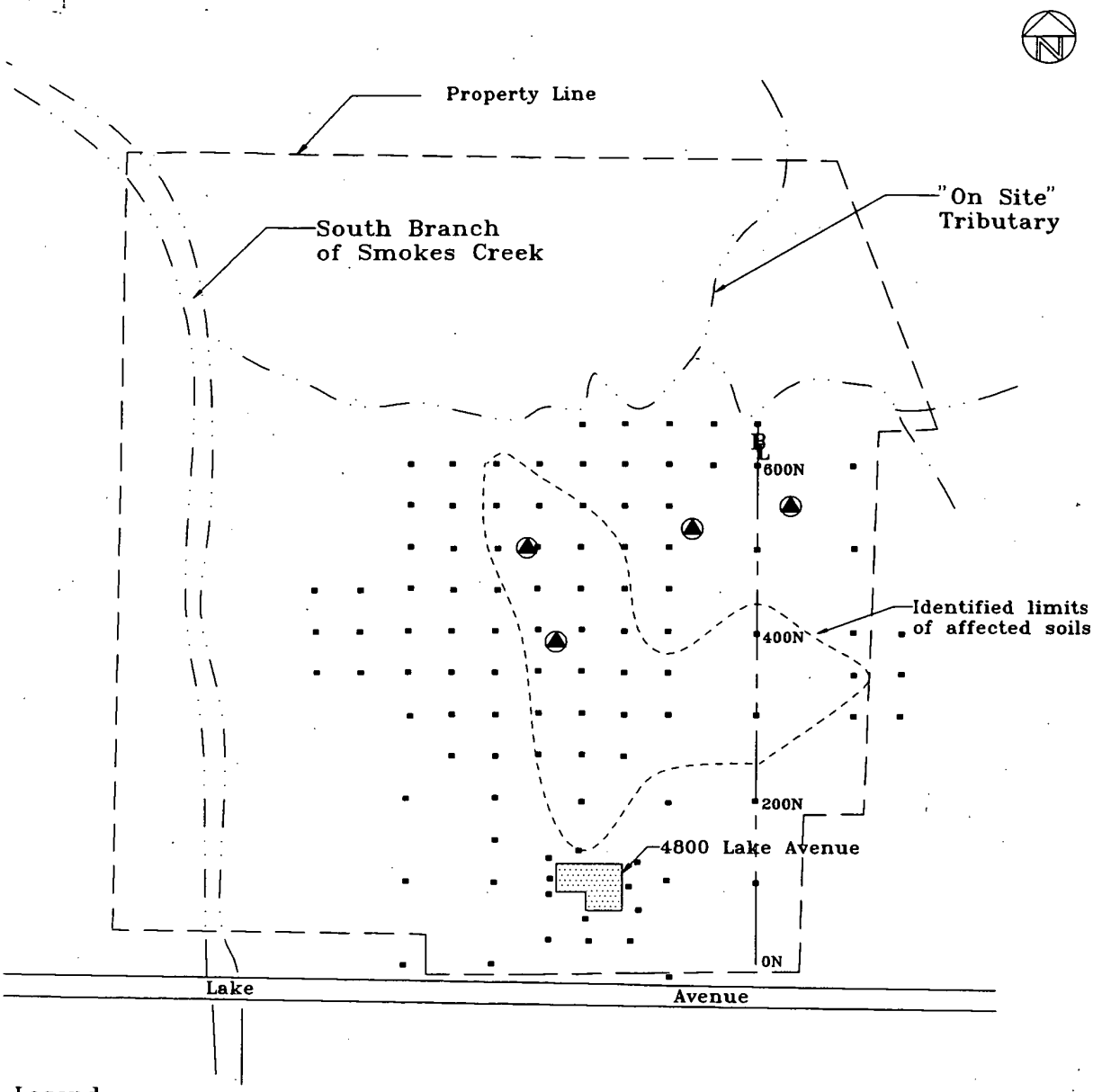
SMP Figure 8



Note: Site features were adapted from a 1972 aerial photograph provided by Erie County Department of Environment and Planning.

McMahon & Mann Consulting Engineers, P.C.	**CHEM-TROL SITE** **HAMBURG, NEW YORK** **FEASIBILITY STUDIES** **SCA Services, Inc.** Scale: 1 inch= 200 feet	**SITE PLAN** **Figure 2**

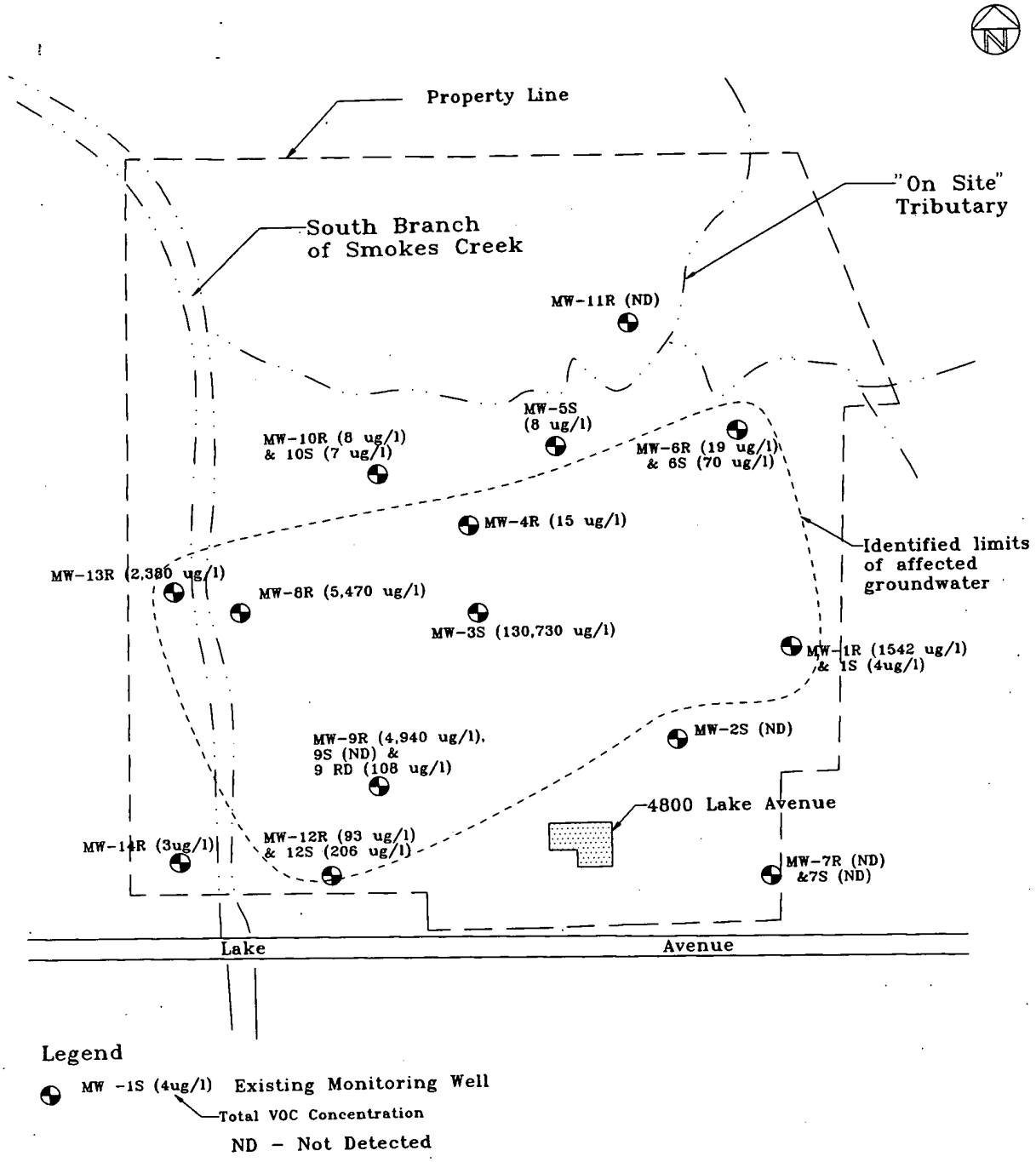
SMP Figure 9



Note: Extent of affected soils estimated based upon test results presented in "Chem-Trol Site Remedial Investigation", GZA GeoEnvironmental of New York, November 1994.

McMahon & Mann Consulting Engineers, P.C.	**CHEM-TROL SITE** **HAMBURG, NEW YORK** **FEASIBILITY STUDIES** **SCA Services, Inc.** Scale: 1 inch= 200 feet	**EXTENT OF AFFECTED SOILS** **Figure 4**

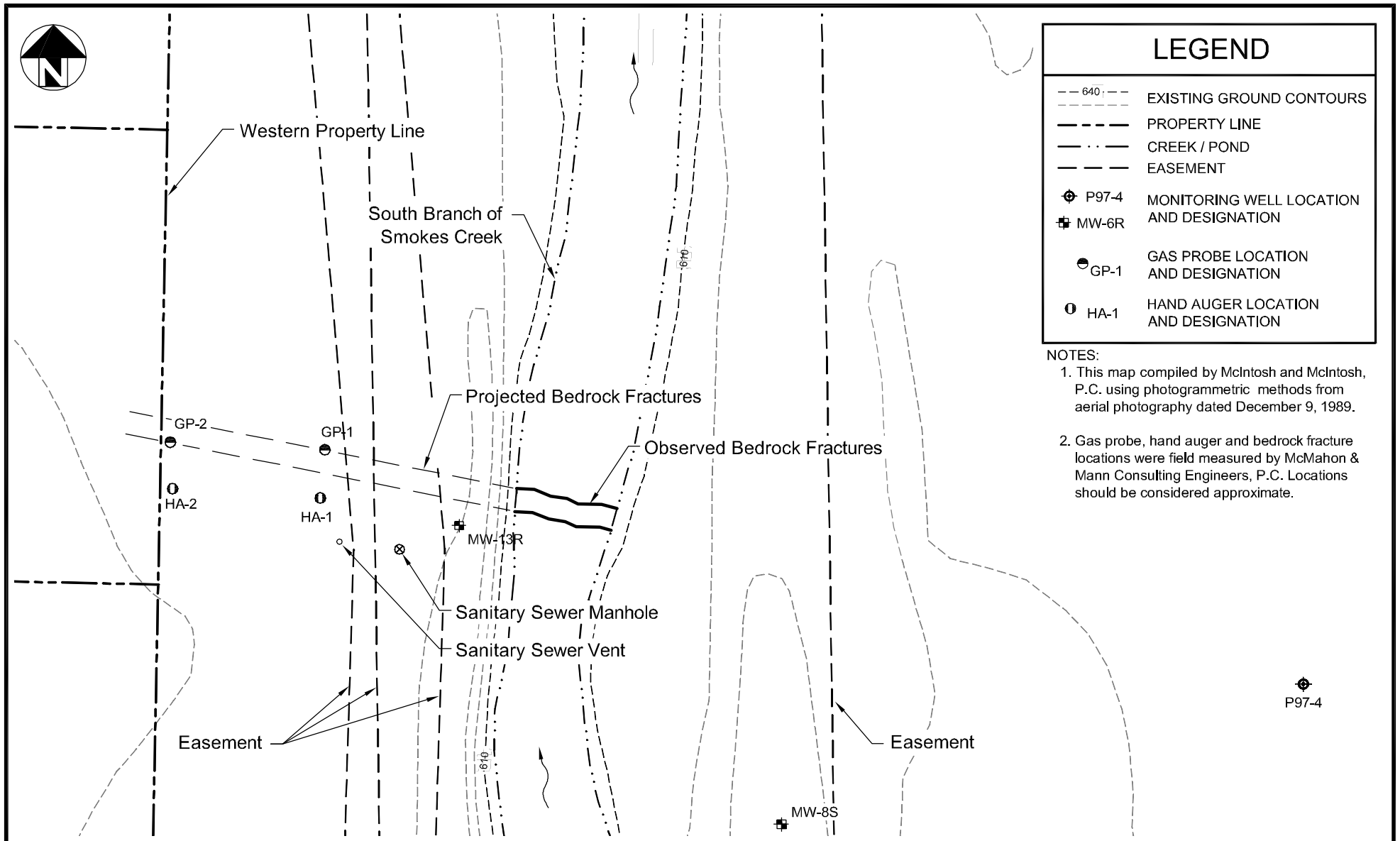
SMP Figure 10



Note: Extent of affected groundwater estimated based upon test results presented in "Chem-Trol Site Remedial Investigation", GZA GeoEnvironmental of New York, November 1994.

McMahon & Mann Consulting Engineers, P.C.	**CHEM-TROL SITE** **HAMBURG, NEW YORK** **FEASIBILITY STUDIES** **SCA Services, Inc.** Scale: 1 inch= 200 feet	**EXTENT OF AFFECTED GROUNDWATER** **Figure 7**

SMP Figure 11



SOIL GAS STUDY PLAN	CHEM-TROL	McMahon & Mann Consulting Engineers, P.C.
DWG. NO. 94022-008		2495 MAIN STREET, SUITE 432 (716) 834-8932
FIGURE 2	ERIE COUNTY NEW YORK	BUFFALO, NY 14214 FAX: (716) 834-8934

SMP Figure 12

NOTES:

1. BASE MAP PREPARED BY McINTOSH & McINTOSH, P.C., JOB NO. 3689-A, DATED JANUARY 30, 1990
   ELEVATIONS REFER TO NGVD-1929
   CONTOUR INTERVAL: 2 FEET
2. SOIL SEDIMENT REMOVAL LOCATIONS ARE APPROXIMATE AND SHOULD BE LOCATED BY SURVEY.

-N-
GRID

SCALE 0' 25' 50' 100'

NORTH BRANCH ON-SITE TRIBUTARY

HOT SPOT SOIL AND SEDIMENT REMOVAL LOCATIONS

SWS-8 SWS-6 SSI-1 SSI-2 FPS-8 FPS-9

ON-SITE TRIBUTARY

SOUTH BRANCH ON-SITE TRIBUTARY

SHALLOW TEST PIT SAMPLE LOCATIONS

ALFRED ROAD

SOUTH BRANCH OF SMOKES CREEK

LAKE AVENUE

CONC. PAD

BLACKTOP PARKING AREA

BLDG. NO. 4856

HOUSE NO. 4838

FAUCET

SEWER VENT

SMP Figure 13

REVISIONS	NO	DRN CHK	DATE
ALBANY			
DRN TSL			8/98
DES JM			8/98
CHK			
APP			

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SCA-CHEM-TROL
SOURCE CONTROL REMEDY
HAMBURG, NEW YORK

HOT SPOT SOIL AND SEDIMENT REMOVAL LOCATIONS

DATE	8/20/98
PROJECT NO	201561
FILENAME	CHEM-2-6.DWG
SHEET NO	3 of 11
DRAWING NO	3

MW-15R	CRIT	09/24
Cyclohexane	--	31
Methylcyclohexane	--	8.8

MW-13R	CRIT	09/24
o-Chlorotoluene	5	1400
MW-13R (DUP)	CRIT	09/24
o-Chlorotoluene	5	1100

MW-8R	CRIT	09/24
o-Chlorotoluene	5	100

MW-9R	CRIT	09/24
1,1,1-Trichloroethane	5	160
1,1-Dichloroethane	5	71

MW-3S	CRIT	09/24
o-Chlorotoluene	5	77000

MW-7R	CRIT	09/24
All Parameters	--	ND

SOUTH BRANCH OF SMOKES CREEK

ON SITE TRIBUTARY OF SMOKES CREEK

GROUNDWATER COLLECTION TRENCH

WATER TREATMENT BUILDING

SOIL VAPOR EXTRACTION BUILDING

LAKE AVENUE

MW-10S
MW-10R
MW-5S
MW-6S
MW-6R
MW-4S
MW-4R
MW-8S
MW-1R
MW-1S
MW-2S
MW-9RD
MW-9S
MW-14R
MW-12S
MW-12R
MW-7S

Legend

- Monitoring Well
- Monitoring Well (Not Sampled)
- Edge of Water
- Existing Ground Elevation Contour
- Site Boundary
- Tax Parcel Boundary

Location ID | Criteria | Sample Date

MW-3S | CRIT | 09/24

o-Chlorotoluene | 5 | 77000

Parameter | Concentration (µg/L)

NOTES:
1. Units are shown in µg/L.
2. Concentration shown in red exceeds criteria.

ACRONYMS:
DUP - Field Duplicate
ND - Non Detect
µg/L - microgram per liter

CRITERIA:
NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998 (includes through 2/2023).
(1) Class GA, Protection for Source of Drinking Water (Groundwater)

150 0 150 Feet

CHEM-TROL 2024 GROUNDWATER ANALYTICAL RESULTS

AECOM

FIGURE 14

File Path: L:\DCS\Projects\60526520_ChmTrl2017\900-CAD-GIS\920-GIS or Graphics\APRX\ChemTrol\ChemTrol_SMP.aprx Date: 02/27/26 Layout: 14 GW ANALYTICAL (2024)

LIMITS OF UPGRADED SOIL COVER

LIMITS OF SVES TREATMENT

NEW FENCE (LOCATION TO BE DETERMINED BY ENGINEER IN THE FIELD.

TREATMENT BUILDING 8'W GRAVEL ACCESS ROAD WITH PARKING/ TURN AROUND

DOUBLE LEAF GATE W/ LOCKING DEVICE

FAUCET

BLDG. NO. 4656

HOUSE NO. 4638

ROAD

ALFRED

SOUTH

SMOKES CREEK

SOUTH BRANCH OF

LAKE AVENUE

N

GRID

SCALE 0' 25' 50' 100'

SMP Figure 15

NO	REVISIONS	DRN	CHK	DATE

ALBANY

DRN	NSL	8/98
DES	JM	8/98
CHK		
APP		

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RUST Environment & Infrastructure Inc.

SCA-CHEM-TROL
SOURCE CONTROL REMEDY
HAMBURG, NEW YORK

FINAL SITE PLAN

DATE	8/20/98
PROJECT NO	201561
FILENAME	CHEM-8.DWG
SHEET NO	8 of 11
DRAWING NO	8

GRADE DATA CHART

Station North	Station East	Station West	10-7-98 Pre-Construction Existing Grade	11-2-98 Prep Grades	11-30-98 Top of Clay	5-13-99 Final Grade
3+89	1+12		640.74	639.2	641.5	641.3
3+30	1+10		641.45	639.4	642.0	642.0
3+50	1+10		641.71	639.9	642.0	642.0
4+00	1+05		640.88	639.3	641.2	641.3
3+16	1+00		641.58	639.6	641.8	642.6
3+50	1+00		641.40	640.0	642.1	642.4
4+00	1+00		641.02	639.4	641.8	642.5
4+50	1+00		641.04	639.4	641.4	642.1
4+24	0+90		640.85	639.8	641.1	641.7
3+00	0+88		641.79	640.7	642.3	642.8
2+70	0+50		641.99	640.6	642.2	642.7
3+00	0+50		641.78	641.8	643.8	644.3
3+50	0+50		641.51	641.9	644.4	645.1
4+00	0+50		641.69	641.7	643.8	644.5
4+50	0+50		641.14	640.0	644.1	643.0
4+63	0+50		640.92	639.7	644.1	642.6
2+50	0+24		641.98	641.0	643.2	
2+32	0+00		641.50	640.6	642.0	642.5
2+50	0+00		641.37	641.0	643.9	643.4
3+00	0+00		641.62	641.9	643.8	643.7
3+50	0+00		641.50	641.8	644.6	645.4
4+00	0+00		641.27	641.7	644.8	645.4
4+50	0+00		641.24	641.5	643.8	644.6
5+00	0+00		640.69	639.6	641.7	642.6
5+12	0+00		640.32	639.5	640.4	641.6
5+00	0+13		640.53	639.9		641.4
1+96		0+50	640.82	640.2	641.7	640.2
2+50		0+50	641.07	640.8	642.9	643.6
3+00		0+50	640.72	641.4	643.4	644.2
3+50		0+50	640.82	641.9	644.1	644.7
4+00		0+50	640.62	641.8	644.6	645.4
4+50		0+50	639.57	641.8	644.7	645.3
5+00		0+50	640.84	641.2	642.7	644.2
5+50		0+50	640.10	639.2	640.9	
5+57		0+50	640.30	639.1	640.0	641.1
6+00		1+08	638.42	637.5	638.8	
1+62		1+00	640.22	639.1	640.6	641.2
2+00		1+00	640.92	640.3	641.8	642.4
2+50		1+00	640.62	640.9	642.5	643.6
3+00		1+00	639.97	641.1	643.1	643.6
3+50		1+00	639.92	641.7	643.7	644.6
4+00		1+00	639.57	–	644.4	645.2
4+50		1+00	640.12	640.1	644.4	645.5
5+00		1+00	641.82	641.4	644.0	644.9
5+50		1+00	640.62	640.1	642.6	643.6
5+96		1+00	638.57	637.9	639.3	640.3
1+50		1+29	639.52	638.2	639.9	640.7
1+41		1+50	639.32	638.0	639.9	
1+50		1+50	639.32	638.4	640.0	640.5
2+00		1+50	639.62	639.6	640.9	641.7
2+50		1+50	639.72	639.8	641.8	642.6
3+00		1+50	639.72	640.8	642.5	643.4
3+50		1+50	639.54	640.9	643.3	644.0
4+00		1+50	640.42	641.8	643.8	644.5
4+50		1+50	642.12	642.1	644.2	644.7
5+00		1+50	641.62	641.6	643.6	644.7
5+50		1+50	640.27	640.3	–	642.7
6+00		1+50	638.22	637.7	638.5 n/c	639.1
6+10		1+50	637.72	636.9	– n/c	637.0
1+30		1+80	638.92	637.7	638.7	
1+57		2+00	639.12	636.0	639.0	639.5
1+50		2+00	639.22	638.4	639.3	639.8
2+00		2+00	639.17	638.4	640.0	640.6
2+50		2+00	639.32	639.3	640.8	641.4
3+00		2+00	639.12	640.1	641.7	642.5
3+50		2+00	639.38	640.6	642.4	643.1
4+00		2+00	639.97	641.4	643.4	
4+50		2+00	641.12	641.8	643.5	644.1
5+00		2+00	640.32	641.1	643.0	643.5
5+50		2+00	638.72	638.9	638.8 n/c	639.3
6+00		2+00	635.92	635.5	636.5 n/c	636.0
6+06		2+00	635.32	635.2	635.5 n/c	635.7
6+00		2+13	635.02	634.7	634.7 n/c	635.5
1+48		2+57	639.12	638.2	638.9	639.1
2+50		2+50	638.62	638.4	639.3	640.4
3+00		2+50	639.02	638.8	640.0	640.9
3+50		2+50	639.12	639.1	641.1	641.7
4+00		2+50	638.82		641.8	642.5
4+50		2+50	639.82	640.4	642.1	642.9
5+00		2+50	638.92	639.3	641.0	641.5
5+50		2+50	637.22	637.5	637.6 n/c	637.6
5+93		2+50	634.42	634.0	634.1 n/c	634.6
2+00		2+48	638.51	638.0	638.7	639.7
2+50		2+61	638.42	637.6	638.6	639.9
3+00		2+74	638.72	637.9	640.1	639.9
3+50		2+87	638.22	637.9	640.0	639.6
3+65		2+90	637.72	637.6		639.7
4+00		2+98	637.12	637.6	638.4	639.8
4+50		3+00	637.72	637.9	639.8	640.7
5+00		3+00	637.02	637.2	638.6	639.3
5+50		3+00	635.82	635.9	635.9 n/c	635.9
5+80		3+00	633.72	633.8	633.8 n/c	633.8
4+50		3+10	637.02	637.3	638.9	639.4
5+00		3+22	635.92	635.9	635.5 n/c	637.7
5+50		3+26	634.72	634.3	634.3 n/c	635.3
5+73		3+28	633.82	633.5	633.9 n/c	633.8

NOTES: n/c – No Clay

LEGEND

WELL — WELL LOCATION

634.65 — SPOT ELEVATION

CONC. PIPE SUPPORTS (2.65' x 2.00')

CHART FOR PIPE LATERALS

LATERAL	PIPE INV. N.W.	PIPE INV. S.E.	LENGTH
0	636.71	636.21	50'
1	635.92	634.84	110'
2	635.81	634.29	160'
3	636.83	634.23	200'
4	637.36	635.17	220'
5	637.78	635.54	220'
6	637.93	635.92	220'
7	639.01	637.59	150'

* DATA PERTAINING TO THE LOCATION AND ELEVATIONS OF PIPE LATERALS AS PROVIDED BY IT CORPORATION REPRESENTATIVE AT ON-SITE MEETING ON MAY 13, 1999. McINTOSH & McINTOSH, P.C. ASSUMES NO RESPONSIBILITY AS THE ACCURACY OF THIS DATA.

NOTES

1) ELEVATIONS BASED UPON N.G.V.D. 29.

2) SITE BENCHMARK: RAILROAD SPIKE IN N.W. FACE OF POWER POLE X/NYSEG/740/49A-3/NYT 49-2 AND BEING 1' ABOVE GRADE LOCATED AT APPROXIMATE GRID STATION 1+55 NORTH, 1+41 WEST. ELEVATION 640.62

3) FOR REFERENCE DRAWING SEE SURVEY PREPARED BY McINTOSH & McINTOSH, P.C., DATED JANUARY 30, 1990 AND IDENTIFIED AS JOB NO. 3689-A.

4) FOR REFERENCE DRAWING SEE TOPOGRAPHIC MAP PREPARED BY McINTOSH & McINTOSH, P.C., DATED MARCH 13, 1990 LAST REVISED FEBRUARY 22, 1999 AND IDENTIFIED AS JOB NO. 3689-B.

McINTOSH & McINTOSH, P.C.
CONSULTING ENGINEERS, LAND SURVEYORS, PLANNERS
LOCKPORT, NEW YORK PHONE 434-9138
BUFFALO, NEW YORK PHONE 625-8360

REVISION	REVISION

NOTE: UNAUTHORIZED ALTERATION OR ADDITION TO THIS MAP IS A VIOLATION OF SECTION 7209, PROVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

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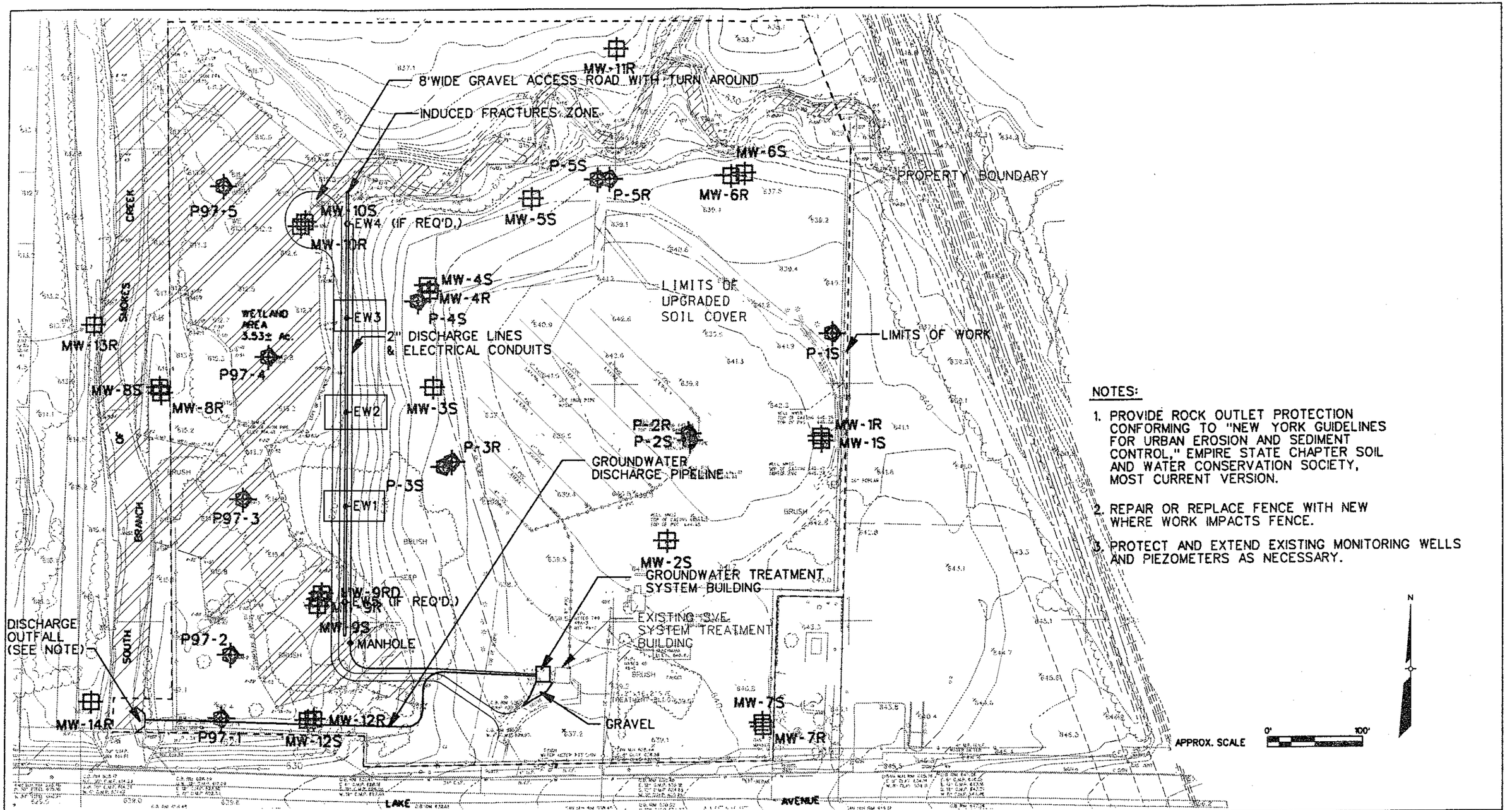
FINAL RECORD PLAN OF CHEM-TROL SITE REMEDIATION PROJECT

LOCATION TOWN OF HAMBURG, ERIE COUNTY, NEW YORK

JOB No.	SCALE:	DATE:	DRAWN	MSS
3689-C	1"= 50'	MAY 13, 1999	COMP.	
			DESC.	
			FILE	OHM10.DWG

SMP Figure 16



NOTES:

1. PROVIDE ROCK OUTLET PROTECTION CONFORMING TO "NEW YORK GUIDELINES FOR URBAN EROSION AND SEDIMENT CONTROL," EMPIRE STATE CHAPTER SOIL AND WATER CONSERVATION SOCIETY, MOST CURRENT VERSION.
2. REPAIR OR REPLACE FENCE WITH NEW WHERE WORK IMPACTS FENCE.
3. PROTECT AND EXTEND EXISTING MONITORING WELLS AND PIEZOMETERS AS NECESSARY.

NO.	REVISIONS	MADE	CHK	DATE

	NAMES	DATE
DRAWN:	JV	8-13-99
DESIGN:	ARB	8-13-99
CHECKED:	MJM	8-13-99
PE:		
APP'D:		
APP'D:		
APP'D:		

SITE LAYOUT

CHEM-TROL SITE
GROUNDWATER CONTROL ELEMENTS
HAMBURG, NEW YORK

EARTH TECH

PROJECT NUMBER 32067
DATE SEP. 1999
EARTHTECH DWG NUMBER C2
FILE NUMBER
CLIENT DWG NUMBER
SHEET NUMBER 2 of 11

The drawings, specifications and other documents prepared by the Engineer for this project are instruments of the Engineer's service for use solely with respect to this project and, unless otherwise provided, the Engineer shall be deemed the author of these documents and shall retain all common law, statutory and other reserved rights, including the copyright.

SMP Figure 17

APPENDIX A – DECLARATION OF COVENANTS AND RESTRICTIONS

.

ERIE COUNTY CLERKS OFFICE
County Clerk's Recording Page

Return To:

SAUL EWING LLP;
CENTRE SQUARE WEST
1500 MARKET ST 38TH FL
PHILABELPHIA PA 19102 9863

Index DEED LIBER

Book 11071 Page 3255

No. Pages 0009

Instrument DECL RSTRCT COV

Date : 3/25/2004

Time : 2:03:08

Control # 200403250904

SC HOLDINGS INC

Employee ID EDF

COUNTY	$	34.50
COE STATE	$	4.75
COE COUNTY	$	1.00
COE ST GEN	$	14.25
	$	.00
	$	.00
	$	.00
	$	.00
	$	.00
Total:	$	54.50

STATE OF NEW YORK
ERIE COUNTY CLERKS OFFICE

WARNING - THIS SHEET CONSTITUTES THE CLERK'S ENDORSEMENT, REQUIRED BY SECTIONS 319&316-a (5) OF THE REAL PROPERTY LAW OF THE STATE OF NEW YORK. DO NOT DETACH. THIS IS NOT A BILL.

DAVID J SWARTS
COUNTY CLERK

D110713255

DECLARATION of COVENANTS and RESTRICTIONS

THIS DECLARATION of COVENANTS and RESTRICTIONS made the 5th day of February, 2003, by SC Holdings, Inc. a Pennsylvania corporation successor by statutory merger to SCA Services, Inc., with an address at Waste Management, Inc. – Northeast Group, 1001 Fannin Street, Suite 4000, Houston Texas 77002 ("WM")

WHEREAS, WM is the owner of an inactive hazardous waste disposal site which is listed in the Registry of Inactive Hazardous Waste Disposal Sites in New York State as Site Number 9-15-015, located on 4818 Lake Avenue in the Township of Hamburg, County of Erie, State of New York, which is part of lands conveyed to SCA Services, Inc. by deeds recorded in the Erie County Clerk's Office in Liber 9997 of Deeds at Page 556 and in Liber 10885 of Deeds at Page 57 and being more particularly described in Appendix "A," attached to this declaration and made a part hereof, and hereinafter referred to as "the Property"; and

WHEREAS, the Property is the subject of a consent order issued by the New York State Department of Environmental Conservation on October 31, 1997 and an amendment to the consent order issued February 26, 1998; and

WHEREAS, the New York State Department of Environmental Conservation set forth a remedy to eliminate or mitigate all significant threats to the environment presented by hazardous waste disposal at the Site in a Record of Decision ("ROD") dated March 29, 1996 , and such ROD and the Post-Remedial Operation and Maintenance Plan Record Drawings and Final Engineering Report, March 2002, required that the Property be subject to restrictive covenants.

NOW, THEREFORE, WM, for itself and its successors and/or assigns, covenants that and NYSDEC agrees that:

First, the Property subject to this Declaration of Covenants and Restrictions is as shown on a map attached to this declaration as Appendix "B" and made a part hereof, and consists of

ALL THAT TRACT OR PARCEL OF LAND, situate in the Town of Hamburg, County of Erie and State of New York, being part of Lot 445, Buffalo Creek Reservation, Township 10, Range 7 of the Holland Land Company survey (so-called), bounded and described as follows:

BEGINNING AT A POINT on the west line of Lot 445 at the northwest corner of Parcel No. 37 as shown on File No. 203-13 for lands acquired by the County of Erie for Lake Avenue by deed recorded in the Erie County Clerk's Office in Liber 7818 of Deeds at Page 233;

RUNNING THENCE: N-01°-08'-53"-E, along the west line of Lot 445, a distance of 938.82 feet to the northwest corner thereof;

RUNNING THENCE: S-88°-49'-38"-E, along the north line of Lot 445, a distance of 771.73 feet to a point;

155481
904
799 8-1

RUNNING THENCE: S-21°-38'-04"-E, a distance of 344.49 feet to a point;

RUNNING THENCE: N-88°-49'-38"-W, parallel with the north line of Lot 445, a distance of 35.80 feet to the most northerly corner of lands conveyed to Miriam J. Adams by deed recorded in the Erie County Clerk's Office in Liber 7507 of Deeds at Page 581;

RUNNING THENCE: S-01°-19'-44"-W, along the west line of said Adams lands, a distance of 468.18 feet to the northeast corner of lands conveyed to Rose Marie Mazzi, et al by deed recorded in the Erie County Clerk's Office in Liber 9587 of Deeds at Page 45;

RUNNING THENCE: N-88°-40'-16"-W, along the north line of said Mazzi lands, a distance of 70.0 feet to the northwest corner thereof.

RUNNING THENCE: S-01°-19'-44"-W, along the west line of said Mazzi lands, a distance of 172.76 feet to a most northeasterly corner of said parcel No. 37 and the north line of Lake Avenue as now laid out;

RUNNING THENCE: S-89°-16'-57"-W, along the north line of Lake Avenue, a distance of 433.0 feet to an angle point therein;

RUNNING THENCE: N-00°-57'24"-E, along the north line of Lake Avenue, a distance of 32.25 feet to an angle point therein;

RUNNING THENCE: N-88°-35'-19"-W, along the north line of Lake Avenue, a distance of 364.43 feet to the POINT OR PLACE OF BEGINNING, containing 18.52 acres, be the same, more or less.

SUBJECT to easement, rights of way and restrictions of record.

BEING AND INTENDED TO BE a portion of lands conveyed to SCA Services, Inc. by deeds recorded in the Erie County Clerk's Office in Liber 9997 of Deeds at Page 556 and in Liber 10885 of Deeds at Page 57. The total acreage is 18.52± Acres.

Second, unless prior written approval by the New York State Department of Environmental Conservation or, if the Department shall no longer exist, any New York State agency or agencies subsequently created to protect the environment of the State and the health of the State's citizens, hereinafter referred to as "the Relevant Agency," is first obtained, no person shall engage in any activity that will, or that reasonably is anticipated to, prevent or interfere significantly with any proposed, ongoing or completed program at the Property or that will, or is reasonably foreseeable to, expose the public health or the environment to a significantly increased threat of harm or damage.

Third, the owner of the Property shall maintain the cap covering the Property by maintaining its grass cover or, after obtaining the written approval of the Relevant Agency, by capping the Property with another material.

Fourth, the owner of the Property shall prohibit the Property from ever being used for purposes other than for industrial or commercial use, excluding use for day care, child care and medical care, without the express written waiver of such prohibition by the Relevant Agency.

Fifth, the owner of the Property shall prohibit the use of the groundwater underlying the Property without treatment rendering it safe for drinking water or industrial purposes, as appropriate, unless the user first obtains permission to do so from the Relevant Agency, except that the groundwater may be reasonably used as necessary to conduct tests to monitor the contamination levels of the groundwater as directed and approved by the Relevant Agency.

Sixth, the owner of the Property shall continue in full force and effect any institutional and engineering controls the Department required Respondent to put into place and maintain unless the owner first obtains permission to discontinue such controls from the Relevant Agency.

Seventh, this Declaration is and shall be deemed a covenant that shall run with the land and shall be binding upon all future owners of the Property and shall provide that the owner, and its successors and assigns, consents to the enforcement by the Relevant Agency of the prohibitions and restrictions that required to be recorded, and hereby covenants not to contest the authority of the Department to seek enforcement.

Eighth, any deed of conveyance of the Property, or any portion thereof, shall recite, unless the Relevant Agency has consented to the termination of such covenants and restrictions, that said conveyance is subject to this Declaration of Covenants and Restrictions.

Ninth, WM may make such use of the Property as it wishes so long as such use is in compliance with applicable law including 6 NYCRR Part 375 and does not violate any of the institutional controls, restrictions or other term of this Declaration.

Tenth, in the event of an emergency which presents a significant risk to public health safety, or to the environment, the restrictions on the use of the Property set forth in this Declaration may be temporarily and unilaterally suspended by WM, provided that WM:

a. Immediately notifies the Relevant Agency of the emergency;

b. Limits both the actual disturbance and the time needed for the disturbance to that action or activity which is reasonably necessary to adequately respond to the emergency;

c. Implements reasonable measures necessary to limit actual or potential, present or future risk of exposure to humans or the environment to the residual contamination; and

d. Restores the affected areas to the pre-emergency conditions to the extent reasonably possible, and provides a report to the Relevant Agency of such emergency and restoration efforts within ninety (90) calendar days after the end of the emergency, unless otherwise approved by the Relevant Agency.

Eleventh, WM may petition the Relevant Agency to modify or terminate this Declaration at such time as it can certify that reliance upon such covenants and restrictions is no longer required to protect the public health or environment.

IN WITNESS WHEREOF, the undersigned has executed this instrument the day written below.

SC HOLDINGS, INC.

Attest: _____

By: _____
Stephen T. Joyce

Title: Area Director, Closed Sites, East Group

Acknowledgements for SC Holdings, Inc.

UNIFORM FORM CERTIFICATE OF PROOF
OF EXECUTION BY A SUBSCRIBING WITNESS
(Outside of New York State)

_____ of _____ :
_____ COUNTY :

On the __ day of _____ in the year 2003, before me, the undersigned, personally appeared _____, the subscribing witness to the foregoing instrument, with whom I am personally acquainted, who, being by me duly sworn, did depose and say that he/she resides in _____ (if the place of residence is in a city, include the street and street number, if any, thereof); that he/she knows STEPHEN T. JOYCE to be the individual described in and who executed the foregoing instrument; that said subscribing witness was present and saw said STEPHEN T. JOYCE execute the same; that said witness at the same time subscribed his/her name as a witness thereto; and that said subscribing witness made such appearance before the undersigned in _____. (Insert the city or other political subdivision and the state or country or other place in which the proof was taken.)

_____
(Signature and office of individual taking proof.)

UNIFORM FORM CERTIFICATE OF ACKNOWLEDGMENT (Outside of New York State)

STATE of MASSACHUSETTS :
ESSEX COUNTY :

On the 5th day of February in the year 2004 before me, the undersigned, personally appeared STEPHEN T. JOYCE, 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, that by his signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument, and that such individual made such appearance before the undersigned in the AMESBURY, MASSACHUSETTS. (Insert the city or other political subdivision and the state or country or other place the acknowledgment was taken).

Joan H. Saponaro
Joan H. Saponaro
(Signature and office of individual taking acknowledgment.)

My commission expires: 9/29/2006

APPENDIX "A"
Legal Description
18.52± Acres

ALL THAT TRACT OR PARCEL OF LAND, situate in the Town of Hamburg, County of Erie and State of New York, being part of Lot 445, Buffalo Creek Reservation, Township 10, Range 7 of the Holland Land Company survey (so-called), bounded and described as follows:

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RUNNING THENCE: S-21°-38'-04"-E, a distance of 344.49 feet to a point;

RUNNING THENCE: N-88°-49'-38"-W, parallel with the north line of Lot 445, a distance of 35.80 feet to the most northerly corner of lands conveyed to Miriam J. Adams by deed recorded in the Erie County Clerk's Office in Liber 7507 of Deeds at Page 581;

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RUNNING THENCE: N-88°-40'-16"-W, along the north line of said Mazzi lands, a distance of 70.0 feet to the northwest corner thereof;

RUNNING THENCE: S-01°-19'-44"-W, along the west line of said Mazzi lands, a distance of 172.76 feet to a most northeasterly corner of said parcel No. 37 and the north line of Lake Avenue as now laid out;

RUNNING THENCE: S-89°-16'-57"-W, along the north line of Lake Avenue, a distance of 433.0 feet to an angle point therein;

RUNNING THENCE: N-00°-57'24"-E, along the north line of Lake Avenue, a distance of 32.25 feet to an angle point therein;

RUNNING THENCE: N-88°-35'-19"-W, along the north line of Lake Avenue, a distance of 364.43 feet to the POINT OR PLACE OF BEGINNING, containing 18.52 acres, be the same, more or less.

SUBJECT to easement, rights of way and restrictions of record.

BEING AND INTENDED TO BE a portion of lands conveyed to SCA Services, Inc. by deeds recorded in the Erie County Clerk's Office in Liber 9997 of Deeds at Page 556 and in Liber 10885 of Deeds at Page 57.

APPENDIX "B"
Map of Property

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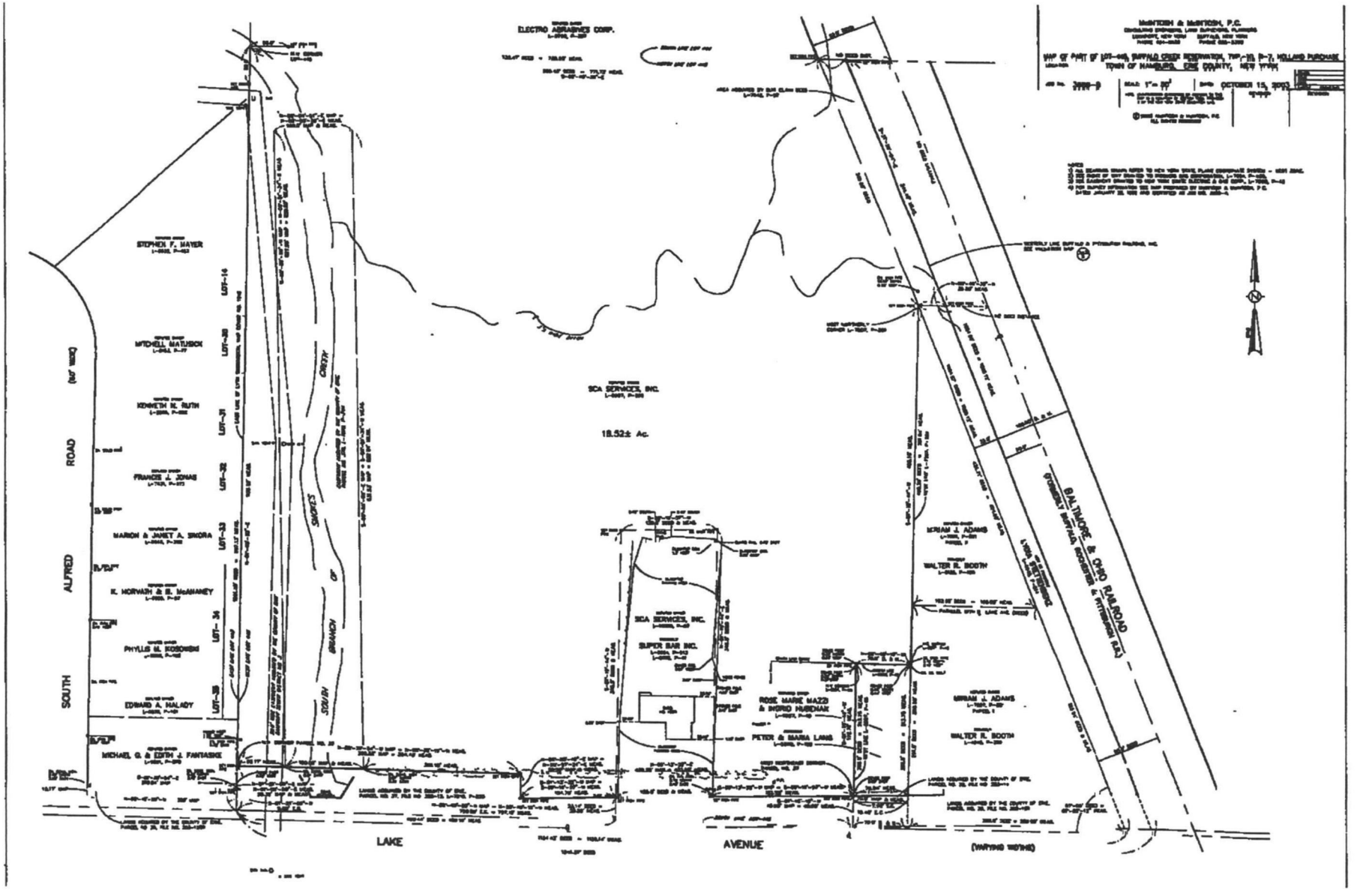
MAP OF PROPERTY FOLLOWS ON NEXT PAGE.


ELECTRO ABRASIVES CORP.
SCA SERVICES, INC.
18.52± Ac.
SOUTH ALFRED ROAD (No. 1002)
STEPHEN F. MAYER
MITCHELL MATUSICK
KENNETH M. RUTH
FRANCIS J. JONAS
MARION & JANET A. SNORA
K. HORVASH & B. McMANEY
PHYLLIS M. KOSOWSKI
EDWARD A. HALADY
MICHAEL G. & EDITH J. FANTASKE
LOT-16
LOT-30
LOT-31
LOT-32
LOT-33
LOT-34
LOT-35
SOUTH BRANCH OF SMOKES CREEK
SUPER BAR INC.
ROSE MARIE MAZZA & INGRID HUBSMAN
PETER & MARIA LANG
MIRIAM J. ADAMS
WALTER R. BOOTH
BALTIMORE & OHIO RAILROAD
(CURRENTLY NORTHAMPTON, ROCHESTER & PITTSBURGH R.R.)
LAKE AVENUE
(VARYING WIDTHS)
McINTOSH & McINTOSH, P.C.
MAP OF PART OF LOT-446, BUFFALO CREEK RESERVATION, TWP-10, R-7, HOLLAND PURCHASE
TOWN OF HAMBURG, ERIE COUNTY, NEW YORK
OCTOBER 15, 2003

RECORD AND RETURN TO:

Margaret M. Gatto
Legal Assistant
Saul Ewing LLP
Centre Square West
1500 Market Street, 38th Floor
Philadelphia, PA 19102-2186

APPENDIX B – LIST OF SITE CONTACTS

Name	Phone/Email Address
SC Holdings, Inc., Site Owner	
E Ryan Donovan, Site Owner District Manager	413-427-4432 edonovan@wm.com
Robert J. Murphy, AECOM USA, Inc. Qualified Environmental Professional	716-836-5636 rob.murphy@aecom.com
Rosaura Andújar-McNeil, AECOM USA, Inc., Professional Engineer	845-233-1923 r.andujar-mcneil@aecom.com
Brad Demo, NYSDEC DER Project Manager	716-851-7139 bradley.demo@dec.ny.gov
Megan Kuczka, NYSDEC DER Project Manager's Supervisor	716-842-2175 megan.kuczka@dec.ny.gov
NYSDEC Site Control	DERSiteControl@dec.ny.gov
Megan Rivera, NYSDOH Project Manager	518-402-7877 megan.rivera@health.ny.gov
Michael Brennan, Site Owner Attorney	267-969-0891 mbrenna5@wm.om

APPENDIX C – MONITORING WELL BORING AND CONSTRUCTION LOGS

TEST PIT FIELD LOG

Project Description Chem-Trol
Project Location Hamburg, New York
GZA Representative S. Blair

Test Pit No. K
Location N 585, W 132
File No. 5945
Date 11/20/92
Time Started 11:45
Time Completed 12:30

Contractor Buffalo Drilling Co, Inc
Operator Terry Sally
Make Rupp Model 1400B

Weather Sunny, 40°F
Ground Elevation

DEPTH (feet)	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION	REMARK NO.
1			Dark brown, Silty CLAY, trace fine to coarse Sand, moist.	
2			Light brown SILT & CLAY and SAND, moist.	
	CT-K-1	2-2.5		
3			White plastic material and wood [FILL]	
4	CT-K-2	3.5-4	White gray, Clayey SILT, intermixed with brown CLAY and SILT, little Sand, moist with intermixed white-gray material (with chalky consistency) and wood branches	
5				
6				
7	CT-K-3	6.5-7	Black, Silty CLAY, trace Sand, moist ... piece of sheet metal ... piece of steel conduit ... 1/2 metal container lid ... grades wet	
8			... water filling hole at 6.5 ft [FILL]	
	CT-K-4	8.5-9	Gray, Clayey SILT, trace Sand, wet (possible natural material)	

REMARKS: BOTTOM OF HOLE AT 9 FT.

TEST PIT FIELD LOG

Project Description Chem-Trol
Project Location Hamburg, New York
GZA Representative S. Blair

Test Pit No. C
Location N 430, W 126
File No. 5945
Date 11/20/92
Time Started 13:30
Time Completed 14:30

Contractor Buffalo Drilling Co, Inc
Operator Terry Sally
Make Rupp Model 1400B

Weather Sunny, 40°F
Ground Elevation

DEPTH (feet)	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION	REMARK NO.
1			Dark brown, Silty CLAY, moist. [FILL]	1
2	CT-C-1	2-2.5	Several metal pipes with brown fine to medium SAND, intermixed and localized around pipes, wet.	
3	CT-C-2	3-4	Black granular slag, very hard, water perched on top of slag.[FILL]	
4			. . . pieces of wood . . . intermixed gray SILT & CLAY and CLAY and SAND, wet	
5			Gray-brown Clayey SILT, little Sand, Clayey SILT, little Sand, wet, (suspected natural material.	
6	CT-C-3	6-6.5		
7			BOTTOM OF HOLE 6.5 FT.	
8				

REMARKS:

1. Followed pipes 25 feet southwest.

TEST PIT FIELD LOG

Project Description Chem-Trol
Project Location Hamburg, New York
GZA Representative S. Blair
Contractor Buffalo Drilling Co, Inc
Operator Terry Sally
Make Rupp Model 1400B

Test Pit No. L
Location N 568, W 185
File No. 5945
Date 11/20/92
Time Started 12:45
Time Completed 13:30
Weather Sunny, 40°F
Ground Elevation

DEPTH (feet)	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION	REMARK NO.
1			Dark brown Silty CLAY, some fine to medium Sand, little Gravel, moist.	
2				
3	CT-L-1	3-3.5	White-gray material (with chalky consistency) and occasionally inter-mixed Clayey SILT, little fine to medium Sand, moist. [FILL]	
4				
5			...grades; wet	
6	CT-L-2	6-6.5	Black stained gray-brown, clayey SILT, some fine to coarse Sand, wet. - chemical odor	1
7	CT-L-3	7-7.5	...grades; some fine to coarse Sand, wet - sheen observed on water at bottom of test pit	
8			...grades; occasional black staining.	

REMARKS: BOTTOM OF HOLE AT 9 FT.

1) Water began entering the test pit at 6 feet.

GZA GEOENVIRONMENTAL OF NEW YORK
364 WAGEL DRIVE, BUFFALO, NEW YORK
ENGINEERS AND SCIENTISTS

PROJECT

BORING No. ___ SHEET ___ OF ___
FILE NO.
CHKD. BY

CONTRACTOR
DRILLER
GZA GEOENVIRONMENTAL REPRESENTATIVE

BORING LOCATION
GROUND SURFACE ELEVATION ___ DATUM
START DATE ___ END DATE

TYPE OF DRILL RIG
CASING SIZE AND TYPE
OVERBURDEN SAMPLING METHOD
ROCK DRILLING METHOD

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /ROD(%)	SAMPLE RECOVERY (%)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG		NOTES
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1									

(1) Numbers in this column are the depth in feet below ground surface..

(2) Numbers in this column report the number of blows required to drive a split spoon sampler (1-3/8 inch inside diameter) 6 inches with a 140 pound hammer free falling 30 inches.

WOH means that the static weight of the 140 pound hammer and the drilling rods attached to the split barrel sampler were sufficient to cause the sampler to advance 6 inches.

WOR means the static weight of the drilling rods attached to the split barrel sampler was sufficient to cause the sampler to advance 6 inches.

(3) The sample number and type are designated in this column.
e.g., S-1 — S: sample type; 1: sample number

S - Split Spoon Sample
U - Shelby Tube Sample
C - Rock Core Sample

(4) The numbers in this column designate the depth, in feet, from the ground surface of the sample identified in column 3.

(5) The standard Penetration Test N-value, which is the sum of the blows recorded over the second and third 6 inch interval (column 2), is recorded in this column for soil samples. OB indicates an obstruction was encountered. R indicates that refusal was encountered. RQD, defined as the summation of all pieces of rock core greater than 4 inches in length divided by the length of the core run and expressed as a percentage, is reported for rock core samples in this column.

(6) The values shown are the length of the soil or rock core sample recovered divided by the distance that the sampler was advanced, expressed as a percentage.

(7) Description of soil samples include:

-- the relative density or consistency;
-- color;
-- a listing of the MAJOR and Minor soil components based on particle size distribution and plasticity;
-- moisture; and
-- other pertinent characteristics.

For example: Medium dense, brown, fine to medium SAND, trace Silt, damp, stratified.

Description of rock core samples include:

-- color, ROCK TYPE, hardness, weathering, texture, structure, discontinuity description, other features (FORMATION NAME, if known).

For example: Dark gray, DOLOMITE, moderately hard, slightly weathered, fine to medium grained, thinly bedded, very closely spaced horizontal fractures throughout (LOCKPORT DOLOMITE).

(8) Equipment installed within the borehole is graphically presented in this column. If no equipment was installed, this column is blank.

(9) The materials used to construct the equipment installed in the borehole are verbally described in this column. If no equipment was installed, this column is blank. Alternatively, field measurements may be included in this column.

(10) Pertinent observations made while advancing the test boring are identified in this column opposite the depth that the observation was made. The observation is explained at the bottom of the page under "Notes" next to the appropriate number.

DESCRIPTION OF SOIL SAMPLES

1. Density or Consistency: The density or consistency listed is determined from the Standard Penetration Test N-value according to the following table:

Density of Granular Soils	SPT N-Value	SPT N-Value	Consistency of Cohesive Soils
Very Loose	0-4	<2	Very Soft
Loose	4-10	2-4	Soft
Medium Dense	10-30	4-8	Medium
Dense	30-50	8-15	Stiff
Very Dense	>50	15-30	Very Stiff
		>30	Hard

2. Color: Visual

3. Soil Components

3.1 Description: The components of a soil sample are described by visually estimating the percentage of each component by weight of the total sample.

a. Major Component: The major soil component (>50 percent) is written with upper case letters for granular soil (e.g., SAND, GRAVEL) and a combination of upper and lower case letters for fine grained soil (e.g., Silty CLAY, Clayey SILT).

b. Minor Component: The minor soil components (≤50 percent) are written with the first letter of each soil type in upper case, and the remaining letters in lower case (e.g., Gravel, Silt). The minor components are identified and prefaced in the description based on the following percentages:

Description	Percentage
and	35-50
some	20-35
little	10-20
trace	0-10

c. Note: The actual percentage of gravel soils may differ from that measured when sampling with a standard split spoon sampler because of the relatively small sampler diameter. Also, it is not possible to identify the presence of boulders and cobbles using a standard split spoon sampler.

d. Fill: Fill is material placed by other than natural processes. It is described by its major component(s) and additional significant components are listed. The word "FILL" follows the sample description.

3.2 Definitions

a. Granular Soil: A granular soil sample is defined by the following particle sizes as referenced to a standard sieve.

Material		Standard Sieve Limit Upper	Lower
GRAVEL	- coarse (c)	3 inch	3/4 inch
	- fine (f)	3/4 inch	No. 4
SAND	- coarse (c)	No. 4	No. 10
	- medium (m)	No. 10	No. 40
	- fine (f)	No. 40	No. 200

b. Fine Grained Soil: A fine grained soil is defined as being finer than a No. 200 sieve and it is described by its plasticity as follows:

Material	Degree of Plasticity
SILT	Nonplastic
Clayey SILT	Slight
SILT & CLAY	Low
CLAY & SILT	Medium
Silty CLAY	High
CLAY	Very High

c. Organic Soil: An organic soil sample is classified by observation of the sample structure.

Material	Description
Topsoil	Surficial soils that support plant life and which contain organic matter.
Peat	Deposits of plant remains in which the original plant fibers may be visible.

4. Moisture Content

Damp - Moisture is not apparent, dusty.
Moist - No visible water.
Wet - Visible free water.

5. Other Pertinent Characteristics

Soil Structure: Produced by deposition of sediments.

Stratified	- Random soil deposits of varying components or color.
Varved	- Alternating soil deposits of varying thickness (i.e. clays or silts).
Stratum	- Soil deposit >12 inches thick.
Layer	- Soil deposit 3 inches to 12 inches thick.
Seam	- Soil deposit 1/8 inch to 3 inches thick.
Parting/lens	- Soil deposit <1/8 inch thick.

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BORING LOG LEGEND

DESCRIPTION OF ROCK CORE SAMPLES

Description of rock core samples on the boring logs are based on visual observation of the samples. Rock core features are generally described with the following information.

1. Color - visual.

2. Rock Type: The geologic rock type is presented.

3. Rock Hardness - a measure of resistance to scratching or abrasion.

Very Hard	- Cannot be scratched with knife or sharp pick. Breaking of hand specimens requires several hard blows of geologist's pick.
Hard	- Can be scratched with knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.
Moderately Hard	- Can be scratched with knife or pick. Gouges or grooves to 1/4 inch deep can be excavated by hard blows of point of a geologist's pick. Hand specimens can be detached by moderate blow of hammer.
Medium Hard	- Can be grooved or gouged 1/16 inch deep by firm pressure on knife or pick point. Can be excavated in small chips to pieces about 1 inch maximum size by hard blows of the point of a geologist's pick.
Soft	- Can be gouged or grooved readily with knife or pick point. Can be excavated in chips to pieces several inches in size. Small thin pieces can be broken by finger pressure.
Very Soft	- Can be carved with knife. Can be excavated readily with point of pick. Pieces 1 inch or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.

Note: This is an engineering description and should not be confused with Moh's scale for minerals.

4. Weathering

Fresh	- Rock fresh, crystals bright, few joints may show slight staining. Rock rings under hammer if crystalline.
Very Slight	- Rock generally fresh, joints stained, some joints may show thin clay coatings, crystals in broken face show bright. Rock rings under hammer if crystalline.
Slight	- Rock generally fresh, joints stained, and discoloration extends into rock up to 1 inch. Joints may contain clay. In granitoid rocks some occasional feldspar crystals are dull and discolored. Crystalline rocks ring under hammer.
Moderate	- Significant portions of rock show discoloration and weathering effects. In granitoid rocks, most feldspars are dull and discolored; some show clayey. Rock has dull sound under hammer and shows significant loss of strength as compared with fresh rock.
Moderately Severe	- All rock except quartz discolored or stained. In granitoid rocks, all feldspars dull and discolored and majority show kaolinization. Rock shows severe loss of strength and can be excavated with geologist's pick. Rock goes "clunk" when struck.
Severe	- All rock except quartz discolored or stained. Rock "fabric" clear and evident, but reduced in strength to strong soil. In granitoid rocks, all feldspars kaolinized to some extent. Some fragments of strong rock usually left.
Very Severe	- All rock except quartz discolored or stained. Rock "fabric" discernible, but mass effectively reduced to "soil" with only fragments of strong rock remaining.

5. Texture: The description of the average or predominant mineralogic grain size diameter of igneous and metamorphic rocks and constituent grain size diameter of sedimentary rocks.

Aphanitic	- Too small to be seen with the unaided eye.
Fine-grained	- Visible with unaided eye to 1/16 inch diameter.
Medium-grained	- 1/16 inch to 1/4 inch diameter.
Coarse-grained	- >1/4 inch.

6. Structure and Discontinuity Description

6.1 Definitions

Bedding	- Composition and textural layering in sedimentary rocks; the term may be used with caution to describe layering in metamorphic and/or volcanic rocks (flow banding).
Foliation	- Any planar fabric homogeneously distributed throughout the rock mass at the scale of observation. Bedding is foliation (primary). Most foliation in rock is secondary.
Discontinuity	- A naturally occurring break in the rock. This general term includes joints, faults, shears and other fractures. Unless stated, the specific nature of the discontinuity is not defined herein.

Discontinuity, Bedding and Foliation Spacing

Spacing	Discontinuity	Bedding and Foliation
Less than 2 inches	Very close	Very thin
2 inches - 1 foot	Close	Thin
1 foot - 3 feet	Moderately Close	Medium
3 feet - 10 feet	Wide	Thick
More than 10 feet	Very wide	Very thick

7. Other Features

7.1 Fracture Surface Mineralization: Secondary mineralization (calcite, quartz, graphite, metals), clay development, rust weathering, solution or other indicators of alteration.

7.2 Slickensides: Polished rock surfaces, sometimes characterized by grooves or striations, resulting from movement along a fracture plane.

7.3 Cavities or Voids: Loss of rock due to selective weathering, dissolution or mechanical plucking.

8. Formation Name: The geologic name of the formation is presented.

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GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-1S
SHEET 1 OF 1
FILE No. R5866
CHKD. BY TRH/R.IS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER K. Moore
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019552.7872 441481.8143 (NYSPC)
GROUND SURFACE ELEVATION 640.66 DATUM NGVD
START DATE 3/28/90 END DATE 3/28/90

TYPE OF DRILL RIG CME-55 on John Deere Log Tractor
CASING SIZE AND TYPE 4-1/4 inch ID HSA
OVERBURDEN SAMPLING METHOD 2 inch OD by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD none

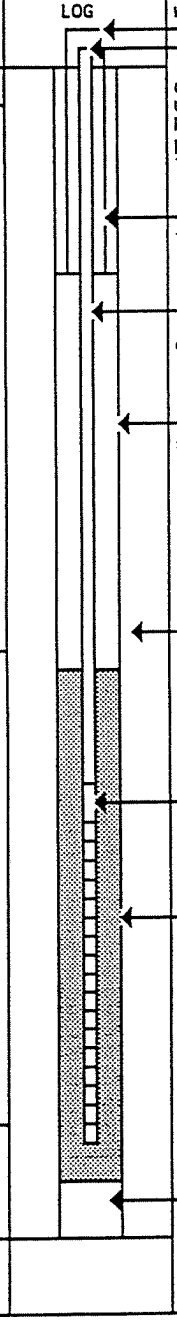
WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
3/28/90	15:45	13.7	14.0	15 min, from G.S.

See water level observation sheets for additional data

DEPTH	BLOWS / 6"	NO.	SAMPLE DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM (PPM)	SAMPLE DESCRIPTION
1	1						Medium, black, CLAY & SILT, little fine to coarse Sand, moist, with intermixed organics (roots) [TOP-SOIL]
	2	S-1	0-2	5	50	ND	
	3						Medium, gray-brown, SILT & CLAY, trace fine Sand, moist (CL)
2	4						
	5						
	6	S-2	2-4	12	65	ND	... grades; stiff
3	6						
	8						
4	3						
	4	S-3	4-6	8	70	ND	
5	4						
	6						
6	4						
	7	S-4	6-8	17	90	ND	... grades; very stiff, with lenses of fine to medium Sand about 1 inch apart
7	10						
	9						
8	3						Stiff, gray, CLAY & SILT, trace fine Sand, moist (CL)
	5	S-5	8-10	12	100	ND	
9	7						
	7						
10	3						
	3	S-6	8-10	6	0/50	ND	
11	3						... grades; little Gravel, trace fine to coarse Sand, wet with 1/4 to 1/2 inch thick seams of fine Sand and Silt about 1 inch apart
	4						
12	6						
	29	S7T	12-14	48	5	3	... grades, with frequently intermixed weathered rock fragments
13	19	S7B				2	
	19						
14	11						Gray, WEATHERED SHALE fragments, and Clayey SILT, moist
	29	S-8	14-15.3	---	80	ND	
15	50/0.3						Spilt spoon refusal at 15.3 ft.
							Bottom of Hole at 15.5 feet (auger refusal)
16							

EQUIPMENT INSTALLATION LOG



4 inch by 5 ft. locking steel protection casing with 1/4 inch vent hole at base.

3/4 inch vented PVC cap. 2.0 foot stick-up from top of 3/4 inch PVC riser (monitoring point) to ground surface.

Concrete surface seal from 0.0 to 3.0 ft.

3/4 inch ID PVC flush joint riser from 0.0 to 9.2 ft.

Bentonite pellets seal from 3 to 8 ft.

[1-3/4 - 5 gallon pails]

Nominal 8-1/2 inch diameter hole to 15.5 ft.

3/4 inch ID PVC flush joint screen (0.01 slot) from 9.2 to 14.2 ft.

Filter pack (No. 4 QROK silica sand) from 8 to 14.5 ft. [150 pounds]

Slots start 0.3 ft. from bottom of screen

PVC plug installed at bottom of screen

Bentonite pellet seal from 14.5 to 15.5 feet (1/4 - 5 gallon pail)

NOTES
2
1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1) No recovery from sample S-6 using a 2 inch split spoon sampler. A second attempt was made, using a 3 inch split spoon sampler, in the same hole (S-6). 50% was then recovered. 2) OVM=peak organic vapor meter reading made in the headspace of the sample jar using a HNu model PI101 photo.detector.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-2S
SHEET 1 OF 2
FILE No. R5866
CHKD. BY TRH/RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER K. Moore
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019439.0163 441330.5231 (NYSPC)
GROUND SURFACE ELEVATION 640.52 DATUM NGVD
START DATE 3/28/90 END DATE 3/29/90

TYPE OF DRILL RIG CME-55 on John Deere Log Tractor
CASING SIZE AND TYPE 4-1/4 inch ID HSA
OVERBURDEN SAMPLING METHOD 2 inch OD by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD none

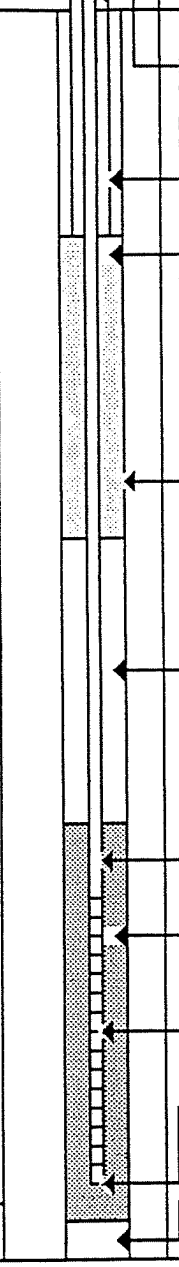
WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
3/29/90	9:00	none	17 ft.	15 min.

See water level observation sheets for additional data

DEPTH	BLOWS / 6"	NO.	SAMPLE DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM (PPM)	SAMPLE DESCRIPTION
1	1						Stiff, black, CLAY & SILT, some fine to coarse Sand, moist, intermixed organics (roots) [TOPSOIL]
	4	S-1	0-2	12	55	ND	
	8						Stiff, brown, SILT & CLAY and fine to coarse SAND, moist with intermixed wood and rock fragments [FILL]
2	7						
	4						
	5	S-2	2-4	10	60	ND	Wire observed in open borehole when augers were removed at 3 and 3.5 ft.
3	5						
	7						
4	2						Stiff, brown, SILT and CLAY, little fine to medium Sand, moist (CL)
	4	S-3	4-6	9	80	190	
5	5						
	10						
6							Interval from 6 to 7 ft. not sampled
7	5						
	5	S-4	6-8	12	85	18	
8	7						
	7						
9	3						Stiff, gray, SILT & CLAY, little fine Sand (CL)
	5	S-5	9-11	15	100	ND	
10	10						
	8						
11	1						... grade; very stiff, SILT & CLAY and fine to coarse SAND, little Gravel, moist (SC)
	4	S-6	11-13	18	80	ND	
12	7						
	7						
13	5						... grades; wet
	8	S-7	13-15	18	80	ND	
14	10						
	13						... grades; frequently intermixed weathered rock fragements
15	5						
	7	S-8	15-17	20	80	ND	
16	13						Gray, WEATHERED SHALE fragments, and Clayey SILT, moist

EQUIPMENT INSTALLATION LOG



4 inch by 5 foot long locking steel protective casing with 1/4 inch vent hole at base.

3/4 inch vented PVC cap. 2.0 ft stick-up from top of 3/4 inch PVC riser (monitoring point) to ground surface

Concrete surface seal from 0 to 3 ft.

Cement/bentonite grout 3.0 to 7.0 feet

[14 gallon water/188 lbs. cement/ 6 lbs. bentonite powder]

Nominal 8-1/2 inch diameter hole to 17 ft

Bentonite pellet seal 7.0 to 10.5 feet

[1-3/4 - 5 gallon pails]

3/4 inch PVC riser pipe to 11.5 feet

Filter pack (No. 4 QROK silica sand) 10.5 to 16.0 ft. (200 lbs)

3/4 inch PVC well screen No. 10 slot from 11.5 to 15.5 ft.

Slot start 0.3 ft. from bottom of screen PVC plug installed at bottom of screen

Bentonite pellet seal 16.0 to 17.0 ft. (1/4-5 gallon pail)

NOTES 1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1) OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-2S
SHEET 2 OF 2
FILE No. R5866
CHKD. BY TRH / RJS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM (PPM)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
17	16						Bottom of Hole at 17.0 ft.	← Bentonite pellets to 17.0 feet	
18									
19									
20									
21									
22									
23									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1) Peak organic vapor meter (Hnu Model PI 101) reading from the headspace of the soil sample jar.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-2R
SHEET 1 OF 2
FILE No. R5866
CHKD. BY TRH /RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER K. Moore
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019448.7484 441328.2894 (NYSPC)
GROUND SURFACE ELEVATION 640.87 DATUM NGVD
START DATE 3/29/90 END DATE 3/30/90

TYPE OF DRILL RIG CME-55 on John Deere Log Tractor
CASING SIZE AND TYPE 6-1/4 inch ID HSA
OVERBURDEN SAMPLING METHOD 2 inch OD by 24 inch Split Spoon Sampler in accordance with ASTM D1586
ROCK DRILLING METHOD NX Size Core Barrel with air as drilling fluid

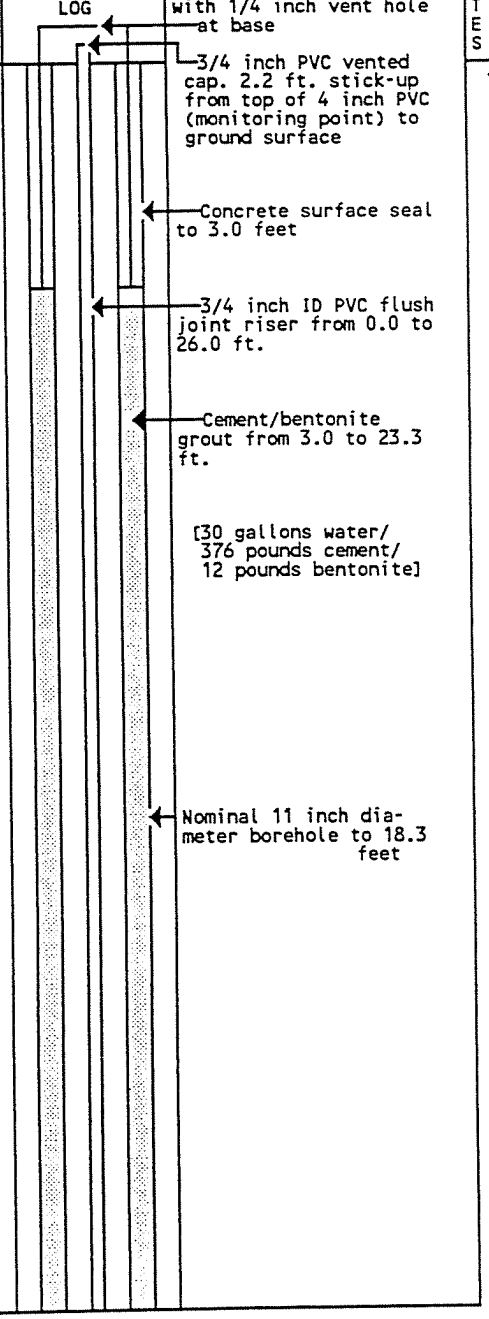
WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

See water level observation sheets.

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM PPM)	SAMPLE DESCRIPTION
							No samples collected 0 to 17 feet. Refer to Boring Log No. P-2S for soil descriptions.

EQUIPMENT INSTALLATION LOG



NOTES
1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, RANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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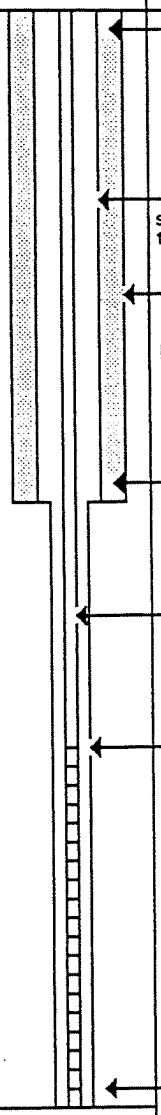
PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-2R
SHEET 2 OF 2
FILE No. R5866
CHKD. BY TRH / RJS

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM (PPM)	SAMPLE DESCRIPTION
17							
	19						
	22	S-1	17-18.8	58	60	ND	
18	36						Auger Refusal at 18.3 feet
	100/0.3						Gray shale, medium hard, moderately weathered, aphamitic very thin bedding (LUDLOWVILLE SHALE)
19							
20							
		C-1	18.3-23.3	50	70		... thin bedding
21							
22							
							... slightly weathered
23							
24							
25							Horizontal slightly open fracture at 25.2 feet
26							
27		C-2	23.3-31.0	85	90		
28							
29							
30							
							Horizontal slightly open fractures at 29.9 ft. and 30.5 ft.
31							Bottom of hole at 31.0 ft.
32							
33							
34							

EQUIPMENT INSTALLATION LOG



Nominal 11-inch diameter borehole to 18.3 feet

3 3/4 inch flush joint schedule 80 PVC casing to 23.3 ft.

Cement/benonite grout to 23.3 ft.

[30 gallons water/376 pounds cement/12 pounds bentonite]

Nominal 6-inch diameter borehole from 18.3 to 23.3 ft.

3/4 inch flush joint PVC riser pipe to 26.0 feet

3/4 inch PVC well screen (0.01 inch slot from 26.0 to 31.0 ft.

PVC plug in bottom of screen

Nominal 3 inch diameter borehole 23.3 to 31.0 feet

NOTES
1
2
3

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1) OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector. 2) Rock reamed using 5-7/8 inch O.D. roller bit from 18.3 to 23.3 feet after C-1. 3) Water observed during coring at 30 ft.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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BORING No. P-2R

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GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-3S
SHEET 1 OF 2
FILE No. R5866
CHKD. BY TRH/RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER K. Moore
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019412.2218 441068.4424 (NYSPC)
GROUND SURFACE ELEVATION 637.18 DATUM NGVD
START DATE 3/28/90 END DATE 3/28/90

TYPE OF DRILL RIG CME-55 on John Deere Log Tractor
CASING SIZE AND TYPE 4-1/4 inch ID HSA
OVERBURDEN SAMPLING METHOD 2 inch OD by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD none

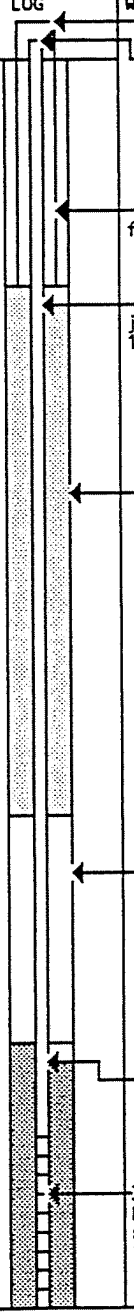
WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
4/1/90	11:15	19.3	19.5	after 10 min, from GS
"	11:50	16.5	PVC	after 45 min, from GS

See Water level observation sheets for add. data.

DEPTH	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM (PPM)	SAMPLE DESCRIPTION
1	1						Medium, brown-black, SILT & CLAY and fine to coarse SAND, moist, with intermixed organics (wood fragments, roots) and occassionally intermixed fill (brick fragments). [TOPSOIL - FILL]
	1	S-1	0-2	7	55	ND	
	6						
2	10						
	10						Very stiff, brown-gray, CLAY & SILT, some fine to coarse Sand, moist, with intermixed seam/lens 1/16 to 1/4 inch thick of fine Sand and Silt. [CL]
3	10	S-2	2-4	20	60	ND	
	10						
4	13						
	3						
5	5	S-3	4-6	10	60	ND	... grades; Stiff, some fine Sand
	5						
6	7						... grades; with red-brown (iron staining) silt and fine Sand vertical and horizontal seam/lens about 1 to 4 inches apart
	3						
7	8	S-4	6-8	21	95	ND	
	13						
8	22						
	13						Hard, gray, Silty CLAY, little fine Sand, moist [CL]
9	15	S-5	8-10	33	100	ND	
	18						
10	22						
	3						... grades; stiff, wet
11	5	S-6	10-12	11	80	ND	
	6						
12	8						
	2						... grades; Medium; trace fine Sand
13	3	S-7	12-14	8	70	ND	
	5						
14	6						
	1						... grades, soft.
15	2	S-8	14-16	5	100	ND	
	2						
16	3						... grades; some fine Sand
	3						Very stiff, gray, SILT & CLAY and fine to coarse SAND, little Gravel

EQUIPMENT INSTALLATION LOG



4 inch by 5 ft. locking steel protection casing with 1/4 inch vent hole at base.

Vented PVC cap. 2.1 foot stick-up from the top of 3/4 PVC riser (monitoring point) to ground surface

Concrete surface seal from 0.0 to 3.0 ft.

3/4 inch ID PVC flush joint riser from 0.0 to 14.0 ft.

Cement/bentonite grout from 3.0 to 10.0 ft.

[21 gallons water/ 282 pounds cement/ 9 pounds bentonite]

Bentonite pellet seal from 10 to 13.0 ft.

[3/4 - 5 gallon pail]

Filter pack (No. 4 QROK Silica Sand) from 13.0 ft. to 19.0 ft.

[250 pounds]

3/4 inch ID flush joint PVC screen (0.01 inch slot) from 14.0 to 19.0 ft.

NOTES: 1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1) OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

GOLDBERG-ZOINO ASSOCIATES OF NEW YORK, P.C.
364 NAGEL DRIVE, BUFFALO, NEW YORK
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-3S
SHEET 2 OF 2
FILE No. R5866
CHKD. BY TRH/RJS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM (PPM)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
17	8	S-9T	16-18	26	75	ND	Wet, with occassionally intermixed weathered shale fragments		
	18	S-9B				1			
18	13						Gray, WEATHERED SHALE, fragments, slightly moist		
19							Bottom of hole at 19.5 ft. (auger refusal)		
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									

Slots start 0.3 ft.. from bottom of screen

PVC plug installed at bottom of screen

Bentonite pellet seal from 19.0 to 19.5 ft.

(1/4 - 5 gallon pail)

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-3R
SHEET 1 OF 2
FILE No. R5866
CHKD. BY TRH/RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER K. Moore
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019418.4111 441079.5231 (NYSPC)
GROUND SURFACE ELEVATION 637.88 DATUM NGVD
START DATE 4/1/90 END DATE 4/2/90

TYPE OF DRILL RIG CME-55 on John Deere Log Tractor
CASING SIZE AND TYPE 6-1/4 inch ID HSA
OVERBURDEN SAMPLING METHOD 2 inch OD by 24 inch Split Spoon Sampler in accordance with ASTM D1586
ROCK DRILLING METHOD NX Size Rock Core with compressed air as drilling fluid

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
4/2/90	15:15	31.9	PVC	15 min, from G.S.

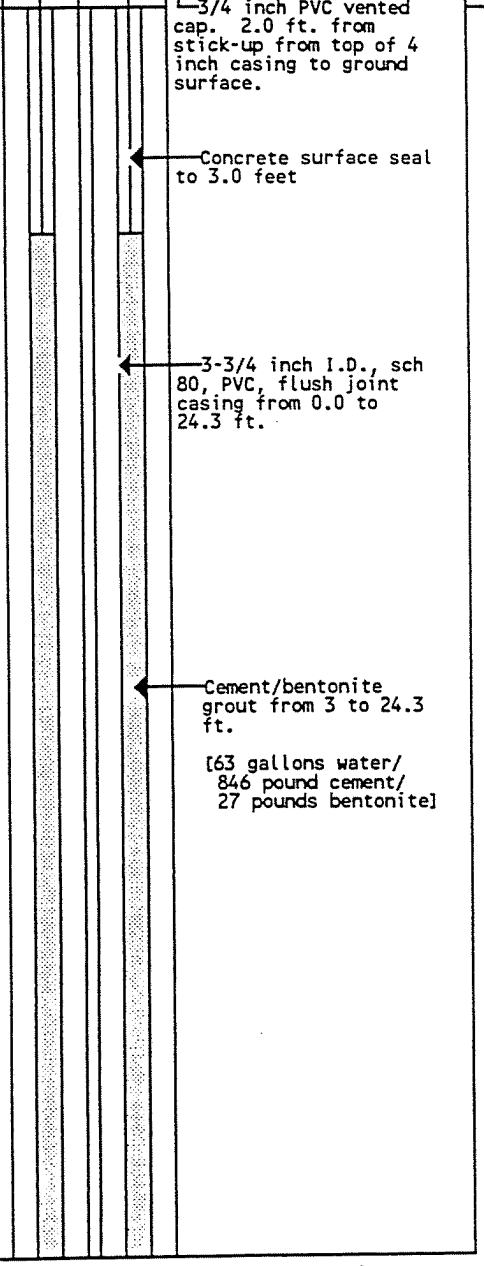
See water level observation sheets for additional data.

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM (PPM)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						

SAMPLE DESCRIPTION

No samples collected 0 to 18.0 ft. Refer to Boring Log No. P-3S for soil descriptions.

EQUIPMENT INSTALLATION LO



NOTES

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1) Some free standing water observed in borehole prior to coring at 19.3 ft. Muck in HSA prevented water level measurements.
2) Rock cuttings from C1 core run returned, by air, to the surface were dry to moist.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, RANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-3R
SHEET 2 OF 2
FILE No. R5866
CHKD. BY TRH/RJS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM3 (PPM)	SAMPLE DESCRIPTION	EQUIPMENT IN TALLATION LOG	NOTES
17									
18	50/ 0.0	S-1	18-18	---	0			Nominal 11 inch diameter hole to 19.3 feet	
19							Auger refusal at 19.3 ft.	Nominal 6 inch hole from 19.3 to 24.3 ft.	
20							Gray Shale, medium hard, moderately weathered, aphanitic thin bedding (LUDLOW VILLE SHALE) ...Slightly weathered		1
21		C-1	19.3-23.7	68	92	--			3
22									2
23							Horizontal slightly open fracture at 22.7 feet		
24								3-3/4 inch flush joint schedule 80 PVC casing to 24.3 feet	
25									
26								3/4 inch PVC flush joint riser pipe to 29.1 feet	
27									
28		C-2	23.7-34.1	84	82	--			
29							High angle closed fracture 28.5 to 29.0 feet		
30								3/4 inch PVC well screen, (0.01 inch slot) from 29.1 to 34.1 feet	
31									
32									
33							Horizontal slightly open fractuers at 32.5, 33.1 and 33.6 feet		
34							Bottom of Hole at 34.1 feet	Nominal 3 inch diameter hole 24.3 to 34.1 feet	
35								PVC plug in bottom of well screen	
36									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 3) Rock reamed using 5-7/8 inch O.D. roller bit from 19.2 to 24.3 after C-1.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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BORING No. P-3R

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-4S
SHEET 1 OF 1
FILE No. R5866
CHKD. BY TRH/RJS

CONTRACTOR John Mathes Associates, Inc.
DRILLER K. Moore
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019585.4858 441037.9318 (NYSPC)
GROUND SURFACE ELEVATION 634.42 DATUM NGVD
START DATE 4/3/90 END DATE 4/3/90

TYPE OF DRILL RIG CME-55 on John Deere Log Tractor (ATV)
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD None

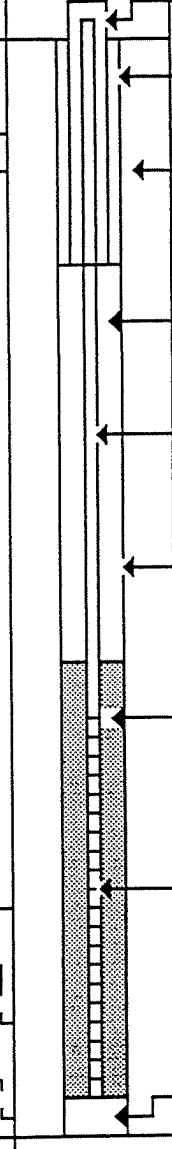
WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
4/3/90	10:00	13.0	--	At completion, from GS

See water level observation sheets for additional data.

DEPTH	BLOWS / 6"	NO.	SAMPLE DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM)	SAMPLE DESCRIPTION
1	3						Medium, black-brown, SILT & CLAY, fine to medium Sand, moist, with intermixed organics (root) [TOPSOIL]
	4	S-1	0-2	11	50	ND	
	7						
2	10						Stiff, red brown, Silty CLAY, trace fine to medium Sand, moist [FILL]
	5						
3	5	S-2	2-4	12	60	ND	Stiff, brown, SILT & CLAY, trace fine Sand, moist [CL]
	7						
4	9						
	3						
5	5	S-3	4-6	12	60	ND	
	7						
6	9						
	5						
7	6	S-4	6-8	17	100	ND	
	11						...grades; very stiff
8	15						
	5						
9	7	S-5	8-10	14	70	1	
	7						
10	15						
	3						
11	3	S-6T	10-12	10	70	200	...grades; stiff, wet
	7	S-6B				200	
12	6						Stiff, brown, fine to medium SAND, little Clayey Silt, wet [SC]
	4						
13	7	S-7T	12-14	18	80	150	Very stiff, gray, Silty CLAY and fine to coarse SAND, trace Gravel, wet, with intermixed weathered rock fragments [SC]
	11	S-7B				130	
14	12						
	28	S-8T	14-14.7	--	50	11	Gray, WEATHERED SHALE fragments and Clayey SILT, moist
15	50/ 0.2	S-8B				4	Bottom of Hole at 14.7 ft. (auger and split spoon refusal)
16							

EQUIPMENT INSTALLATION LOG



4 inch by 5 ft. locking steel protective casing with 1/4 inch vent hole at base

3/4 inch vented PVC cap. 2.0 ft. stick-up from top of 3/4 PVC (monitoring point) to ground surface

Concrete surface seal from 0 to 3 ft.

Bentonite pellet seal from 3.0 to 8.0 ft (2 3/4- 5 gallon pails)

3/4 inch flush joint PVC riser pipe to 9.0 ft.

Nominal 8-1/2 diameter hole

Filter pack (No. 4 QROK Silica sand) 8.0 to 14.0 ft.

[250 pounds]

3/4 inch flush joint PVC riser pipe (0.01 inch slot) from 9.0 to 14.0 ft.

Slots begin 0.3 ft. from bottom of screen

PVC plug installed in bottom of screen.

Bentonite pellet seal 14.0 to 14.7 ft. [1/4 - 5 galon pails]

NOTES: 1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1) OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-5S
SHEET 1 OF 1
FILE No. R5866
CHKD. BY TRH/RJS

CONTRACTOR John Mathes Associates, Inc.
DRILLER K. Moore
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019716.7097 441227.8670 (NYSPC)
GROUND SURFACE ELEVATION 635.38 DATUM NGVD
START DATE 3/30/90 END DATE 3/30/90

TYPE OF DRILL RIG CME-55 on John Deere Log Tractor (ATV)
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD None

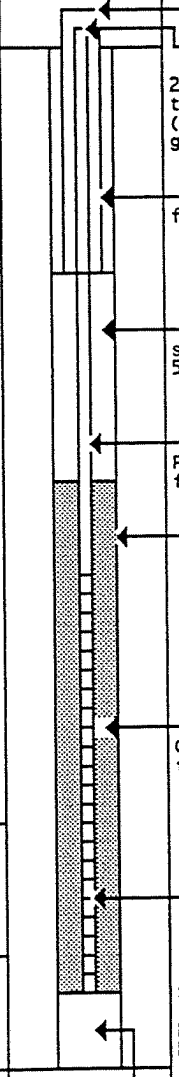
WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
3/30/90	16:30	none	13.5ft	30 min.
3/30/90	8:00	none	PVC 24	hrs. after well pt

See water lvl. obser. sheets for additional data.

DEPTH	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM)	SAMPLE DESCRIPTION
1	1						Very soft, black, SILT & CLAY, little fine to medium Sand, moist with intermixed organics (wood fragments, roots) [TOPSOIL]
	3	S-1	0-2	5	60	ND	
	2						Soft, red brown, Silty CLAY, trace fine Sand, moist. Wood fragments at 1.5 foot. [FILL]
2	4						
	5						
	7	S-2	2-4	15	60	ND	Stiff, light brown, SILT and fine SAND, moist (SM)
3	8						
	10						
4	3						...grades; gray-brown Clayey SILT and fine SAND
	6	S-3	4-6	15	80	ND	
5	9						
	12						
6	5						...grades; very stiff
	8	S-4	6-8	18	80	ND	
7	10						
	13						
8	6						
	7	S-5	8-10	19	60	ND	...grades; little fine to medium Sand, wet, with occasional 1/4 to 1/2 inch thick seams of fine Sand, some silt
9	12						
	13						
10	4						
	8	S-6	10-12	22	80	ND	Very stiff, gray, SILT & CLAY and fine to coarse SAND, little Gravel, moist, with occasionally intermixed weathered rock fragments. (SC)
11	14						
	23						
12	12						Gray, WEATHERED SHALE fragments, slightly moist.
	16	S-7	12-13.2	--	50	2	
13	50/ 0.2						
14							Bottom of Hole at 13.5 ft. (auger refusal)
15							
16							

EQUIPMENT INSTALLATION LOG



4 inch by 5 ft. locking steel protective casing with 1/4 inch vent hole at base

Vented PVC cap.

2.2 ft. stickup from top of 3/4 PVC riser (monitoring point) to ground surface.

Concrete surface seal from 0.0 to 3.0 ft.

Bentonite pellet seal from 3.0 to 5.9 ft.

[1 1/4 - 5 gallon pails]

3/4 inch flush joint PVC riser pipe to 6.9 ft.

Nominal 8-1/2 inch diameter hole

Filter pack (No. 4 QROK Silica Sand) 5.9 to 12.5 ft.

[200 pounds]

3/4 inch I.D. flush joint, PVC screen (0.01 inch slot) from 6.9 to 11.9 ft.

Slots begin 0.3 ft. from bottom of screen PVC plug installed at bottom of screen.

Bentonite pellet seal from 12.5 to 13.5 ft.

[3/4 - 5 gallon pails]

NOTES
2
1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1) No free water observed in the bottom of the HSA at completion of drilling. See water level data table. 2) OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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364 NAGEL DRIVE, BUFFALO, NEW YORK
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-5R
SHEET 1 OF 2
FILE No. R5866
CHKD. BY TRH /RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER K. Moore
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019717.2149 441245.3767 (NYSPC)
GROUND SURFACE ELEVATION 635.82 DATUM NGVD
START DATE 3/31/90 END DATE 4/2/90

TYPE OF DRILL RIG CME-55 or John Deere Log Splitter
CASING SIZE AND TYPE 6-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 580)
ROCK DRILLING METHOD NX Size Core with compressed air as the drilling fluid

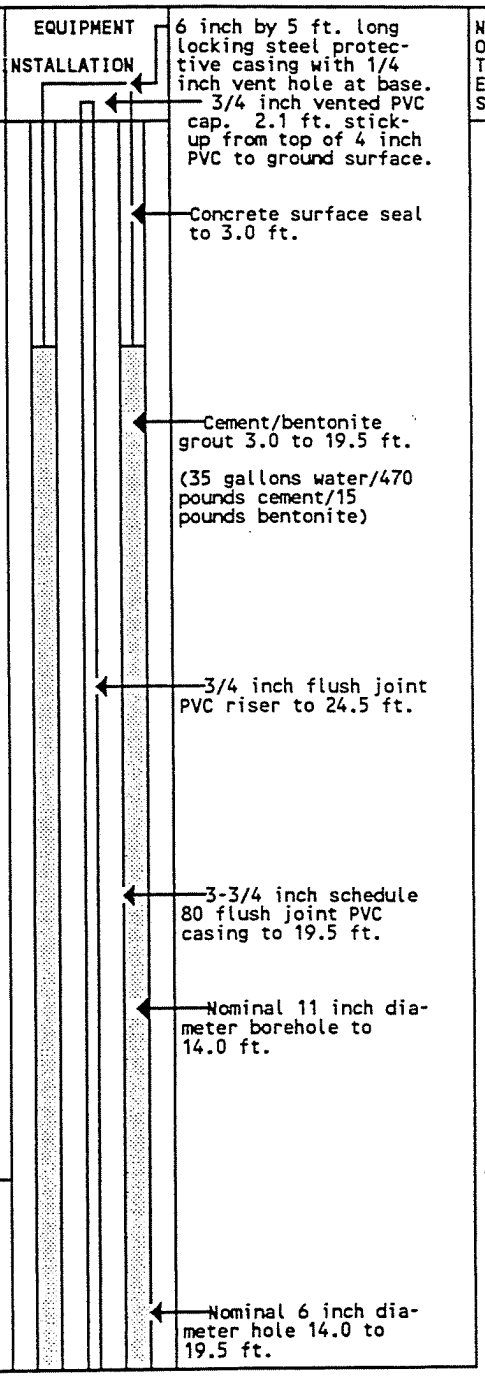
WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

See water level observation sheets.

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM PPM)	SAMPLE DESCRIPTION
1							No samples collected 0 to 14.0 ft. Refer to boring log P-5S for soil descriptions.
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							Auger refusal at 14 ft.
							Gray shale, medium hard, moderately weathered, aphanitic, very thin bedding (LUDLOWVILLE SHALE)
15		C-1	14.0-19.5	47	65		...thin bedding
16							

EQUIPMENT INSTALLATION



NOTES
1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1) Rock reamed with 5-7/8 inch O.D. roller bit from 14.0 to 19.5 feet after C-1.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-5R
SHEET 2 OF 2
FILE No. R5866
CHKD. BY TRH /R.LS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM4 (PPM)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
17		C-1	14.0-19.5	47	65		Gray shale, medium hard, moderately, weathered, amphanitic, thin bedding (LUDLOWVILLE SHALE)	3-3/4 inch schedule 80 flush joints PVC casing to 19.5 ft.	
18								Nominal 6 inch diameter hole from 14 to 19.5 ft.	
19									
20							Low angle closed fracture 20.0 to 20.1 ft.		
21									
22		C-2	19.5-29.5	90	93		High angle slightly open fracture 22.5 to 22.8 ft.		
23								3/4 inch PVC riser pipe to 24.5 ft.	
24							Horizontal slightly open fracture at 24.6 ft.		
25									
26									3
27								3/4 inch PVC well screen, (0.01 inch slot) from 24.5 to 29.5 ft.	
28								PVC plug in bottom of well screen	
29							Horizontal slightly open fractures at 28.3 and 28.7 ft.	Nominal 3 inch diameter core hole 19.5 to 29.5 ft.	
30							Bottom of hole at 29.5 ft.		
31									
32									
33									
34									
35									
36									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 3) Water observed during coring at 26.3 ft.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-1S
SHEET 1 OF 1
FILE No. R5866
CHKD. BY T. Heins/R JS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brungs
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019439.0472 441470.8991(NYSPC)
GROUND SURFACE ELEVATION 641.44 DATUM NGVB
START DATE 7/17/90 END DATE 7/17/90

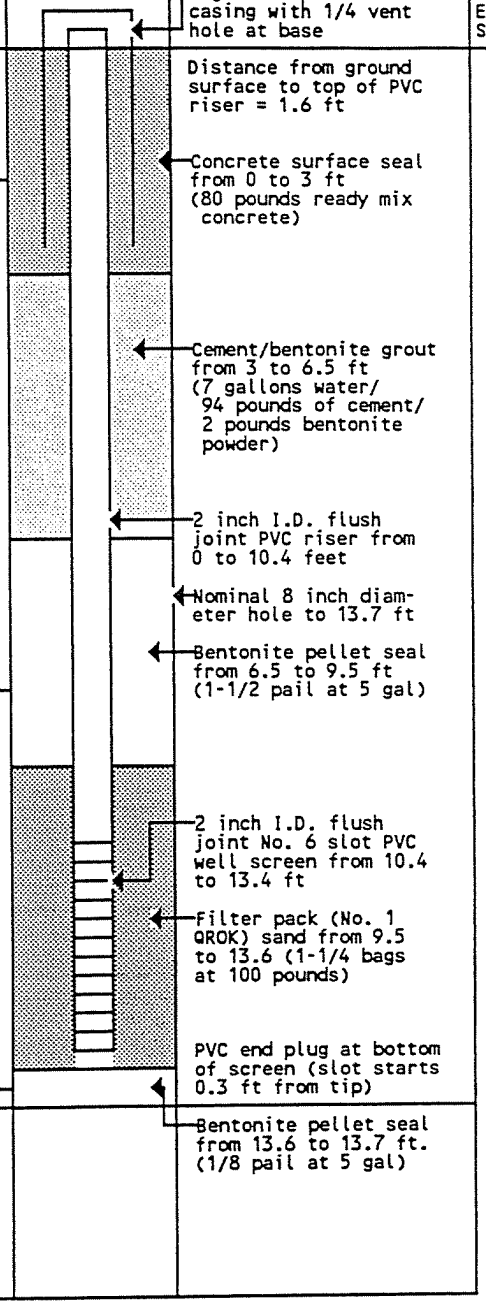
TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
7/17/90	1450	Dry	HSA 14'	5 min

DEPTH	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM ppm	SAMPLE DESCRIPTION
1	2	S-1	0 - 2	12	5	ND	Stiff, black, SILT & CLAY, trace fine to medium Sand, moist, with intermixed organics (roots), rock fragments in tip of spoon (TOPSOIL - FILL)
	3						
	9						
2	11						
	4	S-2	2 - 4	14	45	ND	Stiff, brown, CLAY & SILT and fine SAND, moist, with lenses of fine Sand approximately 1/16 to 1/8 inch thick, 1/4 to 1 inch apart (CL)
3	7						
	7						
	8						
4	2	S-3	4 - 6	6	80	40	. . . grades; medium
	2						
5	4						
	4						
6	3	S-4	6 - 8	7	100	130	
	3						
7	4						
	4						
8	1	S-5	8 - 10	5	50	10	
	2						Medium, gray, SILT & CLAY, some fine Sand, moist (CL)
9	3						
	3						
10	2	S-6	10 - 12	6	75	ND	. . . grades; wet
	2						
11	4						
	4						
12	2	S-7	12 - 14	7	50	ND	
	2	T,B					
13	5						
	11						Gray, weathered rock fragments and Clayey Silt, moist
14							Bottom of Hole at 14.0 ft (augers advanced to 13.7 ft)
15							
16							

EQUIPMENT INSTALLATION LOG



NOTES
1
2

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:
1. OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector.
2. Organic vapor reading of 10 ppm is from sample interval 8 to 8.5 ft. Gray silt and clay from 8.5 to 10' is not detected.

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

GOLDBERG-ZOINO ASSOCIATES OF NEW YORK, P.C.
364 NAGEL DRIVE, BUFFALO, NEW YORK
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-1R
SHEET 1 OF 2
FILE No. R5866
CHKD. BY T. Heins/RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brungs
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019445.1916 441470.3205 (NYSPC)
GROUND SURFACE ELEVATION 641.32 DATUM NGVD
START DATE 7/17/90 END DATE 7/21/90

TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 6-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD NX Size Rock Core using compressed air as the drilling fluid

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
7/17/90	1630	13.8	HSA 14	15 min
7/18/90	810	7.4	"	16 hrs
7/21/90	1430	19.6	Compl.	15 min

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM ppm	SAMPLE DESCRIPTION
1	2	S-1	0 - 2	18	50	ND	Very hard, black, SILT & CLAY, trace fine to medium Sand, moist with intermixed organics (roots) from 0.0 to 0.4 ft and intermixed black cinders from 0.4 to 0.6 ft (TOPSOIL - FILL)
	7						
	11						
2	9						
3							Advanced 6-1/4 inch I.D. HSA from 2.0 to 14.0 ft. No samples collected. See boring log MW-1S for soil description
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							Auger refusal at 14 ft
		C-1	14 - 18.7	50	100	--	Gray, SHALE, medium hard, moderately weathered, aphanitic, very thin bedding (LUDLOWVILLE SHALE)
15							
16							

EQUIPMENT INSTALLATION LOG

- 6inch by 5 ft locking steel protective casing with 1/4 vent hole at base
- Distance from ground surface to top of PVC riser = 1.2 ft
- Concrete surface seal from 0 to 3 ft (80 pounds ready mix concrete)
- Nominal 10 inch diameter hole to 14 ft
- 3-3/4 inch I.D. Sch 80 flush joint PVC casing from 0 to 19.4 ft
- Cement/bentonite grout from 3 to 19.4 ft (60 gallons water, 4 pounds bentonite, 376 pounds cement)
- Nominal 6 inch diameter hole from 14 to 19.4 ft

NOTES
1
2

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector.
2. Rock reamed using 6 inch O.D. solid stem augers from 14 to 19.4 ft following NX core collection.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-1R
SHEET 2 OF 2
FILE No. R5866
CHKD. BY T. Heins /RJS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM ppm	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
17							. . . slightly weathered		
18							Horizontal slightly open fracture at 17.7 ft Horizontal slightly open fracture at 18.4 ft		
19							. . . moderately weathered		
20		C-2	19.4-22	50	38	--			
21								Nominal 3 inch O.D. rock hole from 19.4 to 30.8 ft	3
22		C-3	22-25.7	--	24	--	Zone of weathered rock with frequent clay filled seams 22 to 24.8 ft		
23									
24									
25									
26		C-4	25.7-30.8	90	95		Horizontal slightly open fracture at 26 ft		
27									
28									
29									
30									
31							Bottom of Hole at 30.8 feet		

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 3. Water encountered during coring at 21.4 ft.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-2S
SHEET 1 OF 2
FILE No. R5866
CHKD. BY T. Heins / R J S

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brungs
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019334.9741 441305.4093 (NYSPC)
GROUND SURFACE ELEVATION 640.78 DATUM NGVD
START DATE 7/20/90 END DATE 7/20/90

TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
7/20/90	1520	16.5'	16.7'	10 min

DEPTH	BLOWS / 6"	NO.	SAMPLE DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM ppm	SAMPLE DESCRIPTION
1	3	S-1	0 - 2	12	40	5	Stiff, black, SILT & CLAY, little fine to coarse Sand, moist, with intermixed organics (roots) from 0 to 0.2 ft (TOPSOIL-FILL)
	4						
	8						
2	10						Stiff, gray-brown, CLAY & SILT, some fine to medium Sand, moist (CL)
	10	S-2	2 - 4	13	60	12	
3	6						
	7						
4	5						
	2	S-3	4 - 6	6	100	ND	. . . grades; medium Clayey SILT and fine to medium SAND, with occasional lenses 1/16 to 1/8 inch thick fine Sand and Silt 1/4 to 4 inches apart
5	2						
	4						
6	5						
	3	S-4	6 - 8	7	90	3	
7	3						
	4						
8	6						
	3	S-5	8 - 10	7	80	ND	
9	3						
	4						Stiff, gray , Silty CLAY, trace fine Sand, wet (CL)
10	4						
	2	S-6	10 - 12	6	100	ND	
11	3						
	3						
12	4						
	1	S-7	12 - 14	3	100	ND	
13	1						
	2						. . . grades; some fine to coarse Sand
	3						1/16 inch thick lens of fine to medium Sand at 13.6 ft
14	5	S-8	14 - 16	22	20	ND	
15	9						. . . grades occasional inter-mixed weathered rock fragments
	13						
16	15						

EQUIPMENT INSTALLATION LOG

- 4inch by 5 foot locking steel protective casing with 1/4 vent hole at base
- Distance from ground surface to top of PVC riser = 2.1 ft
- Concrete surface seal from 0 to 3 ft (80 pounds ready mix concrete)
- Cement/bentonite grout from 3 to 8.5 ft (7 gallons water/ 94 pounds of cement/ 2 pounds bentonite)
- 2 inch I.D. flush joint riser from 0.0 to 13. 3 ft
- Nominal 8 inch diameter hole to 13.7 ft
- Bentonite pellet seal from 8.5 to 11.5 ft (1-1/2 pails at 5 gal)
- 2 inch I.D. flush joint No. 6 slot PVC well screen from 13.3 to 15. 3 ft
- Filter pack (No. 1 QROK) sand from 11.5 to 16.7 ft (1-1/2 bags at 100lbs)
- PVC end plug at bottom of screen (slot start 0.2 ft from tip)

NOTES: 1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:
1. OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector.
2. No samples collected from 16.0 to 16.7 ft. Drillers advanced augers past sample interval.

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-2S
SHEET 2 OF 2
FILE No. R5866
CHKD. BY T. Heins /RJS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE RECOVERY (%)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
17							← Bentonite pellet seal from 16.5 to 16.7 ft	
						Bottom of Hole at 16.7 ft (auger refusal)		
18								

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-3S
SHEET 1 OF 2
FILE No. R5866
CHKD. BY T. Heins/RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brungs
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019497.0940 441058.4215 (NYSPC)
GROUND SURFACE ELEVATION 635.54 DATUM NGVD
START DATE 7/20/90 END DATE 7/20/90

TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
7/20/90	1055	17.3	well	10 min

DEPTH	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM ppm
1	2	S-1	0 - 2	8	50	ND
	3					
	5					
2	7					
	3	S-2	2 - 4	7	40	ND
3	4					
	3					
4	5					
	3	S-3	4 - 6	9	45	ND
5	5					
	4					
6	6					
	4	S-4	6 - 8	10	60	ND
7	4					
	6					
8	10					
	3	S-5	8 - 10	12	80	30
9	5					
	7					
10	10					
	3	S-6	10 - 12	10	100	150
11	3					
	7					
12	9					
	3	S-7	12 - 14	12	70	160
13	5					
	7					
14	6					
	2	S-8	14 - 16	14	20	170
15	6					
	8					
16	13					
	12					

SAMPLE DESCRIPTION

Stiff, black, SILT & CLAY, little fine to medium Sand, moist, with intermixed organics (roots) from 0 to 0.2 ft(TOPSOIL)

Stiff, brown, Silty CLAY, some fine to medium Sand, moist (FILL)

. . . grades; occasional intermixed white-gray slag-like material

. . . grades; medium

Stiff, gray-brown, CLAY & SILT little fine to medium Sand, moist (CL)

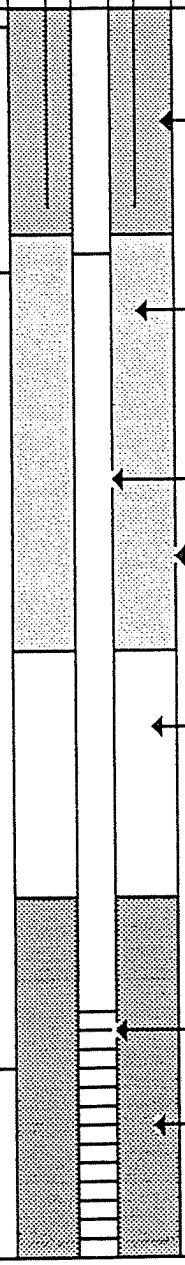
. . . grades; SILT & CLAY, some fine to medium Sand, moist, with 1/16 inch thick lenses of fine Sand and Silt 1/2 to 1 inch apart

Stiff, gray, SILT & CLAY and fine to coarse SAND, little Gravel, wet (SC)

. . . grades; with occasional intermixed Shale fragments

rock fragment in split spoon at 15.5 ft

EQUIPMENT INSTALLATION LOG



NOTES

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

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GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-3S
SHEET 2 OF 2
FILE No. R5866
CHKD. BY T. Heins/RJS

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM ppm	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
17	18	S-9	16-18	54	30	100	. . . grades; frequently intermixed Shale fragments		
	36						Gray, weathered SHALE fragments, and Clayey Silt, wet		
18	26						Gray, weathered SHALE fragments, moist	PVC end plug at bottom of screen (slot start 0.3 ft from tip)	
							Bottom of Hole at 18.5 ft (auger refusal)	Bentonite pellet seal from 18.2 to 18.5 ft	
19									
20									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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GOLDBERG-ZOINO ASSOCIATES OF NEW YORK, P.C.
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GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-4S
SHEET 1 OF 1
FILE No. R5866
CHKD. BY T. Heins/RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brungs
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019608.8426 441051.1914 (NYSPC)
GROUND SURFACE ELEVATION 635.20 DATUM NGVD
START DATE 7/19/90 END DATE 7/19/90

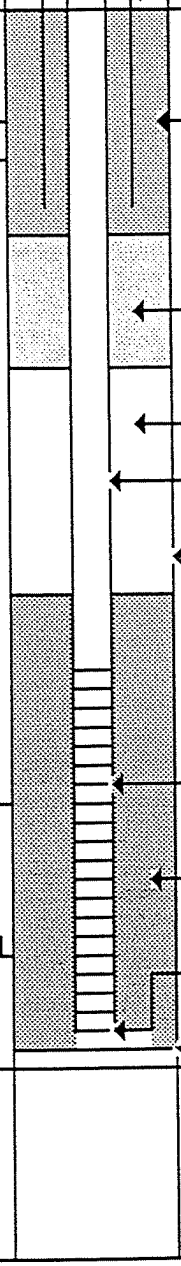
TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
7/19/90	1450	Dry	HSA 14	10 min

DEPTH	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM ppm	SAMPLE DESCRIPTION
1	3	S-1	0 - 2	16	30	ND	Stiff, black, SILT & CLAY, little fine to coarse Sand, moist, with intermixed organics (roots), from 0.0 to 0.2 ft (TOPSOIL-FILL)
	6						
	10						Gray slag type fragment at 1.0 ft
2	11						Stiff, brown, Silty CLAY, some fine to medium Sand, moist(FILL)
	4	S-2	2 - 4	14	40	ND	
3	6						Stiff, gray-brown, CLAY & SILT and fine to coarse SAND, moist (CL)
	8						
4	10						
	3	S-3	4 - 6	10	50	ND	
5	4						
	5						
6	6						
	3	S-4	6 - 8	15	50	ND	
7	6						
	9						
8	9						
	3	S-5	8 - 10	13	80	ND	
9	5						
	8						
10	10						
	2	S-6	10 - 12	7	80	ND	
11	3						Medium, gray, Silty CLAY, trace fine to medium Sand, moist (CL)
	4						
12	5						
	5	S-7	12 - 14	24	40	8	
13	10						Very stiff, Clayey SILT, some fine to coarse Sand, wet, with intermixed weathered rock fragments (SC)
	14						
14	16						Frequent intermixed rock fragment
							Bottom of Hole at 14.0 ft (auger refusal)
15							
16							

EQUIPMENT INSTALLATION LOG



4inch by 5 foot locking steel protective casing with 1/4 vent hole at base

Distance from ground surface to top of PVC riser = 2.0 ft

Concrete surface seal from 0 to 3 ft (80 pounds ready mix concrete)

Cement/bentonite grout from 3 to 4.8 ft (3.5 gallons water/ 47 pounds of cement/ 1 pounds bentonite powder)

Bentonite pellet seal from 4.8 to 7.8 ft (2 pails at 5 gal)

2 inch I.D. flush joint PVC riser from 0 to 8.7 ft

Nominal 8 inch diameter hole to 14 ft

2 inch I.D. flush joint No. 6 slot PVC well screen from 8.7 to 13.7 ft

Filter pack (No. 1 QROK) sand from 7.8 to 13.7 (1-1/2 bags at 100 pounds)

PVC end plug at bottom of screen (slot starts 0.3 ft from tip)

Bentonite pellet seal from 13.7 to 14 ft

NOTES
1
2

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:
1. OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector.
2. Organic vapor reading of 8 ppm is from sample interval 12.5 to 14 ft.

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

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GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-4R
SHEET 1 OF 2
FILE No. R5866
CHKD. BY T. Heins/RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brungs
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019600.6753 441054.5250 (NYSPC)
GROUND SURFACE ELEVATION 635.54 DATUM NGVB
START DATE 7/19/90 END DATE 7/21/90

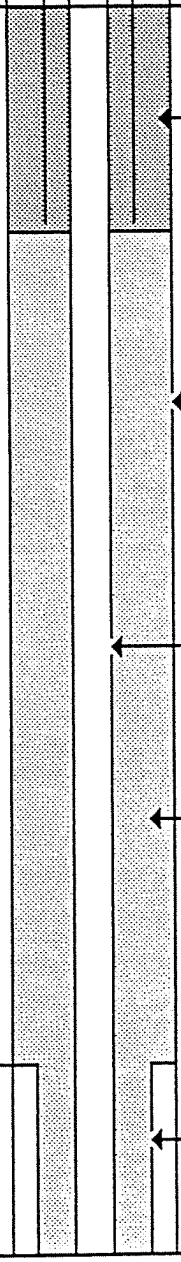
TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 6-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD NX Size Rock Core with compressed air as drilling fluid

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
7/19/90	1550	Dry	HSA 14	2 hours
7/21/90	2000	29	Compl.	15 min

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM ppm	SAMPLE DESCRIPTION	NOTES
1							Advanced HSA from 0 to 14 ft. No samples collected. See boring log MW-4S for soil description.	
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14							Auger refusal at 14 ft	
		C-1	14 - 18.9	LT 20	40	--	Gray, SHALE, medium hard, moderately weathered, aphanitic, very thin bedding (LUDLOWVILLE SHALE)	2
15								1
16								

EQUIPMENT INSTALLATION LOG



LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. Rock reamed using 6 inch O.D. solid stem augers from 14 to 18.9 ft following rock coring.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

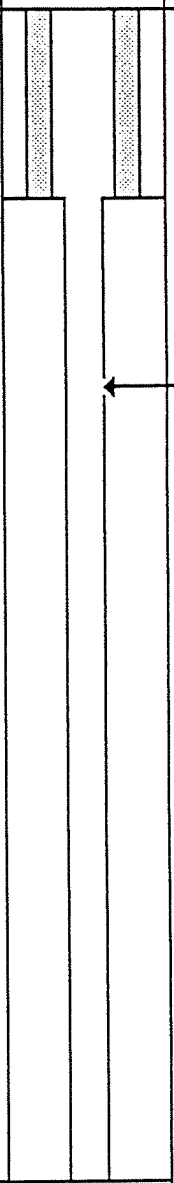
GOLDBERG-ZOINO ASSOCIATES OF NEW YORK, P.C.
364 NAGEL DRIVE, BUFFALO, NEW YORK
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-4R
SHEET 2 OF 2
FILE No. R5866
CHKD. BY T. Heins / RJS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM ppm	SAMPLE DESCRIPTION
17							
18							
19							. . . slightly weathered
20		C-2	18.9-24.2	90	60	--	
21							
22							
23							
24							
25		C-3	24.2-28.1	90	100	--	
26							
27							
28							
29		C-4	28.1-32.1	90	95	--	
30							Horizontal slightly open fracture at approximately 29.5 ft
31							Horizontal slightly open fracture at approximately 31 ft
32							Bottom of Hole at 32.1 feet
33							

EQUIPMENT INSTALLATION LOG



Nominal 3 inch O.D. rock hole from 18.9 to 32.1 ft

NOTES

2

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 2. Water encountered during coring at 29.5 ft.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

BORING No. MW-1R

GOLDBERG-ZOINO ASSOCIATES OF NEW YORK, P.C.
364 NAGEL DRIVE, BUFFALO, NEW YORK
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-5S
SHEET 1 OF 1
FILE No. R5866
CHKD. BY T. Heins/RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brungs
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019697.1449 441160.5477 (NYSPC)
GROUND SURFACE ELEVATION 634.14 DATUM
START DATE 7/20/90 END DATE 7/20/90

TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
7/20/90	830	Dry	HSA 14	5 min

DEPTH	BLOWS / 6"	NO.	SAMPLE DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM ppm	SAMPLE DESCRIPTION
1	2	S-1	0 - 2	10	50	ND	Stiff, black, SILT & CLAY, little fine to medium Sand, moist, with intermixed organics (roots) from 0 to 0.2 ft (TOPSOIL-FILL)
	4						
	6						Stiff, brown, Silty CLAY, some fine to medium Sand, moist (FILL)
2	6						
	4	S-2	2 - 4	6	40	ND	
3	3						
	3						
4	4						Stiff, gray-brown, CLAY & SILT, some fine to medium Sand, moist (CL)
	4	S-3	4 - 6	11	60	ND	
5	5						
	6						
6	8						
	4	S-4	6 - 8	13	60	ND	
7	5						. . . grades; Clayey SILT, little fine to medium Sand
	8						
8	8						
	2	S-5	8 - 10	8	70	ND	
9	4						
	4						
10	4						
	5	S-6	10 - 12	11	80	ND	. . . grades; CLAY & SILT and fine to medium Sand, with 1/16 to 1/4 lenses of wet fine to medium Sand and Silt 1 to 2 inches apart
11	5						. . . grades; wet (SC)
	6						
12	8						
	9	S-7	12 - 14	39	90	ND	
13	22	T,B					
	17						
14	17						Gray, weathered Shale fragments, slightly moist
							Bottom of Hole at 14.0 ft (auger refusal)
15							
16							

EQUIPMENT INSTALLATION LOG

- 4inch by 5 foot locking steel protective casing with 1/4 vent hole at base
- Concrete surface seal from 0 to 3 ft (80 pounds ready mix concrete)
- Cement/bentonite grout from 3 to 4.6 ft (3.5 gallons water/ 47 pounds of cement/ 1 pounds bentonite powder)
- Bentonite pellet seal from 4.6 to 7.6 ft (2 pails at 5 gal)
- 2 inch I.D. flush joint PVC riser from 0 to 8.6 ft
- Nominal 8 inch diameter hole to 14 ft
- 2 inch I.D. flush joint No. 6 slot PVC well screen from 8.6 to 13.6 ft
- Filter pack (No. 1 QROK) sand from 7.6 to 13.6 (1-1/2 bags at 100 pounds)
- PVC end plug at bottom of screen (slot starts 0.3 ft from tip)
- Bentonite pellet seal from 13.6 to 14 ft

NOTES
1 - Distance from ground surface to top of PVC riser = 2.1 ft

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-6S-A
SHEET 1 OF 1
FILE No. R5866
CHKD. BY T. Heins/R JS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brunges
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION Sta. 6+38 o/s 0 (site grid)
GROUND SURFACE ELEVATION ~637 DATUM NGVB
START DATE 7/18/90 END DATE 7/18/90

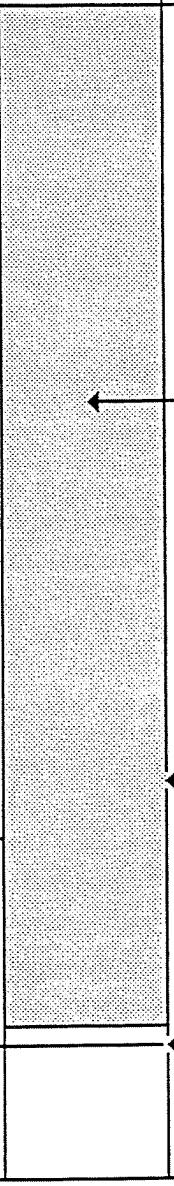
TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM D1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
7/18/90	1450	Dry	13.7'	5 min

DEPTH	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM ppm	SAMPLE DESCRIPTION
1	2	S-1	0 - 2	10	40	ND	Stiff, black, SILT & CLAY, little fine to medium Sand, moist, with intermixed organics (roots) from 0.0 to 0.2 ft (TOPSOIL-FILL)
	6						
	4						Stiff, brown, Silty Clay, some fine to medium Sand, moist (FILL)
2	5						
	4	S-2	2 - 4	10	40	ND	Stiff, gray-brown, CLAY & SILT and fine to coarse SAND, moist (CL)
3	4						
	6						
	8						
4	3	S-3	4 - 6	9	40	ND	
	3						
5	6						
	10						
6	6	S-4	6 - 8	19	40	ND	. . . grades; very stiff
	9						
7	10						
	11						
8	4	S-5	8 - 10	12	50	ND	. . . grades; stiff, CLAY & SILT, some fine Sand
	6						
9	6						
	9						
10	3	S-6	10 - 12	19	20	ND	
	5						
11	14						Medium dense, gray, Clayey SILT and fine to coarse SAND, moist with intermixed Shale fragments
	18						
12	6	S-7	12 - 14	16	30	ND	. . . grades; wet at 11.8 ft (SC)
	6						
13	10						. . . grades; frequently intermixed rock fragments at 12.5 ft
	10						
14							Bottom of Hole at 13.7 ft
15							
16							

EQUIPMENT INSTALLATION LOG



NOTES

1
2
3

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:
1. OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector.
2. Borehole grouted because driller weight from measuring tape was dropped down the hole and could not be retrieved.
3. See boring log MW-6S-C for well installation information.

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-6S-B
SHEET 1 OF 1
FILE No. R5866
CHKD. BY T. Heins 7RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brunges
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION Sta. 6+36 o/s 6R (site grid)
GROUND SURFACE ELEVATION _____ DATUM _____
START DATE 7/18/90 END DATE 7/18/90

TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM D1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
7/18/90		Dry		

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM ppm	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
1							HSA advanced from 0 to 6 ft. No samples collected.		Boring backfilled No well installed
2									
3									
4									
5								← Cement/bentonite grout backfilled from 0 to 6 ft	
6							Bottom of Hole at 6.0 feet (auger refusal)		
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-6S-C
SHEET 1 OF 1
FILE No. R5866
CHKD. BY T. Heins/RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brungs
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019723.4153 441387.5286 (NYSPC)
GROUND SURFACE ELEVATION 637.00 DATUM NGVB
START DATE 7/18/90 END DATE 7/18/90

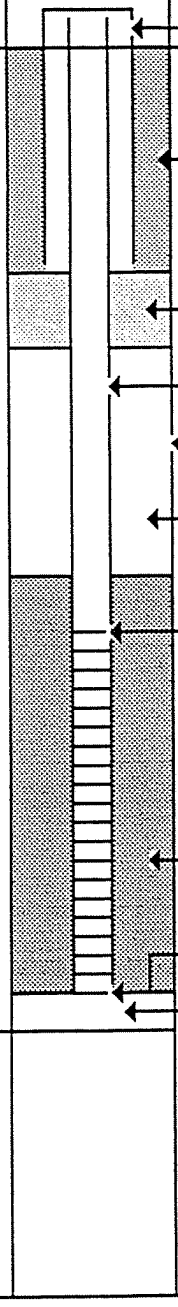
TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
7/18/90	1630	Dry	HSA 13	5 min

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM ppm	SAMPLE DESCRIPTION
1							HSA advanced from 0 to 13 ft. No samples collected. See boring log MW-6S-A for soil descriptions
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							Weathered rock fragments in auger spoil at 12.8 to 13 ft
13							Bottom of Hole at 13 ft (auger refusal)
14							
15							
16							

EQUIPMENT INSTALLATION LOG



NOTES

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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GOLDBERG-ZOINO ASSOCIATES OF NEW YORK, P.C.
364 NAGEL DRIVE, BUFFALO, NEW YORK
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-6RB
SHEET 1 OF 1
FILE No. R5866
CHKD. BY T. Heins / R J S

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brunges
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION Sta. 6+26 o/s 5R (site grid)
GROUND SURFACE ELEVATION _____ DATUM _____
START DATE 7/18/90 END DATE 7/18/90

TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 6-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM D1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
		Dry		

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM ppm	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG		NOTES
1							Advance 6-1/4 HSA to 2 feet No samples collected (see boring log MW-6DC)		← Hole backfilled with native material	
2							Bottom of Hole at 2 ft. (auger refusal)			
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

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364 NAGEL DRIVE, BUFFALO, NEW YORK
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-6RA
SHEET 1 OF 1
FILE No. R5866
CHKD. BY T. Heins / R J S

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brunges
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION Sta. 6+25 o/s 11R (site grid)
GROUND SURFACE ELEVATION _____ DATUM _____
START DATE 7/18/90 END DATE 7/18/90

TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 6-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM D1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
		Dry		

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM ppm	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG		NOTES
1							6-1/4 HSA advanced to 2 feet No samples collected (see boring log MW-6DC)		← Hole backfilled with native material	
2							Bottom of Hole at 2 ft. (auger refusal)			
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-6RC
SHEET 1 OF 2
FILE No. R5866
CHKD. BY T. Heins/R JS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brungs
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019720.4441 441372.9671 (NYSPC)
GROUND SURFACE ELEVATION 637.24 DATUM NGVD
START DATE 7/18/90 END DATE 7/21/90

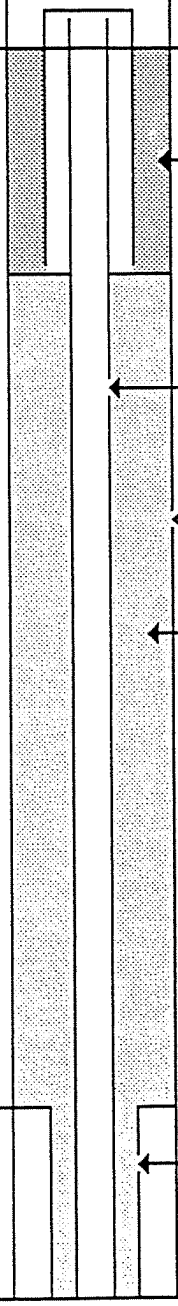
TYPE OF DRILL RIG
CASING SIZE AND TYPE 6-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD NX Size Rock Core with compressed air as the drilling fluid

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
7/18/90	1730	Dry	HSA 14	15 min
7/19/90	810	11.5	HSA 14	14 hrs
7/21/90	1638	~25	well	

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM ppm	SAMPLE DESCRIPTION
1							Advanced 6-1/4 HSA from 0 to 14 ft. No samples collected. See boring log MW-6SA for soil descriptions.
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14		C-1	14-17.8	37	68		Auger refusal at 14 ft Gray, SHALE, medium hard, moderately weathered, aphanitic, very thin bedding
15							
16							. . . slightly weathered

EQUIPMENT INSTALLATION LOG



NOTES

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. Rock reamed using 6 inch O.D. solid stem augers from 14 to 18.8 ft following rock coring.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-6RC
SHEET 2 OF 2
FILE No. R5866
CHKD. BY T. Heins / R J S

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM ppm	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
17							Horizontal slightly open fracture at approximately 16.5 ft		
18									
19		C-2	18.8-23.9	90	80				
20									
21									
22							Horizontal slightly open fracture at approximately 21.6 ft	Nominal 3 inch diameter rock hole from 18.8 to 29 ft	
23									
24									
25		C-3	23.9-29	90	100				
26									
27							Horizontal slightly open fracture at approximately 26.8 ft Horizontal slightly open fracture at approximately 27.6 ft		
28									
29							Bottom of Hole at 29.0 feet		
30									
31									
32									
33									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 2. No water observed coming from borehole during coring from 14 to 17.8 feet.
3. Water encountered during coring at 22.5 ft.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

BORING No. MW-6RC

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, NY	BORING No. MW-7S SHEET 1 OF 1 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER C. Nicometi
GZA GEOENVIRONMENTAL REPRESENTATIVE G. Klawinski

BORING LOCATION 1019144.243, E441409.311 (NYSPC)
GROUND SURFACE ELEVATION 640.37 DATUM NGVD
START DATE 10/20/92 END DATE 10/20/92

TYPE OF DRILL RIG Mobil B-34 (track mounted)
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch split spoon sampler (ASTM 1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION
1	2	S-1	0 - 2	8	75	ND	Stiff, Black-brown, CLAY & SILT, little fine to coarse Sand, moist, with intermixed organics (roots) from 0 to 0.4' (TOPSOIL)
	4						
	4						
2	9						Stiff, gray-brown, SILT & CLAY, some fine to medium Sand, moist (CL).
	3	S-2	2 - 4	12	85	ND	
3	6						
	6						. . . grades; with occasional lenses 1/16 to 1/8" thick fine Sand and Silt 1/2" to 4" apart.
	8						
4	2	S-3	4 - 6	4	100	ND	. . . grades; medium, wet.
5	2						. . . grades; little fine to medium Sand.
	2						
6	3						
	3	S-4	6 - 8	17	85	ND	
7	5						Very stiff, gray-brown, Clayey SILT and fine to coarse SAND, little Gravel, wet (SC).
	12						
8	40						Hard, gray, SILT & CLAY and fine to coarse SAND, with occasional intermixed weathered rock fragment (CL).
	33	S-5	8 - 10	45	10	0.6	
9	23						
	22						
10	26						Rock fragment in bottom of split spoon (S-5).
							Auger Refusal at 10.0 feet. Bottom of Hole at 10.0 feet.
11							
12							
13							
14							
15							
16							

EQUIPMENT INSTALLATION LOG

Stickup from GS to top protective casing 2.7'
Stickup from GS to top of inner PVC riser 2.5'.

- Vented PVC Cap
- 4" by 5' locking steel pro. casing with 1/4" weep hole.
- Concrete surface seal to 2.0'. (2 bags at 80 lbs ready mix concrete)
- Bentonite pellet seal from 2' to 4'. (1 pail at 5 gal)
- 2" I.D., PVC, flush joint Sch 40 riser pipe to 4.8'.
- Nominal 8" diameter hole to 10.0'.
- No. 1 (silica-quartz) sand filter pack from 4' to 9.8'. (1-1/4 bags at 100 lbs)
- 2" I.D. PVC flush joint Sch 40, No. 5 slot well screen from 4.8' to 9.8'.
- Bentonite pellet seal from 9.8' to 10'.

NOTES

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:
1. No water in hole at time of well installation.
2. OVM = peak organic vapor meter readings made in the headspace of the sample jar using a HNu model PI101 photoionization detector.

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-7R SHEET 1 OF 2 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER C. Nicometi
GZA GEOENVIRONMENTAL REPRESENTATIVE G. Klawinski

BORING LOCATION N 1019138.521 E 441410.888 (NYSPC)
GROUND SURFACE ELEVATION 640.46 DATUM NGVD
START DATE 10/20/92 END DATE 11/6/92

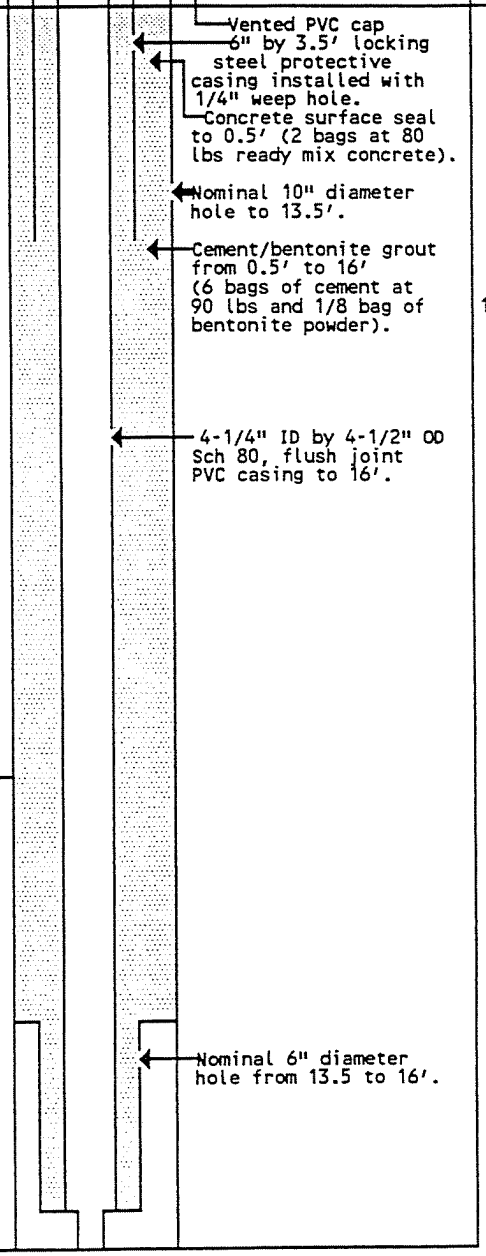
TYPE OF DRILL RIG Mobile B-34 (track mount)
CASING SIZE AND TYPE 6-1/4 inch ID HSA
OVERBURDEN SAMPLING METHOD None
ROCK DRILLING METHOD NX size core with air as drilling fluid to 20.1' with water from 20.1 to '

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION
1							Advanced 6-1/4" ID HSA from ground surface to 10.3'. No samples collected. See boring log MW-7S for soil descriptions.
2							
3							
4							
5							
6							
7							
8							
9							
10							Top of bedrock at 10.3'.
11		C-1	10.3-14.7		40		Gray shale, soft to medium hard, slight to moderate weathering, aphanitic very thin to thin bedding (LUDLOWVILLE SHALE).
12							
13							
14							
15		C-2	14.7-16.0		100		
16							

EQUIPMENT INSTALLATION LOG



Stickup from GS to top protective casing 2.58'
Stickup from GS to top of PVC riser 1.9'

NOTES: 1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. Water was blown up from borehole (<5 gpm) during coring with air from 10.3' to 16.0'.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK
364 NAGEL DRIVE, BUFFALO, NEW YORK

ENGINEERS AND SCIENTISTS

PROJECT
Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York

BORING No. MW-7R
SHEET 2 OF 2
FILE No. 5945
CHKD. BY SHB

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
17		C-3	16-19.3	66	66				
18									
19								3" nominal diameter hole from 16.0 to 36.2'.	
20		C-4	19.3-21.5	86	86				
21									
22		C-5	21.5-26.3	84	94				
23							Horizontal fracture, slightly open to closed, fresh to slightly weathered at 23.1'.		
24									
25							Zone of fractured rock, slightly open to closed, fresh to slightly weathered from 24.4 to 24.9'.		
26									
27		C-6	26.3-31	98	98		Low angle fracture at 27.3'.		
28							Horizontal fracture, moderately weathered, slightly open to closed at 27.8 and 28.8'.		
29									
30									
31		C-7	31-36.2	98	98				
32									
33									
34									
35							Low angle fracture at 25.1'.		
36							Bottom of Hole at 36.2 feet.		

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-7RA SHEET 1 OF 1 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER K. Danser
GZA GEOENVIRONMENTAL REPRESENTATIVE D. DiFante

BORING LOCATION See MW-7R for approximate location.
GROUND SURFACE ELEVATION DATUM
START DATE 11/6/92 END DATE 11/6/92

TYPE OF DRILL RIG Diedrich D-55
CASING SIZE AND TYPE 4-1/4 inch ID HSA
OVERBURDEN SAMPLING METHOD None
ROCK DRILLING METHOD NX size core with water as drilling fluid

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM ppm	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
1							Advanced 4-1/4" HSA from ground surface to 10.5'. No samples collected. See boring log MW-7S for soil descriptions.	Cement/bentonite grout 0' to 15.6'.	
11		C-1	10.5-15.6	63	80		Gray shale, soft to medium hard, moderately weathered, aphanitic, thin bedding (LUDLOWVILLE SHALE). Zone of horizontal fractures, 1" to 3" apart slightly open to open, moderately to moderately severe weathering from 10.5 to 11.1'. High angle fracture moderate to moderately severe weathering at 11.5'.		
16							Bottom of Hole at 15.6 feet.		

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. This test boring was advanced so that a packer pressure test could be done at the top of bedrock.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, NY	BORING No. MW-8S SHEET 1 OF 1 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER C. Nicometi
GZA GEOENVIRONMENTAL REPRESENTATIVE D. DiFante

BORING LOCATION N 1019498.482, E 440768.722 (NYSPC)
GROUND SURFACE ELEVATION 613.97 DATUM NGVD
START DATE 10/26/92 END DATE 10/26/92

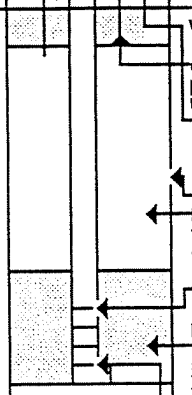
TYPE OF DRILL RIG Mobil B-34 (track mounted)
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD None
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM PPM	SAMPLE DESCRIPTION
1							Advanced 4-1/4 inch I.D. HSA from ground surface to 5.3'. No samples collected. See boring log MW-8R for sample descriptions.
2							
3							
4							
5							
6							Bottom of Hole at 5.3 feet.
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

EQUIPMENT INSTALLATION LOG



Stickup from GS to top protective casing 3.3'
Stickup from GS to top of riser 3.15'

NOTES

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-8R SHEET 1 OF 2 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER C. Nicometi
GZA GEOENVIRONMENTAL REPRESENTATIVE D. DiFante

BORING LOCATION N 1019490.124 E 440771.135 (NYSPC)
GROUND SURFACE ELEVATION 614.27 DATUM NGVD
START DATE 10/26/92 END DATE 10/27/93

TYPE OF DRILL RIG Mobil B-34 (track mount)

CASING SIZE AND TYPE 4-1/4 inch ID HSA/6 inch flush joint

OVERBURDEN SAMPLING METHOD 2 inch OD by 24 inch split spoon sampler (ASTM 1526)

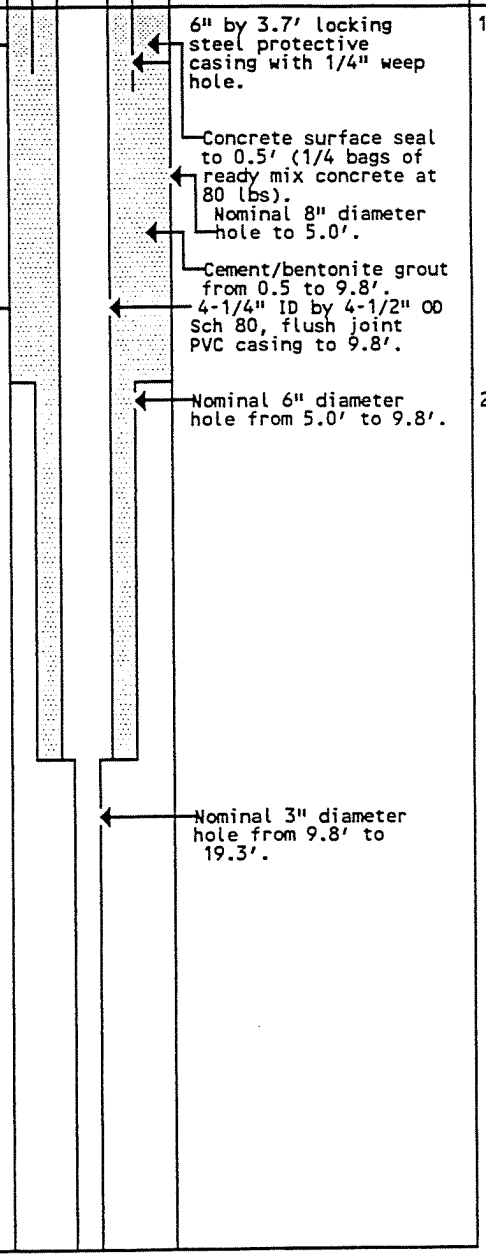
ROCK DRILLING METHOD NX size core with air as drilling fluid

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION
1	1	S-1	0 - 2	6	75	ND	Medium, black-brown CLAY & SILT, some fine to medium Sand, trace organics (roots), damp(TOPSOIL).
	2						
	4						Medium, brown, CLAY & SILT, some fine to medium Sand, moist (CL).
2	7						
	4	S-2	2 - 4	11	50	ND	. . . grades, frequently intermixed weathered rock (shale) fragments.
3	5						
	6						
	8						
4	100/0.3	S-3	4 - 5	--	10	2	Gray, weathered shale fragments in split spoon, moist.
5		C-1	5 - 9.3	33	77		Gray shale, medium hard to soft, moderately to severely weathered, aphanitic, thin bedding (LUDLOWVILLE SHALE). Zone of weathered rock 5.0 to6.9' core barrel dropped slowly from 6.8 to 7.3'.
6							
7							Horizontal fractures, slightly open to closed, fresh to slightly weathered, spaced 1/2 to 6 inches apart from 6.9' to 14.5'.
8							
9							Advanced 5-7/8 roller bit from 9.3 to 9.8'. No samples taken.
10		C-2	9.8-14.5	12	83		
11							
12							
13							
14							
15		C-3	14.5-19.3	94	98		Horizontal, slightly open to closed, fresh to slightly weathered fractures at 15.1, 15.5 15.7, 15.8, 15.9, 16.1, 16.5, 17.0, 17.6, 18.7
16							

EQUIPMENT INSTALLATION LOG



NOTES
1
2

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:
1. OVM = peak organic vapor meter reading made in the headspace of the sample jar using a HNu model PI101 photoionization detector.
2. Auger refusal at 5.0 feet.

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-8R SHEET 2 OF 2 FILE No. 5945 CHKD. BY SHB

DEPTH	SAMPLE					SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG		NOTES
	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (%)				
17									
18									
19									
20						Bottom of Hole at 19.3 feet			
21									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, NY	BORING No. MW-9SA SHEET 1 OF 1 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER C. Nicometi
GZA GEOENVIRONMENTAL REPRESENTATIVE G. Klawinski

BORING LOCATION See MW-9SB for approximate location
GROUND SURFACE ELEVATION DATUM
START DATE 10/22/92 END DATE 10/22/93

TYPE OF DRILL RIG Mobil B-34 (track mounted)
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch split spoon samples (ASTM 1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM PPM	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
1	1	S-1	0 - 2	3	50	ND	Very loose, black, SILT and fine to coarse SAND, trace Gravel, wet with intermixed organics (roots) (suspected fill).	Borehole backfilled with cement bentonite grout from 0 to 4'.	
	1								
	2						Soft, gray-black, SILT & CLAY, some fine to medium Sand, moist, with occasional intermixed organics (roots) (FILL).		
2	3								
	3	S-2	2 - 4	29	50	0.4	. . . grades; wet with intermixed rock (weathered shale) fragments.		
3	4						. . . grades; very stiff.		
	15						No organics.		
	52						Rock fragments in bottom spoon.		
4							Bottom of Hole at 4.2'.		
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. OVM = peak organic vapor meter reading made in headspace of the sample jar using a HNu model PI101 photoionization detector.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, NY	BORING No. MW-9SB SHEET 1 OF 1 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER L. Schroeder
GZA GEOENVIRONMENTAL REPRESENTATIVE D. DiFante

BORING LOCATION N 1019265.672 E 440936.955
GROUND SURFACE ELEVATION 617.12 DATUM NGVD
START DATE 10/29/92 END DATE 10/29/92

TYPE OF DRILL RIG Mobil B-34 (track mounted)
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD None
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM PPM	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
1							Advanced 4-1/4 inch I.D. HSA from ground surface to 8'. No samples were collected. See boring logs MW-9SA and MW-9R for soil description.	Stickup from GS to top protective casing 3'. Stickup from GS to top of PVC riser 2.8'. Vented PVC cap. 6" by 4' locking steel pro. casing installed with 1/4" weep hole. Concrete surface seal to 1.0'. (1 bag at 90 lbs ready mix concrete) Bentonite pellet seal from 1.0' to 2.9'. (1 pail at 5 gal) 2" I.D., PVC, flush joint Sch 40 riser pipe to 4.0'. Nominal 8" diameter hole to 8.3'. 2" I.D., PVC, flush joint Sch 40, screen from 4.0' to 8.0'. No. 1 (silica-quartz) sand filter pack from 2.9' to 8.0'. (1-1/2 bags at 100 lbs) Bentonite pellet seal from 8.0' to 8.3'.	
2									
3									
4									
5									
6									
7									
8									
9							Bottom of Hole at 8.3 feet		
10									
11									
12									
13									
14									
15									
16									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-9R SHEET 1 OF 2 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER C. Nicometi
GZA GEOENVIRONMENTAL REPRESENTATIVE G. Klawinski

BORING LOCATION N 1019274.489 E 440939.495 (NYSPC)
GROUND SURFACE ELEVATION 616.98 DATUM NGVD
START DATE 10/22/92 END DATE 10/28/92

TYPE OF DRILL RIG Mobile B-34 (track mount)
CASING SIZE AND TYPE 6 inch flush joint casing
OVERBURDEN SAMPLING METHOD None
ROCK DRILLING METHOD NX size core with air as drilling fluid

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION
1							Advance 6" flush joint casing to 4'. No samples collected. See boring log MW-9S for soil descriptions.
2							
3							
4		C-1	4 - 9	44	44		
5							Concrete (gray with intermixed gravel) from 4 to 5.5'.
6							Core barrel dropped from 5.5 to 6' Approximately 5 gpm water blowing up from hole at this zone.
7							Core barrel dropped from 7 to 8'.
8							Gray, SHALE, soft to medium hard moderately to severely weathered, aphanitic, very thin bedding (LUDLOWVILLE SHALE).
9		C-2	9 -12.3	46	86		
10							
11							Horizontal slightly open, slightly weathered fracture at 11.3'.
12							Horizontal slightly open,slightly weathered fracture at 12' Advanced 5-7/8 roller bit from 12.3 to 13'. No samples collected.
13							
14		C-3	12.8-17.5	81	91		
15							
16							Zone of horizontal fractures, slightly open to closed, fresh to slightly weathered from 16' to 16.5'.

EQUIPMENT INSTALLATION LOG

Stickup from GS to top protective casing 2.8'
Stickup from GS to top of PVC riser 2.3'
Vented PVC cap.

6" by 4.5' locking steel protective casing installed with 1/4" weep hole.
Concrete surface seal to 1.8' (4 bags at 90 lbs ready mix concrete).
Nominal 8" diameter hole to 4'.
Cement/bentonite grout from 1.8' to 13'. (8 bags at 90 lbs)
4" ID, Sch 80, flush joint, PVC, riser pipe to 13'.
Nominal 8" diameter hole from 4 to 9'.
Nominal 5-7/8" diameter hole to 13'.
Nominal 3" diameter hole from 13 to 23.4'.

NOTES: 1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. Advanced 6" flush joint casing from 4 to 8' after C-1 was collected. Very difficult to spin casing from 4 to 5'.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-9R SHEET 2 OF 2 FILE No. 5945 CHKD. BY SHB

DEPTH	SAMPLE						SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG		NOTES
	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM				
17										
		C-4	17.5-22.5	82	82					
18										
19										
20										
21										
22										
		C-5	22.5-23.4	89	89					
23										
							Bottom of Hole at 23.4 feet.			
24										
25										

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-9RD SHEET 1 OF 4 FILE No. 5945 CHKD. BY RJS

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER L. Schroeder
GZA GEOENVIRONMENTAL REPRESENTATIVE G. Klawinski

BORING LOCATION N 1019282.549 E 440942.546 (NYSPC)
GROUND SURFACE ELEVATION 616.70 DATUM NGVD
START DATE 5/10/94 END DATE 5/25/94

TYPE OF DRILL RIG CME-55 on ATV

CASING SIZE AND TYPE 4-1/4" ID HSA, 6" ID flush joint steel casing

OVERBURDEN SAMPLING METHOD 2" OD by 2" split spoon sampler (ASTM 1586)

ROCK DRILLING METHOD NX size core, 3-7/8" OD roller bit

WATER LEVEL DATA

DATE	TIME	WATER	CASING	STABILIZATION TIME
5/10/94	730am	2	9	14 hrs.

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM PPM	SAMPLE DESCRIPTION
1	2	S-1	0 - 2	--	50	ND	Black-brown, SILT & CLAY, some fine to coarse Sand, wet, with intermixed organics (roots). [FILL]
	2	T,B					
	3						
2	7						Gray-brown, CLAY & SILT, little fine to coarse Sand, trace Gravel, moist with frequently intermixed organics (roots) and occasional intermixed slag type material. (1.5'-2.0')
	40	S-2	2 - 4	--	20	ND	
3	15						
	20						Gray, fine to coarse Sand and Gravel size slag material, wet.
	26						
4	100/0	S-3	4	--	0	--	Very difficult augering from 4' to 5' (suspected concrete).
5							Augers dropped from approximately 5' to 6' (possible void).
6	2	S-4	6 - 8	--	20	12	Gray-black, Silt and very weathered Shale, moist. [weathered shale]
7	3						
	4						
	40						Auger refusal at 8'.
8		C-1	8.1-17.9	70	88		Gray, SHALE, soft to medium hard, moderately to severely weathered, aphanitic, very thin bedding. [LUDLOWVILLE SHALE] Zone severely weathered shale fragments at 9' to 9.1'.
9							
10							
11							Core barrel dropped from 11.1 to 11.4'.
12							
							Horizontal fracture, slightly open, moderately severely weathered at 12.4'.
13							
14							
15							
16							Horizontal fracture, slightly open, moderately weathered at 16.1', 16.7' and 16.9'.

EQUIPMENT INSTALLATION LOG

Stickup from GS to top protective casing 2.6'
Stickup from GS to top of PVC riser 2.4'
Vented PVC cap.

- 6" by 4.5' locking steel protective casing.
- Concrete surface seal to 3'.
- Nominal 8" diameter hole to 8'.
- Cement/bentonite grout from 3' to 19'.
- 1-1/2" ID Sch 40 PVC flush joint riser to 48'.
- 4" ID, Sch 80, flush joint PVC casing to 38'.
- Nominal 5-7/8" diameter hole from 8 to 38'.

NOTES

1
2

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:
1. OVM = Peak organic vapor meter readings made in the headspace of the sample jar using a HNu Model PI101 photoionization detector.
2. Water came up the hole during coring in this zone. The remaining run C-1 cored dry.

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-9RD SHEET 2 OF 4 FILE No. 5945 CHKD. BY RJS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM PPM	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
17									
18		C-2	17.9-19.7	50	100				3
19							Zone of several horizontal fractures, closed to slightly open, slightly to moderately weathered spaced 0.1 to 0.4 apart from 19.2 to 23'.		
20		C-3	19.7-26.0	22	80				
21									
22									
23									
24								Bentonite seal from 19 to 43'.	4
25									5
26		C-4	26.0-28.5	40	100		High angle closed fracture from 25.5 to 26.8'.		
27									
28									
29		C-5	28.5-33.3	92	96				
30							High angle fracture with secondary (calcite) mineralization, closed from 29.6 to 37.5'.		
31									
32									
33									
34		C-6	33.3-37.6	90	98				
35									
36									

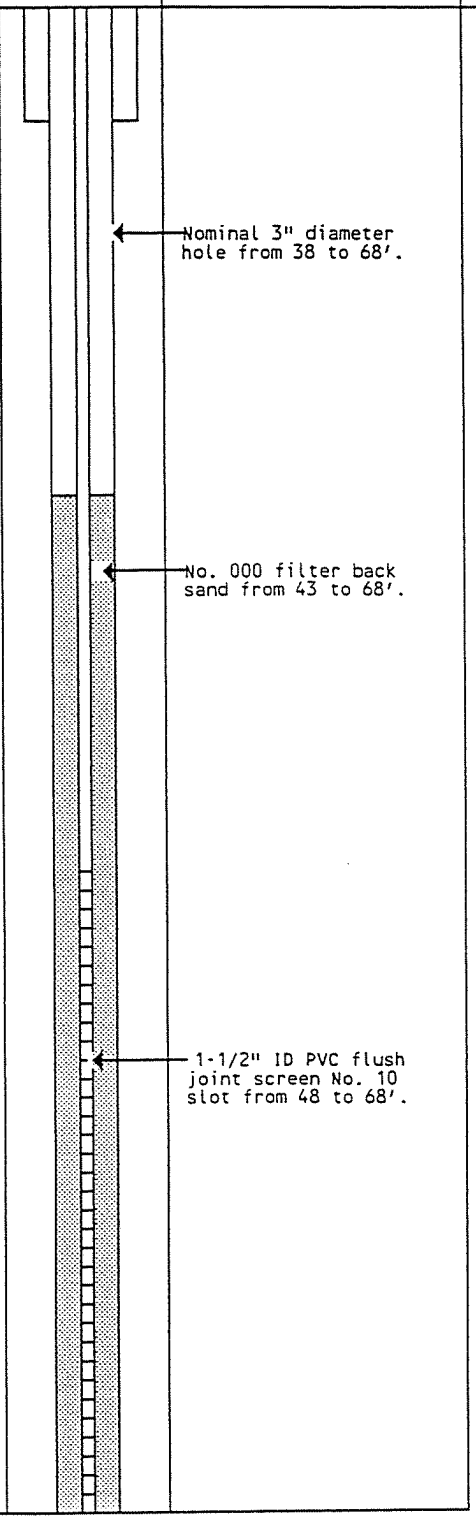
LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:
3. Water came up hole during coring from top C-2 to 37.6 ft.
4. Water shot up out of MW-9R during coring from 24 to 26'.
5. Chemical odor noticed during coring from 23 to 24'.

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-9RD SHEET 3 OF 4 FILE No. 5945 CHKD. BY RJS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM PPM	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
37									
		C-7	37.6-43.2	25	53				
38									
39							Horizontal fractures, closed to slightly open, fresh to moderately weathered, spaced 0.1 to 0.5' apart from 38 to 45'.		
40									
41									
42									
43		C-8	43.2-48.7	30	90				
44									
45									
46									
47									
48									
49		C-9	48.7-53.4	60	100				
50									
51									
52									
53									
54		C-10	53.4-58.0	50	100				
55									
56									



LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-9RD SHEET 4 OF 4 FILE No. 5945 CHKD. BY RJS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
57									
58		C-11	58 -63.5	35	87				
59							Horizontal fractures, closed to slightly open, fresh to moderately weathered, spaced 0.1 to 0.5' apart from 55 to 68'.		
60									
61									
62									
63									
64		C-12	63.5- 68	50	85				
65									
66									
67									
68							Bottom of Hole at 68 feet.		
69									
70									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, NY	BORING No. MW-10S SHEET 1 OF 1 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER C. Nicometi
GZA GEOENVIRONMENTAL REPRESENTATIVE D. DiFante

BORING LOCATION N 1019674.604 E 440922.406 (NYSPC)
GROUND SURFACE ELEVATION 612.39 DATUM NGVD
START DATE 10/28/92 END DATE 10/28/92

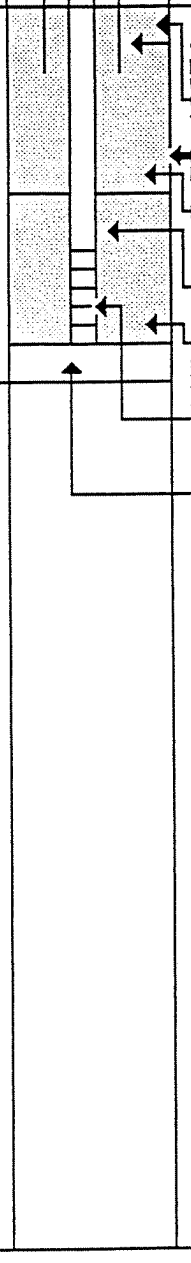
TYPE OF DRILL RIG Mobil B-34 (track mounted)
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD None
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION
1							Advanced 4-1/4 inch I.D. HSA from ground surface to 5.0'. No samples were collected. See boring log MW-10R for soil description.
2							
3							
4							
5							Bottom of Hole at 5.0 feet
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

EQUIPMENT INSTALLATION LOG



NOTES

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-10R SHEET 1 OF 2 FILE No. 5945 CHKD. BY

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER L. Schroeder
GZA GEOENVIRONMENTAL REPRESENTATIVE D. DiFante

BORING LOCATION N 1019667.989 E 440916.435 (NYSPC)
GROUND SURFACE ELEVATION 612.37 DATUM NGVD
START DATE 10/27/92 END DATE 10/28/92

TYPE OF DRILL RIG Mobil B-34 (track mount)
CASING SIZE AND TYPE 4-1/4 inch HSA/6 inch flush joint
OVERBURDEN SAMPLING METHOD 2 inch OD by 24 inch split spoon sampler (ASTM 1586)
ROCK DRILLING METHOD NX size core with air as drilling fluid

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION
1	1	S-1	0 - 2	3	50	0.4	Soft, brown, SILT & CLAY, some fine Sand, trace organics (roots) damp (TOPSOIL).
	1						
	2						
2	3						
	4	S-2	2 - 4	--	55	1.2	. . . grades to; and medium to coarse Sand, some fine Gravel, wet.
	2						
3	56						Gray weathered shale fragments in split spoon, moist, with some gray Silt intermixed.
	89						
4	32	S-3	4 - 4.8	--	50	1.2	
	100/.2						
5		C-1	4.8-10.6	28	81		Gray SHALE, medium hard to soft, moderately to severely weathered, aphanitic, thin bedding (LUDLOW-VILLE SHALE). High angle, closed, fresh fracture from 5.2 to 5.9'. Horizontal fractures, slightly open to closed, fresh to slightly weathered, spaced 6 to 1/4" apart from 4.8 to 7.8'.
6							
7							
8							Core barrel dropped 7.8' to 8.3'.
9							
10							Horizontal fracture, slightly open to open, slightly to severely weathered at 10.0, 10.1, 10.2'.
11		C-2	10.6-13	83	83		Horizontal fracture, slightly open to closed, fresh to slightly weathered at 11.5'.
12							
13		C-3	13 -16.2	71	91		
14							
15							
16							High angle, closed, fresh fracture from 15.5 to 15.9'.

EQUIPMENT INSTALLATION LOG

Stickup from GS to top protective casing 3.1'
Stickup from GS to top of riser 2.9'
Vented PVC cap
6" by 5' locking steel pro. casing installed with 1/4" weep hole.
Concrete surface seal to 0.9' (1 bag of ready mix concrete at 80 lbs).
Nominal 8" diameter hole to 4.8'.
Cement/bentonite grout from 0.9 to 10.6'. (3 bags at 94 lbs)
4-1/4" ID by 4-1/2" OD Sch 80, flush joint PVC casing to 10.6'.
Nominal 6" diameter hole from 4.8' to 10.6'.
Nominal 3" diameter hole from 10.6' to 20.9'

NOTES 2 1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. Water was blowing up from casing during coring at C-1 with air.
2. OVM = peak organic vapor meter reading made in the headspace of the sample jar using a HNu model PI101 photoionization detector.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-10R SHEET 2 OF 2 FILE No. 5945 CHKD. BY SHB

DEPTH	SAMPLE						SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM			
17		C-4	16.2-20.9	96	96		Horizontal fracture, slightly open to closed, fresh to slightly weathered at 20.9'.		
18									
19									
20									
21							Bottom of Hole at 20.9 feet.		
22									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-11RA SHEET 1 OF 1 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER L. Shrander
GZA GEOENVIRONMENTAL REPRESENTATIVE D. DiFante

BORING LOCATION See MW-11RC for approximate location
GROUND SURFACE ELEVATION DATUM
START DATE 11/2/92 END DATE 11/2/93

TYPE OF DRILL RIG Mobil B-34 (track mount)
CASING SIZE AND TYPE 4-1/4 inch HSA
OVERBURDEN SAMPLING METHOD 2 inch OD by 24 inch split spoon sampler (ASTM 1576)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM PPM	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
1	1	S-1	0 - 2	12	75	ND	Very soft, dark brown, CLAY & SILT, some fine to medium Sand, trace organics,wet (TOPSOIL)(CL).		Hole grouted to surface 11/2/93
	5								
	7						Stiff, brown, SILT & CLAY, some fine to medium Sand, damp(CL-ML).		
2	9								
	12	S-2	2 - 2.9		95	ND	Very stiff, gray, Silty CLAY, some fine to medium Sand, moist (SC).		
3	100/4						. . . grades to frequently inter-mixed rock fragments.		
							Split spoon sampler refusal. Bottom of Boring at 2.9 feet.		
4							Moved 20 feet west to new boring location due to auger refusal.		
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-11RB SHEET 1 OF 2 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER L. Schroeder
GZA GEOENVIRONMENTAL REPRESENTATIVE D. DiFante

BORING LOCATION About 30' west of MW-11RC
GROUND SURFACE ELEVATION DATUM
START DATE 11/2/92 END DATE 11/3/93

TYPE OF DRILL RIG Mobile B-34 (track mount)
CASING SIZE AND TYPE 4-1/4 inch HSA/6 inch flush joint
OVERBURDEN SAMPLING METHOD 2 inch OD by 24 inch split spoon sampler (ASTM 1526)
ROCK DRILLING METHOD NX size core with air as drilling fluid

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
1							Advanced 4-1/4" HSA from ground surface to 4.0'. No samples were collected. See boring log MW-11RA for soil descriptions.	PVC casing removed on 11/11/92 due to the casing being loose in the borehole. Borehole was filled to surface with cement grout.	1
2									
3								Nominal 8" diameter hole to 8.6'	
4								Cement/bentonite grout to 14.5'	
	21	S-3	4 - 6	48	75	ND	Very stiff, gray, Silty CLAY, some fine Sand, frequently intermixed rock fragments (SC).		
5	19								
	29					ND			
	20								
6	27	S-4	6 - 8	102	50	ND	. . . grades to hard.		
	48								
7	54						Fractured gray shale fragments 7.2 to 7.5'.		
	44					ND	Hard, brown, CLAY & SILT, frequently intermixed shale fragments.		
8	52	S-5	8 - 8.6	52	50	1			
	100/1								
9		C-1	8.6-13.2	0	0			Nominal 6" diameter hole from 8.6 to 14.5'	
10									
11									
12									
13							Gray, SHALE, soft to medium hard, moderate to severely weathered, aphanitic, very thin bedding. (LUDLOWVILLE SHALE)		
		C-2	13.2-14.6	64	79		Horizontal, slightly open to open severely weathered fracture at 14.1'.		
14									
15								Nominal 3" diameter hole from 14.5 to 23.6'	
		C-3	14.6-18.1	24	54		Horizontal, slightly open to open moderately severe to severely weathered fracture at 15.5'.		
16									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-11RB SHEET 2 OF 2 FILE No. 5945 CHKD. BY SHB

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM PPM	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG		NOTES
17							Zone of severely weathered fractured rock from 17.5 to 17.6' Horizontal, slightly open to open, severely weathered fracture at 17.8'.		Grout to surface on 11/11/92.	
18										
		C-4	18.1-23.6	96	96					
19										
20										
21										
22										
23										
24							Bottom of Hole at 23.6 feet.			
25										

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
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GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-11RC SHEET 1 OF 2 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER L. Schroeder
GZA GEOENVIRONMENTAL REPRESENTATIVE D. DiFante

BORING LOCATION N 1019855.059 E 441250.557
GROUND SURFACE ELEVATION 632.62 DATUM NGVD
START DATE 11/3/92 END DATE 11/4/92

TYPE OF DRILL RIG Mobile B-34 (track mount)
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA/6 inch flush joint
OVERBURDEN SAMPLING METHOD None
ROCK DRILLING METHOD 3 inch roller bit with air as drilling fluid

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION
1							Advanced 4-1/4" HSA to 8.5'. No samples were collected. Removed HSA, and advanced 6" flush joint casing to 9.5'.
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							Advanced 3" roller bit from 14.5' to 24.5'. No rock core samples were collected. See boring log MW-11RB.
15							
16							

EQUIPMENT INSTALLATION LOG

Stickup from GS to top protective casing 3.1'
Stickup from GS to top of PVC riser 2.1'
Vented PVC cap

6" by 5' locking steel protective casing with 1/4" weep hole.

Concrete surface seal to 3.8' (3 bags at 90 lbs ready mix concrete).

Nominal 8" diameter hole to 8.5'.

Cement/bentonite grout from 3.8 to 14.5' (3 bags at 90 lbs).

4-1/4" ID by 4-1/2" OD Sch 80 flush joint PVC casing to 14.5'.

Nominal 6" diameter hole from 8.5' to 14.5'.

3" nominal diameter hole from 14.5' to 24.5'.

NOTES: 1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: Core sample was attempted from 5.5 to 13.0 feet. There was no recovery of a sample.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
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GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-11RC SHEET 2 OF 2 FILE No. 5945 CHKD. BY SHB

DEPTH	SAMPLE						SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG		NOTES
	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM				
17										
18										
19										
20										
21										
22										
23										
24										
25							Bottom of Hole at 24.5 feet			
26										

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
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GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-12S SHEET 1 OF 1 FILE No. 5945 CHKD. BY RJS

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER L. Schroeder
GZA GEOENVIRONMENTAL REPRESENTATIVE G. Klawinski

BORING LOCATION N 1019147.459 E 440927.023 (NYSPC)
GROUND SURFACE ELEVATION 618.97 DATUM NGVD
START DATE 5/23/94 END DATE 5/23/94

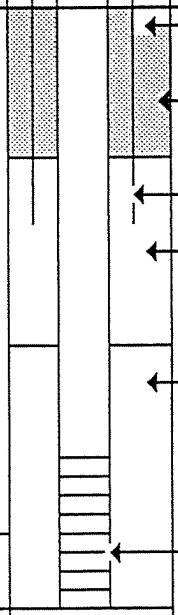
TYPE OF DRILL RIG CME-55 on ATV
CASING SIZE AND TYPE 4-1/4" ID HSA, 6" ID flush joint steel casing
OVERBURDEN SAMPLING METHOD 2" OD by 24" split spoon sampler (ASTM 1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	STABILIZATION TIME
5/23/94	1200p	6.7	7.9	15 min

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION
1	15	S-1	0 - 2	7	50	ND	Gray-brown, SILT & CLAY, little fine to coarse Sand, trace Gravel moist, with intermixed organics (roots) to 1.5'. [FILL]
	3						
	4						
2	4						
	4	S-2	2 - 4	10	50	ND	
	5						
3	5						
	7						
4	7	S-3	4 - 6	11	50	ND	Gray-black, Clayey SILT, some fine to coarse Sand, trace Gravel, wet, with intermixed slag type fragments. [FILL]
	6						
5	5						
	8						
6	7	S-4	6 - 6.9	--	80	ND	
7	50/.4	T,B				ND	Gray-black very weathered shale [weathered SHALE] Advanced augers through weathered rock from 6.9 to 7.9'. Auger refusal at 7.9'.
8							Bottom of Hole at 7.9 feet.
9							
10							
11							
12							
13							
14							
15							
16							

EQUIPMENT INSTALLATION LOG



NOTES

Stickup from GS to top protective casing 2.4'
Stickup from GS to top of PVC riser 2.2'
Vented PVC cap.

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. OVM = peak organic vapor meter readings made in the headspace of the sample jar using a HNu model PI-101 photoionization detector.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

BORING No. MW-12S

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-12R SHEET 1 OF 2 FILE No. 5945 CHKD. BY RJS

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER L. Schroeder
GZA GEOENVIRONMENTAL REPRESENTATIVE G. Klawinski/W. Lemke

BORING LOCATION N 1019148.158 E 440935.523 (NYSPC)
GROUND SURFACE ELEVATION 619.83 DATUM NGVD
START DATE 5/13/94 END DATE 5/16/94

TYPE OF DRILL RIG CME-55 on ATV
CASING SIZE AND TYPE 4-1/4" ID HSA, 6" ID flush joint steel casing
OVERBURDEN SAMPLING METHOD 2" OD by 24" split spoon sampler (ASTM 1586)
ROCK DRILLING METHOD NX size core, 5-7/8" OD roller bit

WATER LEVEL DATA

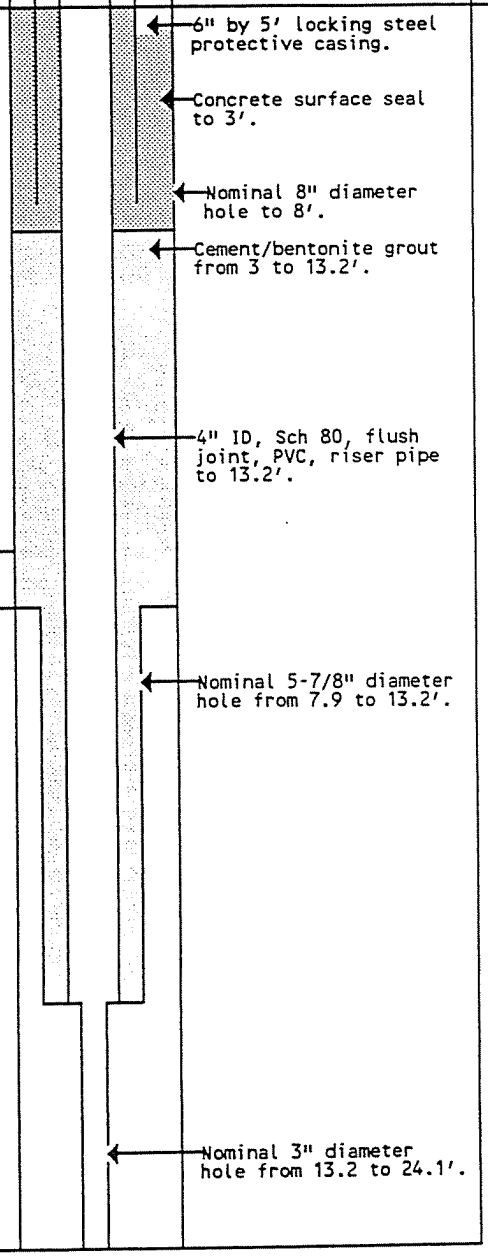
DATE	TIME	WATER	CASING	STABILIZATION TIME
5/13/94	1230p	7.9'	9	1 hr

DEPTH	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION
1	3	S-1	0 - 2	--	50	ND	Gray-brown, SILT & CLAY, little fine to coarse Sand, trace Gravel moist, with intermixed organics (roots) from 0 to 1.5'. [FILL]
	2						
	3						
2	4						
	8	S-2	2 - 4	--	20	ND	
3	7						
	8						
4	11						
	2	S-3	4 - 6	--	50	ND	
5	3	T,B					Gray-black, Clayey SILT, some fine to coarse Sand, trace Gravel, wet, with intermixed slag type fragment at 5.8'. [FILL]
	4						
	64						
6	5	S-4	6 - 7.8	--	20	ND	
7	5						
	16						Gray-black silt and very weathered shale [weathered SHALE]
8	100/.3	C-1	8 -13.2	11	58		Auger refusal at 8'.
9							Gray, SHALE, soft to medium hard, moderately to severely weathered, aphanitic, very thin bedding. [LUDLOWVILLE SHALE]
10							
11							Zone of severely weathered rock with horizontal fractures closed to open, slightly to severely weathered from 8 to 13.4'.
12							
13							
		C-2	13.2-19.1	81	90		
14							
15							Horizontal fracture, slightly open, moderately weathered at 14.4'.
16							

EQUIPMENT INSTALLATION LOG

Stickup from GS to top protective casing 1.9'
Stickup from GS to top of PVC riser 1.7'
Vented PVC cap inst.

NOTES



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LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. OVM = Peak organic vapor meter readings made in the headspace of the sample jar using a HNu Model PI-101 photoionization detector.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK
364 NAGEL DRIVE, BUFFALO, NEW YORK
ENGINEERS AND SCIENTISTS

PROJECT
Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York

BORING No. MW-12R
SHEET 2 OF 2
FILE No. 5945
CHKD. BY RJS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM PPM	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
17							Horizontal fracture, slightly open, moderately weathered at 21.1 and 23'.		
18									
19		C-3	19.1-24.1	98	100				
20									
21									
22									
23									
24							Bottom of Hole at 24.1 feet.		
25									
26									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-13R SHEET 1 OF 2 FILE No. 5945 CHKD. BY RJS

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER L. Schroeder
GZA GEOENVIRONMENTAL REPRESENTATIVE G. Klawinski/W. Lemke

BORING LOCATION N 1019564.179 E 440697.822 (NYSPC)
GROUND SURFACE ELEVATION 613.39 DATUM NGVD
START DATE 5/19/94 END DATE 5/20/94

TYPE OF DRILL RIG CME-55 on ATV
CASING SIZE AND TYPE 4-1/4" ID HSA, 6" ID flush joint steel casing
OVERBURDEN SAMPLING METHOD 2" OD by 24" split spoon sampler (ASTM 1586)
ROCK DRILLING METHOD NX size core, 5-7/8" OD roller bit

WATER LEVEL DATA

DATE	TIME	WATER	CASING	STABILIZATION TIME
5/19/94	1315	Dry	4.0	15 min
5/19/94	1430	4.0	5.2	15 min

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM PPM	SAMPLE DESCRIPTION
1	2	S-1	0 - 2	--	20	ND	Dark brown, CLAY & SILT, little fine to coarse Sand, moist with intermixed organics (roots) to 1'.
	3						
	5						
2	9						
	4	S-2	2 - 4	--	35	ND	. . . grades; brown, Silty CLAY, trace fine to medium Sand with intermixed shale fragments at 4'. [FILL]
3	4	T,B					
	8						
	10						Gray-black, very weathered Shale fragments.
4	100/.2	S-3	4 - 4.2	--	100	ND	Auger refusal at 4.2 ft.
5		C-1	5 - 10	45	90		Gray, SHALE, soft to moderately hard, moderately weathered, aphanitic, very thin bedding [LUDLOWVILLE FORMATION].
6							Moderately to severely weathered from 4.2 to 9'.
7							
8							
9							
10		C-2	10 - 15	90	100		
11							Zone of horizontal fractures, slightly open, moderately to severely weathered from 10.4 to 10.8'.
12							
13							
14							
15		C-3	15 -20.7	95	85		Horizontal fracture, slightly open, moderate to severely weathered at 14.6'.
16							

EQUIPMENT INSTALLATION LOG

Stickup from GS to top protective casing 2.5'
Stickup from GS to top of PVC riser 1.7'
Vented PVC cap.

6" steel protective casing to 3'.
Concrete surface seal to 3'.
Nominal 8" diameter hole to 4.2'.
Cement/bentonite grout from 3' to 10'.
4" ID, Sch 80, flush joint, PVC, riser pipe to 10'.
Nominal 5-7/8" diameter hole from 4.2 to 10'.
Nominal 3" hole from 10 to

NOTES: 1, 2

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:
1. OVM = Peak organic vapor meter readings made in the headspace of the sample jar using a HNu Model PI-101 photoionization detector.
2. Air bubbles were observed coming from fractures in south branch of Smokes Creek creek bed when coring from 6.5' to 7.5'.

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-13R SHEET 2 OF 2 FILE No. 5945 CHKD. BY RJS

DEPTH	SAMPLE						SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG		NOTES
	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM				
17										
18										
19							Horizontal fracture, slightly open, moderately severely weathered at 18.9'.			
20										
21							Bottom of Hole at 20.7 feet.			
22										

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-14R SHEET 1 OF 2 FILE No. 5945 CHKD. BY RJS

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER L. Scroeder
GZA GEOENVIRONMENTAL REPRESENTATIVE G. Klawinski

BORING LOCATION N 1019165.458 E 440699.077 (NYSPC)
GROUND SURFACE ELEVATION 616.63 DATUM NGVD
START DATE 5/20/94 END DATE 5/23/94

TYPE OF DRILL RIG CME-55 on ATV
CASING SIZE AND TYPE 4-1/4" ID HSA, 6" ID flush joint steel casing
OVERBURDEN SAMPLING METHOD 2" OD by 24" split spoon sampler (ASTM 1586)
ROCK DRILLING METHOD NX size core, 5-7/8" OD roller bit

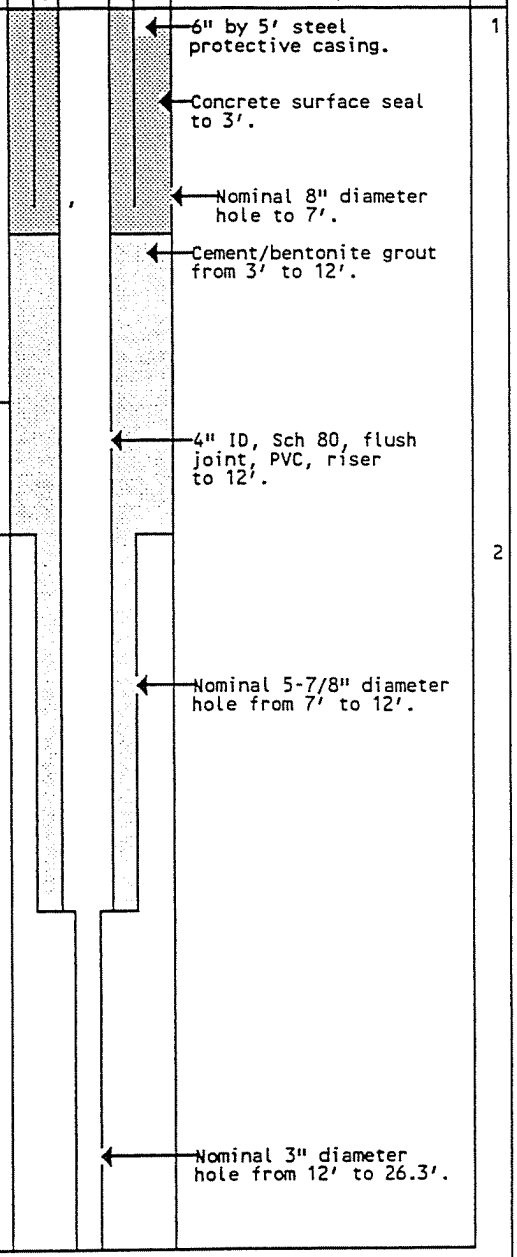
WATER LEVEL DATA

DATE	TIME	WATER	CASING	STABILIZATION TIME
5/23/94	3:00p	6 ft	7 ft	30 min

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION
1	5	S-1	0 - 2	--	50	ND	Black-brown, fine to coarse SAND, little Silt, trace Gravel, moist with intermixed black-gray cinder/slag type fragments. [FILL]
	11						
	18						
2	18						
	9	S-2	2 - 4	--	50	ND	Gray-brown, SILT & CLAY, little fine to coarse Sand, trace Gravel moist. [FILL]
3	9						
	9						
	11						
4	7	S-3	4 - 5.4	--	20	ND	
	10						
5	100/0.4						
							Gray-black Silt and weathered Shale, damp [weathered SHALE].
6	100/.1	S-4	6 - 6.1	--	80	ND	
							Auger refusal at 7 feet.
7		C-1	7 - 12	--	0		
8							
9							
10							
11							
12		C-2	12 -16.4	85	100		Gray, SHALE, soft to moderately hard, moderately weathered, aphanitic, very thin bedding [LUDLOWVILLE FORMATION]
13							
14							
15							
16							

EQUIPMENT INSTALLATION LOG

Stickup from GS to top protective casing 2.5'
Stickup from GS to top of PVC riser 1.9'
Vented PVC cap.



NOTES: 1, 2

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:
1. OVM = Peak organic vapor meter readings made in the headspace of the sample jar using a HNU Model PI-101 photoionization detector.
2. No recovery from C-1, likely due to a significant weathering. Rock cuttings from this zone were weathered and damp.

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-14R SHEET 2 OF 2 FILE No. 5945 CHKD. BY RJS

DEPTH	SAMPLE						SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM			
17		C-3	16.4-21.1	98	95				
18									
19							Horizontal fracture, slightly open to open, moderate to severely weathered at 18.7'.		
20									
21		C-4	21.1-26.3	98	95				
22							Horizontal fracture, slightly open, moderately weathered at 21.7 and 23'.		
23									
24									
25									
26									
27							Bottom of Hole at 26.3 feet.		
28									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

EARTH DIMENSIONS, INC.

Soil and Hydrogeologic Investigations • Wetland Delineations
1091 Jamison Road • Elma, NY 14059
(716) 655-1717 • FAX (716) 655-2915

1G97b HOLE NO. MW 15-99 SURF. ELEVATION _

PROJECT Monitoring Well Installation LOCATION Immediately W. of South Branch, Smoke Creek
Chem-Trol, Lake Ave., Town of Hamburg, N.Y. Downstream from landfill

CLIENT McMahon & Mann Consulting Engineers DATE STARTED 2/16/99 COMPLETED 2/17/99

DEPTH IN FT | BLOWS ON SAMPLER

SN	0/6	6/12	12/18	18/24	N
1	1	1	2	2	3
2	4	6	5	3	11
3	100/5	RUN #1			
		RUN #2			
		RUN #3			

LITH

DESCRIPTION AND CLASSIFICATION

Extremely moist dark olive brown (SANDY-SILT) with little very fine size sand, very loose, weak granular soil structure, (ML). 1.2

Extremely moist olive gray gravelly (SAND) with 20 to 40 percent mostly subrounded gravel and flatter gravel size shale fragments, fine to very coarse size sand, very loose, weakly stratified, noticed one root, (SW). 2.0

Extremely moist faintly mottled dark olive gray (CLAYEY-SILT) with 5 to 10 percent mostly subrounded fine size gravel, little clay, firm, weakly thinly laminated, few fine to medium size roots, (ML-CL). 2.3

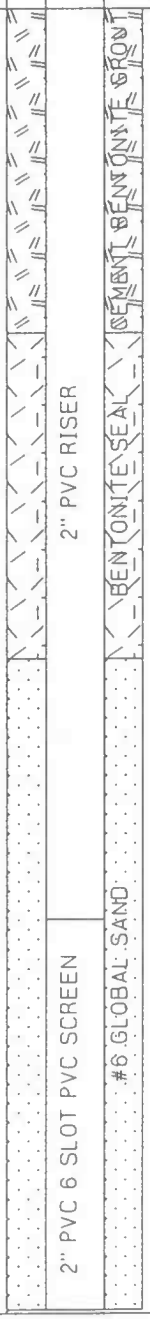
Extremely moist distinctly mottled olive gray very gravelly (SILTY-SAND) with 40 to 60 percent subrounded to flat size gravel, little silt, compact, stratified, few fine size roots, (SM), (GM).
clear transition to 3.0

Extremely moist faintly mottled olive gray very gravelly (CLAYEY-SILT) with 40 to 60 percent mostly subrounded to flat size gravel, loose, weakly statified, few fine size roots, little clay, (GM). 4.3

Olive gray shale bedrock, very soft beds that can be crushed between fingers into CLAYEY-SILT and moderately soft beds that can be etched with finger nail, individual beds as thick as 1/4 inch. 5.0

See next sheet

WELL



WATER TABLE AND REMARKS

Water sorted and deposited silt with little sand to 1.2 feet over water sorted and deposited sand with some gravel to 2.0 feet over silty slack water sediment with little clay, trace gravel to 2.3 feet over water sorted and deposited sand and gravel with little silt to 3.0 feet over water sorted and deposited gravel and

← 5.0'

silt with little clay to 4.3 feet over shale bedrock to end of coring.

← 10.0'

← 14.0'

HQ CORE DATA

#	INT	LGTH	REC	%REC	%RQD
1	5.0' to 10.3'	5.3'	5.3'	100	47.2
2	10.3' to 15.3'	5.0'	5.0'	100	86.0
3	15.3' to 20.4'	5.1'	5.1'	100	92.0

N=NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW

LOGGED BY Donald W. Owens, Senior Soil Scientist (amw)

EARTH DIMENSIONS, INC.

Soil and Hydrogeologic Investigations • Wetland Delineations
1091 Jamison Road • Elma, NY 14059
(716) 655-1717 • FAX (716) 655-2915

1G97b HOLE NO. MW 15-99 SURF. ELEVATION _

PROJECT Monitoring Well Installation LOCATION Immediately W. of South Branch, Smoke Creek
Chem-Trol, Lake Ave., Town of Hamburg, N.Y. Downstream from landfill

CLIENT McMahon & Mann Consulting Engineers DATE STARTED 2/16/99 COMPLETED 2/17/99

DEPTH IN FT | BLOWS ON SAMPLER | SN | 0/6 | 6/12 | 12/18 | 18/24 | N | LITH | DESCRIPTION AND CLASSIFICATION | WELL | WATER TABLE AND REMARKS

SN	0/6	6/12	12/18	18/24	N
		RUN	#4		
		RUN	#5		

Gray shale bedrock, moderately hard, bedrock can be etched with a nail, core separated into 0.1 to 0.2 foot lengths, partings nearly horizontal.

6.1

Gray shale bedrock, moderately hard with < 1/16 inch interbeds, core separated 0.01 to 0.10 foot lengths, partings nearly horizontal with few angular drilled breaks.

7.5

Gray shale bedrock, moderately hard, core can be easily etched with a nail. Core separated into three (3) lengths 0.5 to 1.2 foot long, parting nearly horizontal between 7.5 and 10.3 foot depths, core separated into 9 pieces 0.2 to 1.3 foot long with nearly horizontal partings between 10.3 to 15.3 foot depths, core separated into 5 pieces 0.2 to 2.7 foot long with nearly horizontal partings between 15.3 and 20.4 foot depths, core separated into 3 pieces 0.2 to 0.6 foot long with driller break at one parting between 20.4 and 22.5 foot depths, partings nearly horizontal core separated into 7 pieces between 22.5 and 24.6 foot depths varying in 0.1 to 0.6 foot lengths, parting nearly horizontal except for one high angle separation between 24.0 and 24.2 foot depth and vertical joint between 22.9 and 25.1 foot depths. Little evidence of weathering in the horizontal partings and vertical and high angle joints.

24.6

Coring completed at 24.6 feet.

(1) = 2" PVC 6 SLOT PVC SCREEN

#6 GLOBAL SAND

← 24.0'

← 24.6'

HQ CORE DATA

#	INT	LGTH	REC	%REC	%RQD
4	20.4' to 22.5'	2.1'	2.1'	100	86.0
5	22.5' to 24.6'	2.1'	2.1'	100	19.0

N=NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW

LOGGED BY Donald W. Owens, Senior Soil Scientist (amw)

EARTH DIMENSIONS, INC.

Soil and Hydrogeologic Investigations • Wetland Delineations
1091 Jamison Road • Elma, NY 14059
(716) 655-1717 • FAX (716) 655-2915

1G97b HOLE NO. MW 16-99 SURF. ELEVATION _

PROJECT Monitoring Well Installation LOCATION Alfred & Dorothy

Chem-Trol, Lake Ave., Town of Hamburg, N.Y.

CLIENT McMahon & Mann Consulting Engineers DATE STARTED 2/18/99 COMPLETED 2/18/99

DEPTH IN FT	SN	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N
	1	2	3	4	3	7
	2	3	6	11	11	17
5	3	18	27	00/4"		
	4	95	00/4"			
	5	42	00/3"			
10	6	00/5"				
	7	00/4"				
	8	00/4"				
15	9	00/4"				
	10	00/4"				
20						

LITH

DESCRIPTION AND CLASSIFICATION

Extremely moist dark brown (CLAYEY-SILT) topsoil with 10 to 15 percent fine size gravel, little clay, soft, granular soil structure, common fine roots, (ML-CL). 0.8

Moist distinctly mottled brown (CLAYEY-SILT) with 5 to 10 percent fine size gravel, some clay, firm, with nearly vertical gray desiccation cracks, (ML-CL) tending toward (CL).

clear transition to 3.0

Moist faintly mottled olive gray gravelly (SILTY-CLAY) with 15 to 25 percent mostly soft shale gravel, very stiff, massive soil structure (CL).

clear transition to 5.0

Gray shale bedrock, very soft, shale crushed between fingers into (CLAYEY-SILT) soil material, thinly bedded.

grades downward to 6.0

Gray shale bedrock, soft and moderately soft interbeds, some beds can be crushed into (CLAYEY-SILT) soil material and other beds can be etched with fingernail, thinly bedded.

clear transition to 20.0

WELL

WATER TABLE AND REMARKS

Topsoil to 0.8 foot over clayey weathered glacial till to 3.0 feet over clayey glacial till to 5.0 feet over shale bedrock to end of coring.

N=NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW

LOGGED BY Donald W. Owens, Senior Soil Scientist (amw)

EARTH DIMENSIONS, INC.

Soil and Hydrogeologic Investigations • Wetland Delineations
1091 Jamison Road • Elma, NY 14059
(716) 655-1717 • FAX (716) 655-2915

1G97b HOLE NO. MW 16-99 SURF. ELEVATION —

PROJECT Monitoring Well Installation LOCATION Alfred & Dorothy
Chem-Trol, Lake Ave., Town of Hamburg, N.Y.

CLIENT McMahon & Mann Consulting Engineers DATE STARTED 2/18/99 COMPLETED 2/18/99

DEPTH IN FT | BLOWS ON SAMPLER | SN | 0/6 | 6/12 | 12/18 | 18/24 | N | LITH | DESCRIPTION AND CLASSIFICATION | WELL | WATER TABLE AND REMARKS

RUN #1

Gray shale bedrock, moderately hard, rock can be easily etched with a nail, two thin very soft shale or silt nearly horizontal silt seams at 20.3 and 20.5 foot depths.

20.5

Gray shale bedrock, moderately hard, rock can be etched with a nail, slightly weathered nearly horizontal partings at 20.6', 21.3' and 21.7' depths, closed horizontal parting at 22.5 foot depth and below with core separating into 0.4 to 1.1 foot lengths. Noted high angled joint between 25.1 and 25.5 foot depths, little evidence of weathering below 25.3 feet, core separated into 7 pieces 0.9 to 1.7 foot lengths to 30.0 feet. Noted two (2) slightly weathered low angled partings at 30.6 and 31.3 foot depths.

RUN #2

RUN #3

31.8

Gray shale bedrock, rock broken with silt coating suggesting weathering, nearly horizontal parting.

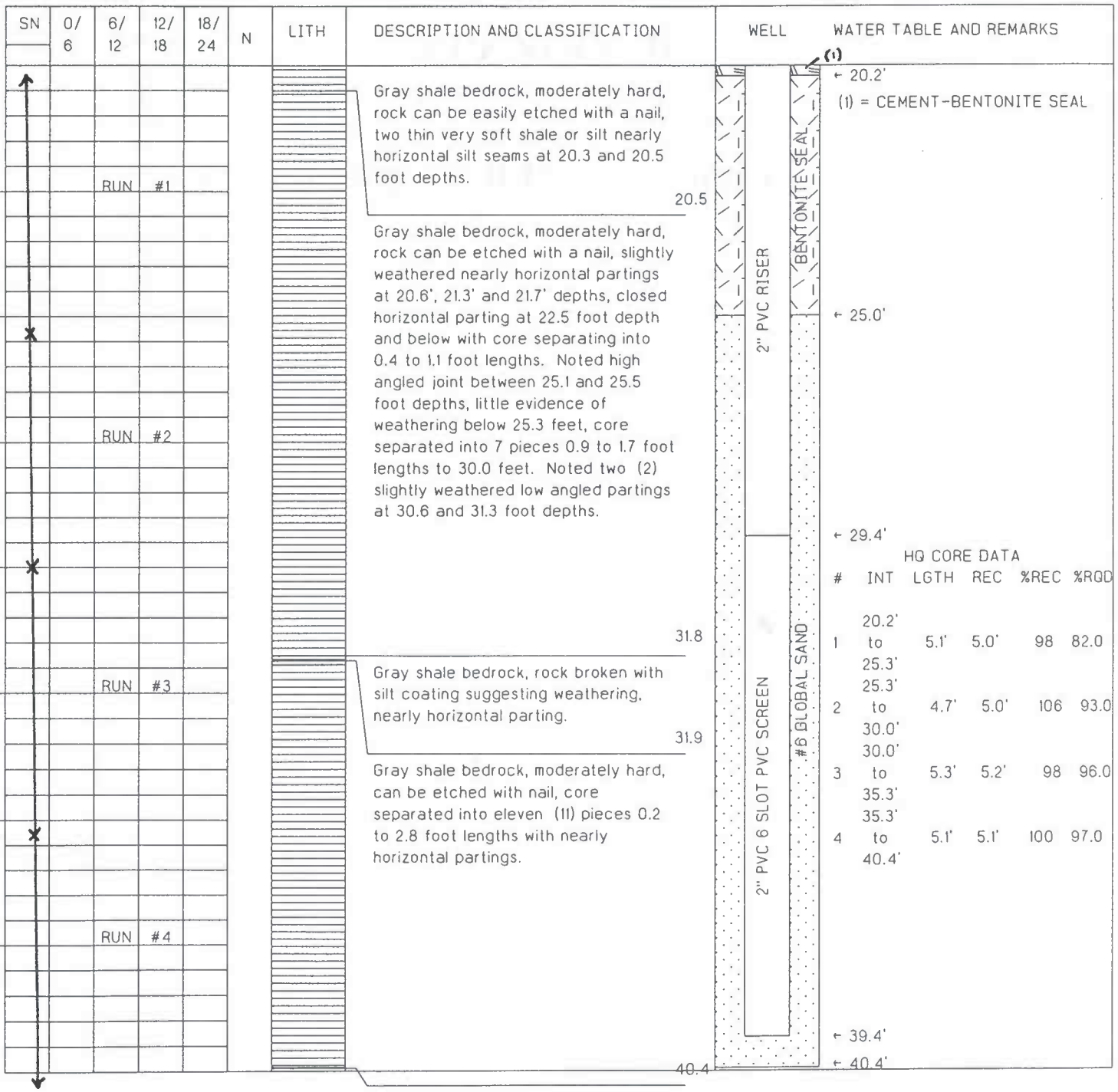
31.9

Gray shale bedrock, moderately hard, can be etched with nail, core separated into eleven (11) pieces 0.2 to 2.8 foot lengths with nearly horizontal partings.

RUN #4

40.4

Coring completed at 40.4 feet.



HQ CORE DATA

#	INT	LGTH	REC	%REC	%RQD
1	20.2' to 25.3'	5.1'	5.0'	98	82.0
2	25.3' to 30.0'	4.7'	5.0'	106	93.0
3	30.0' to 35.3'	5.3'	5.2'	98	96.0
4	35.3' to 40.4'	5.1'	5.1'	100	97.0

N=NUMBER OF BLOWS TO DRIVE 2" SPOON 12" WITH 140 lb. WT. FALLING 30" PER BLOW

LOGGED BY Donald W. Owens, Senior Soil Scientist (amw)

EARTH DIMENSIONS, INC.

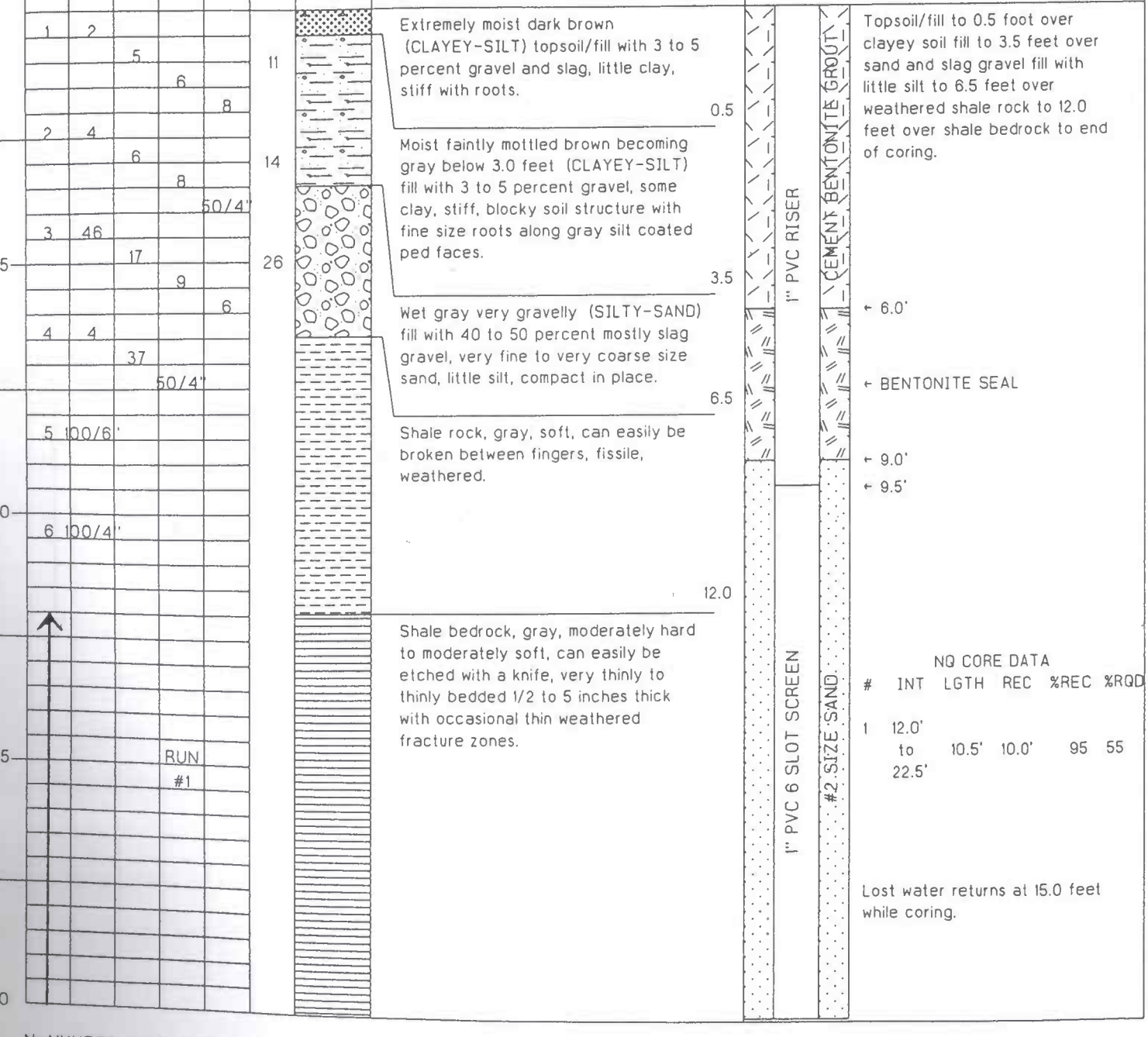
Soil and Hydrogeologic Investigations • Wetland Delineations
1091 Jamison Road • Elma, NY 14059
(716) 655-1717 • FAX (716) 655-2915

1G97a HOLE NO. MW P-97-1 SURF. ELEVATION —

PROJECT Subsurface Investigation and Monitoring Well Installation at Chem-Trol, Hamburg, N.Y. LOCATION See map

CLIENT McMahon & Mann Consulting Engineers DATE STARTED 7/7/97 COMPLETED 7/8/97

DEPTH IN FT	SN	0/6	6/12	12/18	18/24	N	LITH	DESCRIPTION AND CLASSIFICATION	WELL	WATER TABLE AND REMARKS
	1	2						Extremely moist dark brown (CLAYEY-SILT) topsoil/fill with 3 to 5 percent gravel and slag, little clay, stiff with roots.		Topsoil/fill to 0.5 foot over clayey soil fill to 3.5 feet over sand and slag gravel fill with little silt to 6.5 feet over weathered shale rock to 12.0 feet over shale bedrock to end of coring.
			5			11		0.5		
				6				Moist faintly mottled brown becoming gray below 3.0 feet (CLAYEY-SILT) fill with 3 to 5 percent gravel, some clay, stiff, blocky soil structure with fine size roots along gray silt coated ped faces.		
					8					
	2	4								
			6			14				
				8						
					50/4"					
	3	46								
5			17			26				
				9				3.5		
					6			Wet gray very gravelly (SILTY-SAND) fill with 40 to 50 percent mostly slag gravel, very fine to very coarse size sand, little silt, compact in place.		
	4	4								
			37							
				50/4"				6.5		
	5	100/6"						Shale rock, gray, soft, can easily be broken between fingers, fissile, weathered.		
10	6	100/4"								
								12.0		
								Shale bedrock, gray, moderately hard to moderately soft, can easily be etched with a knife, very thinly to thinly bedded 1/2 to 5 inches thick with occasional thin weathered fracture zones.		
15				RUN #1						
20										



NQ CORE DATA

#	INT	LGTH	REC	%REC	%RQD
1	12.0' to 22.5'	10.5'	10.0'	95	55

Lost water returns at 15.0 feet while coring.

N=NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW

LOGGED BY Dale M. Gramza, Senior Geologist (amw)

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1G97a HOLE NO. MW P-97-1 SURF. ELEVATION —

PROJECT Subsurface Investigation and Monitoring Well Installation at Chem-Trol, Hamburg, N.Y. LOCATION See map

CLIENT McMahon & Mann Consulting Engineers DATE STARTED 7/7/97 COMPLETED 7/8/97

DEPTH IN FT	SN	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	LITH	DESCRIPTION AND CLASSIFICATION	WELL	WATER TABLE AND REMARKS
				RUN #1				Shale bedrock, gray, moderately hard to moderately soft, can easily be etched with a knife, very thinly to thinly bedded 1/2 to 5 inches thick with occasional thin weathered fracture zones.	1" PVC 6 SLOT SCREEN; #2 SIZE SAND	← 29.5'
25										
				RUN #2						
30										← 32.5'
								32.5		
								Coring completed at 32.5 feet.		
35										
40										

NQ CORE DATA

#	INT	LGTH	REC	%REC	%RQD
2	22.5' to 32.5'	10.0'	6.7'	67	52

N=NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW

LOGGED BY Dale M. Gramza, Senior Geologist (amw)

EARTH DIMENSIONS, INC.

Soil and Hydrogeologic Investigations • Wetland Delineations

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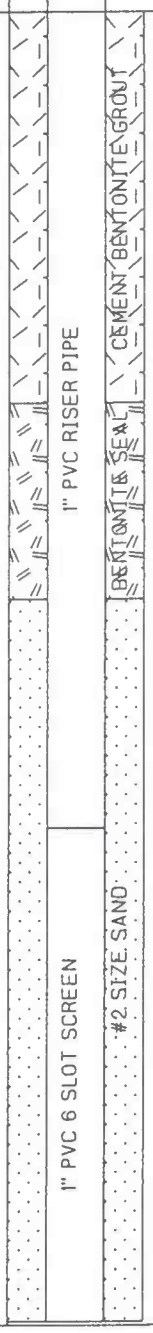
1697a HOLE NO. MW P-97-2 SURF. ELEVATION —

PROJECT Subsurface Investigation and Monitoring Well Installation at Chem-Trol, Hamburg, N.Y. LOCATION See map

CLIENT McMahon & Mann Consulting Engineers DATE STARTED 7/8/97 COMPLETED 7/8/97

DEPTH IN FT	SN	0/6	6/12	12/18	18/24	N	LITH	DESCRIPTION AND CLASSIFICATION	WELL	WATER TABLE AND REMARKS
	1	4	7	8	27	15		Extremely moist dark brown (SANDY-SILT) topsoil/fill with 3 to 5 percent little very fine size sand, compact with roots. 0.4		Topsoil to 0.4 foot over clayey soil fill with some gravel and silt to 2.0 feet over silty tending toward clayey soil fill to 4.5 feet over apparent sand and gravel fill to 6.0 feet over clayey glacial till to 7.0 feet over shale rock to 9.5 feet over Ludlowville shale bedrock to end of coring.
	2	11	10	9	13	19		Moist gray gravelly (CLAYEY-SILT) fill with 20 to 40 percent gravel, occasional cobbles, some clay, stiff. 2.0		
5	3	13	21	22	19	43		Moist faintly mottled gray (CLAYEY-SILT) fill with 3 to 5 percent gravel, little to some clay, very stiff, blocky soil structure. 4.5		
	4	9	14	50/3"				Wet light rusty brown very gravelly (SAND) with 40 to 50 percent gravel, very fine to very coarse size sand, dense in place. 6.0		
10	5	50/4"						Extremely moist gray gravelly (CLAYEY-SILT) with 15 to 25 percent gravel, some clay, hard, massive soil structure. 7.0		
				RUN #1				Shale rock, gray, soft, can easily be broken between fingers, fissile, weathered. 9.5		
15								Ludlowville shale bedrock, medium gray, moderately soft to moderately hard, can easily be etched with a knife, very thinly to thinly bedded 1/2 to 5 inches thick, rock is slightly pitted and weathered from 9.5 to 12.0 feet.		
				RUN #2						
20										



← 6.0'

← BENTONITE SEAL

← 9.0'

No recovery to Sample #5, 8' to 10'.

← 12.5'

NQ CORE DATA

#	INT	LGTH	REC	%REC	%RQD
1	9.5' to 17.0'	7.5'	7.3'	97	60
2	17.0' to 27.0'	10.0'	10.0'	100	65

N=NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW

LOGGED BY Dale M. Gramza, Senior Geologist (amw)

EARTH DIMENSIONS, INC.

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1G97a HOLE NO. MW P-97-2 SURF. ELEVATION —

PROJECT Subsurface Investigation and Monitoring Well Installation at Chem-Trol, Hamburg, N.Y. LOCATION See map

CLIENT McMahon & Mann Consulting Engineers DATE STARTED 7/8/97 COMPLETED 7/8/97

DEPTH IN FT	BLOWS ON SAMPLER SN	0/6	6/12	12/18	18/24	N	LITH	DESCRIPTION AND CLASSIFICATION	WELL	WATER TABLE AND REMARKS
								Ludlowville shale bedrock, medium gray, moderately soft to moderately hard, can easily be etched with a knife, very thinly to thinly bedded 1/2 to 5 inches thick with occasional weathered parting and small vertical fractures.	1" PVC 6 SLOT SCREEN; #2 SIZE SAND	
				RUN #2						
25										
30				RUN #3						
								32.5		← 32.5'
								Coring completed at 32.5 feet.		
35										
40										

NQ CORE DATA

#	INT	LGTH	REC	%REC	%RQD
3	27.0' to 32.5'	5.5'	5.5'	100	100

N=NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW

LOGGED BY Dale M. Gramza, Senior Geologist (amw)

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1G97a HOLE NO. MW P-97-3 SURF. ELEVATION —

PROJECT Subsurface Investigation and Monitoring Well Installation at Chem-Trol, Hamburg, N.Y. LOCATION See map

CLIENT McMahon & Mann Consulting Engineers DATE STARTED 7/9/97 COMPLETED 7/9/97

DEPTH IN FT	SN	0/6	6/12	12/18	18/24	N	LITH	DESCRIPTION AND CLASSIFICATION
	1	WH				3		Wet dark brown (SANDY-SILT) topsoil with little very fine size sand, very loose with roots.
			1					
				2				
					3			0.6
	2	1				2		Extremely moist gray (CLAYEY-SILT) with little clay, soft, blocky soil structure with occasional fine size roots.
			1					
				1				
					2			2.0
	3	26						Extremely moist distinctly mottled brown (CLAYEY-SILT) with little clay, very soft, blocky soil structure with gray silt coated ped faces with occasional fine size roots.
5			100/4"					
	4	46						
			96					
				00/3"				4.3
	5	57						Shale rock, gray moderately soft to soft, can easily be broken between fingers, fissile, weathered, rock becomes dark gray, "wet" with occasional (CLAYEY-SILT) lenses below 10.0 feet.
			100/4"					
10	6	12						
			75					
				00/3"				12.0
								Ludlowville shale bedrock, medium gray, moderately soft to moderately hard, can easily be etched with a knife, very thinly to thinly bedded 1/2 to 5 inches thick with occasional weathered partings.
15				RUN				
				#1				
20								

WELL: 1" PVC RISER PIPE; CEMENT BENTONITE GROUT; BENTONITE SEAL; 1" PVC 6 SLOT SCREEN; #2 SIZE SAND

WATER TABLE AND REMARKS

WH= sampler penetration with weight of rods and hammer.

Topsoil to 0.6 foot over silty slack water sediment with little clay to 4.3 feet over weathered shale rock to Lodlowville shale bedrock to end of coring.

← 6.0'

← BENTONITE SEAL

← 9.0'

Water level at 9.6 feet below ground level with 4 1/4" HSA at 12.0'.

← 12.0'

Lost water returns at 13.5' while coring.

NQ CORE DATA

#	INT	LGTH	REC	%REC	%RQD
1	12.0' to 22.5'	10.5'	10.0'	95	62

N=NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW

LOGGED BY Dale M. Gramza, Senior Geologist (amw)

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1G97a HOLE NO. MW P-97-3 SURF. ELEVATION —

PROJECT Subsurface Investigation and Monitoring Well Installation at Chem-Trol, Hamburg, N.Y. LOCATION See map

CLIENT McMahon & Mann Consulting Engineers DATE STARTED 7/9/97 COMPLETED 7/9/97

DEPTH IN FT	SN	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	LITH	DESCRIPTION AND CLASSIFICATION	WELL	WATER TABLE AND REMARKS
				RUN #1				Ludlowville shale bedrock, medium gray, moderately soft to moderately hard, can easily be etched with a knife, very thinly to thinly bedded 1/2 to 5 inches thick with occasional weathered partings.	1" PVC 6 SLOT SCREEN; #2 SIZE SAND	NQ CORE DATA # INT LGTH REC %REC %RQD 2 22.5' to 32.0' 9.5' 9.3' 98 77
25										
				RUN #2						
30								32.0		← 32.0'
								Coring completed at 32.0 feet.		
35										
40										

N=NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW

LOGGED BY Dale M. Gramza, Senior Geologist (amw)

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1G97a HOLE NO. MW P-97-4 SURF. ELEVATION —

PROJECT Subsurface Investigation and Monitoring Well Installation at Chem-Trol, Hamburg, N.Y. LOCATION See map

CLIENT McMahon & Mann Consulting Engineers DATE STARTED 7/10/97 COMPLETED 7/10/97

DEPTH IN FT	SN	0/6	6/12	12/18	18/24	N	LITH	DESCRIPTION AND CLASSIFICATION	WELL	WATER TABLE AND REMARKS
	1	1	1	2	3	3		Extremely moist dark brown (SANDY-SILT) topsoil with little very fine size sand, loose with roots.		Topsoil to 0.6 foot over apparent silty slack water sediment with little clay to 3.0 feet over weathered shale rock to 12.0 feet over Ludlowville shale bedrock to end of coring.
								0.6		
	2	6	11	23	49	34		Extremely moist brown (CLAYEY-SILT) with 3 to 5 percent fine size gravel, little clay, soft, blocky soil structure.		
								3.0		
5	3	28	93	100/8"				Shale rock, gray, soft, can easily be broken between fingers, fissile, weathered, "dry".	1" PVC RISER PIPE	← CEMENT BENTONITE GROUT ← 4.5' ← BENTONITE SEAL ← 8.0'
	4	100/3"								
	5	100/3"								
								9.0		
10	6	83	100/2"					Shale rock, medium gray, soft to moderately soft, can be broken between fingers, fissile, weathered, "wet" with occasional (CLAYEY-SILT) filled partings.		← 9.8'
								12.0		
								Ludlowville shale bedrock, gray to medium gray, moderately soft to moderately hard, can be easily etched with a knife, very thinly to thinly bedded 1/2 to 5 inches thick with occasional weathered partings.	1" PVC 6 SLOT SCREEN #2 SIZE SAND	Water level at 3.4 feet below ground level with 4 1/4" HSA at 12.0'. Note: Lost water returns at 12.8 feet while coring.
15				RUN #1						
20										

NQ CORE DATA

#	INT	LGTH	REC	%REC	%RQD
1	12.0' to 22.0'	10.0'	9.3'	93	81

N=NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW

LOGGED BY Dale M. Gramza, Senior Geologist (amw)

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1G97a HOLE NO. MW P-97-4 SURF. ELEVATION —

PROJECT Subsurface Investigation and Monitoring Well Installation at Chem-Trol, Hamburg, N.Y. LOCATION See map

CLIENT McMahon & Mann Consulting Engineers DATE STARTED 7/10/97 COMPLETED 7/10/97

DEPTH IN FT	SN	0/6	6/12	12/18	18/24	N	LITH	DESCRIPTION AND CLASSIFICATION	WELL	WATER TABLE AND REMARKS
				RUN #1				Ludlowville shale bedrock gray to medium gray, moderately soft to moderatly hard, can easilyt etched with a knife, very thinly to thinly bedded 1/2 to 5 inches thick with occasional weathered partings.	1" PVC 6 SLOT SCREEN; #2 SIZE SAND	NQ CORE DATA # INT LGTH REC %REC %RQD 2 22.0' to 29.8' 7.8' 8.2' 100+ 89
25				RUN #2						
								29.8		← 29.8'
30								Coring completed at 29.8 feet.		
35										
40										

N=NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW

LOGGED BY Dale M. Gramza, Senior Geologist (amw) SHEET 2 OF 2

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1G97a HOLE NO. MW P-97-5 SURF. ELEVATION —

PROJECT Subsurface Investigation and Monitoring Well Installation at Chem-Trol, Hamburg, N.Y. LOCATION See map

CLIENT McMahon & Mann Consulting Engineers DATE STARTED 7/11/97 COMPLETED 7/11/97

DEPTH IN FT	SN	0/6	6/12	12/18	18/24	N	LITH	DESCRIPTION AND CLASSIFICATION	WELL	WATER TABLE AND REMARKS
	1	1	1	2	3	3		Extremely moist dark brown (SANDY-SILT) topsoil with little very fine size sand, very loose with roots. 0.6		← CEMENT BENTONITE GROUT
	2	2	37	50/3"				Extremely moist faintly mottled brown (CLAYEY-SILT) with little clay, soft, blocky soil structure with gray silt coated ped faces. 1.5		← 3.0'
5	3	76	50/2"					Extremely moist to wet gray gravelly (SAND-SILT-CLAY) with 15 to 25 percent mostly fine size gravel, little clay and very fine to fine size sand, very loose, weakly thinly bedded. 2.5		← BENTONITE SEAL
				RUN #1				Shale rock, gray moderately soft to soft, can easily be broken between fingers, fissile, weathered, "dry". 6.5		← 6.0'
10								Ludlowville shale bedrock, medium gray, moderately hard, can easily be etched with a knife, very thinly to thinly bedded 1/2 to 5 inches thick with occasional weathered partings and thin seams.		← 9.7'
15									1" PVC 6 SLOT SCREEN	#2 SIZE SAND
				RUN #2						
20										

1" PVC RISER PIPE

Lost water returns at 10.8 feet. Notice 1 inch drop while coring.

Topsoil to 0.6 foot over silty slack water sediment with little clay to 1.5 feet over loamy glacial drift to 2.5 feet over weathered shale rock to 6.5 feet over Ludlowville shale bedrock to end of coring.

NQ CORE DATA

#	INT	LGTH	REC	%REC	%RQD
1	5.0' to 13.5'	8.5'	7.0'	82	52
2	13.5' to 22.5'	9.0'	9.0'	100	89

N=NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW

LOGGED BY Dale M. Gramza, Senior Geologist (amw)

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1G97a HOLE NO. MW P-97-5 SURF. ELEVATION —

PROJECT Subsurface Investigation and Monitoring Well Installation at Chem-Trol, Hamburg, N.Y. LOCATION See map

CLIENT McMahon & Mann Consulting Engineers DATE STARTED 7/11/97 COMPLETED 7/11/97

DEPTH IN FT	SN	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	LITH	DESCRIPTION AND CLASSIFICATION	WELL	WATER TABLE AND REMARKS
								Ludlowville shale bedrock, medium gray, moderately hard, can easily be etched with a knife, very thinly to thinly bedded 1/2 to 5 inches thick with occasional weathered partings and thin seams.	1" PVC 6 SLOT SCREEN; #2 SIZE SAND	
				RUN #2						
25										
				RUN #3						
								29.7		← 29.7'
30								Coring completed at 29.7 feet.		
35										
40										

NQ CORE DATA

#	INT	LGTH	REC	%REC	%RQD
2	22.5' to 29.7'	7.2'	6.2'	86	79

N=NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW

LOGGED BY Dale M. Gramza, Senior Geologist (amw) SHEET 2 OF 2

Earth Tech, Inc. Albany, NY (518) 458-1313	**Test Boring Log**				**Boring No.** EW-1
PROJECT: Chem-Trol					Sheet 1 of 1
CLIENT: SC Holdings, Inc.					Job No. 42452
DRILLING CONTRACTOR: Nothnagle Drilling Co.					Meas. Pt. Elev.: Ground
PURPOSE: Extraction Well Installation					Ground Elev.: 621.3'
DRILLING METHOD: HSA 4 1/4"/10 1/4"		SAMPLE	CORE	CASING	Datum: Temp Access Rd
DRILL RIG TYPE: CME 850	TYPE	Auger Cuttings		HSA	Date Started: 12/4/00
GROUNDWATER DEPTH:	DIAM.	NA		10 1/4" ID	Date Finished: 12/4/00
MEAS. PT.:	WEIGHT	NA			Driller: Jay Stockholm
DATE OF MEAS.:	FALL	NA			Inspector: Walt Howard

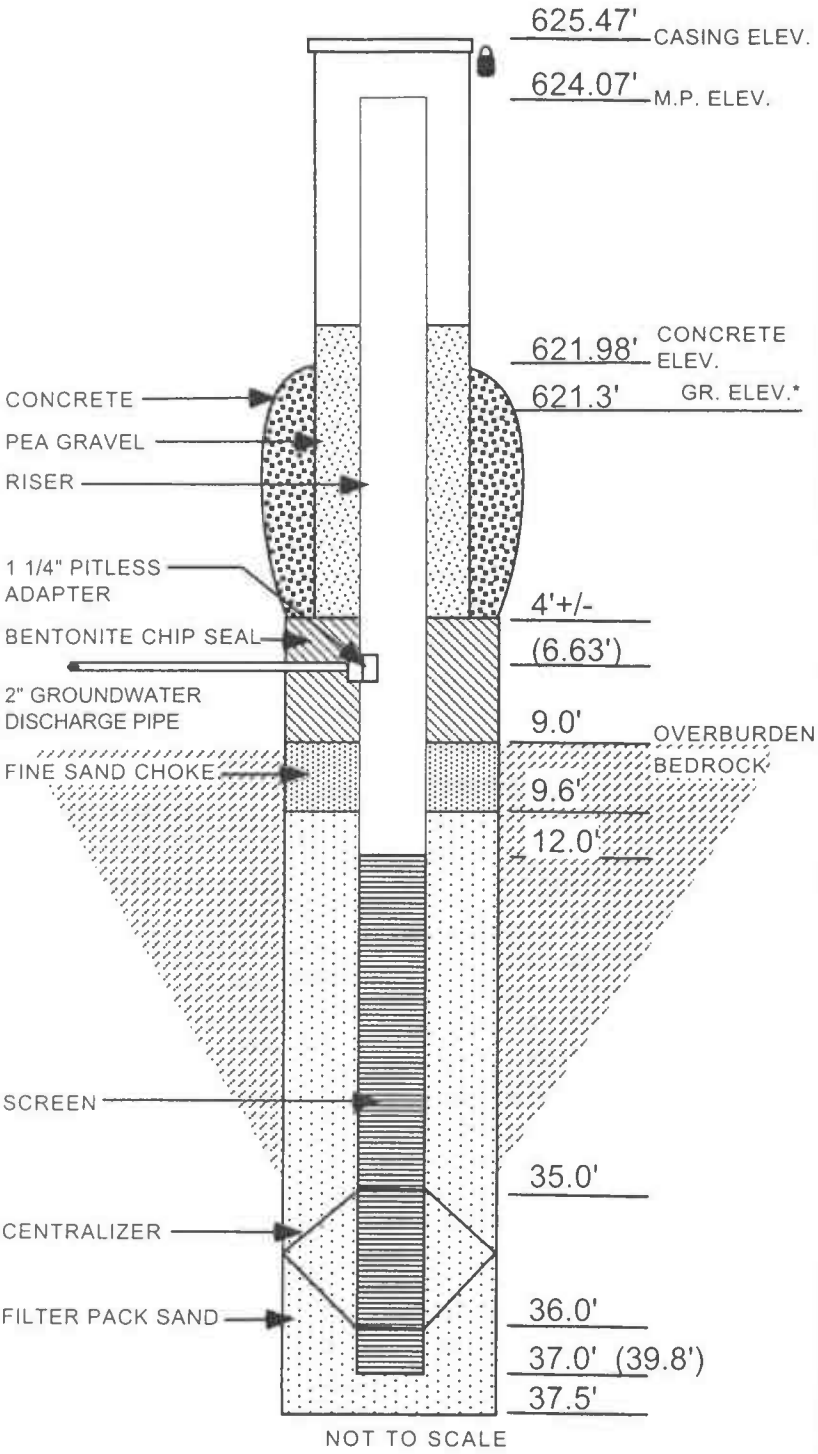
Depth (Feet)	Sample Number	Blow Count	Unified Classif-ication	Graphic Log	GEOLOGIC DESCRIPTION	REMARKS
					Grbr Cy$ l, mfs, tfG: mostly wd dbr fill	Geologic description from auger cutting samples collected at 5' intervals.
					(Fill Overburden) 7.0'	
					Gr mfG: SLAG Fill (Fill) 9.0'	Begin choppy drilling at 7'
10					Gray Shale Bedrock Auger drilling pulverizes shale. Combined w/ groundwater, all cuttings to bottom of boring are gray mud with trace of shale fragments.	Steady firm drilling 9' to T.D.
20						
30						
					37.5'	
40					Bottom of Boring Drill w/ 4 1/4" HSAs to T.D. then overdrill w/ 10 1/4" I.D. HSAs to T.D.	

EXTRACTION WELL COMPLETION LOG WELL NO. EW-1

Earth Tech, Inc.
12 Metro Park Road
Albany, NY 12205
(518) 458-1313

Project ChemTrol
Client SC Holdings, Inc.
Location Hamburg, New York
Project No. 42452
Date Drilled 12/4/00
Date Developed 12/8/00

WELL CONSTRUCTION DETAIL



NOT TO SCALE

DEPTHS ARE LISTED IN FEET BELOW GRADE AT TIME OF DRILLING. DEPTHS LISTED IN PARENTHESES ARE IN FEET BELOW TOP OF PVC WELL CASING.

INSPECTION NOTES

Inspector W. Howard
Drilling Contractor Nothnagle Drilling Co.
Type of Well Extraction Well
Static Water Level 12.15'
Measuring Point (M.P.) Top of PVC
Total Depth of Well 37.0'

Drilling Method
Type Hollow Stem Auger Diameter 10 1/4" I.D.
Casing None
Sampling Method Auger Cuttings
Interval 0 - 37.5'

Riser Pipe Left in Place (including stick up)
Material Sch. 40 PVC Diameter 6" I.D.
Length 14.8' Joint Type Flush Thread

Screen
Material Sch. 40 PVC Diameter 6" I.D.
Slot Size 0.020 inch Length 25.0'
Stratigraphic Unit Screened Fractured Bedrock

Filter Pack Ricci Well Gravel Grade 0
Amount 2200 lbs Interval 9.6' - 37.5'

Sand Choke Ricci Well Gravel Grade 00
Amount 50 lbs Interval 9.0' - 9.6'

Seal(s)
Type Bentonite chips Interval 4' - 9'
Type Concrete Interval 0 - 4'
Type _____ Interval _____
Locking Casing ☒ Yes ☐ No

Notes:

*Ground elevation listed reflects temporary access road grade at time of drilling. Final elevation may change with final site grading/restoration. All material installation depths listed above are relative to grade during drilling.

Earth Tech, Inc. Albany, NY (518) 458-1313	Test Boring Log	Boring No. EW-2
PROJECT: Chem-Trol		Sheet 1 of 1
CLIENT: SC Holdings, Inc.		Job No. 42452
DRILLING CONTRACTOR: Nothnagle Drilling Co.		Meas. Pt. Elev.: Ground
PURPOSE: Extraction Well Installation		Ground Elev.: 619.4'

		SAMPLE	CORE	CASING	
DRILLING METHOD: Hollow Stem Auger					Datum: Temp Access Rd
DRILL RIG TYPE: CME 850	TYPE	Auger Cuttings		HSA	Date Started: 11/29/00
GROUNDWATER DEPTH:	DIAM.	NA		10 1/4" ID	Date Finished: 12/1/00
MEAS. PT.:	WEIGHT	NA			Driller: Jay Stockholm
DATE OF MEAS.:	FALL	NA			Inspector: Skip Delclos

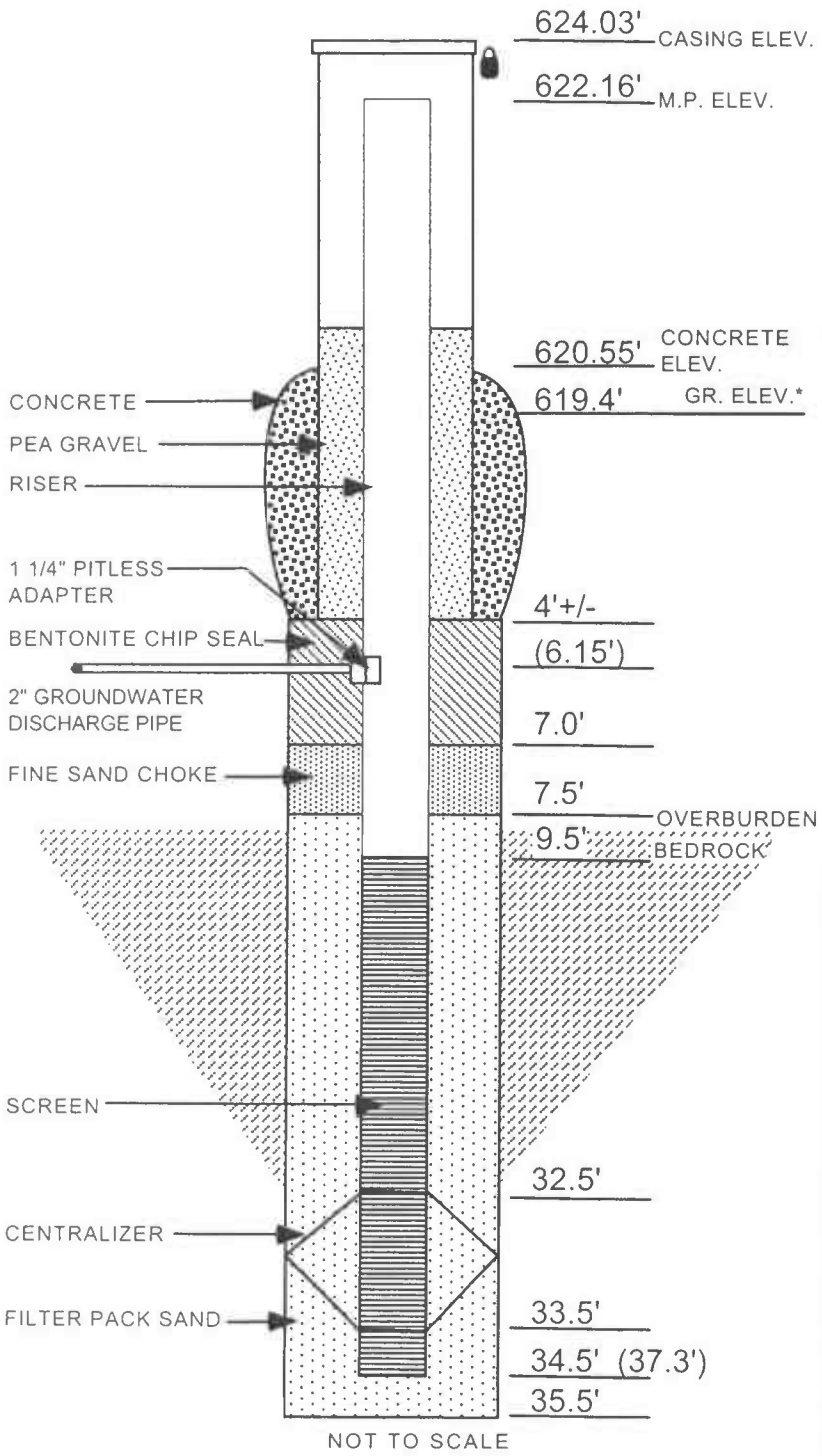
Depth (Feet)	Sample Number	Blow Count	Unified Classif-ication	Graphic Log	GEOLOGIC DESCRIPTION	REMARKS
					Grbr Cy$ l, mfs, tfG	Geologic description from auger cutting samples collected at 5' intervals.
					Overburden 8'	
10					Shale Bedrock - Competent 10' Auger drilling pulverizes shale. Combined w/ groundwater, all cuttings to bottom of boring are gray mud with trace of shale fragments.	Very hard, slow drilling 8' - 10' Steady firm drilling 10' to 35.5'
20						
30						
					35.5'	
40					Bottom of Boring Drill w/ 4 1/4" I.D. HSAs to T.D. and then overdrill to T.D. w/ 10 1/4" I.D. HSAs.	

EXTRACTION WELL COMPLETION LOG WELL NO. EW-2

Earth Tech, Inc.
12 Metro Park Road
Albany, NY 12205
(518) 458-1313

Project ChemTrol
Client SC Holdings, Inc.
Location Hamburg, New York
Project No. 42452
Date Drilled 11/29/00 - 11/30/00
Date Developed 12/8/00

WELL CONSTRUCTION DETAIL



NOT TO SCALE

DEPTHS ARE LISTED IN FEET BELOW GRADE AT TIME OF DRILLING. DEPTHS LISTED IN PARENTHESES ARE IN FEET BELOW TOP OF PVC WELL CASING.

INSPECTION NOTES

Inspector S. Delclos
Drilling Contractor Nothnagle Drilling Co.
Type of Well Extraction Well
Static Water Level 10.32'
Measuring Point (M.P.) Top of PVC
Total Depth of Well 34.5'

Drilling Method
Type Hollow Stem Auger Diameter 10 1/4" I.D.
Casing None
Sampling Method Auger Cuttings
Interval 0 - 35.5'

Riser Pipe Left in Place (including stick up)
Material Sch. 40 PVC Diameter 6" I.D.
Length 12.3' Joint Type Flush Thread

Screen
Material Sch. 40 PVC Diameter 6" I.D.
Slot Size 0.020 inch Length 25.0'
Stratigraphic Unit Screened Fractured Bedrock

Filter Pack Ricci Well Gravel Grade 0
Amount 2200 lbs Interval 7.5' - 35.5'

Sand Choke Ricci Well Gravel Grade 00
Amount 50 lbs Interval 7.0' - 7.5'

Seal(s)
Type Bentonite chips Interval 4' - 7'
Type Concrete Interval 0 - 4'
Type _____ Interval _____
Locking Casing ☒ Yes ☐ No

Notes:

*Ground elevation listed reflects temporary access road grade at time of drilling. Final elevation may change with final site grading/restoration. All material installation depths listed above are relative to grade during drilling.

Earth Tech, Inc. Albany, NY (518) 458-1313	Test Boring Log				Boring No. EW-3
PROJECT: Chem-Trol					Sheet 1 of 1
CLIENT: SC Holdings, Inc.					Job No. 42452
DRILLING CONTRACTOR: Nothnagle Drilling Co.					Meas. Pt. Elev.: Ground
PURPOSE: Extraction Well Installation					Ground Elev.: 618 ±
DRILLING METHOD: Hollow Stem Auger		SAMPLE	CORE	CASING	Datum: Temp Access Rd
DRILL RIG TYPE: CME 850	TYPE	Auger Cuttings		HSA	Date Started: 11/27/00
GROUNDWATER DEPTH:	DIAM.	NA		10 1/4" ID	Date Finished: 11/28/00
MEAS. PT.:	WEIGHT	NA			Driller: Jay Stockholm
DATE OF MEAS.:	FALL	NA			Inspector: Walt Howard

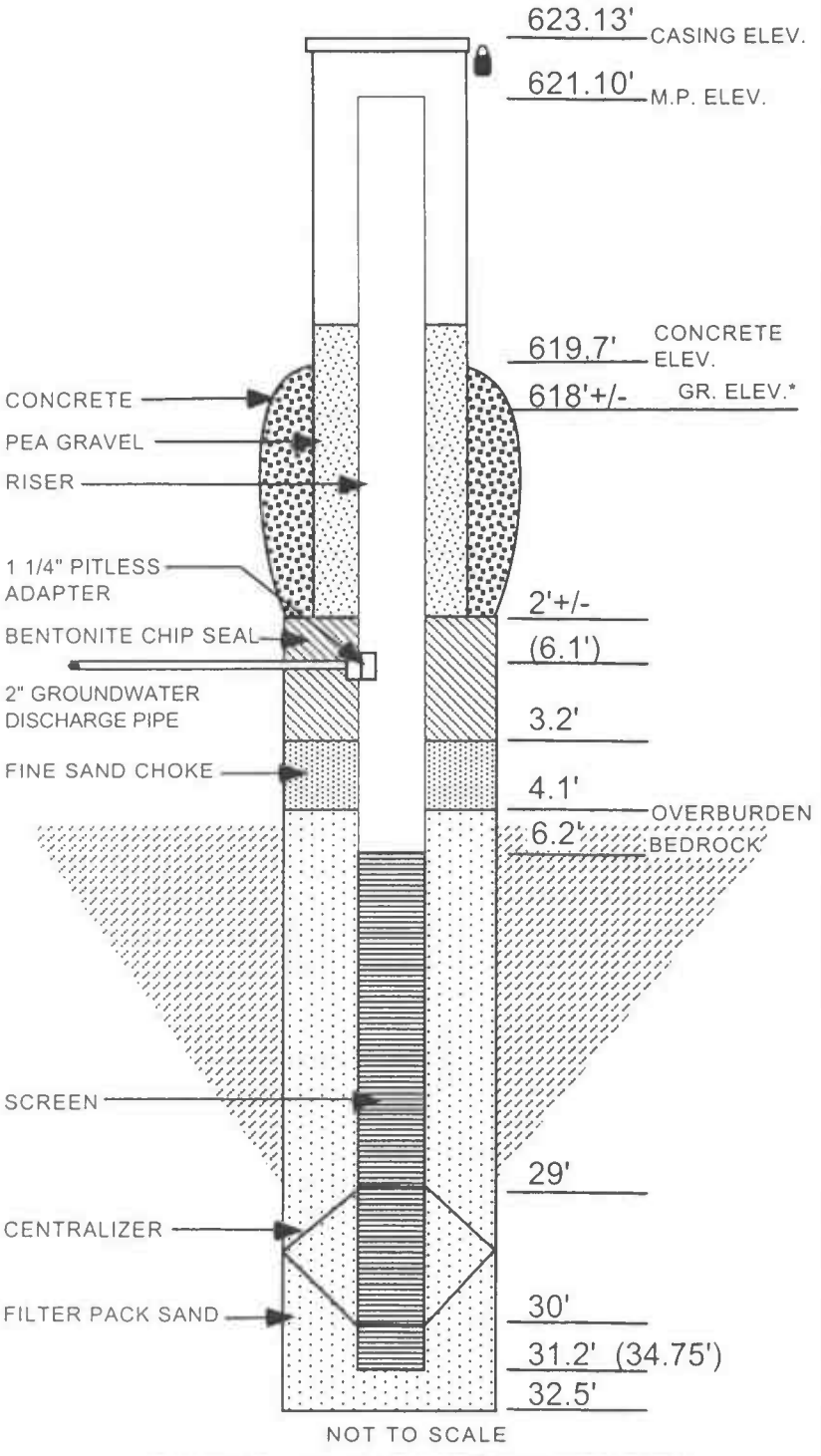
Depth (Feet)	Sample Number	Blow Count	Unified Classif-ication	Graphic Log	GEOLOGIC DESCRIPTION	REMARKS
					Grbr Cy$ l, mfs, tfG Overburden 5.0'	Geologic description from auger cutting samples collected at 5' intervals.
					Shale Bedrock - Competent 7.0'	Very hard, slow drilling 5' - 7'.
10					Auger drilling pulverizes shale. Combined w/ groundwater, all cuttings to bottom of boring are gray mud with trace of shale fragments.	Steady firm drilling 7' to T.D.
20						
30					32.5'	
					Bottom of Boring Drill w/ 4 1/4" I.D. HSAs to T.D. and then overdrill to T.D. w/ 10 1/4" I.D. HSAs.	
40						

EXTRACTION WELL COMPLETION LOG WELL NO. EW-3

Earth Tech, Inc.
12 Metro Park Road
Albany, NY 12205
(518) 458-1313

Project ChemTrol
Client SC Holdings, Inc.
Location Hamburg, New York
Project No. 42452
Date Drilled 11/28/00
Date Developed 12/6/00

WELL CONSTRUCTION DETAIL



NOT TO SCALE

DEPTHS ARE LISTED IN FEET BELOW GRADE AT TIME OF DRILLING. DEPTHS LISTED IN PARENTHESES ARE IN FEET BELOW TOP OF PVC WELL CASING.

INSPECTION NOTES

Inspector W. Howard
Drilling Contractor Nothnagle Drilling Co.
Type of Well Extraction Well
Static Water Level 9.30'
Measuring Point (M.P.) Top of PVC
Total Depth of Well 31.2'

Drilling Method
Type Hollow Stem Auger Diameter 10 1/4" I.D.
Casing None
Sampling Method Auger Cuttings
Interval 0 - 32.5'

Riser Pipe Left in Place (including stick up)
Material Sch. 40 PVC Diameter 6" I.D.
Length 9.3' Joint Type Flush Thread

Screen
Material Sch. 40 PVC Diameter 6" I.D.
Slot Size 0.020 inch Length 25.0'
Stratigraphic Unit Screened Fractured Bedrock

Filter Pack Ricci Well Gravel Grade 0
Amount 2200 lbs Interval 4.1' - 32.5'

Sand Choke Ricci Well Gravel Grade 00
Amount 50 lbs Interval 3.2' - 4.1'

Seal(s)
Type Bentonite chips Interval 2' - 3.2'
Type Concrete Interval 0 - 2'
Type _____ Interval _____
Locking Casing ☒ Yes ☐ No

Notes:
*Ground elevation listed reflects temporary access road grade at time of drilling. Final elevation may change with final site grading/restoration. All material installation depths listed above are relative to grade during drilling.

Earth Tech, Inc. Albany, NY (518) 458-1313	**Test Boring Log**				**Boring No.** OW-1 FR
PROJECT: Chem-Trol					Sheet 1 of 2
CLIENT: SC Holdings, Inc.					Job No. 42452
DRILLING CONTRACTOR: Nothnagle Drilling Co.					Meas. Pt. Elev.: Ground
PURPOSE: Observation Piezometer Installation					Ground Elev.: 618' ±
DRILLING METHOD: Hollow Stem Auger		SAMPLE	CORE	CASING	Datum: Temp. Access Rd.
DRILL RIG TYPE: CME 850	TYPE	Auger Cuttings		HSA	Date Started: 12/1/00
GROUNDWATER DEPTH:	DIAM.	NA		4 1/4" ID	Date Finished: 12/1/00
MEAS. PT.:	WEIGHT	NA			Driller: Jay Stockholm
DATE OF MEAS.:	FALL	NA			Inspector: Skip Delclos

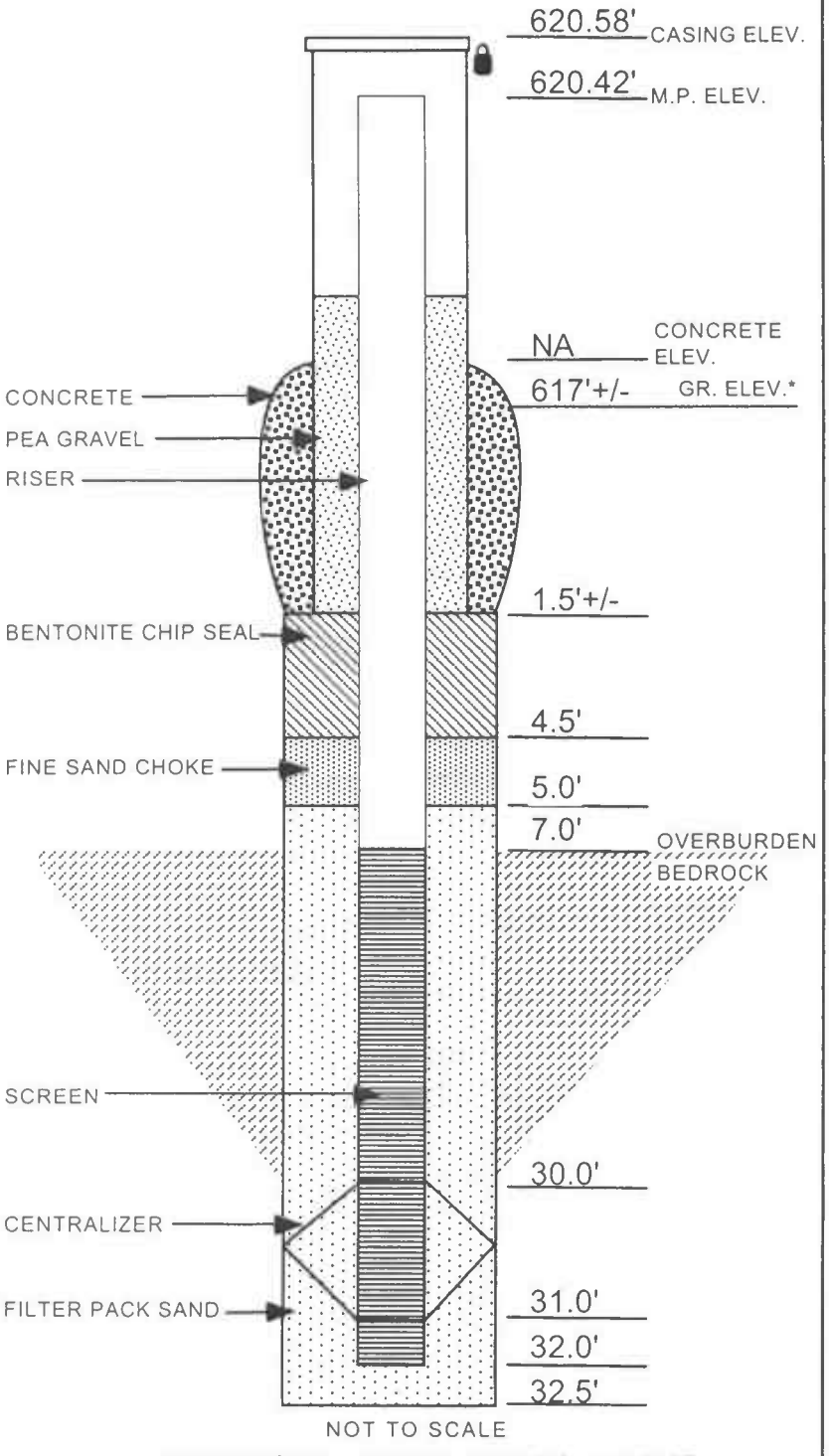
Depth (Feet)	Sample Number	Blow Count	Unified Classif-ication	Graphic Log	GEOLOGIC DESCRIPTION	REMARKS
					Grbr Cy$ l, mfs, tfG Overburden 5.0'	Geologic description from auger cutting samples collected at 5' intervals. (Only 25' taken.)
10					Auger drilling pulverizes shale. Combined w/ groundwater, all cuttings to bottom of boring are gray mud with trace of shale fragments.	Steady, firm drilling 5' - 32.5'.
20						
30					32.5' Bottom of Boring Drill w/ 4 1/4" I.D. HSAs to T.D.	
40						

OBSERVATION WELL COMPLETION LOG WELL NO. OW-1FR

Earth Tech, Inc.
12 Metro Park Road
Albany, NY 12205
(518) 458-1313

Project ChemTrol
Client SC Holdings, Inc.
Location Hamburg, New York
Project No. 42452
Date Drilled 12/1/00
Date Developed 12/6/00

WELL CONSTRUCTION DETAIL



NOT TO SCALE

DEPTHS LISTED IN FEET BELOW GRADE AT TIME OF DRILLING. DEPTHS LISTED IN PARENTHESES ARE IN FEET BELOW TOP OF PVC WELL CASING.

INSPECTION NOTES

Inspector S. Delclos
Drilling Contractor Nothnagle Drilling Co.
Type of Well Observation Piezometer
Static Water Level 8.63'
Measuring Point (M.P.) Top of PVC
Total Depth of Well 32.0'

Drilling Method
Type Hollow Stem Auger Diameter 4 1/4" I.D.
Casing None
Sampling Method Auger Cuttings
Interval 0 - 32.5'

Riser Pipe Left in Place (including stick up)
Material Sch. 40 PVC Diameter 2"
Length 10.4' Joint Type Flush Thread

Screen
Material Sch. 40 PVC Diameter 2" I.D.
Slot Size 0.020 " Length 25.0'
Stratigraphic Unit Screened Fractured Bedrock

Filter Pack Ricci Grade 0 Well Gravel
Amount 1200 lbs Interval 5.0' - 32.5'

Sand Choke Ricci Grade 00 Well Gravel
Amount 25 lbs Interval 4.5' - 5.0'

Seal(s)
Type Bentonite chips Interval 1.5' - 4.5'
Type Concrete Interval 0 - 1.5'
Type _____ Interval _____
Locking Casing ☒ Yes ☐ No

Notes:
*Ground elevation listed reflects temporary access road grade at time of drilling. Final elevation may change with final site grading/restoration. All material installation depths listed above are relative to grade during drilling.

Earth Tech, Inc. Albany, NY (518) 458-1313	**Test Boring Log**				**Boring No.** OW-2 FR
PROJECT: Chem-Trol					Sheet 1 of 1
CLIENT: SC Holdings, Inc.					Job No. 42452
DRILLING CONTRACTOR: Nothnagle Drilling Co.					Meas. Pt. Elev.: Ground
PURPOSE: Observation Well Installation					Ground Elev.: 620.6'
DRILLING METHOD: Hollow Stem Auger		SAMPLE	CORE	CASING	Datum: Temp . Access Rd.
DRILL RIG TYPE: CME 850	TYPE	Auger Cuttings		HSA	Date Started: 12/6/00
GROUNDWATER DEPTH:	DIAM.	NA		4 1/4" ID	Date Finished: 12/6/00
MEAS. PT.:	WEIGHT	NA			Driller: Jay Stockholm
DATE OF MEAS.:	FALL	NA			Inspector: Walt Howard

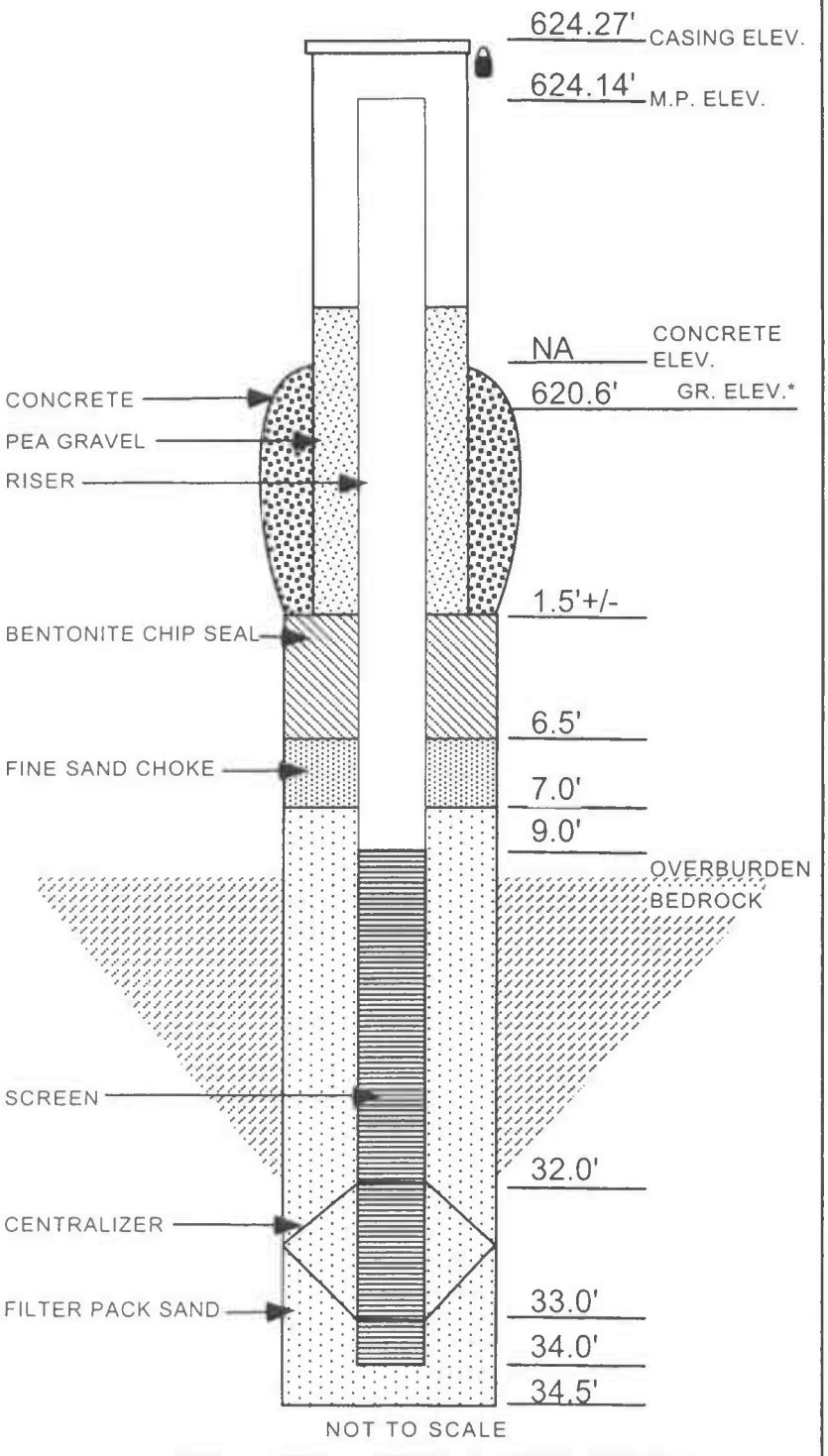
Depth (Feet)	Sample Number	Blow Count	Unified Classif-ication	Graphic Log	GEOLOGIC DESCRIPTION	REMARKS
					Bk cmf S, a Cy$, l fG: org	Geologic description from auger cutting samples collected at 5' intervals.
					(Fill)	
10					Bk Cy$ l, mfS, tfG 10.0'	
					Shale Bedrock	
					Auger drilling pulverizes shale. Combined w/ groundwater, all cuttings to bottom of boring are gray muc with trace of shale fragments.	Begin hard, chopppy drilling at 10'.
20						
30						
					34.5'	
40					Total Depth of Boring Drill w/ 4 1/4" I.D. HSAs to T.D.	

OBSERVATION WELL COMPLETION LOG WELL NO. OW-2FR

Earth Tech, Inc.
12 Metro Park Road
Albany, NY 12205
(518) 458-1313

Project ChemTrol
Client SC Holdings, Inc.
Location Hamburg, New York
Project No. 42452
Date Drilled 12/6/00
Date Developed 12/8/00

WELL CONSTRUCTION DETAIL



NOT TO SCALE

DEPTHS LISTED IN FEET BELOW GRADE AT TIME OF DRILLING. DEPTHS LISTED IN PARENTHESES ARE IN FEET BELOW TOP OF PVC WELL CASING.

INSPECTION NOTES

Inspector W. Howard
Drilling Contractor Nothnagle Drilling Co.
Type of Well Observation Piezometer
Static Water Level 12.16'
Measuring Point (M.P.) Top of PVC
Total Depth of Well 34.0'

Drilling Method
Type Hollow Stem Auger Diameter 4 1/4" I.D.
Casing None
Sampling Method Auger Cuttings
Interval 0 - 34.5'

Riser Pipe Left in Place (including stick up)
Material Sch. 40 PVC Diameter 2" I.D.
Length 12.5' Joint Type Flush Thread

Screen
Material Sch. 40 PVC Diameter 2" I.D.
Slot Size 0.020 inch Length 25.0'
Stratigraphic Unit Screened Fractured Bedrock

Filter Pack Ricci Grade 0 Well Gravel
Amount 1200 lbs Interval 7.0' - 34.5'

Sand Choke Ricci Grade 00 Well Gravel
Amount 25 lbs Interval 6.5' - 7.0'

Seal(s)
Type Bentonite chips Interval 1.5' - 6.5'
Type Concrete Interval 0 - 1.5'
Type _____ Interval _____
Locking Casing ☒ Yes ☐ No

Notes:
*Ground elevation listed reflects temporary access road grade at time of drilling. Final elevation may change with final site grading/restoration. All material installation depths listed above are relative to grade during drilling.

Earth Tech, Inc. Albany, NY (518) 458-1313	Test Boring Log	Boring No. OW-3R
PROJECT: Chem-Trol		Sheet 1 of 2
CLIENT: SC Holdings, Inc.		Job No. 42452
DRILLING CONTRACTOR: Nothnagle Drilling Co.		Meas. Pt. Elev.: Ground
PURPOSE: Observation Well Installation		Ground Elev.:

DRILLING METHOD: Hollow Stem Auger		SAMPLE	CORE	CASING	Datum: Site
DRILL RIG TYPE: CME 850	TYPE	SS		HSA	Date Started: 12/7/00
GROUNDWATER DEPTH:	DIAM.	2" O.D.		4 1/4" I.D.	Date Finished: 12/7/00
MEAS. PT.:	WEIGHT	140 #			Driller: Jay Stockholm
DATE OF MEAS.:	FALL	30"			Inspector: Walt Howard

Depth (Feet)	Sample Number	Blow Count	Unified Classif-ication	Graphic Log	GEOLOGIC DESCRIPTION	REMARKS
					Auger Cuttings 0 - 5'	
					Bk cmtG a, cmf S, l Cy$: Cndrs	
5						
	5 - 1	1 4 4 5			Grbr Cy$ t, mf s; rts org	REC = 1.3' Damp
10						

Earth Tech, Inc. Albany, NY (518) 458-1313	**Test Boring Log**	**Boring No.** OW - 3R
PROJECT: Chem-Trol		Sheet 2 of 2
CLIENT: SC Holdings, Inc.		Job No. 42452

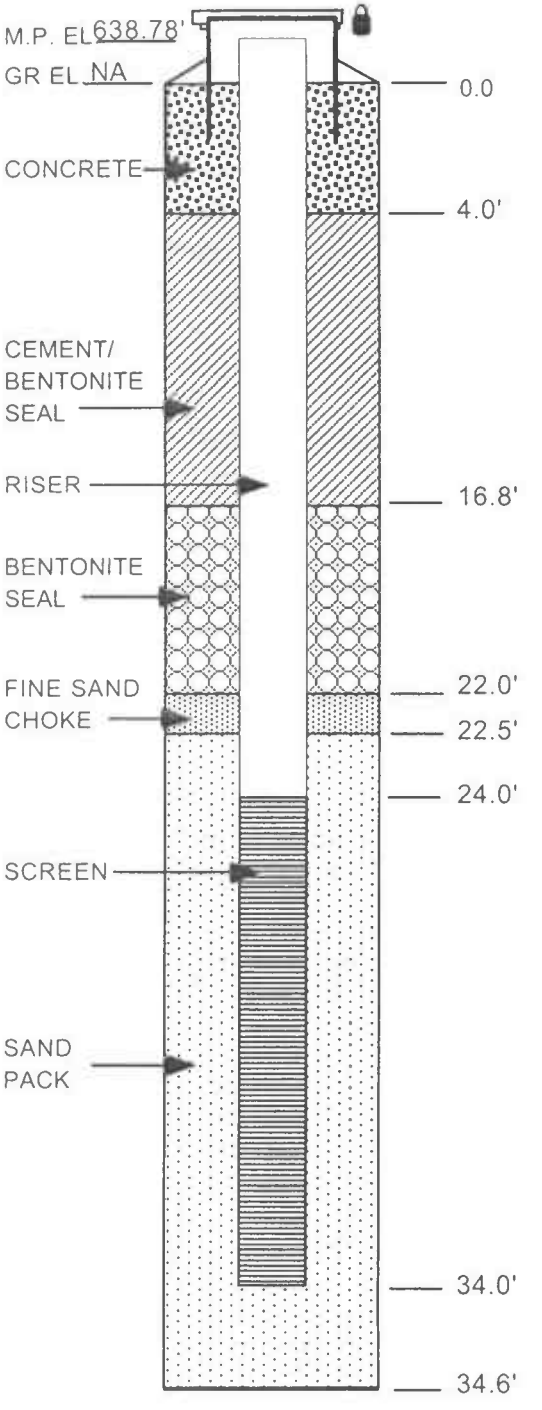
Depth (Feet)	Sample Number	Blow Counts	Unified Classif-ication	Graphic Log	Geologic Description	Remarks
10	5 - 2	3 5 5 6			Grbr Cy$: Frm dmp; disturbed 11.2' Gr C a $; tfS; wet	REC = 2.0' Damp/Wet
15	5 - 3	1 5 13 15			Gr cmfS, t Cy$, s mfG; frm; till 19.4'	REC = 1.0' Wet
					Auger refused on weathered bedrock. Begin wash rotary drilling w/ 3 7/8" roller bit to T.D.	
					Total Depth of Boring 34.6'	

OBSERVATION WELL COMPLETION LOG WELL NO. OW-3R

Earth Tech, Inc.
12 Metro Park Road
Albany, NY 12205
(518) 458-1313

Project ChemTrol
Client SC Holdings, Inc.
Location Hamburg, New York
Project No. 42452
Date Drilled 12/7/00
Date Developed 12/8/00

WELL CONSTRUCTION DETAIL



NOT TO SCALE

INSPECTION NOTES

Inspector W. Howard
Drilling Contractor Nothnagle Drilling Co.

Type of Well Observation Piezometer
Static Water Level ____ Date ____
Measuring Point (M.P.) ____
Total Depth of Well 34.0'

Drilling Method
Type HSA/Wash Rotary Diameter 4 1/4" I.D./5 7/8" O.D.
Casing 6" I.D. Temp. Set @ 19.5'

Sampling Method
Type SS Diameter 2" O.D.
Weight 140 lbs. Fall 30"
Interval 0 - 17'

Riser Pipe Left in Place (including stick up)
Material Sch. 40 PVC Diameter 2" I.D.
Length 26.0' Joint Type Flush Thread

Screen
Material Sch. 40 PVC Diameter 2" I.D.
Slot Size 0.020 inch Length 10'
Stratigraphic Unit Screened Bedrock

Filter Pack Ricci Well Gravel Grade 0
Amount 450 lbs. Interval 22.5' - 34.6'

Sand Choke Ricci Well Gravel Grade 00
Amount 25 lbs. Interval 22.0' - 22.5'

Seal(s)
Type Bentonite Pellets Interval 16.8' - 22.0'
Type Cement/Bent. Grout Interval 4.0' - 16.8'
Type Concrete Interval 0 - 4.0'

Locking Casing ☒ Yes ☐ No
Notes:

APPENDIX D – EXCAVATION WORK PLAN (EWP)

D-1 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination or breach or alter the site's cover system, the site owner or their representative will notify the NYSDEC contacts listed in the table below. Table 1 includes contact information for the above notification. 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*

Brad Demo, NYSDEC Project Manager	716-851-7139 bradley.demo@dec.ny.gov
Megan Kuczka, NYSDEC Project Manager's Supervisor	716-842-2175 megan.kuczka@dec.ny.gov
NYSDEC Site Control	DERSiteControl@dec.ny.gov

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

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent of excavation, plans/drawings for site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated, any modifications of truck routes, and any work that may impact an engineering control;
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work, and submittals (e.g., reports) to the NYSDEC documenting the completed intrusive work;

- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP, 29 Code of Federal Regulation (CFR) 1910.120 and 29 CFR 1926 Subpart P;
- A copy of the contractor's health and safety plan (HASP), in electronic format, if it differs from the HASP provided in Appendix E of this SMP;
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with the required request to import form and all supporting documentation including, but not limited to, chemical testing results.

The NYSDEC project manager will review the notification and may impose additional requirements for the excavation that are not listed in this EWP. The alteration, restoration and modification of engineering controls must conform with Article 145 Section 7209 of the Education Law regarding the application professional seals and alterations.

D-2 SOIL SCREENING METHODS

Visual, olfactory and instrument-based (e.g. photoionization detector [PID]) soil screening will be performed during all excavations into known or potentially contaminated material (remaining contamination) or a breach of the cover system. A qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State will perform the screening. Soil screening will be performed when invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the COC.

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal and material that requires testing to determine if the material can be reused on-site as soil beneath a cover or if the material can be used as cover soil. Further discussion of off-site disposal of materials and on-site reuse is provided in Section D-7 of this Appendix.

D-3 SOIL STAGING METHODS

Soil stockpiles will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters and other discharge points.

Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC.

D-4 MATERIALS EXCAVATION AND LOAD-OUT

A qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the property and remedial party (if applicable) and its contractors are responsible for safe execution of all invasive and other work performed under this Plan.

The presence of utilities and easements on the site will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the site. A site utility stakeout will be completed for all utilities prior to any ground intrusive activities at the site.

Loaded vehicles leaving the site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements). Trucks transporting contaminated soil must have either tight-fitting opaque covers that are secured on the sides and/or back, or opaque covers that are locked on all sides.

A truck wash will be operated on-site, as appropriate. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be washed at the

truck wash before leaving the site until the activities performed under this section are complete. Truck wash waters will be collected and disposed of off-site in an appropriate manner.

Locations where vehicles enter or exit the site shall be inspected daily for evidence of off-site soil tracking.

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the site are clean of dirt and other materials derived from the site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials. Material accumulated from the street cleaning and egress cleaning activities will be disposed off-site at a permitted landfill facility in accordance with all applicable local, State, and Federal regulations.

D-5 MATERIALS TRANSPORT OFF-SITE

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Material transported by trucks exiting the site will be secured with either tight-fitting opaque covers that are secured on the sides and/or back, or opaque covers that are locked on all sides. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

Truck transport routes to an appropriate disposal facility will be determined following proper characterization of waste for off-site disposal. All trucks loaded with site materials will exit the vicinity of the site using only these approved truck routes. This is the most appropriate route and takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off-site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project site.

Egress points for truck and equipment transport from the site will be kept clean of dirt and other materials during site remediation and development.

Queuing of trucks will be performed on-site in order to minimize off-site disturbance. Off-site queuing will be prohibited.

D-6 MATERIALS DISPOSAL OFF-SITE

All material excavated and removed from the site will be treated as contaminated and regulated material and will be transported and disposed off-site in a permitted facility in accordance with all local, State and Federal regulations. If disposal of material from this site is proposed for unregulated off-site disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC project manager. Unregulated off-site management of materials from this site will not occur without formal NYSDEC project manager approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, (e.g. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C&D debris recovery facility). Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include, but will not be limited to: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled consistent with 6 NYCRR Parts 360, 361, 362, 363, 364 and 365. Material that does not meet Unrestricted SCOs is prohibited from being taken to a New York State C&D debris recovery facility (6 NYCRR Subpart 361-5 registered or permitted facility).

D-7 MATERIALS REUSE ON-SITE

The qualified environmental professional, as defined in 6 NYCRR Part 375, will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material (i.e. contaminated) does not remain on-site. Contaminated on-site material, including historic fill and contaminated soil, that is acceptable for reuse on-site will be placed below a demarcation layer or impervious surface, and will not be reused within the cover system or within landscaping berms. Contaminated on-site material, exclusive of gross impacted material, may only be used beneath the site cover as backfill for subsurface utility lines with prior approval from the DEC project manager.

Proposed materials for reuse on-site must be sampled for full suite analytical parameters including per- and polyfluoroalkyl substances (PFAS) and 1,4-dioxane. The sampling frequency will be in accordance with DER-10 Table 5.4(e)10 unless prior approval is obtained from the NYSDEC project manager for modification of the sampling frequency. The analytical results of soil/fill material testing must meet the site use criteria presented in NYSDEC DER-10 Appendix 5 – Allowable Constituent Levels for Imported Fill or Soil for all constituents listed, and the NYSDEC Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (April 2023) guidance values. Approvals for modifications to the analytical parameters must be obtained from the NYSDEC project manager prior to the sampling event.

Soil/fill material for reuse on-site will be segregated and staged as described in Sections D-2 and D-3 of this EWP. The anticipated size and location of stockpiles will be provided in the 15-day notification to the NYSDEC project manager. Stockpile locations will be based on the location of site excavation activities and proximity to nearby site features. Material reuse on-site will comply with requirements of NYSDEC DER-10 Section 5.4(e)4. Any modifications to the requirements of DER-10 Section 5.4(e)4 must be approved by the NYSDEC project manager.

Any demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-site will not be performed without prior NYSDEC approval. Organic matter

(wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the site may only be reused on-site with written approval from the NYSDEC project manager.

D-8 FLUIDS MANAGEMENT

All liquids to be removed from the site, including but not limited to, excavation dewatering and large-scale effort decontamination waters will be handled, transported and disposed off-site at a permitted facility in accordance with applicable local, State, and Federal regulations.

Groundwater monitoring well purge and development waters will be collected in suitable containers (e.g., plastic five-gallon pail) for transport to and treatment through the onsite Groundwater Extraction and Treatment System.

Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the site, and will be managed off-site, unless prior approval is obtained from NYSDEC.

If an excavation design were to include a plan to discharge water generated during large-scale construction activities to surface waters (i.e., a local pond, stream or river), no such activity will occur until a State Pollutant Discharge Elimination System (SPDES) permit, or equivalent, is obtained.

D-9 COVER SYSTEM RESTORATION

After the completion of soil removal and any other invasive activities the cover system will be restored in a manner that complies with the Record of Decision. The existing cover system is comprised of a minimum of 1.5 feet of imported soil and 0.5 feet of topsoil, upon which a grass cover is maintained. The placement of a demarcation layer was not required at the time of cover system installation (1998). Should new material be imported to the Site to serve as part of the cover system a demarcation layer, consisting of orange snow fencing material, white geotextile or equivalent material, will be placed at the location of the final placement of the new material to provide a visual reference to the top of the remaining contamination zone, the zone that requires adherence to special conditions for disturbance of remaining contaminated soils defined in this SMP. If the type of cover

system changes from that which exists prior to the excavation (i.e., a soil cover is replaced by asphalt), this will constitute a modification of the cover element of the remedy and the upper surface of the remaining contamination. A figure showing the modified surface will be included in the subsequent Periodic Review Report and in an updated SMP. The alteration, restoration and modification of engineering controls must conform with Article 145 Section 7209 of the Education Law regarding the application professional seals and alterations.

D-10 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import onto the site will be approved by the qualified environmental professional, as defined in 6 NYCRR Part 375, and will be in compliance with provisions in this SMP prior to receipt at the site. A Request to Import/Reuse Fill or Soil form, which can be found at http://www.dec.ny.gov/regulations/67386.html, will be prepared and submitted to the NYSDEC project manager allowing a minimum of 5 business days for review. A copy of the form is presented in Appendix D-1.

Material from industrial sites, spill sites, other environmental remediation sites, or potentially contaminated sites will not be imported to the site.

All imported soils will meet the backfill and cover soil quality standards established in 6 NYCRR 375-6.7(d) and DER-10 Appendix 5 for commercial use. Soils that meet ‘general’ fill requirements under 6 NYCRR Part 360.13, but do not meet backfill or cover soil objectives for this site, will not be imported onto the site without prior approval by NYSDEC project manager. Soil material will be sampled for the full suite of analytical parameters, including PFAS and 1, 4-dioxane. Solid waste will not be imported onto the site.

Trucks entering the site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

D-11 STORMWATER POLLUTION PREVENTION

In the event excavations less than 1 acre in size are performed, an activity-specific Stormwater Pollution Prevention Plan will be provided to NYSDEC for review prior to performing intrusive work. In the event an excavation exceeding 1 acre is performed, a Stormwater Pollution Prevention Plan that conforms to the requirements of the NYSDEC Division of Water guidelines and NYS regulations will be prepared for NYSDEC review.

D-12 EXCAVATION CONTINGENCY PLAN

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition. The NYSDEC project manager will be promptly notified of the discovery.

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes [TAL metals, TCL volatiles and semi-volatiles (including 1,4-dioxane), TCL pesticides and PCBs, and PFAS], unless the site history and previous sampling results provide sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC project manager for approval prior to sampling. Any tanks will be closed as per NYSDEC regulations and guidance.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone within two hours to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the Periodic Review Report.

D-13 COMMUNITY AIR MONITORING PLAN

In the event this EWP is implemented, the Community Air Monitoring Plan (CAMP) will be consistent with the guidance provided in the New York State Department

of Health (NYSDOH) Generic CAMP obtained in Appendix 1A of DER-10. The locations of the air sampling stations will be based generally on prevailing wind conditions. Prevailing wind direction at the Site is generally out of the southwest. Locations will be adjusted on a daily or more frequent basis based on actual wind directions to provide an upwind and at least two downwind monitoring stations.

Exceedances of action levels listed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers.

D-13A: Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures

There are no individuals or structures within 20 feet of active Site areas.

D-13B Special Requirements for Indoor Work with Co-Located Residences or Facilities

There are no occupied indoor spaces or co-located residences or facilities at the Site.

D-14 ODOR CONTROL PLAN

In the event excavations are required, this odor control plan is intended to control emissions of nuisance odors off-site. Industry-standard odor control methods such as misters or foams may be used if deemed necessary. If nuisance odors are identified at the site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the remedial party's Remediation Engineer, and any measures that are implemented will be discussed in the Periodic Review Report.

Industry-standard means will be considered and may be employed to prevent on- and off-site nuisances. At a minimum, these measures may include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and

other covers; or (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will be considered and may include: (d) direct load-out of soils to trucks for off-site disposal; (e) use of chemical odorants in spray or misting systems; or, (f) use of staff to monitor odors in surrounding neighborhoods.

D-15 DUST CONTROL PLAN

Particulate monitoring must be conducted according to the Community Air Monitoring Plan (CAMP) provided in DER-10, Appendix 1B. If particulate levels at the site exceed the thresholds listed in the CAMP or if airborne dust is observed on the site or leaving the site, the dust suppression techniques listed below will be considered and may be employed. The remedial party will also take measures listed below to prevent dust production on the site.

In the event this excavation work plan is implemented, a dust suppression plan will be developed for NYSDEC review that addresses dust management during invasive on-site work. Dust control measures may include the items listed below:

- Dust suppression may be achieved using a dedicated on-site water truck for road wetting. The truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing of larger sites may be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.
- Gravel may be used on roadways to provide a clean and dust-free road surface.
- On-site roads will be limited in total area to minimize the area required for water truck sprinkling.

D-16 OTHER NUISANCES

If necessary, a plan will be developed and utilized by the remedial contractor for all remedial work to ensure compliance with local noise control ordinances. A plan of this type is generally not required to be submitted to NYSDEC for approval.

APPENDIX D-1 REQUEST TO IMPORT/REUSE FILL MATERIAL FORM

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Request to Import/Reuse Fill or Soil

This form is based on the information required by DER-10, Section 5.4(e) and 6NYCRR Part 360.13. Use of this form is not a substitute for reading the applicable regulations and Technical Guidance document.

SECTION 1 – SITE BACKGROUND

Site Name:

Site Number:

The allowable site use is: Choose an item

Have Ecological Resources been identified? Choose an item

Is this soil originating from the site? Choose an item

How many cubic yards of soil will be imported/reused? Choose an item

If greater than 1000 cubic yards will be imported, enter volume to be imported:

SECTION 2 – MATERIAL OTHER THAN SOIL

Is the material to be imported gravel, rock or stone? Choose an item

Does it contain less than 10%, by weight, material that passes a size 100 sieve? Choose an item

Is this virgin material from a permitted mine or quarry? Choose an item

Is this material recycled concrete or brick from a DEC registered processing facility? Choose an item

SECTION 3 - SAMPLING

Provide a brief description of the number and type of samples collected in the space below:

Example Text: 5 discrete samples were collected and analyzed for VOCs. 2 composite samples were collected and analyzed for SVOCs, Inorganics & PCBs/Pesticides.

If the material meets requirements of DER-10 section 5.4(e)5 (other material), no chemical testing needed.

SECTION 3 CONT'D - SAMPLING

Provide a brief written summary of the sampling results or attach evaluation tables (compare to DER-10, Appendix 5):

Example Text: Arsenic was detected up to 17 ppm in 1 (of 5) samples; the allowable level is 16 ppm.

If Ecological Resources have been identified use the "If Ecological Resources are Present" column in Appendix 5.

SECTION 4 – SOURCE OF FILL

Name of person providing fill and relationship to the source:

Name and address of fill source:

Location where fill was obtained:

Identification of any state or local approvals as a fill source:

If no approvals are available, provide a brief history of the use of the property that is the fill source:

Provide a list of supporting documentation included with this request:

The information provided on this form is accurate and complete.

_____ _____

Signature Date

_____

Print Name

_____

Firm

APPENDIX E – HEALTH AND SAFETY PLAN

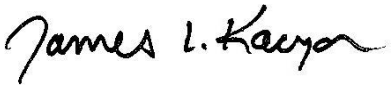
Project-Specific SH&E Plan

Chem-Trol Site
60779298
4818 Lake Avenue
Buffalo, NY 14219
U.S.A.
Latitude: 42.79836345
Longitude: -78.80305177

S3AM-209-FM2
Revision 9
December 12, 2025

Delivering a better world

Quality information

Prepared by	Checked by (Area/Regional/Business Line SH&E Manager or Delegate)	Approved by (Project Manager, Project Director, or Business Line Lead)
		
Signature	Signature	Signature
Kevin J. McGovern, PG, CHMM, STS	Caroline Lee, CSP	James Kaczor, PG
Print Name	Print Name	Print Name

Expiration:	**February 5, 2027**	**Valid for 1 year maximum or until the scope of work, subcontractor(s), methods and/or equipment change.**

Revision History

Revision	Revision date	Details	Authorized	Name	Position

Distribution List

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Table of Contents

1. Safety, Health, and Environment (SH&E) Program 1
1.1 AECOM SH&E Policy 1
1.2 Safety for Life 1
1.3 Life-Preserving Principles 1
1.4 Safety Tenets 1
2. Project Contacts and Resources 2
2.1 Key Personnel 2
2.2 Site Safety Lead (SSL) Determination 2
2.3 Short Service Employee (SSE) Log 2
2.4 Subcontractors and Third Parties 3
2.5 Lone Worker Management Plan 3
3. Site Description and Scope of Work 4
4. Risk Assessment 6
4.1 Anticipated Activities, Situations, and Hazards 6
4.2 Task Hazard Assessment (THA) 12
4.3 Daily Safety Meeting 12
4.4 4-Sight 13
4.5 Stop Work Authority 13
5. Project-Specific SH&E Training 13
5.1 Risk-Based Training 13
6. Personal Protective Equipment (PPE) 15
7. Contractor Management 16
8. Monitoring Performance 17
8.1 Safety Observations and Near Miss Reporting 17
8.2 Corrective Actions for Non-Conformances 17
8.3 Incident Reporting and Response 17
8.4 Audits, Inspections, and Reviews 17
9. Variance to SH&E Management System Requirement 18
10. Personal Acknowledgement 19
Appendix A Emergency Response Plan 20
A.1 Phone List 20
A.2 Additional Phone Numbers 21
A.3 Location Emergency Map(s) 22
A.4 Site Emergency Equipment and Its Location 23
A.5 Directions to Clinic 24
A.6 Directions to Hospital 25
A.7 Method(s) of Emergency Alarm 26
A.8 Evacuation and Sheltering in Place 26
A.9 Medical Emergency 26
A.10 Fire 27
A.11 Workplace Violence 27
A.12 Spill, Leak, or Release of Hazardous Materials (HAZMAT) 27
A.13 Vehicle Incident 28
A.14 Floods/Heavy Rain 28
A.15 Wildfire and Wildfire Smoke 29
A.16 Hurricane 30

A.17 Lightning....30
A.18 Tornado....31
A.19 Earthquake....31
A.20 Severe Weather Storms....32
A.21 Power Outage....32
A.22 Electrical Live Line Contact....32
A.23 Gas Odor or Major Leak....33
Appendix B Pre-Task Forms....34
Appendix C Field Forms....35
Appendix D Applicable SH&E Procedures....36

1. Safety, Health, and Environment (SH&E) Program

1.1 AECOM SH&E Policy

The SH&E Policy – AECOM Global (available on AECOM's Ecosystem intranet) establishes the framework to safeguard AECOM employees and stakeholders through effective management of risk and commitment to a Culture of Caring.

1.2 Safety for Life

Safety for Life is our comprehensive global SH&E program. Its key components, our Culture of Caring, our foundational Life-Preserving Principles, and a wealth of supporting resources and tools, combine to enable AECOM personnel to contribute to and apply our Safety for Life program both on and off the job.

1.3 Life-Preserving Principles

AECOM has adopted the Life-Preserving Principles – AECOM Global (available on AECOM's Ecosystem intranet) which guide our global SH&E program, Safety for Life. These nine principles advance our commitment to achieve our ultimate objective of incident prevention, and protection of the environment while executing our work.

1.4 Safety Tenets

The safety tenets listed below must be followed. If a violation of a safety tenet is observed, the associated work activity must be stopped immediately, and corrective action must be taken.

1.	Use Stop Work Authority immediately upon observation of Imminent Danger. Refer to Safety Tenets and Stopping Work – Americas.
2.	Keep the worksite free of hazards that could cause slips, trips, and falls. For work at height, refer to Work at Height – Americas.
3.	Obtain authorization before entering a confined space. Refer to Confined Spaces – Americas.
4.	Confirm that safety precautions are in place for ground intrusive work. Refer to Ground Disturbance – Americas.
5.	Take precautions to prevent falling into a body of water when working on, in, and near water. Refer to Work On, In, or Near Water – Americas.
6.	Do not work alone when performing tasks with High Potential (HiPo) Risks or when working remotely. Refer to SH&E Risk Assessment and Planning – Americas.
7.	Only work on or near a roadway with proper traffic safety controls in place. Refer to Highway and Road Work – Americas.
8.	Only foul a railroad track with appropriate approvals, proper training, and train protection. Refer to Railroads – Americas.
9.	Wear a seatbelt and never use mobile communication devices or other devices while driving. Refer to Driving – Americas.
10.	Assess risk for all work and changes to scope of work. Refer to SH&E Risk Assessment and Planning – Americas.
11.	Complete SH&E training required to perform identified tasks. Refer to SH&E Training – Americas.
12.	Conduct site-specific safety orientation for all first-time visits. Refer to SH&E Training – Americas.
13.	Use the required personal protective equipment (PPE). Refer to Safety Gear – Americas.
14.	Only use equipment that is maintained in a safe condition and appropriate to the work performed. Refer to Heavy Equipment and Machines – Americas and Hand and Power Tools – Americas.
15.	Report for work fit for duty. Refer to Fitness for Duty – Americas.

2. Project Contacts and Resources

2.1 Key Personnel

Level	Title	Name	Phone #
Project Level	**Project Manager (PM)**	James Kaczor, PG	(716) 866-0522
	Site Supervisor (SS)	Tom Urban	(716) 936-4582
	Site Safety Lead (SSL): if applicable (Section 2.2)	Tom Urban	(716) 936-4582
	Client Contact	Ryan Donovan	(413) 427-4432
*Region Level	**SH&E Manager**	Caroline Lee (Env East)	(445) 345-3568
	Regional SH&E Director	Peter Gregory	201.602.3511

*Note: For guidance on who to list, refer to the appropriate SH&E Organization Chart:

East Org Chart	West Org Chart	Canada Org Chart

2.2 Site Safety Lead (SSL) Determination

AECOM SSL requirements apply if the answer is "yes" to both questions below.

1.	**Will an AECOM employee be tasked with directly supervising safety implementation on a program or project?**	☒ Yes ☐ No
2.	**Do the program or project activities include one or more high hazards (see Question 3 below)?**	☒ Yes ☐ No

Note: If you have questions about "high hazard" activities, please reach out to your SH&E Manager – the Ask SH&E link may be used.

3. Select one of the two options below:

☒ **Site Safety Lead is approved (through the SSL Platform), and the PM acknowledges the SSL is qualified and authorizes the SSL to monitor/supervise the following high hazards (check the boxes below that apply):**

☐ Confined Spaces	☐ Hazardous Energy/Control	☐ Underground Work
☒ Hazardous Substances/Respiratory Protection	☐ Heavy Equipment/Machines	☐ Working at Heights
☐ Ground Disturbance	☐ Highway and Road Work	☐ Work On, In, or Near Water
☒ Power Tools	☐ Railroad	☐ Radiological Hazards
☐ Non-Standard Driving (e.g., utility task vehicles, all-terrain vehicles, off-road vehicles, and pulling a trailer or other equipment)	☐ Other - **Specify**:	Click here to enter

☐ **An approved SSL is NOT required for the project scope of work.**

2.3 Short Service Employee (SSE) Log

1. An Employee is designated as an SSE if they are undertaking work in the field and have less than 6 months experience working in the industry of the work to be performed. An employee is not considered an SSE, when they have more than 6 months field work experience in a similar industry and can demonstrate competency in AECOM's safety management system and processes.

2.	☒	Project scope of work does **NOT** involve short service employees.

2.4 Subcontractors and Third Parties

1. **Refer to Subcontractor Selection and Stewardship – Americas.**

2.

☐ Project scope of work does NOT involve AECOM subcontractors or third parties.

☒ Project scope of work DOES involve one or more AECOM subcontractors and/or third parties. Their information is provided below.

Company/ Affiliation	Relationship to AECOM	Primary Emergency Contact	Alternate Emergency Contact	Phone Number
Matrix Environmental Technologies, Inc.	☒ AECOM Subcontractor (Managed) ☐ Sub of AECOM Sub (Managed) ☐ Client Direct-Hire Contractor (Unmanaged) ☐ Third Party (Unmanaged)	Steven L. Marchetti	TBD	585-770-4332

Notes:

a. An emergency contact is someone who is capable of initiating medical case management/incident response for their company.

b. An alternate emergency contact is recommended, but not required for client direct-hire contractors and third parties.

c. For a subcontractor of an AECOM subcontractor, one of the emergency contacts can be a representative from the AECOM subcontractor that hired them.

2.5 Lone Worker Management Plan

1. **AECOM discourages employees from working alone (i.e., where AECOM personnel are out of visual and audio range of others) when performing field tasks. If lone work is to be performed, a communications/check-in plan must be developed and implemented.**

2. ☒ The project scope of work does NOT involve the lone worker operations.

3. Site Description and Scope of Work

1. Site Location and Description	The Site, Chem-Trol Site is located at 4818 Lake Avenue, Buffalo, NY 14219. The Chem-Trol Site consists of 17.5 acres of open land. The site is located in an urban setting and is bounded by Lake Avenue and commercial properties to the south, the South Branch of Smokes Creek and residential properties to the west, a tributary to the South Branch of Smokes Creek and commercial/industrial properties to the north, and a private residence and commercial property to the east. Prior to 1972, the South Branch of Smokes Creek followed a meandering path across the western portion of the site. In 1972, the alignment of the creek was shifted to the west, and currently runs in a straight channel along the western boundary of the property. A floodplain exists between the former and present channels of the creek. The elevation of the creek is approximately twenty feet lower than the rest of the site, which is relatively flat-lying. The site is zoned for commercial use and is currently vacant.

2. Site Background/ History	In 1969, Chem-Trol Pollution Services purchased the property and began operations as a waste chemical processing facility. These operations included chemical recovery, storage and neutralization. Wastes that were accepted at the facility for processing included the following: capacitors, insecticides, pesticides, oil sludges, paint sludges, pickle liquors, phenolic resins, spent solvents, and chemical processing wastewater. At the facility, these wastes were staged in drums, lagoons, or large (approximately 5,000 gallon) above ground storage tanks. The wastes were distilled or incinerated at the site. In early 1972, operations at the site were terminated, and the associated chemical waste inventory and processing equipment were relocated to a new Chem-Trol Facility in Model City, New York. In June 1972 a major fire occurred at the facility. Water from the firefighting efforts was ponded in the floodplain, behind a temporary dike that had been placed along the eastern shoreline of the South Branch of Smokes Creek. In October, 1973, Chem-Trol was acquired by SCA Services, Inc, and in 1984, SCA Services was acquired by, and became a subsidiary of, Waste Management, Inc. In 1977 SCA Services, Inc completed the following closure actions at the facility: (1) removal of approximately 95 cubic yards of contaminated soil from the lagoons, (2) placement of a clean soil cover over the excavation area, and (3) seeding of the area to establish a vegetative cover. In June 1988 the NYSDEC completed a Phase I Investigation at the site. This investigation included a review of documents, reports and investigations available at that time. In April 1991 Waste Management completed a Phase II Investigation at the site. This investigation included the installation of nine monitoring wells, the chemical analyses of soil samples from various areas of the site, the determination of groundwater flow patterns in the overburden and upper bedrock water bearing zones, and the completion of geophysical surveys to determine the presence of any buried metallic objects (e.g., drums or tanks). Based upon the results of the Phase II Investigation, the site was listed as a Class 2 site in the Registry of Inactive Hazardous Waste Disposal Sites in New York State. In November 1994 SCA Services, Inc completed a Remedial Investigation (RI) at the site. This investigation documented the presence of volatile organic compounds, PCBs and metals in site soils, the presence of PCBs and chromium in sediments in the on-site tributary, and the presence of volatile organic compounds in overburden and upper bedrock groundwater. In March 1995 SCA Services, Inc completed a Feasibility Study (FS) for the site. This study evaluated various remedial alternatives for the site. In March 1996 a Record of Decision for the site was issued by the NYSDEC that included: (1) excavation of contaminated soils and sediments from selected areas of the site, (2) installation of a groundwater collection trench along the western edge of the site, (3) improvement of the existing soil cover over the former waste chemical processing area, and (4) installation of a soil vapor extraction (SVE) system in the former waste chemical processing area. Site Remediation: The selected remedy for site soils and sediments was completed by SCA Services, Inc. in 1998, while construction of the groundwater collection trench and treatment system was completed in 2001. Soil Vapor Intrusion Evaluation: In September 2006 SC Holdings, Inc installed two temporary soil vapor intrusion (SVI) probes at the site and sampled them in accordance with NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York. The purpose of the SVI evaluation was to determine whether VOCs from the site were migrating in soil vapor beyond the western property boundary of the site. The results of the SVI assessment indicated that vapor intrusion into residential homes west of the site is not a concern. Soil Vapor Extraction System Evaluation: During 2010 SC Holdings, Inc completed an evaluation of the SVE system when operating in a passive mode (i.e., air was not actively being pumped from the system). The results of the evaluation indicated that the passive operation of the SVE system was effective at venting soil vapors containing VOCs. Based upon these results, SC Holdings recommended that active operation of the SVE system permanently cease and that passive operation of the SVE system continue in the future. The NYSDEC agreed with this recommendation in March 2011.
3. Client and/or Third-Party Operations at Site	☒ There are NO client and/or third-party operations anticipated at the Site during AECOM's field activities.

4. Scope of Work	The scope of work is as follows:
	• Routine, recurring O&M of groundwater collection and treatment system
	• Collection of treated water effluent sample on an every-other-month schedule (odd-numbered months)
	  ○ Sample for VOCs (site-specific short list), iron, and other permit-equivalent parameters
	• Periodic cleaning of shallow-tray air striper to remove iron bacteria on an every-other-month schedule (even-numbered months)
	  ○ Cleaning consists of removing stainless steel air stripper trays and power washing
	• Non-routine O&M of groundwater collection and treatment system
	  ○ Typically handled by subcontractor Matrix Environmental Technologies
	  ○ Typically involves updating/adjusting logic controller, replacement of PVC piping, etc.
	• Semi-annual groundwater elevation monitoring of site monitoring wells
	• Every-other-year groundwater monitoring event (six wells).

Project Start Date	12/10/2010	**Field Work Start Date or Next Mobilization to Site**	12/10/2010	**Project Completion Date**	12/31/2026

4. Risk Assessment

☐	AECOM or AECOM-managed subcontractors are NOT self-performing or exposed to any of the activities below.
☒	AECOM or AECOM-managed subcontractors are self-performing or exposed to any of the activities/hazards below.

Drug & Alcohol Testing	Medical Surveillance	Heat and Cold Stress
Excessive Noise	Biological Hazards	Ground Disturbance
Heavy Equipment and Machines	Railroads	Underground Work
Highway and Road Work	Hazardous Substances and Communication	Hand and Power Tools
Confined Spaces	Working at Height	Work On, In, or Near Water
Respiratory Protection	Hot Work	Hazardous Energy Control
Radiological Hazards		

Non-standard driving activities, including undertaking trips more than 250 miles each way, driving in remote or hazardous areas, or operation of utility task vehicles (UTVs), all-terrain vehicles (ATVs), off-road vehicles, towing trailers or other equipment

4.1 Anticipated Activities, Situations, and Hazards

Select all applicable boxes that describe the activities, situations, or hazards expected to occur during the project's scope of work.

Fitness for Duty – Americas		
☒	**Does the project scope of work or the work location require workers to be**	**If not already enrolled and current, contact the Occupational Health Team at nurse@aecom.com and indicate any project-specific protocols.**

	enrolled in a medical surveillance program?	
Substance Abuse Prevention – Americas		
☐	**Is drug testing required by law or client for the specific work activities being performed?**	**Contact the Americas Drug and Alcohol Program Coordinator at nurse@aecom.com**
Hazardous Substance and Communication – Americas		
☒	**Does the project scope of work require chemical materials (i.e., hazardous materials/substance and/or Materials of Trade) to be brought onto the site to perform work?**	**Use Project Hazardous Materials Communication Plan – Americas**
☒	**Is potential exposure to chemical hazards reasonably anticipated to have the potential to result in inhalation, dermal contact, ingestion, or injection routes of exposure during the performance of one or more tasks?** **Chemical hazards can be from materials brought on the Site to perform work, constituents of concern found or suspected to be in environmental media under investigation, and/or simultaneous operations being performed at the Site by the property owner/third party.**	**For the U.S., use Project Hazardous Substance Exposure Control Plan – Americas**
☒	**Will activities being performed at hazardous waste sites involve or potentially involve employee or equipment exposure to and/or physical contact with hazardous materials, hazardous substances, hazardous wastes and/or health hazards?**	**For the U.S., use Project Hazardous Substance Exposure Control Plan – Americas**
Respiratory Protection – Americas		
☐	**Are respirators required for use on site?**	**If yes, please complete the following:**
		Type of respirator to be used
		Click here to enter
		Type of cartridge to be used
		Click here to enter
		Hazardous material(s) being controlled by the respirator
		Click here to enter
		Cartridge change out schedule
		Click here to enter
		Respirator storage procedure
		Click here to enter
		Respirator maintenance procedure
		Click here to enter
		Locations on the site and for which task(s) respirators are required
		Click here to enter
		Add Respiratory Equipment Inspection – Americas, as required
☐	**Are respirators being used voluntarily?**	**Add Voluntary Use of Respirators– Americas**

☐	**Will activities include hot work?**	**If yes, add contractor/client hot work procedures and permit form**
Heat and Cold Stress – Americas		
☒	**Will you perform activities with potential for heat stress to occur?**	**Source(s) of heat stress**
		Weather
		Engineering controls
		Wait for cooler weather
		Administrative controls
		Cooling breaks, with drinks (e.g.., Gatorade, etc.).
		Personal protective equipment
		Ice Vest
		If applicable, add Heat Stress Monitoring Log – Americas
		Add a heat stress monitoring plan if required by the state where the work will take place (e.g., Oregon, California, Washington, Nevada, or Maryland)
☒	**Will you perform activities with potential for cold stress to occur?**	**Engineering controls**
		Wait for warmer weather
		Administrative controls
		Warming breaks, with hot liquid
		Personal protective equipment
		Warm Cloths
Biological Hazards – Americas		
☒	**Are there any known wildlife, domestic animals (including pets or livestock), biting or stinging insects, or hazardous plants present at the project site?**	**Complete the biological hazard control plan below.**
		Animals of concern (select all that apply)
		☐ Bears ☐ Carnivores ☐ Ungulates (hoofed mammal) ☐ Snakes ☐ Alligators
		☐ Other (specify): Click here to enter
		Insects of concern (select all that apply)
		☒ Ticks ☐ Spiders ☐ Stinging Insects (Bees/Mosquitos)
		☐ Other (specify): Click here to enter
		Plants of concern (select all that apply)
		☐ Poison ivy ☐ Poison oak ☐ Poison sumac ☐ Giant hogweed (giant cow parsnip) ☐ Wild parsnip ☐ Devils club ☐ Stinging nettle
		☐ Other (specify): Click here to enter
		Equipment to be used specific to animals, plants, and insects of concern (e.g. snake chaps, bear spray, etc.)
		Click here to enter
		Identify the response procedure in case one is encountered
		Avoidance, tick checks and have a tick removal tool on their person.
☐	**Will you be required to work in areas that may expose you to human bodily**	**Bloodborne Pathogen – Exposure Control Plan**
		Exposure Determination (source of exposure)

	fluids (e.g., wastewater treatment plants, sanitary sewers, sharps, abandoned buildings etc.)?	Click here to enter
		Training
		Click here to enter
		Hepatitis B Vaccination offered
		Click here to enter
		Engineering Work Practice Controls
		Click here to enter
		PPE
		Click here to enter

Noise – Americas

☒	**Will your work activities expose or potentially expose you to an average of 85 decibels (dBA) over an 8-hour period, or 94 decibels over a 1-hour period?** **Note: A sign and symptom of exceeding 85 dBA may be having to shout to be heard by someone 3 feet away, and/or experiencing ringing of your ears, respectively.**	**Hearing protection device (HPD) selected**	Ear Plugs
		Areas of required HPD use	Click here to enter
		Monitoring Procedures and Action Levels Noise Dosimeter Instrument Type	Click here to enter

Action Level	Response Activity
<85 dBA	• **Continue work activities.**
>85 dBA	• **Don hearing protection (plugs or muffs) with Minimum Noise Reduction Rating (NRR) of 27.**
	• **Contact the Site Safety Lead or Supervisor.**
>95 dBA	• **Don dual hearing protection (muffs over plugs).**
	• **Contact the Site Safety Lead or Supervisor.**
>100 dBA	• **Cease activities and contact the Site Safety Lead or Site Supervisor.**
	• **Implement additional control measures and obtain Project Manager approval before resuming work.**

Radiological Hazards – Americas

☐	**Will you be entering a posted Radiation Area or other radiologically controlled area, room, vehicle or enclosure; or a radiologically controlled area without an escort operating under a separate Radiation Protection Plan?**	**Contact Regional Radiation Safety Officer (RSO).**
☐	**Will you be shipping, receiving, transporting, storing or operating a portable nuclear densometer gauge?**	**Contact Regional RSO. For the U.S., refer to U.S. Gauge Source – Radiation Protection Program (RPP) – DCS – Americas – U.S.**

Driving – Americas

☐	**Will you undertake trips more than 250 miles each way or drive in remote or hazardous areas?**	**Add Journey Management Plan – Americas**
☐	**Will you be required to operate off-road vehicles (e.g., ATV, snowmobile, etc.)?**	**Add Off-Highway Vehicle Inspection – Americas**

Ground Disturbance – Americas		
☐	**Will you be performing/managing excavation, drilling, surface mining, and/or other ground disturbance operations?**	**Add Utilities and Subsurface Clearance Checklist – Americas**
☐	**Will you be working around or performing oversight of drilling operations?**	**Add Drill Site Safety Inspection Checklist – Americas**
☐	**Will you be designated as the Competent Person for excavation and/or trenching operations?**	**Add Daily Excavation Checklist – Americas**
☐	**Is there a potential to encounter munitions and explosives of concern (MEC), which includes unexploded ordnance (UXO), discarded military munitions (DMM), and explosive compounds, on a project site?**	**Contact the Munitions Response Program (MRP) Technical Group**
Work at Height – Americas		
☐	**Will you be working on sites where fall protection hazards are present but managed by others?**	**If yes, add contractor/client fall protection plan.**
☐	**Will you be directly responsible/managing fall protection systems and work at height procedures?**	**Add Fall Protection Plan – Americas** **As applicable, add:** **Fall Protection Harness Inspection – Americas** **Fall Protection Lanyard Inspection – Americas** **Fall Protection Life Line Inspection – Americas** **Fall Protection Rope Grab Inspection – Americas** **Fall Protection Cable Sling Inspection – Americas** **Fall Protection Carabiner Inspection – Americas**
☐	**Will you be required to use ladders?**	**Add Ladder THA; refer to the THA Library Ecosystem page**
☐	**Will you be required to use scaffolds?**	**Add Scaffold THA; refer to the THA Library Ecosystem page**
☐	**Will you be required to use mobile elevating work platforms?**	**Add Mobile Elevated Work Platform (MEWP) THA; refer to the THA Library Ecosystem page**
☐	**Will you be required to use rope access?**	**Add a rope access safe work plan**
Highway and Road Work – Americas		
☐	**Will you work on or adjacent to a roadway with live traffic being managed by others?**	**Attach the site-specific traffic control plan (TCP) being implemented by others (contractors, client, etc.)**
☐	**Will AECOM be responsible for and/or directly managing traffic control procedures, implementation, and set-up while working on/adjacent to live traffic, no matter the duration?**	**Attach a site-specific traffic control plan (TCP) prepared by a Competent Person.**
Confined Spaces – Americas		
☐	**Will you be required to enter or directly manage contractors entering confined spaces?**	**Add Confined Space Entry Classification / Permit – Americas**
Work On, In, or Near Water- Americas		

☐	**Will you be working on, in or near open water hazards?**	**Source(s) and nature of hazard(s)**	Click here to enter
☐	**Will you be working on a vessel located offshore?**	**Add Float Plan – Americas**	
☐	**Will offshore vessel work be potentially subjected to or impacted by extreme weather?**	**Add Weather Plan -Americas**	
☐	**Is underwater diving required?**	**Contact AECOM Dive Safety Team; refer to AECOM Dive Safety Ecosystem page.**	
Railroads – Americas			
☐	**Will you be required to work on or near railroads?**	**Add Railroad THA – refer to THA Library Ecosystem page**	
		Railroad Agency	Click here to enter
Hazardous Energy Control – Americas			
☒	**Will you be working around (exposure), but not on live electrical equipment (not including power tools)?** **(Examples - Overhead lines and obstructions. extension cords/ temporary electric power, lights and task lights, circuit breakers, hydraulic, mechanical and pneumatic sources.)**	**Describe hazardous energy sources:**	
		Electricity	
☒	**Will you be required to apply Lockout/Tagout procedures?**	**Lock and Tag Log – Americas** **As applicable, add:** **Lockout Tagout Permit – Americas** **Equipment-Specific LOTO Process Template – Americas**	
☐	**Will the job require you to operate or use a machine or equipment that may present an electrical hazard?**	**Add machine- and/or equipment-specific THA.**	
Heavy Equipment and Machines – Americas			
☐	**Will you be working on sites with exposure to heavy mobile equipment (skid steers, back hoes, excavators, etc.)?**	**Describe onsite heavy equipment:**	
		Click here to enter	
☐	**Does your work involve directly managing employees and/or subcontractors operating heavy equipment and/or machines?**	**As applicable, add:** • **Lift Classification Checklist – Americas** • **Critical Lift Plan – Americas** • **Personnel Platform Lifting – Americas** • **Pre-Operations Powered Industrial Truck Checklist** • **MEWP Pre-Operation Checklist – Americas** • **Under Bridge Inspection Unit Pre-Operation Checklist – Americas**	
Hand and Power Tools – Americas			
☒	**Will you be required to work with hand and/or power tools?**	**Add Tool-Specific THA and manufacturer's operating manual**	
Underground Work – Americas			
☐	**Will you be constructing or entering underground tunnels, shafts, chambers, or passageways?**		
☐	**Will you be performing down-hole geologic logging or caisson inspections?**		
☐	**Does your work involve cut-and-cover excavations both physically connected to ongoing underground construction operations and covered in such a manner as to create conditions characteristic of underground construction?**		

4.2 Task Hazard Assessment (THA)

1. THA forms must be prepared using Task Hazard Assessment – Americas or equivalent for each task to be performed as part of the scope of work as well as the hazards, associated risk, and appropriate controls for all other on-site activities and exposures. For DCS U.S. East and LATAM and DCS U.S. West, the THA Library Ecosystem page may also be used to find previously approved THAs, though these should be modified to be project and site-specific.

2. Each operation being performed by AECOM and each operation performed by an AECOM subcontractor working under the AECOM SH&E Plan is summarized below, and the relevant field forms, including THAs, are included in Appendix C Field Forms

Task Name	Permit(s) Required		Primary Task Performed By	
			AECOM	Subcontractor
Site Walk – General Hazards	☐ Yes	☒ No	☒	☒
Load and Unload Vehicle	☐ Yes	☒ No	☒	☐
Gauging Groundwater Monitoring Wells	☐ Yes	☒ No	☒	☐
Groundwater Sampling – Low Flow	☐ Yes	☒ No	☒	☐
Air Stripper Cleaning	☐ Yes	☒ No	☐	☒
Click here to enter	☐ Yes	☐ No	☐	☐

***Note:** **All AECOM subcontractors must have a THA for each assigned task. THA(s) for AECOM subcontractors working under the AECOM SH&E Plan must be included in Appendix C Field** Forms**.**

3. A review of THAs must take place during the Daily Safety Meeting (Section 4.3). When employees arrive on site, conditions may be different from what was originally planned or additional job steps may be required. The THA requires workers to update or 'dirty up' the THA in the 'On-Site Edits' rows to assess the risks presented by the changed condition(s) and requires the worker to describe steps to reduce the risk. If the hazard(s) cannot be successfully mitigated, the work must NOT proceed.

4.3 Daily Safety Meeting

1. A Daily Safety Meeting must be held at the start of each shift to instruct employees, managed subcontractors and others, as necessary, on the anticipated scope, reasonably anticipated hazards and controls. Participants in simultaneous operations are encouraged to attend each other's safety meetings, or at the very least, the supervisors should discuss the coordination of activities and associated hazards of each other's tasks.

2. Daily Safety Meeting – Americas, or equivalent form, to document names of all attendees and meeting topics must be completed and retained in the project folder. Alternatively, use the appropriate QR code to download the app and/or go to the eDaily Safety Meeting App Ecosystem page for details, guides, training sessions and other information:

	iOS	Android

How will you conduct and document the daily safety meetings?			
☐ Daily Safety Meeting – Americas	☐ eDaily Safety Meeting App	☐ Other:	Click here to enter

4.4 4-Sight

When preparing hazard assessments and throughout the day workers should use 4-Sight. This is a mental process through which workers ask themselves (and each other) four questions designed to effectively assess hazards. Answering these questions during each task, especially those without established THAs, will help workers identify hazards and condition changes so that they can control them or stop work to seek assistance.

- What am I about to do?
- What could go wrong?
- What could be done to make it safer?
- What have I done to communicate the hazard?

4.5 Stop Work Authority

AECOM empowers and expects all employees to exercise their Stop Work Authority (refer to Safety Tenets and Stopping Work – Americas). All employees have the authority and responsibility to issue a Stop Work Order for work activities deemed to present an Imminent Danger or when the control of an SH&E risk is not clearly established or understood. Employees issuing a Stop Work Order must do so without any fear of retaliation or form of intimidation.

5. Project-Specific SH&E Training

All personnel at project sites must be qualified and experienced in the tasks they are assigned. SH&E Training - Americas establishes the general training requirements for AECOM employees.

Select all boxes that describe the training that is applicable to the site and/or scope of work.			
☒	Project Emergency Response Plan Review	☒	AECOM Field Safety (annual requirement)
☒	Project SH&E Plan Review	☒	Defensive Driving
☒	Site Safety Orientation	☐	AED/First Aid/CPR
☐	Client- or Host Facility-Specific Training	☐	Client- or Host Facility-Specific Training
	Specify: Click here to enter		**Specify:** Click here to enter

5.1 Risk-Based Training

☐	AECOM or AECOM-managed subcontractors are NOT self-performing or exposed to any of the activities below.
☒	AECOM or AECOM-managed subcontractors are self-performing or exposed to any of the activities below.

Drug & Alcohol Testing	Medical Surveillance	Heat and Cold Stress
Excessive Noise	Biological Hazards	Ground Disturbance
Heavy Equipment and Machines	Railroads	Underground Work
Highway and Road Work	Hazardous Substances and Communication	Hand and Power Tools
Confined Spaces	Working at Height	Work On, In, or Near Water
Respiratory Protection	Hot Work	Hazardous Energy Control

Radiological Hazards	
Non-standard driving activities, including undertaking trips more than 250 miles each way, driving in remote or hazardous areas, or operation of utility task vehicles (UTVs), all-terrain vehicles (ATVs), off-road vehicles, towing trailers or other equipment	

6. Personal Protective Equipment (PPE)

PPE Must	
1.	Properly fit the Employee's body including gender-specific gear and sizing.
2.	Be selected, used, cared for, and stored in accordance with recognized standards (e.g., American National Standards Institute [ANSI]) and manufacturer's specifications/instructions.
3.	Provide effective protection.
4.	Not in itself create a hazard to the wearer.
5.	Be compatible so one item of PPE does not interfere with another.
6.	Be maintained in good working order and in a sanitary condition.
7.	Not be altered in any way.
8.	Be inspected prior to use.
9.	Be removed from service and replaced if worn out, expired, damaged, and/or defective.

Site Minimum PPE	
• Hard hat or helmet • Safety glasses with side shields • High visibility safety vest • Gloves (on person) – required to be worn if handling materials, equipment, etc.	• Shirt with sleeves that cover the shoulders • Long pants • Work boots with defined heel and over-ankle support • Hearing protection (on person)

Project-Specific PPE (Above Site Minimum)		
Applicable?	**Type of PPE Protection**	**Description of PPE**
☐	Head Protection (ANSI Z89.1 / CSA Z94.1)	Click here to enter
☐	Eye Protection (ANSI Z87.1/ CSA Z94.3)	Click here to enter
☐	Face Protection (ANSI Z87.1/ CSA Z94.3)	Click here to enter
☐	Hand Protection (ANSI/ISEA 105 / ISEA 138)	Click here to enter
☐	Body and Limb Protection	Click here to enter
☐	Foot Protection (ASTM F2413/CSA Z195)	Click here to enter
☐	Fall Protection (ANSI A10.14 / ANSI Z359 / CSA Z259)	Click here to enter
☐	Water/Drowning Protection	Click here to enter
☐	Thermal (Cold/Hot) Protection	Click here to enter

7. Contractor Management

☐	**Performance of the project scope of work DOES NOT involve the use of AECOM subcontractors.**
☒	**Performance of the project scope of work DOES involve the use of one or more subcontractors. The requirements for subcontractor selection and subcontractor safety responsibilities are outlined in Subcontractor Selection and Stewardship – Americas.**

Subcontractor 1		
Name of Subcontractor	Matrix Environmental Technologies, Inc.	
Assigned Task	**High Risk Task (Yes or No)**	**Contractor Site Supervisor Name and Number**
DPE Remediation System O&M (Air Stripper Cleaning)	Yes	Steven L. Marchetti, 585-770-4332
Injection well installation, development	Yes	
Substrate Mixing and Pumping/ Injection	Yes	

Required Subcontractor Documents

The Project Manager must verify that the following documents are in place for each subcontractor:

Select one	☐ Subcontractor's Project/Site-specific SH&E Plan **OR** ☒ Subcontractor will work under AECOM's SH&E Plan and field personnel will sign the AECOM SH&E Plan Acknowledge Form If the second box is checked, the following is required: 1. The subcontractor's THA(s) must be included in this Project SH&E Plan. 2. The Project SH&E Plan must be reviewed with and available to the subcontractor's field personnel prior to the start of work. 3. The subcontractor field personnel must sign the Project SH&E Plan Acknowledgement Page prior to the start of work.

Select all that apply and have been verified

☒	Copy of signed contract
☐	Project-specific purchase order for subcontractor
☐	Copy of the subcontractor's business license and training certificates (task specific)
☒	Copy of task specific THAs/Job Hazard Analyses (JHAs) and inspection/tailgate forms
☒	Competent Person documentation

Prequalification Status

Supplier Status		**Action(s)**
☐ Approved		None – skip to the next subcontractor.
☒ Conditionally Approved		Sub may be required to increase current insurance limits based on selected Service Types. PM to work with Procurement to determine AECOM and Prime Contract minimum insurance limits based on a specific scope of work and risk level.
☐ Pending Approval		Subcontractor must not be used until approved or conditionally approved.

8. Monitoring Performance

8.1 Safety Observations and Near Miss Reporting

1. Safety observations are a tool used by AECOM to identify both at-risk behaviors, including unsafe conditions and acts, and positive safety behaviors. These observations can be made informally during normal site operations when conditions or behaviors are addressed or as part of a more formal observation program. Employees may perform a formal safety observation on another AECOM employee or subcontractor.

2. Following the activity, the Observer must provide immediate one-on-one feedback to the Employee, noting the safe behaviors and at-risk behaviors identified during the observation. The Observer and the person being observed (employee or contractor) are required to discuss the identified barriers to safe behaviors and the potential solutions.

3. Formal Safety Observations must be entered into Vector EHS Management (a.k.a. IndustrySafe) or project-based system, where applicable. If an individual does not have access to a system, a member of the Regional SH&E Team must be contacted to obtain hard stock observation cards.

8.2 Corrective Actions for Non-Conformances

1. The intent of issuing non-conformances, observations and corrective and preventive actions is to confirm criteria and systems deviations are logged, actioned, and closed out as part of the continuous improvement process. When non-conformances are identified in audits, inspections, reviews, and observations, corrective actions should be created and tracked to completion in the appropriate online data management system (e.g., Vector EHS Management [a.k.a. IndustrySafe], or a project-based system).

2. The Project Manager, SH&E Manager, and Regional Management Team, as required, must document necessary follow-up actions, assign accountability for corrective actions, and confirm that all corrective actions are closed within the assigned timeframe. Corrective actions identified must be taken in a timely manner by the responsible parties who have been identified. Immediate corrective action must be taken for Imminent Danger. When it is not possible to immediately rectify non-conformances, interim actions must be implemented to prevent injury, illness, property loss, or impairment to the environment until planned/long-term corrective measures are implemented.

8.3 Incident Reporting and Response

Refer to Appendix A Emergency Response Plan.

8.4 Audits, Inspections, and Reviews

1. Refer to Monitoring SH&E Performance and Continuous Improvement – Americas for definitions of the different types of audits, inspections, and reviews listed below.

9. Variance to SH&E Management System Requirement

The Project Manager request for variance to or waiver of any SH&E Management System requirement must provide an equal or greater level of protection, be substantiated with the relevant SH&E Plan and THA(s) for the activity seeking a variance, and must be documented using the SH&E Management System Variance Request – Americas or equivalent documentation.

10. Personal Acknowledgement

By signing below, the undersigned acknowledges that they, including managed subcontractors, have reviewed the AECOM SH&E Plan for the Chem-Trol Site. The undersigned people also acknowledge that they have been instructed in the contents of this document and understand the information pertaining to the specified work and will comply with the provisions contained therein. The undersigned people understand that they are **NOT** to perform any work that they have not been adequately trained for and that they are to stop work if it is unsafe to proceed. Finally, the undersigned people understand to notify the Site Supervisor or Site Safety Lead and the **Incident Hotline at 800-348-5046** for any incident, **including ANY injury even if no first aid or medical treatment is required.**

Print Name Clearly	Signature	Organization	Date
Click here to enter		Click here to enter	Click or tap to enter a date.
Click here to enter		Click here to enter	Click or tap to enter a date.
Click here to enter		Click here to enter	Click or tap to enter a date.
Click here to enter		Click here to enter	Click or tap to enter a date.
Click here to enter		Click here to enter	Click or tap to enter a date.
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Click here to enter		Click here to enter	Click or tap to enter a date.

Disclaimer: This SH&E Plan, and each of its provisions, is applicable only to, and for use only by, AECOM, its affiliates, and its subcontractors. Any use of this Plan by other parties, including, without limitation, third-party contractors on industrial sites or projects where AECOM is providing engineering, construction management, or similar services, without the express written permission of AECOM, will be at that party's sole risk, and AECOM Corporation shall have no responsibility. The existence and use of this SH&E Plan by AECOM shall not be deemed an admission or evidence of any acceptance of any safety responsibility by AECOM for other parties unless such responsibility is expressly assumed in writing by AECOM in a specific project contract.

Appendix A Emergency Response Plan

A.1 Phone List

All incidents and near misses, regardless of type and perceived severity, must be reported in accordance with SH&E Incident Response and Investigation – Americas.

Contact Type	Phone Number	Availability	Instructions
SH&E Incident Hotline	**1-800-348-5046**	24/7	**After the scene has been stabilized, immediately report all incidents** including any potential work-related injuries, illnesses, discomfort/pain, property damage, security issues, regulatory inspections, and environmental impacts/spills
AECOM Nurse Line Direct	**U.S.: 512-419-5016** **Canada:1-877-424-5256**	24/7	The SH&E Incident Hotline operator (number above) will transfer injured/ill employee to nurse. If the transfer fails or employee's condition worsens following initial consultation, call direct.

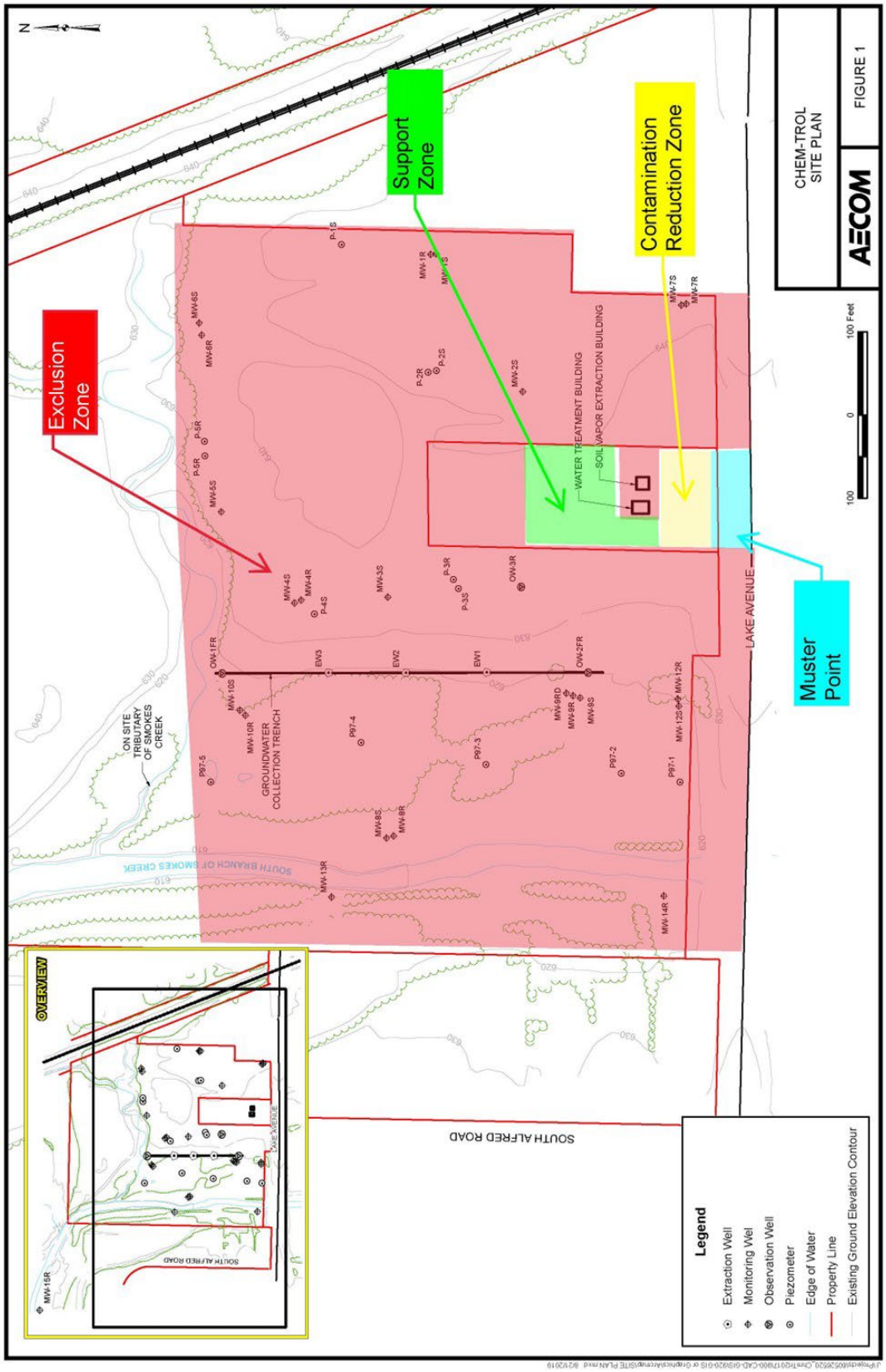
Resource Type	Phone #	Site-Specific Contact	Address	Hours of Operation
Site Emergency Response	**911**	N/A	N/A	24/7
Clinic	(716) 608-2226	WellNow Urgent Care	3245 Southwestern Blvd, Orchard Park, NY 14127	8AM-7:30 PM S-S
Hospital	(716) 826-7000	Mercy Hospital of Buffalo	565 Abbott Rd, Buffalo, NY 14220	24/7
First Aid/CPR Providers	(716) 936-4582	Tom Urban	On-site	During operational hours
Fire	(716) 825-3663	Newton Abbott Fire Company, Inc	N/A	24/7
Police	(716) 662-6444	Orchard Park Police Department	N/A	24/7
U.S. Poison Control	**1-800-222-1222**	N/A	N/A	24/7
Canada Poison Control	**1-844-POISON-X or 1-844-764-7669** **Nunavut: contact your local health center** **Québec: 1-800-463-5060**			
Fire Warden(s)	(716) 936-4582	Tom Urban	On-site	During operational hours
Other	1-800-457-7362	NYSDEC Spill Hotline	NA	24/7

A.2 Additional Phone Numbers

Support Resource / Company	Name	Phone #
Fleet Management	Holman	1-800-227-2273
Global Security & Resilience	Name	
HazMat Shipping Emergency Response Support	INFO TRAC AECOM Account Number: 74984	1-800-535-5053
Human Resources Business Partner	Name	
Employee Assistance Program	Name	
Drug and Alcohol Program Coordinator	Name	
Legal Business Partner	Name	
Other	Name	

Utility and Pipeline Information	
Select one based on the scope of work.	
X	Scope of work does NOT involve activities that could interfere with overhead or underground utilities or facilities.

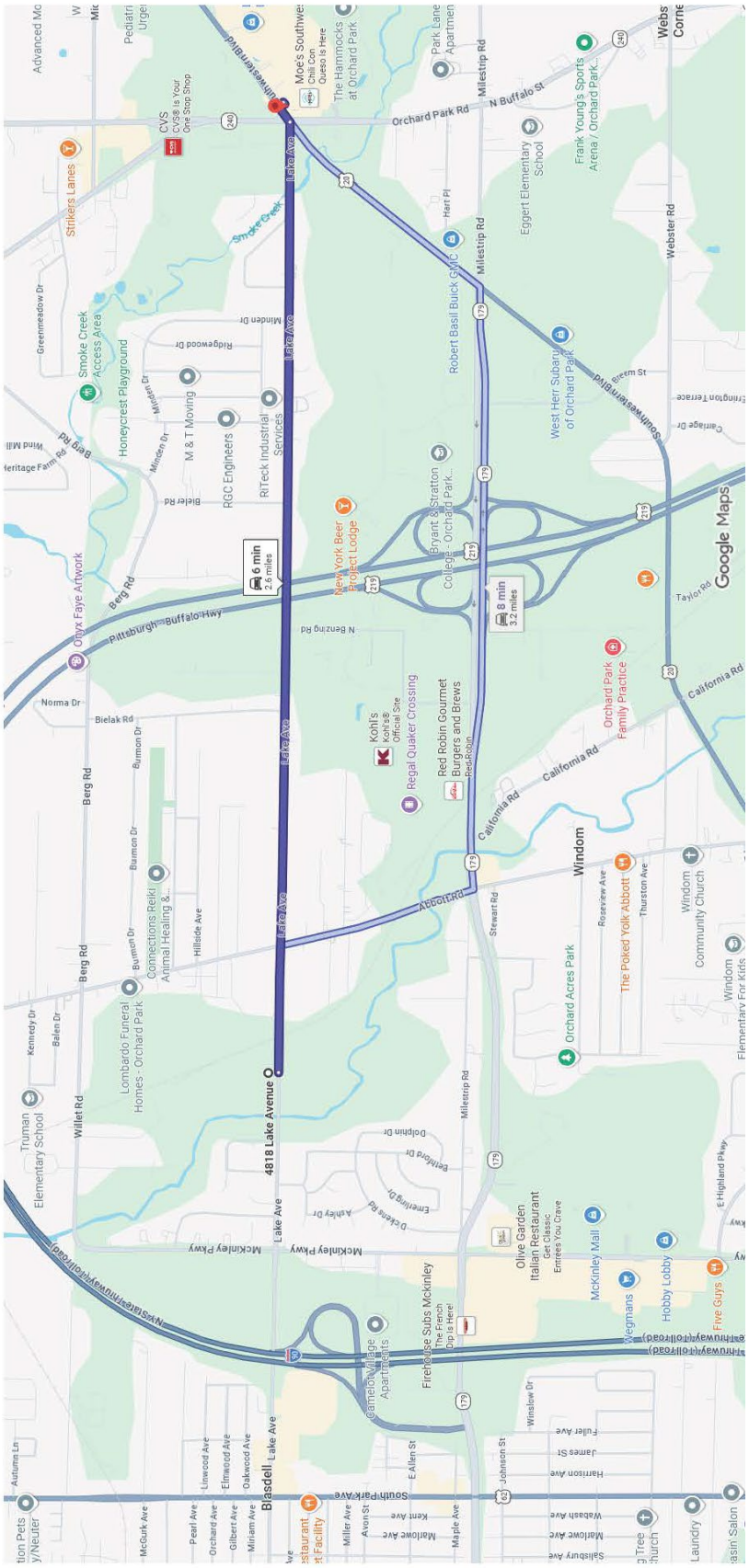
A.3 Location Emergency Map(s)



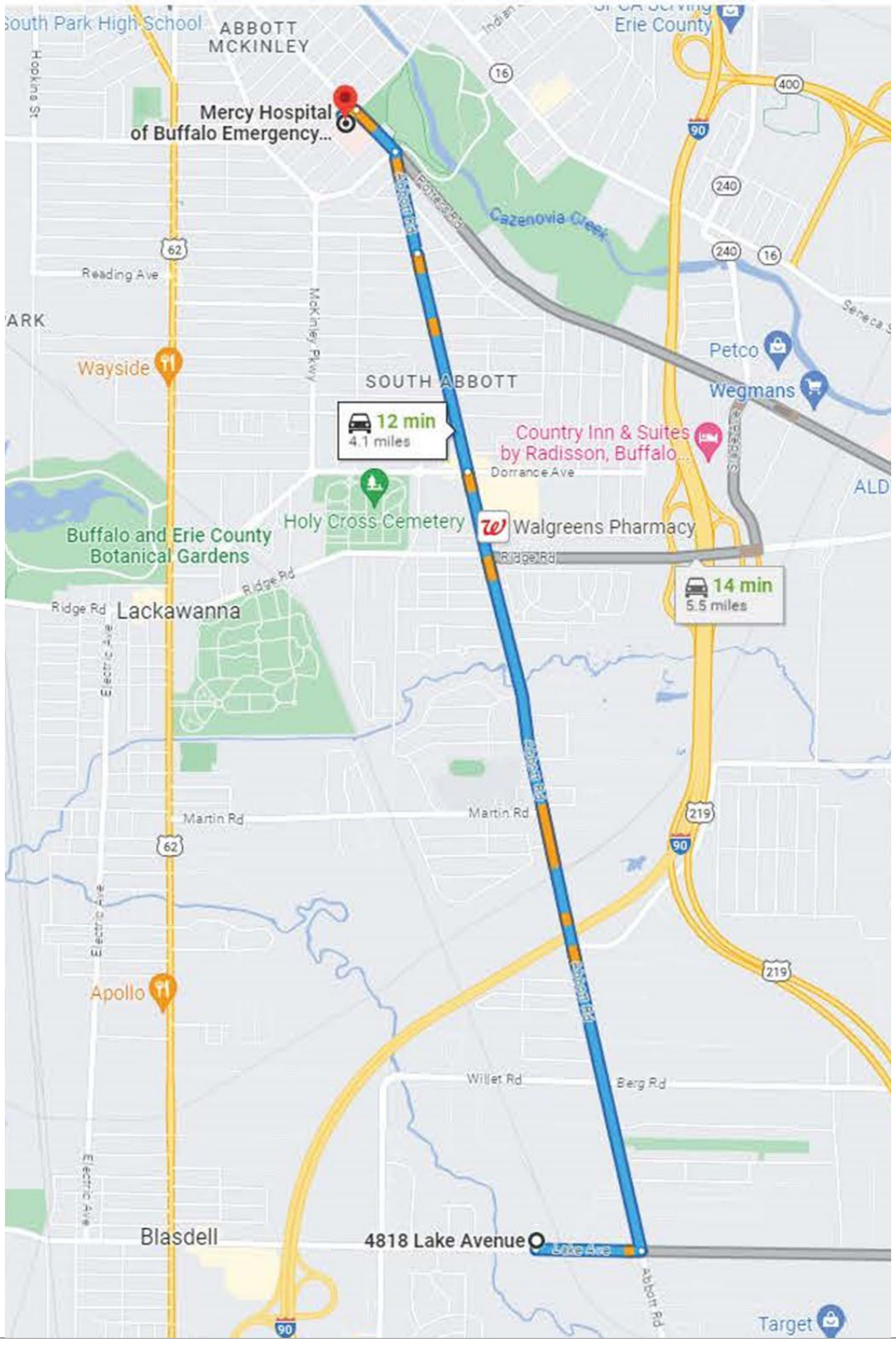
A.4 Site Emergency Equipment and Its Location

Item	Item Description	Location(s)
First Aid Kit(s)	ANSI Z308.1 Class A, Type III	AECOM Field Vehicle
Eyewash Station(s)	Single Use Saline	Field Vehicle(s)
Fire Extinguisher(s)	2A:10B:C (5 lb. ABC) 4A:80B:C (10 lb. ABC)	AECOM Fleet Vehicle(s) Drill Rig or Support Vehicle
Spill Kit(s)	PIG® Spill Kit in 5-Gallon High Visibility Economy Container (or similar)	Field Vehicle(s)
Cold/Heat Stress Aid(s)	Climate-Controlled Environment	Field Vehicle(s)
	Other:	

A.5 Directions to Clinic



A.6 Directions to Hospital



A.7 Method(s) of Emergency Alarm

Vehicle Horn

A.8 Evacuation and Sheltering in Place

1. If a situation requires an evacuation or emergency muster/assembly, the pre-determined alarm must be initiated.
2. All personnel (e.g., employees, consultants, visitors) in the office requiring evacuation must immediately assemble at the designated muster point, assembly point or shelter-in-place as determined by the alarm or communication.
3. Employees accompanying visitors working directly with AECOM must escort the visitors to the muster point.
4. Elevators must not be used unless pre-arranged due to known circumstances.
5. The Site Supervisor or designee must take action to account for all personnel, including visitors (i.e. head count, roll call).
6. Upon evacuation or dismissal, only authorized or essential employees are allowed access to the facility or project area during an emergency. Other personnel must await further instruction (e.g., all clear and re-entry or further evacuation) from the Site Supervisor or designee.

A.9 Medical Emergency

1. Stop the work activity.
2. Assess the cause of the injury to avoid injury to yourself (e.g., live wires, gases, hazardous materials).
3. Do not move the casualty unless they remain in danger.
4. A First Aid Provider must designate an individual to call for medical assistance (e.g., 911, ambulance, site medic).
5. A First Aid Provider must designate an individual to retrieve the first aid kit and blankets.
6. Request assistance from other First Aid Providers as necessary. Administer first aid:
    a. Assess responsiveness: ask permission.
    b. Send for medical help.
    c. Place casualty face up.
    d. Check airway, breathing and circulation (ABCs)
    e. Control severe bleeding.
7. If CPR is deemed necessary:
    a. Begin chest compressions at a rate of at least 100-120 compressions per minute.
    b. CPR shall be continued until:
        i. An AED is applied,
        ii. casualty begins to respond,
        iii. Another First Aid Provider takes over,
        iv. A medical responder takes over, or
        v. The Aid Provider is physically unable to continue.
8. If the casualty begins to breathe on their own, place them in the recovery position, monitor and treat for shock as appropriate.
9. The individual in communication with the designated medical assistance must attempt to answer any questions, stay on the line until information is verified and follow instructions.
10. Arrange for medical transport as needed. A designated individual should be positioned to direct medical transport to the casualty.
11. Personnel must await further instruction from the Site Supervisor or designee (e.g., resume activity).

A.10 Fire

1. Alert others in the area of the fire.
2. Sound the alarm or confirm that the applicable notification system is initiated.
3. All personnel must vacate the building or site and proceed to the muster point. DO NOT use elevators.
4. The Site Supervisor or designee must confirm that all personnel have exited.
5. Employees are not expected to extinguish a fire. However, if the fire is small enough to be contained and if trained to do so, employees can decide to attempt to extinguish a fire with the correct type of extinguisher, applying the contents from an upwind position. Remember PASS:
    a. P – pull the pin.
    b. A – aim the hose at the base of the fire.
    c. S – squeeze the handle.
    d. S – sweep from side to side until the fire is out or the extinguisher is empty
6. Employees must:
    a. Retreat and call the local fire department if the fire cannot be contained or there is any concern of an extinguished fire reigniting. Give directions to the location; stay on the line until information is verified.
    b. Never face away from a fire. Always back away until at a safe distance.
    c. Stay low and close to the floor if smoke and heat are strong.
    d. Never return a discharged fire extinguisher to its normal location. Take it out of service, tag the extinguisher for recharging, and replace it with a fully charged unit.
7. The Site Supervisor or designee must take action to account for all personnel, including visitors (e.g., head count, roll call).
8. A designated individual should be positioned to direct the fire truck to the fire location.
9. Personnel must await further instruction (e.g., all clear and re-entry or further evacuation) from the Site Supervisor or designee.

A.11 Workplace Violence

1. **Active Workplace Violence Event:** If you become aware of an active workplace violence incident posing a threat to AECOM employees, contractors or visitors, immediately contact local emergency services using the appropriate emergency number. If you are in the vicinity of the incident, evacuate the area if it is safe to do so, or seek shelter where possible.
2. **Potential for Workplace Violence:** All AECOM employees are responsible for reporting any information related to potential workplace violence. Reports should be made to your manager, Human Resources, or through the AECOM Ethics and Compliance Hotline.
3. **AECOM Workplace Violence Procedure:** AECOM's Workplace Violence Procedure – Americas outlines the company's zero-tolerance policy toward workplace violence. It defines what constitutes workplace violence, details employee responsibilities, explains reporting mechanisms, and describes the procedures followed during investigations and follow-up actions**.**
4. **Training:** AECOM Global Security & Resilience (GSR) has a Field Security Briefing and Office Security Briefing available to offices and projects through Teams. Topics included in both trainings cover situational awareness, active shooter awareness, tips on how to identify someone who could be a threat and tips on how to de-escalate a situation. Active Shooter Awareness training is also available on AECOM University. Contact GSR@aecom.com for details or to schedule the training.

A.12 Spill, Leak, or Release of Hazardous Materials (HAZMAT)

1. Identify the product and assess the risk of injury, fire or explosion.
2. If there is insufficient information on the product or inadequate PPE, move upwind if possible and leave the area immediately (initiate personnel evacuation if required).
3. Isolate the area and deny access to any unauthorized personnel.
4. Only if safe to do so, take measures to stop and control the spill, leak, or release.

5. Eliminate all ignition sources, if required (no smoking, flares, sparks / flames, engines running).
6. As applicable, designate an individual to notify the Emergency Response Coordinator or designee.
7. Consult the product Safety Data Sheet for accidental release / handling procedures.
8. If it is not possible to stop or control the release, call 911 or appropriate emergency services.
9. Tend to any injured personnel (follow Medical Emergency steps).
10. Personnel must await further instruction (e.g., further evacuation or resume activity) from the Site Supervisor or designee.

A.13 Vehicle Incident

The Employee(s) involved in a collision must:

1. Assess the situation to confirm everyone is safe and remove any vehicle occupants from harm's way if safe to do so.
2. Turn on the vehicle's flashers to warn other motorists.
3. Call or have someone else call the appropriate local emergency phone number (e.g., 911) immediately when necessary.
4. As appropriate, remain at the scene of a collision for police to arrive. If the scene is unsafe, immediately move to a safe place of refuge proximate to the incident.
5. As applicable, consider moving the vehicle out of the traffic flow if it is safe to do so. Do not operate a damaged vehicle if its:
    a. safety is questionable,
    b. operating condition is illegal per applicable local law, or
    c. condition is such that further damage would likely result from its operation.
6. Obtain:
    a. Names, phone numbers, and addresses of owner(s), driver(s), and occupants of the other car(s) involved.
    b. Other party's insurance company's name, address, phone number, policy number, and insurance agent.
    c. Names, phone numbers, and addresses of all witnesses.
    d. Photographs of the accident scene when safe to do so.
7. Do not discuss liability (e.g. who is at fault), agree to pay for damage, or sign a document related to an incident except as required by local law.
8. If requested, provide information to the police. Obtain the officer's jurisdiction, name, and badge number, as well as a copy of the police report.
9. If contacted by a third party, do not answer any questions. Immediately report this contact to the Project Manager and AECOM Legal.

A.14 Floods/Heavy Rain

1. If external to a building:
    a. Monitor conditions and escape routes.
    b. Monitor Regional Resiliency communications, television, radio or other sources identified as reliable (e.g., social media, websites) for information, updates and evacuation orders.
    c. Shut off electrical power and utilities if flooding is imminent.
    d. Implement measures to minimize rain or flood damage if time permits (e.g., stacking sandbags, clearing drainpipes, clearing culverts, confirming sump pump operation).
    e. If ordered to evacuate, do so immediately as directed. Evacuation should be to higher ground and/or appropriate shelter, as floodwaters often rise rapidly.
    f. Avoid walking through water-covered areas as hazards may not be visible.
    g. Watch for and avoid low-lying areas. Don't drive through flooded areas. If your vehicle stalls, abandon it immediately.

h. Don't attempt to cross a flowing stream, or to swim to safety.

i. Beware of wildlife displaced by floodwater.

j. Do not return unless the Site Supervisor, designee, or authorities permit.

2. If internal to a building:

a. Assume any electrical equipment that may not be disconnected, is live and should be treated as a potential electrocution threat.

b. Protect contents from damage by relocating them if time permits.

c. Begin cleanup operations as quickly as possible.

A.15 Wildfire and Wildfire Smoke

1. During a wildfire

a. The most important information will come from your local government. Authorities will let you know when you should leave to stay safe. If wildfire impacts your home, follow instructions from the local government. If wildfire impacts your office, follow instructions from AECOM and the local government. Your Human Resources/SH&E partners will reach out to confirm your safety.

b. All wildfire events will be monitored and responded to by the Regional Resilience Team. Employees should access AECOM's website and phone message systems for status or direction updates.

c. Do not return to a closed office until it is authorized by the Regional Resilience Team.

d. Follow SH&E and Facilities guidance for office re-entry.

2. During wildfire smoke

a. The Site Supervisor or designee must take steps to reduce or eliminate continued exposure to wildfire smoke as appropriate. Warning signs to consider include an individual's symptoms, intensity of exposure, air quality index levels, and exposure controls in place. Actions to take include but are not limited to:

i. Stop work;

ii. Reschedule work;

iii. Stay inside a building or vehicle with proper ventilation;

iv. Reduce the work schedule;

v. Contact the SH&E Manager for guidance; and

vi. Wear respiratory protection.

b. Air quality should be monitored using the appropriate national index (e.g., the U.S. Air Quality Index [AQI] or Canada's Air Quality Health Index [AQHI]) which provides real-time information on outdoor air pollution levels and associated health risks through government websites and mobile apps.

c. Symptoms of wildfire smoke-related illness can include:

i. Coughing, difficulty breathing, wheezing, shortness of breath, asthma attack, runny nose, sore throat, sinus pain or pressure.

ii. Chest pain or discomfort; fast or irregular heartbeat; feeling weak, light-headed, faint, or dizzy; pain or discomfort in the jaw, neck, or back.

iii. Sudden numbness or weakness in the face, arm, or leg—especially on one side of the body; sudden confusion; trouble speaking or difficulty understanding speech; sudden trouble seeing in one or both eyes; sudden trouble walking, dizziness, loss of balance, or lack of coordination; sudden severe headache with no known cause.

iv. Headache, scratchy or irritated eyes, fatigue, or tiredness.

d. The following actions should be taken if an individual is experiencing a wildfire smoke exposure related illness:

i. Move individual to a safe location away from the hazards.

ii. Let the individual(s) rest and move them to an area of better air quality.

iii. The Employee must call the AECOM Incident Hotline (800-348-5046) if experiencing symptoms of wildfire smoke exposure and submit an incident report of the incident within 24 hours into IndustrySafe. In the event of a medical emergency related to smoke inhalation, call 911.

A.16 Hurricane

1. Monitor Regional Resiliency communications, television, radio or other sources identified as reliable (e.g., social media, websites) for information, updates and evacuation orders.
2. Monitor the progress of the storm and estimate the amount of time required to perform all essential tasks.
3. If ordered to evacuate, do so immediately.
4. Move valuables out of the area or to upper floors if located in a flood or storm surge zone.
5. Secure or store furniture, equipment, signs or other objects outside the building.
6. If required to remain, stay inside and away from windows, doors and outside walls. Watch for roof leaks, pipe breakage, fire or structural damage. Workers should never remain alone.
7. During the height of the hurricane, personnel should remain in a place that has been identified as safe from wind and flood.
8. During a power failure, turn off electrical switches to prevent reactivation before necessary checks are completed.
9. Remember that a lull often signifies the storm's eye—not its end. Anyone riding out a hurricane should wait for authorities to announce that the danger has passed.

A.17 Lightning

1. Lightning can strike several miles/kilometers from its source, so early precautions are crucial. If thunderstorms are in the forecast, reassess your plans for outdoor activities.
2. If you can hear thunder, then you are close enough to the storm to be at risk. Use the 30/30 Rule to help you. If you can count 30 seconds or less between seeing lightning and hearing thunder, you should seek shelter immediately. Take cover and lower elevated equipment (e.g., booms) if possible.
3. Seek shelter inside a house, large building or motor vehicle and keep windows and doors shut. Stand clear from windows, doors and electrical appliances and avoid contact with piping, including sinks and faucets.
4. Unplug equipment well before a storm nears—never during.
5. Avoid contact with metal and water. If boating, head for shore or, if the threat is immediate, crouch low in the boat.
6. If no shelter is readily available, stay clear of high ground, open spaces, trees, sheds and small or open buildings. If in a flat open field:
    a. Crouch as low as possible but do not lie flat
    b. Only the balls of the feet should contact the ground with heels together
    c. Bend forward with head down
    d. Cover ears with hands, elbows pointing down
    e. Maintain at least 17 feet (5 meters) between personnel
    f. Refer to Figure 1 for a sketch of the lightning position described above.

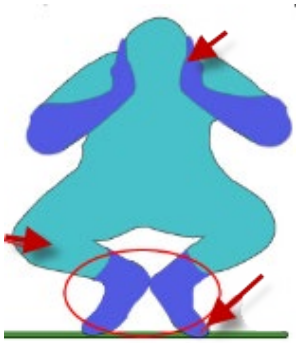


Figure 1. Lightning Position

7. Contact emergency services and First Aid Provider(s) if someone is struck by lightning.
8. Look for cardiopulmonary distress, broken bones, burns, and entry and exit wounds when treating lightning-related injuries.
9. Avoid contact with piping including sinks and faucets.
10. Check for and extinguish fires.
11. If power is lost, shut down equipment.

A.18 Tornado

1. Monitor Regional Resiliency communications, television, radio or other sources identified as reliable (e.g., social media, websites) for information, updates and evacuation orders.
2. Go to a center stairwell or corridor of the building's lowest level possible. Move away from the perimeter of the building and exterior glass.
3. Close any exterior office doors.
4. Sit or kneel down to protect yourself from a possible head injury.
5. Take shelter under a desk if there is no stairwell, basement, or other protected location.
6. Avoid seeking shelter in large open shop areas. Seek shelter in interior rooms, preferably with concrete surround. AVOID TAKING SHELTER IN ANY TRAILER UNIT OR VEHICLE.
7. Tornados generate considerable static electricity and can damage electrical lines, creating electrical shock hazards through telephone lines; therefore, do not use "land-line" telephone systems until they are rendered safe.
8. If the facility is so equipped, listen for information and directions via the Public Address system.
9. Follow the directions of the Site Supervisor or designee or Emergency Services personnel.
10. If outside, seek a safe place in a sturdy nearby building. As a last resort, take cover in a ditch or low-lying area away from trees; lie flat with hands covering head and neck.
11. If driving pull over, exit the vehicle and take cover in a ditch away from the vehicle as described above OR if flying debris is encountered, stay in the vehicle, seatbelt on, and cover your head with your hands, keeping your head below closed windows.

A.19 Earthquake

1. **If inside, DUCK, COVER, and HOLD:**
    a. Take cover under a desk or table, or sit or stand against an inside wall (not inside a doorway, unless you know it is strongly supported and load bearing).
    b. Hold tightly to the desk or table until the shaking stops.
    c. Move away from windows or objects that may fall and utilize suitable material to shield head and face if available.
    d. Do not run outside during the shaking.

e. After the shaking has stopped, evacuate the building if structural damage is apparent (per local guidance; use stairs, not the elevator).

f. Avoid use of the telephone. Replace telephone handsets shaken off the hook.

g. Do not create an ignition source due to possible gas leaks.

2. **If outside:**

a. Do not enter any building.

b. Move clear of buildings, falling glass, utility poles, wires and large trees.

c. Get on the ground — DUCK, COVER, HOLD.

d. After the shaking stops, watch for falling glass, electrical wires, poles and other debris.

3. **If driving:**

a. Drive away from overpasses and underpasses.

b. Stop in a safe place.

c. Set the parking brake.

d. Stay in the vehicle. If wires fall onto the vehicle, stay inside until rescued.

4. **Be prepared for aftershocks and fires.**

5. **Personnel must obtain or wait for instructions (i.e., all clear and re-entry or further evacuation) from the Site Supervisor, his or her designee, or Emergency Services personnel.**

A.20 Severe Weather Storms

1. Monitor Regional Resiliency communications, television, radio or other sources identified as reliable (e.g., social media, websites) for information, updates and road closures.
2. Consider requesting staff to work from home to reduce travel risk or sending staff home prior to the start of a storm.
3. Locate the emergency supplies, such as flashlights, water and medical supplies.
4. If conditions deteriorate to the point of closure, confirm that employees know road conditions and that remaining on site may be the best decision.

A.21 Power Outage

1. If it is safe to do so, shut down any equipment or processes that could be hazardous if the power suddenly returns.
2. Ensure appropriate personnel have been notified if there are critical areas that require power.
3. Retrieve flashlights from emergency supplies.
4. If unsafe to continue working due to inadequate lighting or any other hazard, evacuation to the designated in-place shelter location should be initiated.
5. The Site Supervisor or designee must conduct a roll call to confirm all personnel are accounted for.
6. If it is unsafe to go to the in-place shelter location continue to the designated muster point.
7. If unable to proceed to the designated location (e.g., it is unsafe to leave the area due to inadequate lighting) inform other personnel of the situation and wait for assistance. Do not attempt to proceed unless there is immediate danger.
8. Personnel should await further instruction (i.e., all clear and re-entry or further evacuation) from the emergency response coordinator or designee.

A.22 Electrical Live Line Contact

1. All personnel must evacuate to the designated muster point if safely able to do so.
2. Establish the danger zone: 33-foot (10-meter) radius from anything in contact with the live line.

3. If contact was made while operating a vehicle or equipment, the operator should, if feasible:
    a. Remain on the equipment or inside the cab. All other personnel must keep away from the machine and any other applicable connected or contacted components such as rope or load.
    b. Try, unaided and without anyone approaching the machine, to back off the equipment until it is well clear of the power line.
    c. If the machine cannot be self-propelled away or disentangled from the line, remain inside the machine until the electrical authorities de-energize the circuit and confirm that conditions are safe.
    d. If the cable or equipment appears to be welded to the line do not try to back the equipment off. This could cause the line to whip or snap.
    4. If hazards such as fire are present that require the operator to leave the equipment or vehicle, the operator must jump to the ground, taking critical care to keep both feet together and not fall or touch the equipment or ground with any other body part.
5. To leave the danger zone the individual must Hydro Shuffle* or bunny hop with both feet leaving and making contact with the ground at the same time. Hopping should be the secondary choice as the potential to fall is increased.
6. Notify emergency response coordinator or designee. Contact the electrical company.
7. Assess the scene. Lock out power supply if it is possible to do so safely. Identify potential hazards, such as fire, explosion, or slack lines away from the immediate area.
8. Take appropriate control measures to prevent further hazards if it is safe to do so.
9. Should it be determined that a worker is still within the hazard zone, establish whether a rescue can be safely attempted. Follow emergency rescue procedures if a rescue attempt will not put another life in danger.
10. Ensure any piece of equipment that has sustained a live line contact is inspected.

A.23 Gas Odor or Major Leak

1. If safe to do so, restrict ignition sources from the area (e.g. electrical devices, engines, smoking, etc.) from the area.
2. Leave the area immediately and warn others in the area to leave as well.
3. Sound the alarm or confirm applicable notification system is initiated.
4. All personnel must vacate the building or site and proceed to the Muster Point.
5. If gas is burning, call **911**. Give directions to the location; stay on the line until information is verified.
6. Notify the appropriate authorities (e.g. utility owner emergency line, client).
7. Provide responding utility and emergency personnel with any relevant information.
8. Personnel should await further instructions (i.e., all clear and re-entry or further evacuation) from the Site Supervisor or designee.

* Note on how to Hydro Shuffle: To avoid electrical shock keep both feet tightly together. Shuffle, using short steps where the heel of one foot never moves beyond the toe of the other foot. Hopping with both feet together can also prevent shock as you leave the hazard area.

Appendix B Pre-Task Forms

AECOM

Americas

Assessment of SH&E Training Requirements

S3AM-003-FM1

Instructions

1. **This form must be completed in accordance with SH&E Training – Americas S3AM-003-PR2.**
2. **This form should be used as a guideline for providing SH&E training to employees per the requirements of their role, in relation to the specific risks posed by their work activity, and in accordance with legal, client, and industry requirements. Other applicable region-, business line-, or project-specific training assessments should also be consulted.**
3. **The completed form must be retained in the employee or project files.**

If the assessment is for an individual		For project-based assessments, or optionally for individual assessments	
Employee	….	**Project Number**	60771777
Employee Email	….	**Project Location**	215 and 221 Erie Street, Lancaster, NY 14086

Required Training for All Employees

Applies?	Course Title	Regulatory	Frequency	Additional Information
☒	Core Curriculum	N	Annual	Based on regional training plans.
☒	Global SH&E Orientation	N	Within one week of starting at AECOM	Training will set the expectations of the AECOM Safety for Life program.
☒	New Employee SH&E Orientation	Y	Once	Accomplished via a combination of AECOM U modules and region-specific training plans.
☒	Emergency Preparedness Plan/ Emergency Action Plan	Y	As needed	For office personnel, this is covered as part of office-specific orientation. For field/site personnel, this is covered in project/site-specific orientation

Risk- and Role-Based Training

Applies?	Course Title	Regulatory	Frequency	Should You Attend?	Additional Information
SH&E Risk Assessment and Planning					
☒	Field Safety Training	N	Annual	Required for all employees performing field work who are not in the hazardous waste or mine safety training programs. This training is also required for any DCS Project Manager that manages projects where field work is performed.	Specific content and delivery method will depend on the office and the employees' expected work.
☒	• 10-Hour Construction Safety & Health Course • 30-hour Construction Safety & Health Course • Equivalent level of certification, with prior approval obtained by SH&E	N	Once	U.S. only: 1. You perform work that exposes you to active construction/demolition. 2. You perform work that exposes you to construction-like hazards. 3. As required by client or local law.	1. Project sites where we, our client, or another contractor (whether AECOM managed or not) are presently building, removing, or disassembling structures or digging excavations of any size by mechanical means. 2. On sites where the focus is NOT construction/ demolition, but where our work scope includes use of heavy machinery movement, work at heights, confined space, hot work, lifting/hoisting loads, and/or ground breaking (includes drill rig, direct push and vac truck use).

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Applies?	Course Title	Regulatory	Frequency	Should You Attend?	Additional Information
					3. Some jurisdictions, clients and/or controlling contractors require OSHA refresher training. Note: It is not applicable if your work area is separated from the construction/demolition with enough distance or physical barriers that fully prevent exposure of our team to those hazards. Note: If an AECOM employee is escorted by another employee, contractor, client, or third party, with training equivalent to 10-hour Construction training, for the entire duration of their site visit, 10-hour training for the escortee may not be required. The escort's level of training must be confirmed prior to conducting the site visit.
SH&E Incident Response and Investigation					
☐	Cardiac Pulmonary Resuscitation (CPR)	Y	As established by the training provider – typically biennial	Required: 1. For employees who are designated as first aid responders; 2. For employees who are performing high hazard activities (e.g., potential for falls, suffocation, electrocution, amputation) and medical attention is more than 4 minutes away; or 3. by client contract.	Acquire training from recognized source (e.g., Red Cross, American Heart).
☐	Automated External Defibrillator (AED)	Y	As established by the training provider	You are designated to be an AED user at an office or project site.	
☐	First Aid	Y	As established by the training provider – typically biennial	Required for 1. employees who are designated as first aid responders; 2. employees who are performing high hazard activities (e.g., potential for falls, suffocation, electrocution, amputation) and medical attention is more than 4 minutes away; or 3. required by client contract.	Acquire training from a recognized source (e.g., Red Cross, American Heart).
☐	Bloodborne Pathogens	Y	Annual	Required for employees designated as a first aid responder or others who have a potential bloodborne pathogen exposure.	May be included in first aid or CPR class.
☐	Fire Extinguisher	Y	Annual	You may be expected to use fire extinguishers (fixed facilities and project sites).	

Applies?	Course Title	Regulatory	Frequency	Should You Attend?	Additional Information
Safety Gear					
☒	Risk-Based Personal Protective Equipment	Y	Minimally once and then as required by procedure and/or regulation.	When PPE is required to complete the project/program.	Staff will receive adequate instruction on the correct use, limitations, and assigned maintenance duties for the equipment to be used. The following information, at a minimum, will be covered during PPE training: • What, when, and why PPE is required. • How to properly don, doff, adjust, and wear the PPE described. • The limitations of the PPE, including its expected useful life. • How to properly care for, maintain, and dispose of the PPE
Confined Spaces					
☐	Confined Space Entry Awareness	N	As needed	Employees who work around confined spaces but are not responsible for performing entry/authorizer/attendant duties.	Available online through AECOM U.
☐	Confined Space Entry (Performance Based)	Y	Once	You perform confined space entry/authorizer/attendant duties (including anyone performing non-entry rescue activities).	
☐	Confined Space Refresher	N	As needed	Recommended if you perform entry activities.	
☐	Confined Space Rescuer (Performance Based)	Y	Once	You may have to enter a confined space to perform a rescue.	
Driving					
☒	Vehicle/Driver Safety	N	Once	Required for all employees who drive on behalf of AECOM.	Generally completed upon hire by employees who may become authorized drivers. Available online through the AECOM U.
☐	Defensive Driving	N	Once, followed by refresher every three years	Required for all DCS employees who drive on behalf of AECOM.	National Safety Council, Alert Driving, Smith System or equivalent.
☐	Off-Highway Vehicle (OHV) Driving	N	As required	Required for all employees who operate an OHV.	Refer to local law and OHV manufacturer instructions.
Ground Disturbance					
☐	Excavations/Trenching Awareness	N	As needed	Employees who could potentially be exposed to or directly involved with excavation and trenching activities.	Available online through AECOM U.
☐	Competent Person – Excavations	Y	Once and as required by client or training provider	Required for employees serving the role of Competent Person. To be completed via formal training or documented experience reviewed and approved by SH&E.	Frequency may be established by an applicable standard
☐	Driller's Safety Training	N	Once and as required by client or training provider	Required for employees involved in overseeing drilling activities.	Frequency may be established by an applicable standard. Available online through AECOM U.
☐	24-Hour Surface Miner Training	Y	Once	You perform work at surface mine sites regulated by MSHA.	Training is conducted by MSHA-approved instructors under MSHA-approved training plan.

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Applies?	Course Title	Regulatory	Frequency	Should You Attend?	Additional Information
Hand and Power Tools					
☒	Hand Safety Awareness	N	As needed	Recommended for employees who are required to work with various hand and/or power tools	Available online through AECOM U.
☐	Hand and Power Tool-Specific Training (Performance-based)	Y	As needed	Required for employees whose job duties include these activities.	This includes site-level training. Manufacturer's specifications must be reviewed and followed in addition to regulatory requirements.
Hazardous Energy Control					
☒	Lockout/Tagout Awareness – Affected Person	Y	Once; refresher as required by local law	You work with and around equipment that may need to be locked out/tagged out. (You are not responsible for applying tags/locks).	May be included in OSHA 10 or other classes
☒	Lockout/Tagout – Authorized Person	Y	Once; refresher as required by local law	You lock out or tag out machines or equipment in order to perform servicing or maintenance on that machine or equipment.	Specific to individual machines.
☐	Electrical Safety (Awareness level)	Y	Once	Employees who have potential exposures to electrical hazards but are not working on live electrical equipment (not including power tools)	Available online through AECOM U.
Heavy Equipment and Machines					
☐	Powered Industrial Trucks (Forklifts)	Y	Once	Your job assignments include operating a powered industrial truck (forklift).	Required more frequently if assessments indicate the need.
☐	Heavy Equipment Safety	N	As needed	You work around heavy equipment but are not operating them.	Available online through AECOM U. May be included as part of a 10- or 30- hour Construction Health and Safety course.
Railroads					
☐	Agency-Specific Roadway Worker Protection Training	Y	As required		
Underground Work					
☐	24-Hour New Surface Miner Training	Y	Once	You perform work at surface mine sites regulated by the U.S. Mine Safety and Health Administration (MSHA). Training is conducted by MSHA-approved instructors under MSHA-approved training plan.	
☐	Experienced Miner Training	Y	Once, followed by annual refreshers	You meet the MSHA definition of an “Experienced Miner.”	See Surface Miner and Underground Miner training for information on annual refreshers.
☐	8-Hour Surface Miner Training – Annual Refresher	Y	Annual	You perform work at surface mine sites regulated by MSHA.	Training is conducted by MSHA-approved instructors under MSHA-approved training plan.
☐	40-Hour Underground Miner Training – New	Y	Once	You perform work in underground mine sites regulated by MSHA.	Training is conducted by MSHA-approved instructors under MSHA-approved training plan.
☐	8-Hour Underground Miner Training – Annual Refresher	Y	Annual	You perform work in underground mine sites regulated by MSHA.	Training is conducted by MSHA-approved instructors under MSHA-approved training plan.

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Applies?	Course Title	Regulatory	Frequency	Should You Attend?	Additional Information
Work at Height					
☐	Fall Protection – Awareness	Y	Once and as needed	You are able to recognize hazards to avoid areas where fall protection is needed.	May be included in OSHA 10 or other classes
☐	Fall Protection Authorized User	Y	Once and as needed	You perform duties at a locations where exposure to fall hazards and personal fall arrest systems are required.	
☐	Fall Protection – Competent	Y	Once and as needed	You review/approve fall protection plans. You supervise, implement and monitor fall protection programs.	
☐	Fall Protection – Qualified Person	Y	Once and as needed	You possess a recognized degree or professional certificate and can design/analyze fall protection systems via extensive knowledge, training, and experience.	
☐	Mobile Elevating Work Platform (MEWP) Training (Performance Based)	Y	Once	You are required to operate MEWPs such as bucket trucks, manlifts, and under bridge inspection units.	
☐	Under Bridge Inspection Units (Awareness Level}	N	Once	You are required to occupy/operate Under Bridge Inspection Units (UBIUs) or to manage a project involving UBIUs.	Available online through AECOM U. This training is an AECOM requirement and not a substitute for ANSI/SAIA A92.24-2018 training requirements adopted by AECOM.
Work On, In, and Near Water					
☐	U.S. Coast Guard Safe Boating Course or equivalent	N	Once	Required if you operate watercraft.	
☐	Water and Ice Safety Awareness	N	Annually	Recommended if you work over or near water.	
☐	Marine Trash and Debris Awareness and Limitation	Y	Annual	You work on contract operations for lessees and/or operators of oil and gas operations in the Gulf of Mexico.	Provided by lessee or operator.
Biological and Wildlife					
☒	Biological Hazards	N	As required	Employees potentially exposed to wildlife or poisonous plants.	Available online through AECOM U.
☒	Bloodborne Pathogens	Y	Annually, as required	Employees working in areas that may expose them to human bodily fluids (waste treatment plants, sanitary sewers, etc.).	Available online through AECOM U.
☐	Bear Aware	N	As required	Employees working in areas with known bear populations.	Available online through AECOM U.
Ergonomics					
☐	Ergonomics Self-Assessment	N	Once	For Employees who work in a home office, AECOM office, or project office.	Generally completed upon hire or change in assignment. Available online through the AECOM U.
Fitness for Duty					
☐	Fitness for Duty	N	Once, refresher as needed.	Recommended for applicable field projects (i.e., safety sensitive, night work, etc.)	Available online through AECOM U.
☐	Reasonable Suspicion for Supervisors	N	Once, refresher as needed.	For People Managers.	Available online through AECOM U.

Applies?	Course Title	Regulatory	Frequency	Should You Attend?	Additional Information
Injury and Illness Claims Management					
☐	Injury and Illness Claims Management Flow	N	As required	Required for Employees who sustain an injury or illness that involves claims management.	Available online through AECOM U.
Heat and Cold Stress					
☒	Heat Stress	N	Once, refresher as required by local law	For employees that might be exposed to heat stress	Can be completed via AECOM U or other approved training, including 10-/30-hour Construction Health and Safety courses.
☒	Cold Stress	N	Once, refresher as required by local law	For employees that might be exposed to cold stress.	Can be completed via AECOM U or other approved training, including 10-/30-hour Construction Health and Safety courses.
Noise					
☒	Hearing Conservation	Y	Annual	Employees exposed to noise ≥ 85 decibels averaged over an 8-hour day, or who otherwise utilize hearing protectors.	Project-specific hearing conservation training and available online through AECOM U.
Radiological					
☐	Nuclear Density Gauge Operator	Y	Contact your Business Group Radiation Safety Officer for region-specific training requirements	You operate nuclear density gauges / densometers.	Troxler or equivalent training.
☐	Nuclear Density Gauge Transporter	Y		You transport nuclear density gauges / densometers.	Hazardous Materials shipping - ground and/or air.
☐	Radiation Worker (Nuclear Energy Worker)	Y		You may require non-routine or short-term unescorted access to radiological controlled areas (excluding High Radiation Areas and Airborne Radiation Areas), or you work in areas where radioactive materials are stored.	Occupational dose limits apply.
☐	Radiation Safety Officer	Y		You are designated as a Radiation Safety Officer.	
Respirator Usage					
☐	Respiratory Protection	Y	Annual	Required for any employee who may be required to wear a respirator.	May be included in HAZWOPER refresher training
☐	Self-Contained Breathing Apparatus (SCBA)/Cascade Systems	Y	Once	Required for any employee required to wear SCBAs or to operate a supplied air system.	Part of Project Safety training as needed.
Hazardous Substances and Communication					
☒	40-Hour Hazardous Waste Operations	Y	Once	Anyone performing work or expected to perform at hazardous waste sites or treatment, storage, and disposal facilities or those responding to emergency releases of hazardous substances.	Training must have a 'hands-on' component (i.e., donning/doffing PPE). Any exceptions must be approved by a Regional SH&E Manager.
☒	8-Hour Hazardous Waste Operations – Refresher	Y	Annual	Only attend if you have completed the 40-Hour Hazardous Waste Operations training - see above.	When offered as a combination of online modules and classroom instruction, online modules must be completed prior to the classroom portion for participants to receive credit. Both portions (online and classroom) need to be completed within the same calendar year.

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Applies?	Course Title	Regulatory	Frequency	Should You Attend?	Additional Information
☐	8-Hour Hazardous Waste Operations – Supervisor	Y	Once	Required for anyone serving as the site supervisor or overseeing subcontractor activities at a hazardous waste site.	When offered as a combination of online modules and classroom instruction, online modules must be completed prior to the classroom portion for participants to receive credit. Both portions (online and classroom) need to be completed within the same calendar year.
☐	Anhydrous Ammonia Awareness	Y	Once - refresher as required by local law	You perform work where you may be potentially exposed to anhydrous ammonia. This may include tasks associated with industrial refrigeration equipment or piping, petroleum refineries, and agricultural fertilizer.	Available online through AECOM U and provided by Vector Solutions.
☐	Asbestos Awareness	Y	Once; refresher as required by local law	You perform work where you work in areas that contain or may contain asbestos and have the potential to disturb the asbestos-containing material	Available online through AECOM U.
☐	Asbestos Inspector	Y	Annual	You perform asbestos sampling tasks.	
☐	Asbestos Planner	Y	Annual	You serve as the project asbestos planner.	
☐	Cadmium Awareness	Y	Once, followed by annual refreshers		Available through AECOM U – Vector Solutions.
☐	Crystalline Silica Awareness	Y	Once; refresher as required by local law	You perform work where you may be potentially exposed to silica.	Available through AECOM U – Vector Solutions.
☐	Hazard Communication	Y	Initially and if hazards change	Required for anyone who is potentially exposed to/works with hazardous chemicals.	Training must occur before any work with hazardous chemicals. Included (as needed) in safety orientation. After the initial training, required updates will typically be handled as part of project-specific safety training.
☐	Hazardous Materials Shipping	Y	Every 3 years	Required for anyone who packages, labels, transports, completes paperwork for, or offers for shipment, hazardous materials/dangerous goods.	
☐	Hot Work	Y	Once	Your job duties include these activities.	
☐	Hydrogen Sulfide (H2S) Alive	Y	Annual	For employees performing ground disturbance activities in the oil and gas industries.	
☐	Hydrogen Sulfide (H2S) Awareness	Y	Annual	For employees performing ground disturbance activities who are at risk of hydrogen sulfide exposure, but do not work in the oil or gas industry	
☐	Laboratory Safety (Awareness Level)	Y	Once	You work in a laboratory.	Available through AECOM U – Vector Solutions.
☐	Lead Awareness	Y	Once - refresher as required by local law	You perform work where you may be potentially exposed to lead.	
☐	Lead Project Designer	Y	Every 3 years	You are a lead project designer.	
☐	Lead Risk Assessor	Y	Every 3 years	You are a project lead risk assessor inspector.	

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Applies?	Course Title	Regulatory	Frequency	Should You Attend?	Additional Information
☐	Substance Specific	Y	Once	Any U.S. employee potentially exposed to a substance covered by the 29 CFR substance specific regulations.	Includes Ammonia, Benzene, Cadmium, Chromium (VI), Hydrogen Sulfide, Silica and Lead. Offered as part of project-specific training.
☐	Waste Specialist	Y	Once with annual refresher	You are responsible for waste management at a small or large quantity generator facility.	
☐	Workplace Hazardous Materials Information System (WHMIS)	Y	Annual	You are assigned to a Canadian facility and work with or around hazardous materials.	Canadian Hazard Communications
Highway and Road Work					
☐	Flagger Training	Y	Once	Anytime a worker is responsible for directing or controlling traffic on a construction site, road maintenance project, or any other area where they need to manage vehicular or pedestrian flow	Available through external vendor approved by SH&E Manager.
☐	Work Zone Safety (Awareness Level)	N	Once	Work on or adjacent to roadway live traffic.	Available online through AECOM U.

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Americas

Project Hazardous Materials Communication Plan

S3AM-110-FM2

Instructions

1. **This form, or equivalent, is to be completed in accordance with Hazardous Substances and Communication – Americas S3AM-110-PR2.**
2. **This form, or equivalent, must be completed and attached as an appendix as part of the Project-Specific SH&E Plan – Americas S3AM-209-FM2 when the project scope of work requires chemical materials (i.e., hazardous materials/substance and/or Materials of Trade) to be brought onto the site to perform work.**
3. **Materials to be brought to the Site by AECOM and/or its subcontractors and chemical hazards that will be encountered on the Site must have a Safety Data Sheet (SDS) maintained in an accessible location for workers to review.**
4. **Applicable SDSs must be attached to this form.**
5. **The completed form must be retained in the project files as part of the project-specific SH&E plan.**

Materials to be brought or encountered on the Site will include the following (add rows as necessary):

Chemical Name		Purpose/use/source
1.	Hydrochloric Acid	Bottleware Preservative
2.	Nitric acid	Bottleware Preservative
3.	Gasoline	Fuel
4.	Isobutylene	Cal Gas
5.	Alconox	Detergent
6.	1,1,1-Trichloroethane	Site Contaminant
7.	1,1-Dichloroethane	Site Contaminant
8.	Chloroethane	Site Contaminant
9.	Cyclohexane	Site Contaminant
10.	Sulfuric Acid	Site Contaminant
11.	Hexachlorocyclopentadiene	Site Contaminant
12.	Methylcyclohexane	Site Contaminant
13.	o-Chlorotoluene	Site Contaminant
14.	Polychlorinated biphenyls (PCBs)	Site Contaminant
15.	Xylene	Site Contaminant

The applicable SDSs are attached to this form below:

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Project Hazardous Substance Exposure Control Plan

S3AM-110-FM3

Instructions

1. **This form, or equivalent, is to be completed in accordance with Hazardous Substances and Communication – Americas S3AM-110-PR2.**
2. **This form must be completed and attached as an appendix to the Project-Specific SH&E Plan Template – Americas S3AM-209-FM2 only when there is a potential for employee exposure to any chemicals listed in the table below. This determination should be based on information obtained from historical investigations and other relevant sources indicating that the chemicals may be present at elevated concentrations at the site. when any chemicals listed in the table below are known or suspected to be present at elevated concentrations at the site based on information obtained from historical investigations and other sources.**
3. **For the first table, add rows as necessary and delete rows of the chemicals not applicable to your project.**
4. **For Occupational Exposure Limits to Chemical and Biological Agents in other Canadian provincial or territorial areas refer to the applicable jurisdictional legislation.**
5. **The completed form must be retained in the project files as part of the project-specific SH&E plan.**

Materials to be brought or encountered on the Site will include the following:

Note: Max. Conc. = Maximum Concentration | **PEL** = Permissible Exposure Limit | **TLV** = Threshold Limit Value | **IP** = Ionization Potential | **eV** = Electron Volt | **mg** = milligrams | **µg** = micrograms | **cm³** = centimeters cubed | **m³** = meters cubed | **f** = fiber | **ppm** = parts per million

Chemical Name	Media	Exposure Route(s)	Max. Conc. Observed at Site	PEL– U.S. OSHA (Cal/OSHA or Canadian province where noted)	TLV	IP (eV)
Other Common Site Constituents of Concern						
1,1,1-Trichloroethane	Groundwater If 'Other', please specify: _____	Inhalation	….	350 ppm	350 ppm	11
1,1-Dichloroethane	Groundwater If 'Other', please specify: _____	Inhalation	….	100 ppm	100 ppm	11.06
Chloroethane	Choose an item. If 'Other', please specify: _____	Inhalation	….	1000 ppm	1000 ppm	10.97
Cyclohexane	Groundwater If 'Other', please specify: _____	Inhalation	….	300 ppm	100 ppm	9.88
Sulfuric Acid	Groundwater If 'Other', please specify: _____	Inhalation		1 mg/m³	0.2 mg/m³	n/a
Hexachlorocyclopentadiene	Groundwater If 'Other', please specify: _____	Inhalation		n/a	0.01 ppm	n/a

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Chemical Name	Media	Exposure Route(s)	Max. Conc. Observed at Site	PEL– U.S. OSHA (Cal/OSHA or Canadian province where noted)	TLV	IP (eV)
Methylcyclohexane	Groundwater If 'Other', please specify: _____	Inhalation		500 ppm	400 ppm	9.85
o-Chlorotoluene	Groundwater If 'Other', please specify: _____	Inhalation		n/a	50 ppm	8.83
Polychlorinated biphenyls (PCBs)	Groundwater If 'Other', please specify: _____	Inhalation	....	1 mg/m^3 (42% chlorine); 0.5 mg/m^3 (54% chlorine)	1 mg/m^3 (42% chlorine); 0.5 mg/m^3 (54% chlorine)	n/a
Xylene	Groundwater If 'Other', please specify: _____	Inhalation	....	100 ppm	100 ppm	8.45, 8.56

Exposure Monitoring Needs Assessment

During the performance of the scope of work, there is a reasonable potential for exposure to chemical hazards. These may originate from materials brought on site, constituents of concern present in environmental media under investigation, or simultaneous operations conducted by the property owner or third parties. Such exposures could result in vapors, fumes, aerosols, mists, or airborne particulates/dusts approaching permissible exposure limits. Therefore, the worker exposure monitoring measures to be implemented are described below.

Industrial Hygiene Sampling

☒ Industrial hygiene (IH) sampling will **NOT** be used as part of worker exposure monitoring
☐ Industrial hygiene (IH) sampling **WILL** be used as part of worker exposure monitoring. IH sampling will consist of ____.

Point Source Monitoring

☒ Direct-read instruments will **NOT** be used to collect point source readings to guide field investigation and sample selection.
☐ One or more direct-read instruments **WILL** be used to collect point source readings, as a standard industry practice, to guide field investigation and sample selection. These readings are **NOT** representative of worker exposure.

Instrument Selection

Worker exposure monitoring will be conducted using a combination of direct-read instruments and industrial hygiene sampling methods, as outlined below. Monitoring will take place within the work area to detect the presence and relative levels of toxic substances. All monitoring activities will be performed in accordance with the work permit and Task Hazard Analysis (THA). Instruments used on site must be intrinsically safe to prevent fire or explosion.

Instrument	Manufacturer/Model	Hazard Detected/Measured
☐ Photo Ionization Detector (PID)	**RAE Systems mini-RAE (min. 11.7 eV bulb)**	Petroleum hydrocarbons Organic solvents
☐ Other: Single gas detectors	Draeger Chip Measurement System (CMS)	Vinyl Chloride

Instrument Calibration/Bump Checks

Direct-read instruments must be calibrated prior to use each day following the procedure outlined by the manufacturer in the instrument manual. Calibration results shall be documented in a digital or hardcopy field form or logbook. Full calibration records from the instrument provider (i.e., rental company) shall be retained in the central project file.

Direct-Read Instrument Monitoring Procedures and Action Levels

The monitoring procedures shown below are general guidelines for sampling activities. In general, readings are considered actionable if sustained readings are observed for 5 minutes or more or if intermittent peaks are seen more than 1 time the action level. A reading more than action level outlined below will require additional ventilation (natural or mechanical) for 30 minutes, followed by re-monitoring.

Parameter	Zone Location and Monitoring Interval	Action Level	Response Activity
☐ **Volatile Organic Compounds** (VOCs) and Volatile Hydrocarbons (total by PID)	Breathing zone, continuously during tasks where exposure to VOCs and volatile hydrocarbons is possible	<5 ppm	Continue monitoring, may continue work in required PPE
		5- 25 ppm (sustained for 5 minutes)	**STOP WORK** and notify PM. Investigate the cause of elevated VOC measurements and identify measures to reduce concentrations (cover impacted soils, ventilation, etc.). Work activities shall only continue once levels have decreased to or below 5 units above background. If levels continue above 5 units, only individuals who are medically qualified to wear respiratory protection are permitted to continue work activities with Project Manager approval. Don Level C PPE (organic vapor respirator cartridges), continue monitoring, and initiate continuous air monitoring for benzene.
		> 25 ppm (sustained for 5 minutes)	Cease work, exit, and contact the Site Safety Lead, Site Supervisor, and Project Manager.

Instrument Recordkeeping

Instrument readings collected for the purpose of monitoring or determining worker exposure will include the date, time, activity being performed, location, and result/reading. Results will be recorded at the following frequency:

Decontamination

Contact with chemicals and/or contaminated/impacted materials while performing field activities may occur. All practical steps shall be taken to reduce or minimize contact with chemicals and contaminated/impacted materials while performing field activities. All decontaminated equipment shall be visually inspected for contamination prior to leaving the Contaminant Reduction Zone (CRZ). Decontamination procedures, solutions and equipment are summarized in the table(s) below.

Site Control

See A.3

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Personnel Decontamination

Procedure	Decontamination Solution	Equipment & Materials Needed
Disposable sampling equipment and PPE – containerize for disposal	Alconox	Trash bags; DOT-approved 55-gallon steel drums
Non-disposable sampling equipment and PPE – decontaminate with Alconox and water		Alconox solution; potable water; deionized water; spray bottles; 5-gallon buckets; brushes; plastic sheeting

Equipment Decontamination

Equipment Type	Decontamination Solution	Procedure
Non-disposable sampling equipment and PPE	Alconox solution; potable water rinse; deionized water rinse	Wash with an Alconox solution; rinse with potable water to remove all traces of detergent; final rinse with deionized water; containerize decon fluids for disposal

Waste Management

AECOM and AECOM subcontractor activities that generate waste on behalf of our client must be appropriately managed and disposed of in accordance with regulatory requirements. The following waste streams/products are anticipated to be generated by the project scope of work and be handling, management and disposed of as outlined in the table below.
DELETE THIS SECTION IF NO WASTE WILL BE GENERATED

Summary of Investigation and Site Activities Derived Waste

Waste Streams/Products	Handling and Disposal Procedures
Purge Water	To be handled at on-site groundwater treatment system.

Medical Surveillance

Medical surveillance is required for employees who:

1. Are or may be exposed to hazardous substances or health hazards at or above the permissible exposure limits or, if there is no permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year;
2. All employees who wear a respirator for 30 days or more a year.
3. All employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation; and
4. Members of HAZMAT teams.

Based on potential exposures is supplemental medical surveillance appropriate?	☒ Yes (contact a SH&E Manager for assistance) ☐ No

The applicable SDSs are attached to this form below:

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SAFETY DATA SHEET

Version 4.10
Revision Date 09/23/2016
Print Date 01/08/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : 1,1,1-Trichloroethane

Product Number : 402877
Brand : Sigma-Aldrich
Index-No. : 602-013-00-2

CAS-No. : 71-55-6

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Inhalation (Category 4), H332
Skin irritation (Category 2), H315

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)
H315 Causes skin irritation.
H332 Harmful if inhaled.

Precautionary statement(s)
P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264 Wash skin thoroughly after handling.
P271 Use only outdoors or in a well-ventilated area.
P280 Wear protective gloves.
P302 + P352 IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P312 Call a POISON CENTER/doctor if you feel unwell.

P321	Specific treatment (see supplemental first aid instructions on this label).
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	'Chlorothene' Methylchloroform
Formula	:	$C_2H_3Cl_3$
Molecular weight	:	133.40 g/mol
CAS-No.	:	71-55-6
EC-No.	:	200-756-3
Index-No.	:	602-013-00-2

Hazardous components

Component	Classification	Concentration
1,1,1-Trichloroethane		
	Acute Tox. 4; Skin Irrit. 2; Eye Irrit. 2A; Ozone 1; H315, H319, H332	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation.
For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
1,1,1-Trichloroethane	71-55-6	TWA	350.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Liver damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		STEL	450.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Liver damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		C	350.000000 ppm 1,900.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		See Appendix C 15 minute ceiling value		
		TWA	350.000000 ppm 1,900.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		

		PEL	350 ppm 1,900 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	450 ppm 2,450 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	800 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
1,1,1-Trichloroethane	71-55-6	Methyl chloroform	40ppm	In end-exhaled air	ACGIH - Biological Exposure Indices (BEI)
	Remarks	Prior to last shift of workweek			
		Trichloroacetic acid	10.0000 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of the workweek (After four or five consecutive working days with exposure)			
		Total trichloroethanol	30.0000 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			
		Total trichloroethanol	1.0000 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 60 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an

industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	-35.0 °C (-31.0 °F)
f)	Initial boiling point and boiling range	72.0 - 75.0 °C (161.6 - 167.0 °F)
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 15 %(V) Lower explosion limit: 7.5 %(V)
k)	Vapour pressure	133.3 hPa (100.0 mmHg) at 20.0 °C (68.0 °F)
l)	Vapour density	No data available
m)	Relative density	1.34 g/cm3
n)	Water solubility	1.25 g/l at 23 °C (73 °F)
o)	Partition coefficient: n-octanol/water	log Pow: 2.49
p)	Auto-ignition temperature	537.0 °C (998.6 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.
Contains the following stabiliser(s):
Low alkyl epoxide (<=0.05 %)

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents, Potassium, Magnesium, Sodium/sodium oxides, Zinc, Strong bases

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 9,600 mg/kg
Remarks: Cardiac:Pulse rate. Nutritional and Gross Metabolic:Weight loss or decreased weight gain.

LD50 Oral - Mouse - 6,000 mg/kg
Remarks: Cardiac:Pulse rate. Nutritional and Gross Metabolic:Weight loss or decreased weight gain.

LC50 Inhalation - Mouse - 2 h - 3911 ppm
Remarks: Behavioral:Excitement.

Dermal: No data available

LD50 Intraperitoneal - Rat - 3,593 mg/kg

LD50 Intraperitoneal - Mouse - 2,568 mg/kg

LD50 Subcutaneous - Mouse - 16.0 mg/kg
Remarks: Drowsiness Behavioral:Ataxia.

LD50 Intraperitoneal - Dog - 3,100 mg/kg
Remarks: Liver:Liver function tests impaired.

Skin corrosion/irritation
Skin - Rabbit
Result: Skin irritation - 24 h

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC: 3 - Group 3: Not classifiable as to its carcinogenicity to humans (1,1,1-Trichloroethane)

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a

carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, Exposure to and/or consumption of alcohol may increase toxic effects., prolonged or repeated exposure can cause:, narcosis, Liver injury may occur., Kidney injury may occur.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 42.3 mg/l - 96 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential

Bioaccumulation	Lepomis macrochirus (Bluegill) - 28 d - 0.0734 mg/l
	Bioconcentration factor (BCF): 9

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 2831 Class: 6.1 Packing group: III
Proper shipping name: 1,1,1-Trichloroethane
Reportable Quantity (RQ): 1000 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 2831 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: 1,1,1-TRICHLOROETHANE

IATA
UN number: 2831 Class: 6.1 Packing group: III
Proper shipping name: 1,1,1-Trichloroethane

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
1,1,1-Trichloroethane	71-55-6	2007-07-01

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloroethane	71-55-6	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloroethane	71-55-6	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloroethane	71-55-6	2007-07-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Eye Irrit.	Eye irritation
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
Ozone	Hazardous to the ozone layer
Skin Irrit.	Skin irritation

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the

product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.10 Revision Date: 09/23/2016 Print Date: 01/08/2018

SAFETY DATA SHEET

Nonflammable Gas Mixture: 1,1-Dichloroethane / 1,1-Dichloroethylene / 1,2-Dichloroethane (Ethylene Dichloride) / Nitrogen

Section 1. Identification

GHS product identifier : Nonflammable Gas Mixture: 1,1-Dichloroethane / 1,1-Dichloroethylene / 1,2-Dichloroethane (Ethylene Dichloride) / Nitrogen

Other means of identification : Not available.

Product type : Gas.

Product use : Synthetic/Analytical chemistry.

SDS # : 017546

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : GASES UNDER PRESSURE - Compressed gas

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : Contains gas under pressure; may explode if heated.
May displace oxygen and cause rapid suffocation.

Precautionary statements

General : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction.

Prevention : Not applicable.

Response : Not applicable.

Storage : Protect from sunlight. Store in a well-ventilated place.

Disposal : Not applicable.

Hazards not otherwise classified : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Other means of identification : Not available.

Product code : 017546

Ingredient name	%	CAS number
Nitrogen	99.7 - 99.9997	7727-37-9
1,2-dichloroethane	0.0001 - 0.0999	107-06-2
1,1-dichloroethane	0.0001 - 0.0999	75-34-3
1,1-dichloroethylene	0.0001 - 0.0999	75-35-4

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards.

Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Specific treatments : No specific treatment.

Section 4. First aid measures

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
nitrogen oxides

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid breathing gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
Avoid contact with eyes, skin and clothing. Empty containers retain product residue and can be hazardous.

Section 7. Handling and storage

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F). Keep container tightly closed and sealed until ready for use. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Nitrogen	**ACGIH TLV (United States, 3/2019). Oxygen Depletion [Asphyxiant].**
1,2-dichloroethane	**ACGIH TLV (United States, 3/2019).** TWA: 40 mg/m³ 8 hours. TWA: 10 ppm 8 hours. **NIOSH REL (United States, 10/2016).** STEL: 8 mg/m³ 15 minutes. STEL: 2 ppm 15 minutes. TWA: 4 mg/m³ 10 hours. TWA: 1 ppm 10 hours. **OSHA PEL 1989 (United States, 3/1989).** STEL: 8 mg/m³ 15 minutes. STEL: 2 ppm 15 minutes. TWA: 4 mg/m³ 8 hours. TWA: 1 ppm 8 hours. **OSHA PEL Z2 (United States, 2/2013).** AMP: 200 ppm 5 minutes. CEIL: 100 ppm TWA: 50 ppm 8 hours.
1,1-dichloroethane	**ACGIH TLV (United States, 3/2019).** TWA: 405 mg/m³ 8 hours. TWA: 100 ppm 8 hours. **NIOSH REL (United States, 10/2016).** TWA: 400 mg/m³ 10 hours. TWA: 100 ppm 10 hours. **OSHA PEL (United States, 5/2018).** TWA: 400 mg/m³ 8 hours. TWA: 100 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** TWA: 400 mg/m³ 8 hours. TWA: 100 ppm 8 hours.
1,1-dichloroethylene	**ACGIH TLV (United States, 3/2019).** TWA: 5 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** TWA: 4 mg/m³ 8 hours. TWA: 1 ppm 8 hours.

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Section 8. Exposure controls/personal protection

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas.

Color : Not available.

Odor : Not available.

Odor threshold : Not available.

pH : Not available.

Melting point : -210.01°C (-346°F) This is based on data for the following ingredient: nitrogen.

Boiling point : Not available.

Critical temperature : Lowest known value: -146.95°C (-232.5°F) (nitrogen).

Flash point : Not available.

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Not available.

Vapor pressure : Not available.

Vapor density : Highest known value: 0.97 (Air = 1) (nitrogen).

Gas Density (lb/ft ^{3}) : Only known value: 0.072 (nitrogen).

Relative density : Not applicable.

Section 9. Physical and chemical properties

Solubility : Not available.

Solubility in water : Not available.

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

Viscosity : Not applicable.

Flow time (ISO 2431) : Not available.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Incompatible materials : No specific data.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
1,2-dichloroethane	LC50 Inhalation Gas.	Rat	2646 ppm	1 hours
1,1-dichloroethane	LC50 Inhalation Gas.	Rat	13000 ppm	4 hours
	LD50 Oral	Rat	725 mg/kg	-
1,1-dichloroethylene	LC50 Inhalation Gas.	Rat	12700 ppm	1 hours
	LC50 Inhalation Gas.	Rat	6350 ppm	4 hours
	LD50 Oral	Rat	200 mg/kg	-

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
1,2-dichloroethane	Eyes - Mild irritant	Rabbit	-	24 hours 500 mg	-
	Eyes - Severe irritant	Rabbit	-	63 mg	-
	Skin - Mild irritant	Rabbit	-	24 hours 500 mg	-
	Skin - Mild irritant	Rabbit	-	625 mg	-

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Section 11. Toxicological information

Not available.

Classification

Product/ingredient name	OSHA	IARC	NTP
1,2-dichloroethane	-	2B	Reasonably anticipated to be a human carcinogen.
1,1-dichloroethylene	-	2B	-

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
1,2-dichloroethane	Category 3	-	Respiratory tract irritation
1,1-dichloroethane	Category 3	-	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards.

Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Section 11. Toxicological information

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
1,2-dichloroethane	Acute EC50 189 ppm Fresh water	Algae - Scenedesmus subspicatus	72 hours
	Acute EC50 155 mg/l Fresh water	Daphnia - Daphnia magna - Instar	48 hours
	Acute LC50 110 ppm Marine water	Crustaceans - Americamysis bahia	48 hours
	Acute LC50 115 mg/l Marine water	Fish - Pleuronectiformes	96 hours
	Chronic NOEC 29000 µg/l Fresh water	Fish - Pimephales promelas - Larvae	32 days
1,1-dichloroethylene	Acute EC50 9.12 mg/l Fresh water	Algae - Chlamydomonas reinhardtii - Exponential growth phase	72 hours
	Acute EC50 410000 µg/l Fresh water	Algae - Scenedesmus abundans	96 hours
	Acute LC50 >798 ppm Marine water	Crustaceans - Americamysis bahia	48 hours
	Acute LC50 11600 µg/l Fresh water	Daphnia - Daphnia magna	48 hours
	Acute LC50 74 mg/l Fresh water	Fish - Lepomis macrochirus - Young of the year	96 hours
	Chronic EC10 3.94 mg/l Fresh water	Algae - Chlamydomonas reinhardtii - Exponential growth phase	72 hours

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Nitrogen	0.67	-	low
1,2-dichloroethane	1.45	2	low
1,1-dichloroethane	1.79	-	low
1,1-dichloroethylene	2.13	12.88	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1956	UN1956	UN1956	UN1956	UN1956
UN proper shipping name	COMPRESSED GAS, N.O.S. (1,2-Dichloroethane, Nitrogen)	COMPRESSED GAS, N.O.S. (1,2-Dichloroethane, Nitrogen)	COMPRESSED GAS, N.O.S. (1,2-Dichloroethane, Nitrogen)	COMPRESSED GAS, N.O.S. (1,2-Dichloroethane, Nitrogen)	COMPRESSED GAS, N.O.S. (1,2-Dichloroethane, Nitrogen)
Transport hazard class(es)	2.2	2.2	2.2	2.2	2.2
Packing group	-	-	-	-	-
Environmental hazards	No.	No.	No.	No.	No.

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Additional information

TDG Classification : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2).
Explosive Limit and Limited Quantity Index 0.125
Passenger Carrying Road or Rail Index 75

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to IMO instruments : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 4(a) final test rules**: 1,2-dichloroethane

TSCA 8(a) PAIR: 1,2-dichloroethane; 1,1-dichloroethane; 1,1-dichloroethylene

TSCA 8(a) CDR Exempt/Partial exemption: Not determined

Clean Water Act (CWA) 307: 1,2-dichloroethane; 1,1-dichloroethane; 1,1-dichloroethylene

Clean Water Act (CWA) 311: 1,2-dichloroethane; 1,1-dichloroethylene

Section 15. Regulatory information

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

State regulations

Massachusetts : The following components are listed: NITROGEN; NITROGEN (LIQUIFIED)

New York : None of the components are listed.

New Jersey : The following components are listed: NITROGEN

Pennsylvania : The following components are listed: NITROGEN

California Prop. 65

⚠ **WARNING**: This product can expose you to chemicals including Ethylene dichloride, 1,1-Dichloroethane and Vinylidene chloride, which are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

Ingredient name	No significant risk level	Maximum acceptable dosage level
Ethylene dichloride	Yes.	-
1,1-Dichloroethane	Yes.	-
Vinylidene chloride	Yes.	-

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia : All components are listed or exempted.

Canada : At least one component is not listed in DSL but all such components are listed in NDSL.

China : All components are listed or exempted.

Section 15. Regulatory information

Europe : All components are listed or exempted.

Japan : **Japan inventory (ENCS)**: Not determined.
Japan inventory (ISHL): Not determined.

New Zealand : All components are listed or exempted.

Philippines : All components are listed or exempted.

Republic of Korea : All components are listed or exempted.

Taiwan : All components are listed or exempted.

Thailand : Not determined.

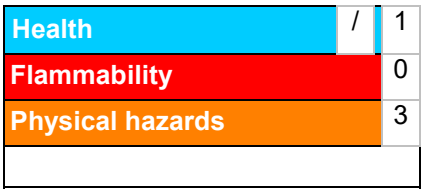
Turkey : Not determined.

United States : All components are active or exempted.

Viet Nam : All components are listed or exempted.

Section 16. Other information

Hazardous Material Information System (U.S.A.)



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

National Fire Protection Association (U.S.A.)

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
GASES UNDER PRESSURE - Compressed gas	On basis of test data

History

Date of printing : 3/30/2021

Date of issue/Date of revision : 3/30/2021

Date of previous issue : No previous validation

Version : 1

Section 16. Other information

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

SAFETY DATA SHEET

Version 6.12
Revision Date 08/08/2025
Print Date 08/09/2025

SECTION 1. IDENTIFICATION

1.1 Product identifiers

Product name : 1,1-Dichloroethylene

Product Number : 02574
Brand : Sigma-Aldrich
Index-No. : 602-025-00-8
CAS-No. : 75-35-4

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

Uses advised against : The product is being supplied under the TSCA R&D Exemption (40 CFR Section 720.36). It is the recipient's responsibility to comply with the requirements of the R&D exemption. The product may not be used for a non-exempt commercial purpose under TSCA unless appropriate consent is granted in writing by MilliporeSigma.

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2. HAZARDS IDENTIFICATION

GHS classification in accordance with the OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids : Category 1

Acute toxicity (Oral) : Category 4

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Acute toxicity (Inhalation)	:	Category 4
Eye irritation	:	Category 2A
Carcinogenicity	:	Category 2
Specific target organ toxicity - repeated exposure (Inhalation)	:	Category 1 (Nose)
Specific target organ toxicity - repeated exposure (Oral)	:	Category 2 (Liver)
Short-term (acute) aquatic hazard	:	Category 2
Long-term (chronic) aquatic hazard	:	Category 3

Other hazards

None known.

GHS label elements

Hazard pictograms :

Signal Word : Danger

Hazard Statements :
H224 Extremely flammable liquid and vapour.
H302 + H332 Harmful if swallowed or if inhaled.
H319 Causes serious eye irritation.
H351 Suspected of causing cancer.
H372 Causes damage to organs (Nose) through prolonged or repeated exposure if inhaled.
H373 May cause damage to organs (Liver) through prolonged or repeated exposure if swallowed.
H401 Toxic to aquatic life.
H412 Harmful to aquatic life with long lasting effects.

Precautionary statements :

Prevention:

P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P233 Keep container tightly closed.

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P240 Ground and bond container and receiving equipment.
P241 Use explosion-proof electrical/ ventilating/ lighting equipment.
P242 Use non-sparking tools.
P243 Take action to prevent static discharges.
P260 Do not breathe mist or vapours.
P264 Wash skin thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P271 Use only outdoors or in a well-ventilated area.
P273 Avoid release to the environment.
P280 Wear protective gloves, protective clothing, eye protection and face protection.

Response:

P301 + P312 + P330 IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.
P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P312 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P337 + P313 If eye irritation persists: Get medical advice/ attention.
P370 + P378 In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.

Storage:

P403 + P235 Store in a well-ventilated place. Keep cool.
P405 Store locked up.

Disposal:

P501 Dispose of contents/ container to an approved waste disposal plant.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Substance

Components

Chemical name	CAS No./Unique ID	Concentration (% w/w)	Trade secret
1,1-Dichloroethene	75-35-4*	>= 80 - <= 100	TSC

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* Indicates that the identifier is a CAS No.
TSC- the actual concentration or concentration range is withheld as a trade secret

SECTION 4. FIRST AID MEASURES

General advice	:	Show this safety data sheet to the doctor in attendance.
If inhaled	:	After inhalation: fresh air. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.
In case of skin contact	:	In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.
In case of eye contact	:	After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.
If swallowed	:	After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.
Most important symptoms and effects, both acute and delayed	:	The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11
Protection of first-aiders	:	For personal protection see section 8.
Notes to physician	:	No data available

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Water Foam Carbon dioxide (CO2) Dry powder
Unsuitable extinguishing media	:	For this substance/mixture no limitations of extinguishing agents are given.
Specific hazards during fire fighting	:	Combustible. Pay attention to flashback.

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Vapours are heavier than air and may spread along floors.

Development of hazardous combustion gases or vapours possible in the event of fire.

Forms explosive mixtures with air at ambient temperatures.

Hazardous combustion products	:	Carbon oxides Hydrogen chloride gas
Specific extinguishing methods	:	No data available
Further information	:	Remove container from danger zone and cool with water. Suppress (knock down) gases/vapours/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.
Special protective equipment for fire-fighters	:	Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Advice for non-emergency personnel: Do not breathe vapours, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition. Evacuate the danger area, observe emergency procedures, consult an expert. Advice for emergency responders: For personal protection see section 8.
Environmental precautions	:	Do not let product enter drains. Risk of explosion.

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Methods and materials for containment and cleaning up	:	Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

SECTION 7. HANDLING AND STORAGE

For precautions see section 2.2.

Advice on protection against fire and explosion	:	Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharge.
Advice on safe handling	:	Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.
Further information on storage conditions	:	Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition. Keep locked up or in an area accessible only to qualified or authorised persons.
Storage class	:	3, Flammable liquids
Recommended storage temperature	:	36 - 46 °F / 2 - 8 °C
Further information on storage stability	:	Air and moisture sensitive. Light sensitive. Store under inert gas. Over time, pressure may increase causing containers to burst

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ingredients with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
1,1-Dichloroethene	75-35-4	TWA	5 ppm	ACGIH

Engineering measures : No data available

Personal protective equipment

Respiratory protection : required when vapours/aerosols are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN

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EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Recommended Filter type: : Filter type AX

The entrepeneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer. These measures have to be properly documented.

Hand protection

Material	:	Viton®
Break through time	:	480 min
Glove thickness	:	0.7 mm
Protective index	:	Full contact
Manufacturer	:	Vitoject® (KCL 890 / Aldrich Z677698, Size M)
Material	:	Nitrile rubber
Break through time	:	30 min
Glove thickness	:	0.4 mm
Protective index	:	Splash contact
Manufacturer	:	Camatril® (KCL 730 / Aldrich Z677442, Size M)
Remarks	:	This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN 16523-1 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Eye protection : Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).
Safety glasses

Skin and body protection : Flame retardant antistatic protective clothing.

Hygiene measures : Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : liquid, clear

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Color	:	colourless
Odor	:	No data available
Odor Threshold	:	No data available
pH	:	No data available
Melting point/ range	:	-188 °F / -122 °C Method: lit.
Boiling point/boiling range	:	86 - 90 °F / 30 - 32 °C Method: lit.
Flash point	:	-9.4 °F / -23.0 °C Method: closed cup
Evaporation rate	:	No data available
Flammability (solid, gas)	:	No data available
Flammability (liquids)	:	No data available
Burning rate	:	No data available
Self-ignition	:	968.0 °F / 520.0 °C
Upper explosion limit / Upper flammability limit	:	15.5 %(V)
Lower explosion limit / Lower flammability limit	:	6.5 %(V)
Vapor pressure	:	667.3 hPa (68.0 °F / 20.0 °C) 2,137.4 hPa (131.0 °F / 55.0 °C)
Relative vapour density	:	No data available
Relative density	:	No data available
Density	:	1.213 g/mL (68 °F / 20 °C) Method: lit.
Solubility(ies) Water solubility	:	2.5 g/l soluble (68.9 °F / 20.5 °C)
Partition coefficient: n-octanol/water	:	No data available

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Autoignition temperature	:	968 °F / 520 °C
Decomposition temperature	:	No data available
Viscosity, dynamic	:	No data available
Viscosity, kinematic	:	No data available
Flow time	:	No data available
Explosive properties	:	Not classified as explosive.
Oxidizing properties	:	none
Molecular weight	:	96.94 g/mol
Particle characteristics Particle size	: :	 No data available

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	Vapours may form explosive mixture with air.
Chemical stability	:	The product is chemically stable under standard ambient conditions (room temperature) .
Contains the following stabiliser(s):	:	hydroquinone monomethyl ether (0.02 %)
Possibility of hazardous reactions	:	Violent reactions possible with: Amines Alkaline earth metals metallic salts Strong oxidizing agents Strong bases amides chlorosulfonic acid Potassium hydroxide Powdered metals Nitric acid fuming sulfuric acid Risk of explosion with: Alkali metals Ozone perchloryl fluoride Peroxides polymerisation initiators Oxygen
Conditions to avoid	:	Warming.

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Incompatible materials	:	various plastics Strong oxidizing agents
Hazardous decomposition products	:	In the event of fire: see section 5

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
Acute toxicity estimate Oral - 1,500 mg/kg
(Calculation method)
LD50 Oral - Rat - female - 1,500 mg/kg
Remarks: (ECHA)
Acute toxicity estimate Inhalation - 4 h - 11.1 mg/l - vapour(Calculation method)

Acute toxicity estimate Inhalation - 4 h - 11.1 mg/l - vapour

(Expert judgement)
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)
Dermal: No data available

Skin corrosion/irritation
Skin - reconstructed human epidermis (RhE)
Result: No skin irritation - 3 - 60 min
(Regulation (EC) No. 440/2008, Annex, B.40)

Serious eye damage/eye irritation
Eyes - Bovine cornea
Result: Causes serious eye irritation. - 10 min
(OECD Test Guideline 437)

Respiratory or skin sensitization
Local lymph node assay (LLNA) - Mouse
Result: negative
(OECD Test Guideline 429)

Germ cell mutagenicity
Based on available data the classification criteria are not met.

Test Type: comet assay
Species: Rat
Cell type: Bone marrow
Application Route: inhalation (vapour)
Method: OECD Test Guideline 489
Result: positive

Test Type: Micronucleus test
Species: Mouse
Cell type: Bone marrow
Application Route: Inhalation
Method: OECD Test Guideline 474
Result: negative

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Test Type: Micronucleus test
Species: Mouse
Cell type: Bone marrow
Application Route: Oral
Method: OECD Test Guideline 474
Result: negative

Test Type: Mutagenicity (mammal cell test): chromosome aberration.
Species: Rat
Cell type: Implant
Application Route: Inhalation
Method: OECD Test Guideline 478
Result: negative

Carcinogenicity
Suspected of causing cancer.

IARC:	2B - Group 2B: Possibly carcinogenic to humans (1,1-Dichloroethene)
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
Inhalation - Causes damage to organs through prolonged or repeated exposure.
- Nose
Oral - May cause damage to organs through prolonged or repeated exposure.
- Liver

Aspiration hazard
No data available

11.2 Additional Information

Repeated dose toxicity - Rat - female - Oral - 90 Days - No observed adverse effect level - 9 mg/kg - Lowest observed adverse effect level - 14 mg/kg
Remarks: (ECHA)

RTECS: KV9275000
Nausea, Headache, Vomiting, Dizziness, Drowsiness, Confusion., Incoordination., Central nervous system depression
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

After absorption:

Headache
somnolence

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Unconsciousness
Coma

After absorption of large quantities:

Damage to:

Liver
Kidney
Lungs
Central nervous system

This substance should be handled with particular care.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Components:

1,1-Dichloroethene:

Toxicity to fish	:	LC50 (Pimephales promelas (fathead minnow)): 108 mg/l Exposure time: 96 h Test Type: flow-through test Analytical monitoring: yes Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia magna (Water flea)): 37 mg/l End point: Immobilization Exposure time: 48 h Test Type: static test Analytical monitoring: yes Method: OECD Test Guideline 202 GLP: yes Remarks: (ECHA)
Toxicity to algae/aquatic plants	:	EC50 (Chlamydomonas reinhardtii (green algae)): 9.12 mg/l Exposure time: 72 h Test Type: static test Analytical monitoring: yes Remarks: (ECHA) EC10: 3.94 mg/l

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Exposure time: 72 h
Remarks: (ECHA)

Toxicity to microorganisms : EC50 (Pseudomonas putida): > 2,000 mg/l
Exposure time: 17 h
Remarks: (IUCLID)

Ecotoxicology Assessment

Acute aquatic toxicity : Toxic to aquatic life.

Chronic aquatic toxicity : Harmful to aquatic life with long lasting effects.

Persistence and degradability

Components:

1,1-Dichloroethene:

Biodegradability : Result: Not readily biodegradable.
Biodegradation: 0 %
Exposure time: 28 d
Method: OECD Test Guideline 301D

Bioaccumulative potential

Components:

1,1-Dichloroethene:

Bioaccumulation : Species: Cyprinus carpio (Carp)
Bioconcentration factor (BCF): 2.5 - 6.4
Exposure time: 6 Weeks
Temperature: 77 °F / 25 °C
Concentration: 0.5 mg/l
Method: OECD Test Guideline 305C
GLP: yes

Mobility in soil

Components:

1,1-Dichloroethene:

Distribution among environmental compartments : Koc: 65, log Koc: 1.81
Method: (experimental)
Remarks: Mobile in soils

Other adverse effects

Product:

Ozone-Depletion Potential : Regulation: 40 CFR Protection of Environment; Part 82 Protection of Stratospheric Ozone - CAA Section 602 Class I Substances
Remarks: This product neither contains, nor was manufactured with a Class I or Class II ODS as

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defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).

Components:

1,1-Dichloroethene:

Additional ecological information	:	Discharge into the environment must be avoided.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

SECTION 14. TRANSPORT INFORMATION

International Regulations

IATA-DGR

UN/ID No.	:	UN 1303
Proper shipping name	:	Vinylidene chloride, stabilized
Class	:	3
Packing group	:	I
Labels	:	Class 3 - Flammable liquids
Packing instruction (cargo aircraft)	:	361
Packing instruction (passenger aircraft)	:	351

IMDG-Code

UN number	:	UN 1303
Proper shipping name	:	VINYLIDENE CHLORIDE, STABILIZED
Class	:	3
Packing group	:	I
Labels	:	3
EmS Code	:	F-E, S-D
Marine pollutant	:	yes

Transport in bulk according to IMO instruments

Not applicable for product as supplied.

National Regulations

49 CFR Road

UN/ID/NA number	:	UN 1303
Proper shipping name	:	Vinylidene chloride, stabilized

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Class	:	3
Packing group	:	I
Labels	:	Class 3 - Flammable liquids
ERG Code	:	130P
Marine pollutant	:	yes
Poison Inhalation Hazard	:	No

Special precautions for user

The transport classification(s) provided herein are for informational purposes only, and solely based upon the properties of the unpackaged material as it is described within this Safety Data Sheet. Transportation classifications may vary by mode of transportation, package sizes, and variations in regional or country regulations.

SECTION 15. REGULATORY INFORMATION

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
1,1-Dichloroethene	75-35-4	100	100
1,1-Dichloroethene	75-35-4	100	100 (D029)

SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

This material does not contain any components with a section 302 EHS TPQ.

SARA 311/312 Hazards : Fire Hazard
Acute Health Hazard
Chronic Health Hazard

SARA 313 : The following components are subject to reporting levels established by SARA Title III, Section 313:

1,1-Dichloroethene 75-35-4 >= 90 - <= 100 %

Clean Air Act

This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).
The following chemical(s) are listed as HAP under the U.S. Clean Air Act, Section 112 (40 CFR 61):

1,1-Dichloroethene 75-35-4 >= 90 - <= 100 %

The following chemical(s) are listed under the U.S. Clean Air Act Section 112(r) for Accidental Release Prevention (40 CFR 68.130, Subpart F):

1,1-Dichloroethene 75-35-4 >= 90 - <= 100 %

The following chemical(s) are listed under the U.S. Clean Air Act Section 111 SOCMI Intermediate or Final VOC's (40 CFR 60.489):

1,1-Dichloroethene 75-35-4 >= 90 - <= 100 %

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Clean Water Act

The following Hazardous Substances are listed under the U.S. CleanWater Act, Section 311, Table 116.4A:

1,1-Dichloroethene	75-35-4	>= 90 - <= 100 %

The following Hazardous Chemicals are listed under the U.S. CleanWater Act, Section 311, Table 117.3:

1,1-Dichloroethene	75-35-4	>= 90 - <= 100 %

This product contains the following toxic pollutants listed under the U.S. Clean Water Act Section 307

1,1-Dichloroethene	75-35-4	>= 90 - <= 100 %

This product contains the following priority pollutants related to the U.S. Clean Water Act:

1,1-Dichloroethene	75-35-4	>= 90 - <= 100 %

US State Regulations

Massachusetts Right To Know

1,1-Dichloroethene	75-35-4

Pennsylvania Right To Know

1,1-Dichloroethene	75-35-4

Maine Chemicals of High Concern

Product does not contain any listed chemicals

Vermont Chemicals of High Concern

Product does not contain any listed chemicals

Washington Chemicals of High Concern

Product does not contain any listed chemicals

California Prop. 65

WARNING: This product can expose you to chemicals including 1,1-Dichloroethene, which is/are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

The components of this product are reported in the following inventories:

TSCA	:	All substances listed as active on the TSCA inventory

TSCA list

No substances are subject to a Significant New Use Rule.

No substances are subject to TSCA 12(b) export notification requirements.

SECTION 16. OTHER INFORMATION

Full text of other abbreviations

ACGIH	:	USA. ACGIH Threshold Limit Values (TLV)
ACGIH / TWA	:	8-hour, time-weighted average

AIIC - Australian Inventory of Industrial Chemicals; ASTM - American Society for the Testing of Materials; bw - Body weight; CERCLA - Comprehensive Environmental Response,

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Compensation, and Liability Act; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DOT - Department of Transportation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; EHS - Extremely Hazardous Substance; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonised System; GLP - Good Laboratory Practice; HMIS - Hazardous Materials Identification System; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organisation; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardisation; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; MSHA - Mine Safety and Health Administration; n.o.s. - Not Otherwise Specified; NFPA - National Fire Protection Association; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organisation for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; RCRA - Resource Conservation and Recovery Act; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RQ - Reportable Quantity; SADT - Self-Accelerating Decomposition Temperature; SARA - Superfund Amendments and Reauthorization Act; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TECI - Thailand Existing Chemicals Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative

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SAFETY DATA SHEET

Version 8.8
Revision Date 05/06/2025
Print Date 02/02/2026

SECTION 1. IDENTIFICATION

1.1 Product identifiers

Product name : Hexachlorocyclopentadiene

Product Number : H6002
Brand : Aldrich
Index-No. : 602-078-00-7
CAS-No. : 77-47-4

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2. HAZARDS IDENTIFICATION

GHS classification in accordance with the OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute toxicity (Oral) : Category 4

Acute toxicity (Inhalation) : Category 1

Acute toxicity (Dermal) : Category 3

Skin corrosion : Category 1B

Serious eye damage : Category 1

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Short-term (acute) aquatic hazard	:	Category 1
Long-term (chronic) aquatic hazard	:	Category 1

Other hazards

None known.

GHS label elements

Hazard pictograms :

Signal Word : Danger

Hazard Statements :
H302 Harmful if swallowed.
H311 Toxic in contact with skin.
H314 Causes severe skin burns and eye damage.
H330 Fatal if inhaled.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary Statements :

Prevention:

P260 Do not breathe mist or vapors.
P264 Wash skin thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P271 Use only outdoors or in a well-ventilated area.
P273 Avoid release to the environment.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
P284 Wear respiratory protection.

Response:

P301 + P312 + P330 IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.
P301 + P330 + P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P310 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.
P305 + P351 + P338 + P310 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor.
P362 Take off contaminated clothing and wash before

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reuse.
P391 Collect spillage.

Storage:

P403 + P233 Store in a well-ventilated place. Keep container tightly closed.
P405 Store locked up.

Disposal:

P501 Dispose of contents/ container to an approved waste disposal plant.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Substance

Components

Chemical name	CAS No./Unique ID	Concentration (% w/w)	Trade secret
1,2,3,4,5,5-Hexachlorocyclopentadiene	77-47-4*	>= 90 - <= 100	-

* Indicates that the identifier is a CAS No.
Actual concentration is withheld as a trade secret

SECTION 4. FIRST AID MEASURES

General advice : First aiders need to protect themselves.
Show this material safety data sheet to the doctor in attendance.

If inhaled : After inhalation: fresh air. Immediately call in physician.
If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

In case of skin contact : In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.
Call a physician immediately.

In case of eye contact : After eye contact: rinse out with plenty of water.
Immediately call in ophthalmologist.
Remove contact lenses.

If swallowed : After swallowing: make victim drink water (two glasses at most), avoid vomiting (risk of perforation).
Call a physician immediately.
Do not attempt to neutralise.

Most important : The most important known symptoms and effects are

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symptoms and effects, both acute and delayed		described in the labelling (see section 2.2) and/or in section 11
Protection of first-aiders	:	For personal protection see section 8.
Notes to physician	:	No data available

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	:	Water Foam Carbon dioxide (CO2) Dry powder
Unsuitable extinguishing media	:	For this substance/mixture no limitations of extinguishing agents are given.
Specific hazards during fire fighting	:	Combustible. Vapors are heavier than air and may spread along floors. Forms explosive mixtures with air on intense heating. Development of hazardous combustion gases or vapours possible in the event of fire.
Hazardous combustion products	:	Carbon oxides Hydrogen chloride gas
Specific extinguishing methods	:	No data available
Further information	:	Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.
Special protective equipment for fire-	:	Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe

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fighters	distance or by wearing suitable protective clothing.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert. Advice for emergency responders: For personal protection see section 8.
Environmental precautions	:	Do not let product enter drains.
Methods and materials for containment and cleaning up	:	Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

SECTION 7. HANDLING AND STORAGE

For precautions see section 2.2.

Advice on safe handling	:	Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.
Further information on storage conditions	:	Tightly closed. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorized persons.
Storage class	:	6.1A, Combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials
Recommended storage temperature	:	Recommended storage temperature see product label.
Further information on storage stability	:	Moisture sensitive.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ingredients with workplace control parameters

Components	CAS-No.	Value type	Control	Basis

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		(Form of exposure)	parameters / Permissible concentration	
1,2,3,4,5,5-Hexachlorocyclopentadiene	77-47-4	TWA	0.01 ppm	ACGIH
		TWA	0.01 ppm 0.1 mg/m3	NIOSH REL

Engineering measures : No data available

Personal protective equipment

Respiratory protection : required when vapours/aerosols are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Recommended Filter type: : Filter type ABEK

The entrepeneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer. These measures have to be properly documented.

Hand protection

Remarks : required

Eye protection : Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).
Tightly fitting safety goggles

Skin and body protection : protective clothing

Hygiene measures : Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : liquid

Color : yellow

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Odor	:	pungent
Odor Threshold	:	No data available
pH	:	No data available
Melting point/ range	:	14 °F / -10 °C Method: lit.
Boiling point/boiling range	:	462 °F / 239 °C (1,004 hPa) Method: lit.
Flash point	:	228.2 °F / 109.0 °C Method: closed cup
Evaporation rate	:	No data available
Flammability (solid, gas)	:	No data available
Flammability (liquids)	:	No data available
Burning rate	:	No data available
Self-ignition	:	> 1112 °F / > 600 °C ca. 1,017.25 hPa Method: ASTM E-659
Upper explosion limit / Upper flammability limit	:	No data available
Lower explosion limit / Lower flammability limit	:	No data available
Vapor pressure	:	No data available
Relative vapor density	:	No data available
Relative density	:	No data available
Density	:	1.702 g/cm3 (77 °F / 25 °C) Method: lit.
Water solubility	:	No data available
Partition coefficient: n-octanol/water	:	No data available
Autoignition temperature	:	No data available
Decomposition	:	No data available

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temperature		
Viscosity, dynamic	:	No data available
Viscosity, kinematic	:	No data available
Flow time	:	No data available
Explosive properties	:	Not classified as explosive.
Oxidizing properties	:	none
Molecular weight	:	272.77 g/mol
Particle characteristics Particle size	:	No data available

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	Forms explosive mixtures with air on intense heating. A range from approx. 15 Kelvin below the flash point is to be rated as critical.
Chemical stability	:	The product is chemically stable under standard ambient conditions (room temperature) .
Possibility of hazardous reactions	:	No data available
Conditions to avoid	:	Strong heating.
Incompatible materials	:	Strong oxidizing agents
Hazardous decomposition products	:	In the event of fire: see section 5

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male and female - 1,400 mg/kg
(OECD Test Guideline 401)
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)
LC50 Inhalation - Rat - male - 4.0 h - 0.018 mg/l - vapor

(OECD Test Guideline 403)
LD50 Dermal - Rabbit - 430.0 mg/kg
Remarks: (RTECS)

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Skin corrosion/irritation
Skin - Rabbit
Result: Severe skin irritation - 4 h
Remarks: (RTECS)
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Causes serious eye damage.
(OECD Test Guideline 405)

Respiratory or skin sensitization
No data available

Germ cell mutagenicity

Test Type: dominant lethal test
Species: Mouse

Application Route: Oral
Method: OECD Test Guideline 478
Result: negative

Carcinogenicity

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

Repeated dose toxicity - Rat - male and female - Oral - 13 Weeks - NOAEL (No observed adverse effect level) - 10 mg/kg

Repeated dose toxicity - Rabbit - male and female - Dermal - 4 Weeks - NOAEL (No observed adverse effect level) - > 5 mg/kg - LOAEL (Lowest observed adverse effect level) - 1 mg/kg

RTECS: GY1225000
Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., spasm, inflammation and edema of the larynx, spasm, inflammation

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and edema of the bronchi, pneumonitis, pulmonary edema, burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Components:

1,2,3,4,5,5-Hexachlorocyclopentadiene:

Toxicity to fish	:	LC50 (Lepomis macrochirus (Bluegill)): 0.13 mg/l End point: mortality Exposure time: 96 h Test Type: static test Method: OECD Test Guideline 203
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia magna (Water flea)): 0.04 mg/l End point: mortality Exposure time: 48 h Test Type: static test Method: OECD Test Guideline 202
M-Factor (Acute aquatic toxicity)	:	100
M-Factor (Chronic aquatic toxicity)	:	10

Persistence and degradability

No data available

Bioaccumulative potential

Components:

1,2,3,4,5,5-Hexachlorocyclopentadiene:

Bioaccumulation	:	Species: Pimephales promelas (fathead minnow) Bioconcentration factor (BCF): < 11 Exposure time: 30 d Temperature: 77 °F / 25 °C Concentration: 0.007 mg/l Method: OECD Test Guideline 305

Mobility in soil

No data available

Other adverse effects

No data available

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SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

SECTION 14. TRANSPORT INFORMATION

International Regulations

IATA-DGR
Not permitted for transport

IMDG-Code

UN number	:	UN 2646
Proper shipping name	:	HEXACHLOROCYCLOPENTADIENE
Class	:	6.1
Packing group	:	I
Labels	:	6.1
EmS Code	:	F-A, S-A
Marine pollutant	:	yes

Transport in bulk according to IMO instruments

Not applicable for product as supplied.

National regulation

49 CFR Road

UN/ID/NA number	:	UN 2646
Proper shipping name	:	Hexachlorocyclopentadiene
Class	:	6.1
Packing group	:	I
Labels	:	Division 6.1 - Poison inhalation hazard
ERG Code	:	151
Marine pollutant	:	no
Poison Inhalation Hazard	:	Hazard Zone B

Special precautions for user

The transport classification(s) provided herein are for informational purposes only, and solely based upon the properties of the unpackaged material as it is described within this Safety Data Sheet. Transportation classifications may vary by mode of transportation, package sizes, and variations in regional or country regulations.

SECTION 15. REGULATORY INFORMATION

CERCLA Reportable Quantity

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Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
1,2,3,4,5,5-Hexachlorocyclopentadiene	77-47-4	10	10

SARA 304 Extremely Hazardous Substances Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
1,2,3,4,5,5-Hexachlorocyclopentadiene	77-47-4	10	10

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

Components	CAS-No.	Component TPQ (lbs)
1,2,3,4,5,5-Hexachlorocyclopentadiene	77-47-4	100

SARA 311/312 Hazards : Acute Health Hazard

SARA 313 : The following components are subject to reporting levels established by SARA Title III, Section 313:

1,2,3,4,5,5-Hexachlorocyclopentadiene	77-47-4	>= 90 - <= 100 %

US State Regulations

Massachusetts Right To Know

1,2,3,4,5,5-Hexachlorocyclopentadiene 77-47-4

Pennsylvania Right To Know

1,2,3,4,5,5-Hexachlorocyclopentadiene 77-47-4

Maine Chemicals of High Concern

Product does not contain any listed chemicals

Vermont Chemicals of High Concern

Product does not contain any listed chemicals

Washington Chemicals of High Concern

Product does not contain any listed chemicals

The ingredients of this product are reported in the following inventories:

TSCA : All substances listed as active on the TSCA inventory

TSCA list

No substances are subject to a Significant New Use Rule.

No substances are subject to TSCA 12(b) export notification requirements.

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SECTION 16. OTHER INFORMATION

Full text of other abbreviations

ACGIH	:	USA. ACGIH Threshold Limit Values (TLV)
NIOSH REL	:	USA. NIOSH Recommended Exposure Limits
ACGIH / TWA	:	8-hour, time-weighted average
NIOSH REL / TWA	:	Time-weighted average concentration for up to a 10-hour workday during a 40-hour workweek

AIIC - Australian Inventory of Industrial Chemicals; ASTM - American Society for the Testing of Materials; bw - Body weight; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DOT - Department of Transportation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; EHS - Extremely Hazardous Substance; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; HMIS - Hazardous Materials Identification System; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; MSHA - Mine Safety and Health Administration; n.o.s. - Not Otherwise Specified; NFPA - National Fire Protection Association; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; RCRA - Resource Conservation and Recovery Act; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RQ - Reportable Quantity; SADT - Self-Accelerating Decomposition Temperature; SARA - Superfund Amendments and Reauthorization Act; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TECI - Thailand Existing Chemicals Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative

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Revision Date : 05/06/2025

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SAFETY DATA SHEET

Creation Date 24-Nov-2010 **Revision Date** 22-Dec-2025 **Revision Number** 4

This safety data sheet was created pursuant to the requirements of: US OSHA Hazard Communication Standard 2024 (29 CFR 1910.1200)

1. Identification

Product Name **2-Chlorotoluene**

Cat No. : **B23596**

CAS No 95-49-8
Synonyms 1-Chloro-2-methylbenzene; OCT

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757

Emergency Telephone Number
For information **US** call: 001-800-227-6701 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No. **US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous according to [US] OSHA (29 CFR 1910.1200, 2024)

Flammable liquids	Category 3
Acute Inhalation Toxicity - Vapors	Category 4
Reproductive Toxicity	Category 2

Label Elements

Signal Word
Warning

Hazard Statements
Flammable liquid and vapor
Harmful if inhaled
Suspected of damaging the unborn child

Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
Keep container tightly closed
Ground and bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting equipment
Wear protective gloves/protective clothing/eye protection/face protection
Take action to prevent static discharges
Use non-sparking tools
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove person to fresh air and keep comfortable for breathing
Skin
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower
Fire
In case of fire: Use CO2, dry chemical, or foam to extinguish
Storage
Store locked up
Store in a well-ventilated place. Keep cool
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects
Toxic to aquatic life with long lasting effects

Hazards classified under paragraph (d)(1)(ii) of 1910.1200
No information available

3. Composition/information on Ingredients

Component	CAS No	Weight %
o-Chlorotoluene	95-49-8	>95

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Skin Contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention.

Inhalation Remove from exposure, lie down. Remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.

Ingestion Clean mouth with water. Get medical attention.

Most important symptoms and effects Difficulty in breathing. . Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Water spray. Carbon dioxide (CO_2). Dry chemical. Chemical foam. Water mist may be used to cool closed containers.

Unsuitable Extinguishing Media No information available

Flash Point 49 °C / 120 °F

Method - No information available

Autoignition Temperature 450 °C / 842 °F

Explosion Limits

Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Flammable. Containers may explode when heated. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back.

Hazardous Combustion Products
Carbon monoxide (CO). Carbon dioxide (CO_2). Hydrogen chloride gas.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	2	0	N/A

6. Accidental release measures

Personal Precautions Remove all sources of ignition. Take precautionary measures against static discharges.
Environmental Precautions Do not flush into surface water or sanitary sewer system.

Methods for Containment and Clean Up Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment. Do not let this chemical enter the environment.

7. Handling and Storage

Handling Avoid contact with skin and eyes. Do not breathe mist/vapors/spray. Do not ingest. If swallowed then seek immediate medical assistance. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Use spark-proof tools and explosion-proof equipment. Use only non-sparking tools. Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharges.

Storage. Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Keep away from heat, sparks and flame. Flammables area. Keep away from heat/sparks/open

flames/hot surfaces. - No smoking. Keep container tightly closed in a dry and well-ventilated place. Incompatible Materials. Strong oxidizing agents.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH	Mexico OEL (TWA)
o-Chlorotoluene	TWA: 50 ppm	(Vacated) TWA: 50 ppm (Vacated) TWA: 250 mg/m³	TWA: 50 ppm TWA: 250 mg/m³ STEL: 75 ppm STEL: 375 mg/m³	TWA: 50 ppm TWA: 250 mg/m³ STEL: 75 ppm STEL: 375 mg/m³

Engineering Measures Use explosion-proof electrical/ventilating/lighting equipment. Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection No protective equipment is needed under normal use conditions.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Appearance

Physical State	Liquid	
Color	Colorless	
Odor	aromatic	
Odor Threshold	No information available	
Property	**Values**	**Remarks • Method**
Melting Point/Range	-36 °C / -32.8 °F	
Softening Point	No data available	
Boiling Point/Range	157 - 159 °C / 314.6 - 318.2 °F	@ 760 mmHg
Flash Point	49 °C / 120 °F	**Method -** No information available
Flammability (liquid)	Flammable	On basis of test data
Flammability (solid,gas)	Not applicable	Liquid
Explosion Limits	**Lower** 1 vol% **Upper** 12.6 vol%	
Autoignition Temperature	450 °C / 842 °F	
Decomposition Temperature	No data available	
pH	No information available	
Viscosity	No data available	
Water Solubility	Slightly soluble	
Solubility in other solvents	No information available	

Partition Coefficient (n-octanol/water)

Component	log Pow
o-Chlorotoluene	3.42

Vapor Pressure	3.5 mbar @ 20 °C	
Density / Specific Gravity	1.080	
Bulk Density	Not applicable	Liquid
Vapor Density	4.38	(Air = 1.0)
Particle characteristics	Not applicable (liquid)	

Other Information

Molecular Formula C7 H7 Cl
Molecular Weight 126.59
Explosive Properties explosive air/vapour mixtures possible

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under recommended storage conditions.

Conditions to Avoid Keep away from open flames, hot surfaces and sources of ignition. Incompatible products.

Incompatible Materials Strong oxidizing agents

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2), Hydrogen chloride gas

Hazardous Polymerization No information available.

Hazardous Reactions None under normal processing.

11. Toxicological information

Information on expected route of exposure

Inhalation Not an expected route of exposure.
Ingestion May be harmful if swallowed.
Eyes Avoid contact with eyes.
Skin Avoid contact with skin.

Toxicology data for the components

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
o-Chlorotoluene	3227 mg/kg (Rat)	> 5000 g/kg (Rat)	LC50 = 7119 ppm (Rat) 4 h

Toxicologically Synergistic Products No information available

(b) skin corrosion/irritation; No data available

(c) serious eye damage/irritation; No data available

(d) respiratory or skin sensitization;
Respiratory No data available
Skin No data available

(e) germ cell mutagenicity; No data available

(f) carcinogenicity;

The table below indicates whether each agency has listed any ingredient as a carcinogen

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
o-Chlorotoluene	95-49-8	Not listed	Not listed	Not listed	Not listed	Not listed

(g) reproductive toxicity; Category 2

(h) STOT-single exposure; No data available

(i) STOT-repeated exposure; No data available

Target Organs No information available.

(j) aspiration hazard; No data available

Other Adverse Effects See actual entry in RTECS for complete information

Symptoms / effects,both acute and delayed Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.

Other Adverse Effects See actual entry in RTECS for complete information.

Endocrine Disrupting Properties This product does not contain any known or suspected endocrine disruptors.

12. Ecological information

Ecotoxicity

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
o-Chlorotoluene	Not listed	LC50 = 7.7 mg/L 96 h	EC50 = 2.90 mg/L 5 min EC50 = 3.33 mg/L 15 min EC50 = 4.70 mg/L 30 min	EC50 = 0.7 mg/L 48 h

Persistence and Degradability May persist based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility . Is not likely mobile in the environment due its low water solubility.

Component	log Pow
o-Chlorotoluene	3.42

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No UN2238
Proper Shipping Name CHLOROTOLUENES
Hazard Class 3
Packing Group III

TDG

UN-No UN2238
Proper Shipping Name CHLOROTOLUENES
Hazard Class 3
Packing Group III

IATA

UN-No	UN2238
Proper Shipping Name	CHLOROTOLUENES
Hazard Class	3
Packing Group	III

IMDG/IMO

UN-No	UN2238
Proper Shipping Name	CHLOROTOLUENES
Hazard Class	3
Packing Group	III

15. Regulatory Information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
o-Chlorotoluene	95-49-8	X	ACTIVE	-

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA - Per 40 CFR 751, Regulation of Certain Chemical Substances & Mixtures, Under TSCA Section 6(h) (PBT) Not applicable

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
o-Chlorotoluene	95-49-8	X	-	202-424-3	X	X	X	X	X	X

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311/312 Hazard Categories
Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications.

CWA (Clean Water Act) Not applicable

Clean Air Act Not applicable

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA
This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level

pertaining to releases of this material.

California Proposition 65 This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
o-Chlorotoluene	X	X	X	-	X

U.S. Department of Transportation
Reportable Quantity (RQ): N
DOT Marine Pollutant Y
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Authorisation/Restrictions according to EU REACH Not applicable

Component	CAS No	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
o-Chlorotoluene	95-49-8	-	-	-

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
o-Chlorotoluene	95-49-8	Listed	Not applicable	Not applicable	Not applicable

Contains component(s) that meet a 'definition' of per & poly fluoroalkyl substance (PFAS)?
Not applicable

Other International Regulations

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
o-Chlorotoluene	95-49-8	Not applicable	Not applicable	Not applicable	Annex I - Y45

16. Other Information

Prepared By Health, Safety and Environmental Department
Email: chem.techinfo@thermofisher.com
www.thermofisher.com

Creation Date	24-Nov-2010
Revision Date	22-Dec-2025
Print Date	22-Dec-2025
Revision Summary	Updated to the U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) which published its Final Rule in the Federal Register revising the Hazard Communication Standard (HCS/HazCom), 29 CFR 1910.1200 (2024) (HCS §1910.1200, 2024), May 20, 2024, effective July 19, 2024.

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

ChemicalBook

Chemical Safety Data Sheet MSDS / SDS

Polychlorinated Biphenyls (PCBs)

Revision Date:2026-01-03 Revision Number:1

SECTION 1: Identification of the substance/mixture and of the company/undertaking

Product identifier

Product name	: Polychlorinated Biphenyls (PCBs)
CBnumber	: CB7160460
CAS	: 1336-36-3
EINECS Number	: 215-648-1
Synonyms	: PYRANOL,Polychlorinated biphenyls

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	: For R&D use only. Not for medicinal, household or other use.
Uses advised against	: none

Company Identification

Company	: Chemicalbook
Address	: Building 1, Huihuang International, Shangdi 10th Street, Haidian District, Beijing
Telephone	: 010-86108875

SECTION 2: Hazards identification

Classification of the substance or mixture

Specific target organ toxicity – repeated exposure, Category 2

Hazardous to the aquatic environment, short-term (Acute) - Category Acute 1

Hazardous to the aquatic environment, long-term (Chronic) - Category Chronic 1

Label elements

Pictogram(s)

Signal word Warning

Hazard statement(s)

H373 May cause damage to organs through prolonged or repeated exposure

H410 Very toxic to aquatic life with long lasting effects

Precautionary statement(s)

Prevention

P260 Do not breathe dust/fume/gas/mist/vapours/spray.

P273 Avoid release to the environment.

Response

P319 Get medical help if you feel unwell.

P391 Collect spillage.

Storage

none

Disposal

P501 Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Other hazards

no data available

SECTION 3: Composition/information on ingredients

Substance

Product name	: Polychlorinated Biphenyls (PCBs)
Synonyms	: PYRANOL,Polychlorinated biphenyls
CAS	: 1336-36-3
EC number	: 215-648-1
MF	: N/A
MW	: 0

SECTION 4: First aid measures

Description of first aid measures

If inhaled

Move the victim into fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration and consult a doctor immediately. Do not use mouth to mouth resuscitation if the victim ingested or inhaled the chemical.

Following skin contact

Take off contaminated clothing immediately. Wash off with soap and plenty of water. Consult a doctor.

Following eye contact

Rinse with pure water for at least 15 minutes. Consult a doctor.

Following ingestion

Rinse mouth with water. Do not induce vomiting. Never give anything by mouth to an unconscious person. Call a doctor or Poison Control Center immediately.

Most important symptoms and effects, both acute and delayed

no data available

Indication of any immediate medical attention and special treatment needed

If PCB-containing substances have been ingested recently, gastric decontamination may be reasonable. Activated charcoal has not been proven beneficial, but is not contraindicated.

SECTION 5: Firefighting measures

Extinguishing media

Use dry chemical, carbon dioxide, or alcohol foam extinguishers. Vapors are heavier than air and will collect in low areas. Vapors in confined areas may explode when exposed to fire. Containers may explode in fire. Storage containers and parts of containers may rocket great distances, in many directions. If material or contaminated runoff enters waterways, notify downstream users of potentially contaminated waters. Notify local health and fire officials and pollution control agencies. From a secure, explosion-proof location, use water spray to cool exposed containers. If cooling streams are ineffective (venting sound increases in volume and pitch, tank discolors, or shows any signs of deforming), withdraw immediately to a secure position ... The only respirators recommended for fire fighting are self-contained breathing apparatuses that have full facepieces and are operated in a pressure-demand or other positive pressure mode.

Specific Hazards Arising from the Chemical

no data available

Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

NFPA 704

1

2 0

■	HEALTH	2	Intense or continued but not chronic exposure could cause temporary incapacitation or possible residual injury (e.g. diethyl ether, ammonium phosphate, iodine)
■	FIRE	1	Materials that require considerable preheating, under all ambient temperature conditions, before ignition and combustion can occur. Includes some finely divided suspended solids that do not require heating before ignition can occur. Flash point at or above 93.3 °C (200 °F). (e.g. mineral oil, ammonia)
■	REACT	0	Normally stable, even under fire exposure conditions, and is not reactive with water (e.g. helium,N2)
□	SPEC. HAZ.		

SECTION 6: Accidental release measures

Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing mist, gas or vapours.Avoid contacting with skin and eye. Use personal protective equipment.Wear chemical impermeable gloves. Ensure adequate ventilation.Remove all sources of ignition. Evacuate personnel to safe areas.Keep people away from and upwind of spill/leak.

Environmental precautions

Prevent further spillage or leakage if it is safe to do so. Do not let the chemical enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up

Dry sand or earth should be spread on the leak, or spill area. ...

SECTION 7: Handling and storage

Precautions for safe handling

Handling in a well ventilated place. Wear suitable protective clothing. Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Use non-sparking tools. Prevent fire caused by electrostatic discharge steam.

Conditions for safe storage, including any incompatibilities

PCB material should be stored in closed containers, in ventilated areas ... PCB's should be handled in isolated areas of the plant, where efficient ventilation systems remove airborne PCB's. ...

SECTION 8: Exposure controls/personal protection

Control parameters

Occupational Exposure limit values

Component	1,1'-Biphenyl, chloro derivs.			
CAS No.	1336-36-3			
	Limit value - Eight hours		**Limit value - Short term**	
	ppm	**mg/m^3**	**ppm**	**mg/m^3**
Canada - Ontario	?	0,05 (1)	?	?
Denmark	?	0,01	?	0,02
Finland	?	0,003 (1)	?	?
Germany (DFG)	?	0,003 (1)(2)(3)(5)	?	0,024 (1)(2)(3)(4)(5)
Hungary	?	POP	?	?
Ireland	?	0,1	?	?
Japan	?	0,01	?	?
Japan - JSOH	?	0,01	?	?
Latvia	?	1	?	?
New Zealand	?	0,1	?	?
Poland	?	1	?	?
Sweden	?	0,01	?	0,03 (1)
Switzerland	0,05	0,5	0,4	4
United Kingdom	?	0,1	?	?
	Remarks			
Canada - Ontario	(1) as sum of components assayed by chromatographic procedure with reference of the bulk sample			
Finland	(1) Total PCB = 5*([PCB 28] + [PCB 52] + [PCB 101] + [PCB 138] + [PCB 153] + [PCB 180])			

Germany (AGS)	(1) 42% Chlorine (CAS-No. 53469-21-9) (2) 54% Chlorine (CAS-No. 11097-69-1)
Germany (DFG)	(1) Only for chlorinated biphenyls with Cl
Hungary	POP Persistent Organic Pollutant
Sweden	(1) Short-term value, 15 minutes average value

Biological limit values

no data available

Exposure controls

Ensure adequate ventilation. Handle in accordance with good industrial hygiene and safety practice. Set up emergency exits and the risk-elimination area.

Individual protection measures

Eye/face protection

Wear tightly fitting safety goggles with side-shields conforming to EN 166(EU) or NIOSH (US).

Skin protection

Wear fire/flame resistant and impervious clothing. Handle with gloves. Gloves must be inspected prior to use. Wash and dry hands. The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.

Respiratory protection

If the exposure limits are exceeded, irritation or other symptoms are experienced, use a full-face respirator.

Thermal hazards

no data available

SECTION 9: Physical and chemical properties

Information on basic physicochemical properties

Physical state	no data available
Colour	Vary from mobile oily liquids to white crystalline solids and hard noncrystalline resins.
Odour	Practically odorless; mild aromatic odor
Melting point/freezing point	no data available
Boiling point or initial boiling point and boiling range	340～375
Flammability	no data available
Lower and upper explosion limit/flammability limit	no data available
Flash point	195(O.C)
Auto-ignition temperature	no data available
Decomposition temperature	no data available
pH	no data available
Kinematic viscosity	no data available
Solubility	Solubility in water is extremely low; soluble in oils and organic solvents.
Partition coefficient n-octanol/water	... literature Kow values will vary. These increase with increasing chlorination. log Kow values at 25 deg C: 3.76 (biphenyl); 5.7 (Cl4-PCB's); 6.0 (Cl5-PCB's); 7.0 (Cl6-PCB's); 8.26 (Cl10-PCB's).

Vapour pressure	2.04E-07mmHg at 25°C
Density and/or relative density	1.44(30°C)
Relative vapour density	no data available
Particle characteristics	no data available

SECTION 10: Stability and reactivity

Reactivity

NIOSH considers chlorodiphenyl containing 54% chlorine to be a potential occupational carcinogen. Aroclor 1254

NIOSH considers chlorodiphenyl containing 54% chlorine to be a potential occupational carcinogen. Aroclor 1254

Chemical stability

PCB's are chemically very inert and are stable to conditions of hydrolysis and oxidation in industrial use. Photochemical degradation may be one route of their breakdown in the environment. ...

Possibility of hazardous reactions

Flame resistant.

Conditions to avoid

no data available

Incompatible materials

Liquid chlorine reacts exothermically with polychlorinated biphenyl heat transfer liquid. Polychlorinated biphenyl

Hazardous decomposition products

When heated to decomposition it emits toxic fumes of Chloride.

SECTION 11: Toxicological information

Acute toxicity

- Oral: LD50 Mouse (C57B1/6J) male oral 19 mg/kg/28 day
- Inhalation: no data available
- Dermal: no data available

Skin corrosion/irritation

no data available

Serious eye damage/irritation

no data available

Respiratory or skin sensitization

no data available

Germ cell mutagenicity

no data available

Carcinogenicity

EPA: Possibly carcinogenic to humans, IARC: Probably carcinogenic to humans, NTP: Known to be a human carcinogen

Reproductive toxicity

An epidemiological study of women occupationally exposed to high levels of PCBs suggested a relationship between PCB exposure and reduced birth weight and shortened gestational age of their babies; however, limitations of the study limit the strength of the conclusion. Two series of human studies that investigated exposure to PCBs through the consumption of contaminated fish suggest that exposure to PCBs may cause developmental effects in humans. Both studies reported an association between consumption of fish with high PCB levels by pregnant women and an increased incidence of neurodevelopmental effects, such as motor deficits at birth, impaired psychomotor index, impaired visual recognition, and deficits in short-term memory in infants. Human studies are not conclusive on the reproductive effects of PCBs. One study of men who were occupationally exposed to PCBs showed no fertility abnormalities, while another study of men with low sperm counts found elevated levels of PCBs in the blood and an association between certain PCB compounds in semen and decreased sperm motility. Animal studies have reported developmental effects, such as learning deficits, impaired immune functions, focal liver necrosis, and cellular alterations of the thyroid, in the offspring of animals exposed orally to PCBs. Reproductive effects, such as decreased fertility, decreased conception, and prolonged menstruation have also been noted in animal studies of dietary PCB exposures.

STOT-single exposure

no data available

STOT-repeated exposure

no data available

Aspiration hazard

no data available

SECTION 12: Ecological information

Toxicity

Toxicity to fish: no data available

Toxicity to daphnia and other aquatic invertebrates: no data available

Toxicity to algae: EC50; Species: Pseudokirchneriella subcapitata (green algae); Conditions: freshwater, static, 22 deg C; Concentration: 182 nmol/L for 48 hr; Effect: decreased population biomass />98% pure

Toxicity to microorganisms: no data available

Persistence and degradability

AEROBIC: The microbial mineralization of three chlorophenols and a PCB mixture was studied using natural bacterial assemblages in laboratory model systems. The systems consisted of water and surface sediment from two lake types: one with a high content of humic substances and the other with a low content. Final PCB concentration in the model systems was 38 ug/L. Aerobic mineralization of the (14)C-ring-labelled compounds was determined as production of (14)CO2 in the systems over the course of 60 days. Mineralization of PCBs in the systems was low compared to the aromatics. The breakdown of PCB was 0.047 nM in the humic cultures and 0.052 nM in cultures from the clear water lake. The avg mineralization rates of PCBs over the 60 day test period for the clear-water and humic cultures were 1.1 and 1.2

pM/day. More than 90% of the PCBs adsorbed to the sediment, while <1% was found in the water phase.

Bioaccumulative potential

Polychlorinated biphenyls (PCBs) are highly lipophilic and bioconcentrate in tissue from concentrations in water ...

Mobility in soil

PCB mobility in aqueous soil-sediment systems has reported experimental Koc values ranging from 510 to 13,300,000 for a variety of Aroclors and PCB congeners; reported Koc values were mostly above 5000(1). Reviews of the PCB mobility literature have found that adsorption of PCBs to soil and sediment generally increases with an increase in the degree of chlorination(2,3). Organic solvents, found at hazardous waste sites, will also increase the solubility and mobility of PCBs(3). Using soil TLC, column leaching and five different soils, PCBs were found to be generally immobile when leached with water or aqueous landfill leachate, but highly mobile when leached with organic solvents(4). PCB fluids can penetrate and travel through the cracks and other connected void spaces found in soil formations(5). In the presence of organic material dissolved from soil, the water solubility of PCBs increases which may augment its leachability. Environmental releases of PCBs often accompany releases of carrier materials from utility equipment. The PCBs that are present in the mineral oil-PCB mixture become even less water soluble than before. This is due to the PCB partitioning into the mineral oil and the reduced interaction of the PCBs with precipitation or groundwater caused by the hydrophobic nature of the oil matrix. The volatility of PCBs also affects their migration through the soil profile. Researchers have carried out simulations that indicate that PCBs can volatilize beneath the soil surface and potentially migrate through several meters of soil cover(5).

Toxics Screening Level

The Initial Risk Screening Level (IRSL) for polychlorinated biphenyls is 0.01 µg/m3 based on an annual averaging time.

Other adverse effects

no data available

SECTION 13: Disposal considerations

Disposal methods

Product

The material can be disposed of by removal to a licensed chemical destruction plant or by controlled incineration with flue gas scrubbing. Do not contaminate water, foodstuffs, feed or seed by storage or disposal. Do not discharge to sewer systems.

Contaminated packaging

Containers can be triply rinsed (or equivalent) and offered for recycling or reconditioning. Alternatively, the packaging can be punctured to make it unusable for other purposes and then be disposed of in a sanitary landfill. Controlled incineration with flue gas scrubbing is possible for combustible packaging materials.

SECTION 14: Transport information

UN Number

ADR/RID: Not dangerous goods. (For reference only, please check.)

IMDG: Not dangerous goods. (For reference only, please check.)

IATA: Not dangerous goods. (For reference only, please check.)

UN Proper Shipping Name

ADR/RID: Not dangerous goods. (For reference only, please check.)

IMDG: Not dangerous goods. (For reference only, please check.)

IATA: Not dangerous goods. (For reference only, please check.)

Transport hazard class(es)

ADR/RID: Not dangerous goods. (For reference only, please check.)

IMDG: Not dangerous goods. (For reference only, please check.)

IATA: Not dangerous goods. (For reference only, please check.)

Packing group, if applicable

ADR/RID: Not dangerous goods. (For reference only, please check.)

IMDG: Not dangerous goods. (For reference only, please check.)

IATA: Not dangerous goods. (For reference only, please check.)

Environmental hazards

ADR/RID: Yes

IMDG: Yes

IATA: Yes

Special precautions for user

no data available

Transport in bulk according to IMO instruments

no data available

SECTION 15: Regulatory information

Safety, health and environmental regulations specific for the product in question

European Inventory of Existing Commercial Chemical Substances (EINECS)

Listed.

EC Inventory

Listed.

United States Toxic Substances Control Act (TSCA) Inventory

Listed.

China Catalog of Hazardous chemicals 2015

Not Listed.

New Zealand Inventory of Chemicals (NZIoC)

Not Listed.

PICCS

Listed.

Vietnam National Chemical Inventory

Listed.

IECSC

Listed.

Korea Existing Chemicals List (KECL)

Listed.

SECTION 16: Other information

Abbreviations and acronyms

CAS: Chemical Abstracts Service

ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road

RID: Regulation concerning the International Carriage of Dangerous Goods by Rail

IMDG: International Maritime Dangerous Goods

IATA: International Air Transportation Association

TWA: Time Weighted Average

STEL: Short term exposure limit

LC50: Lethal Concentration 50%

LD50: Lethal Dose 50%

EC50: Effective Concentration 50%

References

IPCS - The International Chemical Safety Cards (ICSC), website: http://www.ilo.org/dyn/icsc/showcard.home

HSDB - Hazardous Substances Data Bank, website: https://toxnet.nlm.nih.gov/newtoxnet/hsdb.htm

IARC - International Agency for Research on Cancer, website: http://www.iarc.fr/

eChemPortal - The Global Portal to Information on Chemical Substances by OECD, website: http://www.echemportal.org/echemportal/index?pageID=0&request_locale=en

CAMEO Chemicals, website: http://cameochemicals.noaa.gov/search/simple

ChemIDplus, website: http://chem.sis.nlm.nih.gov/chemidplus/chemidlite.jsp

ERG - Emergency Response Guidebook by U.S. Department of Transportation, website: http://www.phmsa.dot.gov/hazmat/library/erg

Germany GESTIS-database on hazard substance, website: http://www.dguv.de/ifa/gestis/gestis-stoffdatenbank/index-2.jsp

ECHA - European Chemicals Agency, website: https://echa.europa.eu/

Disclaimer:
The information in this MSDS is only applicable to the specified product, unless otherwise specified, it is not applicable to the mixture of this product and other substances. This MSDS only provides information on the safety of the product for those who have received the appropriate professional training for the user of the product. Users of this MSDS must make independent judgments on the applicability of this SDS. The authors of this MSDS will not be held responsible for any harm caused by the use of this MSDS.

AZER SCIENTIFIC

SDS Safety Data Sheet – Xylenes

Section 1: IDENTIFICATION OF SUBSTANCE AND SUPPLIER

PRODUCT NAME: Xylenes, High Purity Chemicals

SYNONYMS: Dimethylbenzene; xylol, methyltoluene; Xylene mixture of isomers

PRODUCT CODES: ES609, ES609-5G

MANUFACTURER: Azer Scientific, Inc.
ADDRESS: 701 Hemlock Rd, Morgantown, PA 19543

CHEMTREC PHONE: 800-424-9300 (USA)
+1.703.527.3887 (International)

SUPPORT: 610-524-5810

FAX: 610-901-3046

PRODUCT USE: This product is recommended for laboratory and manufacturing use only. It is NOT recommended for drug, food or household use.

PREPARED BY: CB

Section 2: HAZARDS IDENTIFICATION

Emergency Overview:

WARNING! HIGHLY FLAMMABLE LIQUID AND VAPOR. CAUSES IRRITATION TO EYES, SKIN, AND RESPIRATORY TRACT. ASPIRATION HAZARD IF SWALLOWED. MAY BE HARMFUL IF ABSORBED THROUGH THE SKIN OR IF INHALED. MAY CAUSE CENTRAL NERVOUS SYSTEM DEPRESSION.

GHS Classification(s):
Acute Toxicity, Dermal (Category 4)
Acute Toxicity, Inhalation (Category 4)
Aspiration Hazard (Category 1)
Chronic aquatic toxicity (Category 3)
Eye irritation (Category 2A)
Flammable Liquids (Category 3)
Skin irritation (Category 2)
Specific Target Organ Toxicity – single exposure (Category 3)

Target Organs: Central nervous system, Eyes, Respiratory system, Skin

GHS label elements (including precautionary statements)

Signal Word: DANGER!

Hazard Phrases	
H226	Flammable liquid and vapor
H304	May be fatal if swallowed and enters airways.
H312	Harmful in contact with skin
H315	Causes skin irritation
H319	Causes serious eye irritation.
H332	Harmful if inhaled
H335	May cause respiratory irritation
H412	Harmful to aquatic life with long lasting effects

Precautionary Phrases	
P261	Avoid breathing dust/fumes/gas/mist/vapors
P501	Dispose of contents and container to an approved waste disposal plant.
P331	Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove immediately all contaminated clothing. Rinse skin with water.
P310+P310	IF SWALLOWED: Immediately call a POISON CENTER or a doctor/physician.
P210	Keep away from heat, sparks, open flames and hot surfaces. No smoking.
P280	Wear protective gloves and eye and face protection

Other hazards which do not result in classification:

Potential Health Effects:

Organ	Description
Eyes	Contact with eyes generally causes transient superficial injury. Based on animal studies with mixed xylene isomers, it is probably a mild irritant.
Ingestion	Aspiration hazard. May cause irritation of the digestive tract. May cause central nervous system depression characterized by excitement followed by nausea, headache, and unconsciousness. Advanced stages may cause collapse, loss of consciousness, coma, and death from respiratory failure. May cause affects similar to acute inhalation.
Inhalation	High concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness, and coma. Prolonged exposures may result in dizziness and general weakness. Irritation may lead to pneumonitis and pulmonary edema. May cause liver and kidney damage. Causes irritation of the mucous membranes. Odor is not an adequate warning of exposure to xylene. Reversible liver and kidney damage has been reported in cases of extreme overexposure. Industrial fatalities due to severe overexposure have been described.
Skin	May be harmful if absorbed through the skin. Causes skin irritation, defatting, cracking, and dryness. Blistering may occur, particularly if exposure is concentrated and the exposed area is covered. Liquid and vapor and be absorbed through the skin, but not as easily as inhalation or ingestion. Absorption is reported to be slow and significant health effects are not expected by this route of exposure.
Chronic	Prolonged or repeated exposure to xylene may cause defatting and dermatitis., reversible eye damage, labored breathing, confusion, dizziness, apprehension, memory loss, headache, tremors, weakness, anorexia, nausea, ringing in the ears, irritability, thirst, mild changes in liver function, kidney impairment, anemia, and hyperplasia (but not destruction) of bone marrow.

Section 3: COMPOSITION AND INFORMATION ON INGREDIENTS

Chemical Identity: Xylene
Common name / Synonym: Dimethylbenzene, xylol, methyltoluene
CAS #: 1330-20-7; 100-41-4
EINECS #: 215-535-7; 202-849-4
ICSC #: 0268 (Ethyl Benzene)
RTECS #: DA0700000 (Ethyl Benzene)
UN #: 1307
EC #: 601-023-00-4 (Ethyl Benzene)

% Weight	Material	CAS
15-25	Ethyl Benzene	100-41-4
75-85	Xylenes	1330-20-7

Section 4: FIRST AID MEASURES

General Advice
Take proper precautions to ensure your own health and safety before attempting rescue and providing first aid. Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

Skin
Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing/shoes. Get medical aid if irritation persists. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Inhalation
If inhaled, remove to fresh air. If breathing is difficult, give supplemental oxygen. If not breathing, begin artificial respiration. Get medical attention.

Eyes
Check for and remove contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Ingestion
Aspiration hazard if swallowed. Get medical attention immediately. DO NOT induce vomiting unless directed by medical personnel. Never give anything by mouth to an unconscious person.

Note to Physician
Treat symptomatically and supportively.

Section 5: FIRE FIGHTING MEASURES

Suitable (and unsuitable) extinguishing media:
Water streams may be ineffective and spread the fire. Use water spray, dry chemical, carbon dioxide or appropriate foam.

Specific hazards arising from the chemical (e.g., nature of any hazardous combustion products):
No data available.

Special protective equipment and precautions for fire fighters:
Wear self-contained breathing apparatus in pressure-demand (MSA/NIOSH approved or equivalent), and full protective gear. Use water spray to keep fire exposed containers cool. Approach fire upwind to avoid hazardous vapors and toxic decomposition products. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas. Liquid is lighter than water and may travel to a source of ignition and spread fire. May accumulate static electricity.

Flammable Properties
Classification OSHA/NFPA Class IC Flammable Liquid
Flash Point 25-32° C (77-90°F) – closed cup
Autoignition temperature 527° C (982°F)

Section 6: ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures:
Wear respiratory protection. Do not inhale vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas.
Environmental precautions:
Stop leak. Contain spill if possible and safe to do so. Prevent product from entering drains.
Methods and materials for containment and clean up:
Use water spray to dilute into a non-flammable mixture. Avoid runoff into storm sewers and ditches which lead to waterways. Provide ventilation to the affected area and remove all ignition sources. Vapor suppressing foam may be used. Water spray may be reduce vapors but may not prevent ignition in closed spaces. Absorb spilled liquid with sorbent pads, socks, or other inert material such as vermiculite, sand or earth. Approach the spill from upwind and pick up absorbed material and place it in a suitable container. Always use proper personal protective equipment as described in section 8.

Section 7: HANDLING AND STORAGE

Precautions for safe handling:
Always use proper personal protective equipment as described in section 8. Wash thoroughly after handling. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Remove contaminated clothing and wash before reuse. Empty containers contain product residue (liquid and vapor) and can be dangerous. Keep container tightly closed and away from heat, spark, and flame. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use with adequate ventilation. Avoid breathing vapor or mist.

Conditions for safe storage, including any incompatibilities:
Keep away from heat, sparks, and flame in a flammables area. Keep container closed when no in use. Keep from contact with oxidizing materials and strong acids. Store in a cool, dry, well-ventilated space and avoid contact with incompatible materials.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters, e.g., occupational exposure limit values or biological limit values:
Occupational Exposure Limits

Component	Source	Type	Value	Note
Ethyl Benzene	US (NIOSH)	TWA	100 ppm /435 mg/m^3	NIOSH Recommended exposure limit
Ethyl Benzene	US (ACGIH)	TWA	100 ppm	ACGIH Threshold Limit Value
Ethyl Benzene	US (OSHA)	TWA	100 ppm / 435 mg/m^3	29 CFR 1910.1000 Table Z-1 Limits for Air Contaminants
Xylene	US (OSHA)	TWA	100 ppm / 435 mg/m^3	29 CFR 1910.1000 Table Z-1 Limits for Air Contaminants
Xylene	US (ACGIH)	TWA	100 ppm / 34 mg/m^3	ACGIH Threshold Limit Value

Appropriate engineering controls:
Use explosion-proof ventilation equipment. Facilities storing or using the material should be equipped with eyewash station and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Individual protection measures, such as personal protective equipment:
Respiratory Protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).
Hand protection:
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.
Eye protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Use equipment approved by appropriate government standards, such as NIOSH (US) or EN166 (EU). Maintain eye wash fountain and quick-drench facilities in work area.
Skin and body protection:
Wear impervious, flame retardant, antistatic protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Hygiene measures:
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance *(physical state, color, etc.)*	Liquid. Colorless. Clear
Odor	Aromatic odor
Odor threshold	1 ppm
pH	Not available
Freezing point	-34° C (-29.2° F)
Initial boiling point and boiling range	137-140°C (279-284°F)
Flash point	22.8°C (73°F) – Closed cup
Evaporation rate	(Butyl acetate = 1): 0.7
Flammability (solid, gas)	Flammable
Upper / Lower flammability or explosive limits	Lower Limit – 1.1 vol %, Upper Limit – 7.0 vol %
Vapor pressure	8.29 mmHg at 25°C (77°F)
Vapor density	3.66
Relative density	0.865 g/cm^3
Solubility(ies)	Insoluble
Partition coefficient n-octanol/water(ies)	Not Available
Auto-ignition temperature	527°C (982°F)
Decomposition temperature	Not Available
Formula	$C_6H_4(CH_3)_2$
Molecular weight (Xylene Mixtures)	106.17 g/mol

Section 10: STABILITY AND REACTIVITY

Chemical Stability	Stable under recommended storage conditions
Possibility of hazardous reactions	Hazardous Polymerization: Will not occur
Conditions to avoid (e.g., static discharge, shock or vibration)	Ignition sources and excess heat.
Incompatible materials	Strong oxidizing agents, , strong acids, acetic acid, and nitric acid
Hazardous decomposition products	Carbon monoxide and carbon dioxide

Section 11: TOXICOLOGICAL INFORMATION

Xylenes: Ethyl benzene 1330-20-7: 100-41-4

Product Summary: Epidemiology: 175 workers were exposed to 21 ppm of xylene for 7 years. Subjective symptoms, such as anxiety, forgetfulness, inability to concentrate, and dizziness were reported. Xylenes accounted for 70%of the total exposure. Liver and kidney effects were reported. Teratogenicity: No increased evidence of birth defects was reported in a study of lab workers exposed to xylene during early pregnancy. Exposure to other solvents and chemicals also occurred. An increased incidence of spontaneous abortions was reported. Animal information suggests that xylene is not teratogenic or embryotoxic at levels that are not harmful to the mother. Reproductive Effects: an increase in menstrual disorders has been reported in women exposed to organic solvents such as benzene, toluene, and xylenes. It is not possible to attribute these effects to xylene in particular. Mutagenicity: Xylene does not appear to be a mutagen. Neurotoxicity: Xylene may damage hearing or enhance sensitivity to noise in chronic occupational exposures, probably from a neurotoxic mechanism.

Acute Toxicity:

Animal Toxicity (Ethylbenzene)

LC50 Inhalation	Rat	55,000 mg/m^3	2 hours
LD50 Oral	Rat	3500 mg/kg	
LD50 Dermal	Rabbit	17,800 uL/kg	
LC50 Oral	Mouse	35,000 mg/m^3	2 hours
Draize test	Rabbit eye	500 mg	Severe

Animal Toxicity (Xylenes)

LC50 Inhalation	Rat	5,000 mg/m^3	4 hours
LD50 Oral	Rat	4300 mg/kg	
LD50 Dermal	Rabbit	>1700 mg/kg	

LD50 Oral	Mouse	2,119 mg/kg	
Draize test	Rabbit eye	87mg	Mild
Draize test	Rabbit eye	5 mg/24H	Severe
Draize test	Rabbit skin	100%	moderate
Draize test	Rabbit skin	500 mg/24H	Moderate

Irritation:
Routes of Entry:
Inhalation, skin absorption, skin contact

Carcinogenicity
IARC: Group 3: Not classifiable as to its carcinogenicity to humans (Xylene): Group 2B: Possibly carcinogenic to humans (Ethylbenzene)

ACGIH: Carcinogenicity (Xylenes): ACGIH: A4, not classifiable as a human carcinogen IARC: Group 3 – not classifiable. Carcinogenicity (Ethylbenzene):ACGIH: A3, confirmed animal carcinogen with unknown relevance to humans California: carcinogen, initial date 6/11/04 NTP: Not listed IARC: Group 2B carcinogen

NTP: No data is available

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Other Hazards

Organ	Description
Eyes	Contact with eyes generally causes transient, superficial injury. Based on animal studies with mixed Xylene isomers, it is probably a mild irritant.
Ingestion	Aspiration hazard. May cause irritation of the digestive tract. May cause central nervous system depression characterized by excitement followed by nausea, headache, dizziness, and unconsciousness. Advanced stages may cause collapse, loss of consciousness, coma, and death from respiratory failure. May cause affects similar to acute inhalation.
Inhalation	High concentrations may cause central nervous systems effects characterized by nausea, headache, dizziness, unconsciousness, and coma. Prolonged exposures may result in dizziness and general weakness. Irritation may lead to pneumonitis and pulmonary edema. May cause liver and kidney damage. Causes irritation of the mucous membranes. Odor is not an adequate warning of exposure to xylene. Industrial fatalities due to severe overexposure have been described
Skin	May be harmful if absorbed through the skin. Causes skin irritation, defatting, cracking, and dryness. Blistering may occur, particularly if exposure is concentrated and the exposed area is covered. Liquid and vapor and be absorbed through the skin, but not as easily as inhalation or ingestion. Absorption is reported to be slow and significant health effects are not expected by this route of exposure.
Chronic	Prolonged or repeated exposure to xylene may cause defatting and dermatitis., reversible eye damage, labored breathing, confusion, dizziness, apprehension, memory loss, headache, tremors, weakness, anorexia, nausea, ringing in the ears, irritability, thirst, mild changes in liver function, kidney impairment, anemia, and hyperplasia (but not destruction) of bone marrow.

Section 12: ECOLOGICAL INFORMATION

Xylenes: Ethyl benzene 1330-20-7: 100-41-4

Ecotoxicity (aquatic and terrestrial, where available):
Fish: rainbow trout: LC50 = 13.5 mg/L; 96 Hr; unspecified
Fish: rainbow trout: LC50 = 8.5 mg/L; 96 Hr; static conditions
Fish: goldfish: LD50 = 13 mg/L; 24 Hr; unspecified
Fish: fathead minnow: LC50 = 46 mg/L; 1 Hr; Static bioassay
Fish: fathead minnow: LC50 = 16.1mg/L; 96 Hr; flow-through conditions
Fish: bluegill: EC50 = 16.1mg/L; 48 Hr; flow-through conditions
Water flea: EC50 = 3.82 mg/L; 24 Hr; flow-through conditions
Photobacterium phosphoreum: EC50 = 0.0084 mg/L; 24Hr; microtox test

Persistence and degradability:
No data available

Bioaccumulative potential:
No data available

Other adverse effects:
Environmental Fate: (Atmosphere): According to a model of gas/particulate partitioning of semi volatile organic compounds in the atmosphere, xylene, which has an experimental vapor pressure of 7.99 mm Hg at 25° C, will exist solely as a vapor in the ambient atmosphere by reaction with photochemically-produced hydroxyl radicals. The atmospheric lifetime of xylene is about 14-26 hours. Ambient levels of xylene are detected in the atmosphere due to large emissions of this compound. Soil: In soil, it will volatilize and leach into groundwater. Little bioconcentration is expected.

Section 13: DISPOSAL CONSIDERATIONS

Description of waste residues and information on their safe handling and methods of disposal, including the disposal of any contaminated packaging:
Material that cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Processing, use or contamination of this product may change the waste management options. Waste generators must decide if discarded acetonitrile is a hazardous waste. State and local disposal regulations may differ from federal disposal definitions found in 40 CFR 261.3. Dispose of container and unused contents in accordance with federal, state, and local requirements. This material is not a “P” listed waste under 40 CFR 261.33. It is not a “U” listed waste.

Section 14: TRANSPORT INFORMATION

Description of waste residues and information on their safe handling and methods of disposal:

UN number	UN1307
UN proper shipping name	Xylenes
Transport hazard class(es)	3
Packing group *(if applicable)*	III

Reportable Quantity
454 kg

IMDG
UN-Number: 1307 Class: 3 Packing Group: III
EMS-No: F-E, S-D
Proper shipping name: XYLENES
Marine pollutant: No
IATA
UN-Number: UN1307 Class: 3 (6.1) Packing Group: III
Proper shipping name: Xylenes

Section 15: REGULATORY INFORMATION

Safety, health and environmental regulations specific for the product in question:
OSHA Hazards
Flammable liquid, Harmful by skin absorption, Irritant

All ingredients are on the following inventories or are exempted from listing

Country	Notification
Australia	AICS
Canada	DSL
China	IECS
European Union	EINECS
Japan	ENCS/ISHL
Korea	ECL
New Zealand	NZIoC

Philippines	PICCS
United States of America	TSCA

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302. Does not have a TPQ.

SARA 313 Components
Xylenes (CAS# 1330-20-7) and ethylbenzene (CAS# 100-41-4) are reportable under section 313 and 40 CFR373.

SARA 311/312 Hazards
Acute Health Hazard
Chronic Health Hazard
Fire Hazard

CERCLA
CERCLA Hazardous Substances: CAS# 1330-20-7: 1000 lb final RQ; 454 kg final RQ: CAS# 100-41-4: 1000 lb final RQ; 454 kg final RQ

Massachusetts Right to Know Components

Ethylbenzene CAS-No. 100-41-4 Revision date 2007-07-01; Xylene CAS-No. 1330-20-7 Revision date 1989-08-11

Pennsylvania Right to Know Components
Ethylbenzene CAS-No. 100-41-4 Revision date 2007-07-01; Xylene CAS-No. 1330-20-7 Revision date 1989-08-11

New Jersey Right to Know Components
Ethylbenzene CAS-No. 100-41-4 Revision date 2007-07-01; Xylene CAS-No. 1330-20-7 Revision date 1989-08-11

California Prop 65 Components
WARNING! This product contains a chemical known to the State of California to cause cancer. Ethylbenzene CAS-No. 100-41-4 Revision date 2007-09-08

Section 16: OTHER INFORMATION: INCLUDING INFORMATION ON PREPARATION AND REVISION OF THE SDS

NFPA:

Disclaimer
Azer Scientific believes that the information on this MSDS was obtained from reliable sources. However, the information is provided without any warranty, expressed or implied, regarding its correctness. Some information presented and conclusions drawn herein are from sources other than direct test data on the substance itself. The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, Azer Scientific does not assume responsibility and expressly disclaims liability for loss, damage, or expense arising out of or in any way connected with handling, storage, use, or disposal of this product. If the product is used as a component in another product, this MSDS information may not be applicable. Information is correct to the best of our knowledge at the date of the MSDS publication.

Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950
US GHS

Synonyms: Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded Motor or Automotive Gasoline

* * * Section 1 - Product and Company Identification * * *

Manufacturer Information

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

Phone: 732-750-6000 Corporate EHS
Emergency # 800-424-9300 CHEMTREC
www.hess.com (Environment, Health, Safety Internet Website)

* * * Section 2 - Hazards Identification * * *

GHS Classification:

Flammable Liquid - Category 2
Skin Corrosion/Irritation - Category 2
Germ Cell Mutagenicity - Category 1B
Carcinogenicity - Category 1B
Toxic to Reproduction - Category 1A
Specific Target Organ Toxicity (Single Exposure) - Category 3 (respiratory irritation, narcosis)
Specific Target Organ Toxicity (Repeat Exposure) - Category 1 (liver, kidneys, bladder, blood, bone marrow, nervous system)
Aspiration Hazard - Category 1
Hazardous to the Aquatic Environment – Acute Hazard - Category 3

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

DANGER

Hazard Statements

Highly flammable liquid and vapour.
Causes skin irritation.
May cause genetic defects.
May cause cancer.
May damage fertility or the unborn child.
May cause respiratory irritation.
May cause drowsiness or dizziness.
Causes damage to organs (liver, kidneys, bladder, blood, bone marrow, nervous system) through prolonged or repeated exposure.
May be fatal if swallowed and enters airways.
Harmful to aquatic life.

Safety Data Sheet

Material Name: Gasoline All Grades

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Woodbridge, NJ 07095-0961

Phone: 732-750-6000 Corporate EHS
Emergency # 800-424-9300 CHEMTREC
www.hess.com (Environment, Health, Safety Internet Website)

* * * Section 2 - Hazards Identification * * *

GHS Classification:

Flammable Liquid - Category 2
Skin Corrosion/Irritation - Category 2
Germ Cell Mutagenicity - Category 1B
Carcinogenicity - Category 1B
Toxic to Reproduction - Category 1A
Specific Target Organ Toxicity (Single Exposure) - Category 3 (respiratory irritation, narcosis)
Specific Target Organ Toxicity (Repeat Exposure) - Category 1 (liver, kidneys, bladder, blood, bone marrow, nervous system)
Aspiration Hazard - Category 1
Hazardous to the Aquatic Environment – Acute Hazard - Category 3

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

DANGER

Hazard Statements

Highly flammable liquid and vapour.
Causes skin irritation.
May cause genetic defects.
May cause cancer.
May damage fertility or the unborn child.
May cause respiratory irritation.
May cause drowsiness or dizziness.
Causes damage to organs (liver, kidneys, bladder, blood, bone marrow, nervous system) through prolonged or repeated exposure.
May be fatal if swallowed and enters airways.
Harmful to aquatic life.

Precautionary Statements

Prevention

Keep away from heat/sparks/open flames/hot surfaces. No smoking
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ventilating/lighting/equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Wear protective gloves/protective clothing/eye protection/face protection.
Wash hands and forearms thoroughly after handling.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Do not breathe mist/vapours/spray.
Use only outdoors or in well-ventilated area.
Do not eat, drink or smoke when using this product.
Avoid release to the environment.

Response

In case of fire: Use water spray, fog, dry chemical fire extinguishers or hand held fire extinguisher.
IF ON SKIN (or hair): Wash with plenty of soap and water. Remove/Take off immediately all contaminated clothing and wash before reuse. If skin irritation occurs, get medical advice/attention.
IF exposed or concerned: Get medical advice/attention.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a poison center or doctor/physician if you feel unwell.
Get medical advice/attention if you feel unwell.
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Do not induce vomiting.

Storage

Store in a well-ventilated place.
Keep cool. Keep container tightly closed.
Store locked up.

Disposal

Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 3 - Composition / Information on Ingredients * * *

CAS #	Component	Percent
86290-81-5	Gasoline, motor fuel	100
108-88-3	Toluene	1-25
106-97-8	Butane	<10
1330-20-7	Xylenes (o-, m-, p- isomers)	1-15
95-63-6	Benzene, 1,2,4-trimethyl-	<6
64-17-5	Ethyl alcohol	0-10
100-41-4	Ethylbenzene	<3
71-43-2	Benzene	0.1-4.9

110-54-3	Hexane	0.5-4

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol). Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

* * * Section 4 - First Aid Measures * * *

First Aid: Eyes

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

First Aid: Skin

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or with waterless hand cleanser. Obtain medical attention if irritation or redness develops.

First Aid: Ingestion

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

First Aid: Inhalation

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

* * * Section 5 - Fire Fighting Measures * * *

General Fire Hazards

See Section 9 for Flammability Properties.

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

Hazardous Combustion Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

Extinguishing Media

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or gaseous extinguishing agent.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration.

Unsuitable Extinguishing Media

None

Fire Fighting Equipment/Instructions

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment. Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

* * * Section 6 - Accidental Release Measures * * *

Recovery and Neutralization

Carefully contain and stop the source of the spill, if safe to do so.

Materials and Methods for Clean-Up

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal. Caution, flammable vapors may accumulate in closed containers.

Emergency Measures

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Personal Precautions and Protective Equipment

Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

Environmental Precautions

Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Prevention of Secondary Hazards

None

* * * Section 7 - Handling and Storage * * *

Handling Procedures

USE ONLY AS A MOTOR FUEL.
DO NOT SIPHON BY MOUTH

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents."

Storage Procedures

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

Incompatibilities

Keep away from strong oxidizers.

* * * Section 8 - Exposure Controls / Personal Protection * * *

Component Exposure Limits

Gasoline, motor fuel (86290-81-5)

ACGIH: 300 ppm TWA
500 ppm STEL

Toluene (108-88-3)

ACGIH: 20 ppm TWA
OSHA: 200 ppm TWA; 375 mg/m3 TWA
150 ppm STEL; 560 mg/m3 STEL
NIOSH: 100 ppm TWA; 375 mg/m3 TWA
150 ppm STEL; 560 mg/m3 STEL

Butane (106-97-8)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases: Alkane C1-4)
OSHA: 800 ppm TWA; 1900 mg/m3 TWA
NIOSH: 800 ppm TWA; 1900 mg/m3 TWA

Xylenes (o-, m-, p- isomers) (1330-20-7)

ACGIH: 100 ppm TWA
150 ppm STEL
OSHA: 100 ppm TWA; 435 mg/m3 TWA
150 ppm STEL; 655 mg/m3 STEL

Benzene, 1,2,4-trimethyl- (95-63-6)

NIOSH: 25 ppm TWA; 125 mg/m3 TWA

Ethyl alcohol (64-17-5)

ACGIH: 1000 ppm STEL
OSHA: 1000 ppm TWA; 1900 mg/m3 TWA
NIOSH: 1000 ppm TWA; 1900 mg/m3 TWA

Ethylbenzene (100-41-4)

ACGIH: 20 ppm TWA
OSHA: 100 ppm TWA; 435 mg/m3 TWA
125 ppm STEL; 545 mg/m3 STEL
NIOSH: 100 ppm TWA; 435 mg/m3 TWA
125 ppm STEL; 545 mg/m3 STEL

Benzene (71-43-2)

ACGIH: 0.5 ppm TWA
2.5 ppm STEL
Skin - potential significant contribution to overall exposure by the cutaneous route
OSHA: 5 ppm STEL (Cancer hazard, Flammable, See 29 CFR 1910.1028, 15 min); 0.5 ppm Action Level; 1 ppm TWA
NIOSH: 0.1 ppm TWA
1 ppm STEL

Hexane (110-54-3)

ACGIH: 50 ppm TWA
Skin - potential significant contribution to overall exposure by the cutaneous route
OSHA: 500 ppm TWA; 1800 mg/m3 TWA
NIOSH: 50 ppm TWA; 180 mg/m3 TWA

Engineering Measures

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

Personal Protective Equipment: Respiratory

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

Personal Protective Equipment: Hands

Gloves constructed of nitrile, neoprene, or PVC are recommended.

PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment: Eyes

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

Personal Protective Equipment: Skin and Body

Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

* * * Section 9 - Physical & Chemical Properties * * *

Appearance:	Translucent, straw-colored or light yellow	**Odor:**	Strong, characteristic aromatic hydrocarbon odor. Sweet-ether like
Physical State:	Liquid	**pH:**	ND
Vapor Pressure:	6.4 - 15 RVP @ 100 °F (38 °C) (275-475 mm Hg @ 68 °F (20 °C)	**Vapor Density:**	AP 3-4
Boiling Point:	85-437 °F (39-200 °C)	**Melting Point:**	ND
Solubility (H2O):	Negligible to Slight	**Specific Gravity:**	0.70-0.78
Evaporation Rate:	10-11	**VOC:**	ND
Percent Volatile:	100%	**Octanol/H2O Coeff.:**	ND
Flash Point:	-45 °F (-43 °C)	**Flash Point Method:**	PMCC
Upper Flammability Limit (UFL):	7.6%	**Lower Flammability Limit (LFL):**	1.4%
Burning Rate:	ND	**Auto Ignition:**	>530°F (>280°C)

* * * Section 10 - Chemical Stability & Reactivity Information * * *

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources.

Incompatible Products

Keep away from strong oxidizers.

Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

* * * Section 11 - Toxicological Information * * *

Acute Toxicity

A: General Product Information

Harmful if swallowed.

B: Component Analysis - LD50/LC50

Gasoline, motor fuel (86290-81-5)

Inhalation LC50 Rat >5.2 mg/L 4 h; Oral LD50 Rat 14000 mg/kg; Dermal LD50 Rabbit >2000 mg/kg

Toluene (108-88-3)

Inhalation LC50 Rat 12.5 mg/L 4 h; Inhalation LC50 Rat >26700 ppm 1 h; Oral LD50 Rat 636 mg/kg; Dermal LD50 Rabbit 8390 mg/kg; Dermal LD50 Rat 12124 mg/kg

Butane (106-97-8)

Inhalation LC50 Rat 658 mg/L 4 h

Xylenes (o-, m-, p- isomers) (1330-20-7)
Inhalation LC50 Rat 5000 ppm 4 h; Inhalation LC50 Rat 47635 mg/L 4 h; Oral LD50 Rat 4300 mg/kg; Dermal LD50 Rabbit >1700 mg/kg

Benzene, 1,2,4-trimethyl- (95-63-6)
Inhalation LC50 Rat 18 g/m3 4 h; Oral LD50 Rat 3400 mg/kg; Dermal LD50 Rabbit >3160 mg/kg

Ethyl alcohol (64-17-5)
Oral LD50 Rat 7060 mg/kg; Inhalation LC50 Rat 124.7 mg/L 4 h

Ethylbenzene (100-41-4)
Inhalation LC50 Rat 17.2 mg/L 4 h; Oral LD50 Rat 3500 mg/kg; Dermal LD50 Rabbit 15354 mg/kg

Benzene (71-43-2)
Inhalation LC50 Rat 13050-14380 ppm 4 h; Oral LD50 Rat 1800 mg/kg

Hexane (110-54-3)
Inhalation LC50 Rat 48000 ppm 4 h; Oral LD50 Rat 25 g/kg; Dermal LD50 Rabbit 3000 mg/kg

Potential Health Effects: Skin Corrosion Property/Stimulativeness

Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

Potential Health Effects: Eye Critical Damage/ Stimulativeness

Moderate irritant. Contact with liquid or vapor may cause irritation.

Potential Health Effects: Ingestion

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

Potential Health Effects: Inhalation

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

Respiratory Organs Sensitization/Skin Sensitization

This product is not reported to have any skin sensitization effects.

Generative Cell Mutagenicity

This product may cause genetic defects.

Carcinogenicity

A: General Product Information

May cause cancer.

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

B: Component Carcinogenicity

Gasoline, motor fuel (86290-81-5)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans

Toluene (108-88-3)

ACGIH: A4 - Not Classifiable as a Human Carcinogen
IARC: Monograph 71 [1999]; Monograph 47 [1989] (Group 3 (not classifiable))

Xylenes (o-, m-, p- isomers) (1330-20-7)

ACGIH: A4 - Not Classifiable as a Human Carcinogen
IARC: Monograph 71 [1999]; Monograph 47 [1989] (Group 3 (not classifiable))

Ethyl alcohol (64-17-5)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans
IARC: Monograph 100E [in preparation] (in alcoholic beverages); Monograph 96 [2010] (in alcoholic beverages) (Group 1 (carcinogenic to humans))

Ethylbenzene (100-41-4)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans
IARC: Monograph 77 [2000] (Group 2B (possibly carcinogenic to humans))

Benzene (71-43-2)

ACGIH: A1 - Confirmed Human Carcinogen
OSHA: 5 ppm STEL (Cancer hazard, Flammable, See 29 CFR 1910.1028, 15 min); 0.5 ppm Action Level; 1 ppm TWA
NIOSH: potential occupational carcinogen
NTP: Known Human Carcinogen (Select Carcinogen)
IARC: Monograph 100F [in preparation]; Supplement 7 [1987]; Monograph 29 [1982] (Group 1 (carcinogenic to humans))

Reproductive Toxicity

This product is suspected of damaging fertility or the unborn child.

Specified Target Organ General Toxicity: Single Exposure

This product may cause drowsiness or dizziness.

Specified Target Organ General Toxicity: Repeated Exposure

This product causes damage to organs through prolonged or repeated exposure.

Aspiration Respiratory Organs Hazard

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

* * * Section 12 - Ecological Information * * *

Ecotoxicity

A: General Product Information

Very toxic to aquatic life with long lasting effects. Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations.

B: Component Analysis - Ecotoxicity - Aquatic Toxicity

Gasoline, motor fuel (86290-81-5)

Test & Species		Conditions
96 Hr LC50 Alburnus alburnus	119 mg/L [static]	
96 Hr LC50 Cyprinodon variegatus	82 mg/L [static]	
72 Hr EC50 Pseudokirchneriella subcapitata	56 mg/L	
24 Hr EC50 Daphnia magna	170 mg/L	

Toluene (108-88-3)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	15.22-19.05 mg/L [flow-through]	1 day old
96 Hr LC50 Pimephales promelas	12.6 mg/L [static]	
96 Hr LC50 Oncorhynchus mykiss	5.89-7.81 mg/L [flow-through]	
96 Hr LC50 Oncorhynchus mykiss	14.1-17.16 mg/L [static]	
96 Hr LC50 Oncorhynchus mykiss	5.8 mg/L [semi-static]	
96 Hr LC50 Lepomis macrochirus	11.0-15.0 mg/L [static]	
96 Hr LC50 Oryzias latipes	54 mg/L [static]	
96 Hr LC50 Poecilia reticulata	28.2 mg/L [semi-static]	
96 Hr LC50 Poecilia reticulata	50.87-70.34 mg/L [static]	
96 Hr EC50 Pseudokirchneriella subcapitata	>433 mg/L	
72 Hr EC50 Pseudokirchneriella subcapitata	12.5 mg/L [static]	
48 Hr EC50 Daphnia magna	5.46 - 9.83 mg/L [Static]	
48 Hr EC50 Daphnia magna	11.5 mg/L	

Xylenes (o-, m-, p- isomers) (1330-20-7)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	13.4 mg/L [flow-through]	

96 Hr LC50 Oncorhynchus mykiss	2.661-4.093 mg/L [static]
96 Hr LC50 Oncorhynchus mykiss	13.5-17.3 mg/L
96 Hr LC50 Lepomis macrochirus	13.1-16.5 mg/L [flow-through]
96 Hr LC50 Lepomis macrochirus	19 mg/L
96 Hr LC50 Lepomis macrochirus	7.711-9.591 mg/L [static]
96 Hr LC50 Pimephales promelas	23.53-29.97 mg/L [static]
96 Hr LC50 Cyprinus carpio	780 mg/L [semi-static]
96 Hr LC50 Cyprinus carpio	>780 mg/L
96 Hr LC50 Poecilia reticulata	30.26-40.75 mg/L [static]
48 Hr EC50 water flea	3.82 mg/L
48 Hr LC50 Gammarus lacustris	0.6 mg/L

Benzene, 1,2,4-trimethyl- (95-63-6)

Test & Species	Conditions
96 Hr LC50 Pimephales promelas	7.19-8.28 mg/L [flow-through]
48 Hr EC50 Daphnia magna	6.14 mg/L

Ethyl alcohol (64-17-5)

Test & Species	Conditions
96 Hr LC50 Oncorhynchus mykiss	12.0 - 16.0 mL/L [static]
96 Hr LC50 Pimephales promelas	>100 mg/L [static]
96 Hr LC50 Pimephales promelas	13400 - 15100 mg/L [flow-through]
48 Hr LC50 Daphnia magna	9268 - 14221 mg/L
24 Hr EC50 Daphnia magna	10800 mg/L
48 Hr EC50 Daphnia magna	2 mg/L [Static]

Ethylbenzene (100-41-4)

Test & Species	Conditions
96 Hr LC50 Oncorhynchus mykiss	11.0-18.0 mg/L [static]
96 Hr LC50 Oncorhynchus mykiss	4.2 mg/L [semi-static]
96 Hr LC50 Pimephales promelas	7.55-11 mg/L [flow-through]
96 Hr LC50 Lepomis macrochirus	32 mg/L [static]
96 Hr LC50 Pimephales promelas	9.1-15.6 mg/L [static]
96 Hr LC50 Poecilia reticulata	9.6 mg/L [static]
72 Hr EC50 Pseudokirchneriella subcapitata	4.6 mg/L
96 Hr EC50 Pseudokirchneriella subcapitata	>438 mg/L
72 Hr EC50 Pseudokirchneriella subcapitata	2.6 - 11.3 mg/L [static]

96 Hr EC50 Pseudokirchneriella subcapitata	1.7 - 7.6 mg/L [static]
48 Hr EC50 Daphnia magna	1.8 - 2.4 mg/L

Benzene (71-43-2)

Test & Species	Conditions
96 Hr LC50 Pimephales promelas	10.7-14.7 mg/L [flow-through]
96 Hr LC50 Oncorhynchus mykiss	5.3 mg/L [flow-through]
96 Hr LC50 Lepomis macrochirus	22.49 mg/L [static]
96 Hr LC50 Poecilia reticulata	28.6 mg/L [static]
96 Hr LC50 Pimephales promelas	22330-41160 µg/L [static]
96 Hr LC50 Lepomis macrochirus	70000-142000 µg/L [static]
72 Hr EC50 Pseudokirchneriella subcapitata	29 mg/L
48 Hr EC50 Daphnia magna	8.76 - 15.6 mg/L [Static]
48 Hr EC50 Daphnia magna	10 mg/L

Hexane (110-54-3)

Test & Species	Conditions
96 Hr LC50 Pimephales promelas	2.1-2.98 mg/L [flow-through]
24 Hr EC50 Daphnia magna	>1000 mg/L

Persistence/Degradability

No information available.

Bioaccumulation

No information available.

Mobility in Soil

No information available.

* * * Section 13 - Disposal Considerations * * *

Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment recommendations.

Disposal of Contaminated Containers or Packaging

Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 14 - Transportation Information * * *

Component Marine Pollutants

This material contains one or more of the following chemicals required by US DOT to be identified as marine pollutants.

Component	CAS #	
Gasoline, motor fuel	86290-81-5	DOT regulated marine pollutant

DOT Information

Shipping Name: Gasoline
UN #: 1203 **Hazard Class:** 3 **Packing Group:** II
Placard:

* * * Section 15 - Regulatory Information * * *

Regulatory Information

A: Component Analysis

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4).

Toluene (108-88-3)
SARA 313: 1.0 % de minimis concentration
CERCLA: 1000 lb final RQ; 454 kg final RQ

Xylenes (o-, m-, p- isomers) (1330-20-7)
SARA 313: 1.0 % de minimis concentration
CERCLA: 100 lb final RQ; 45.4 kg final RQ

Benzene, 1,2,4-trimethyl- (95-63-6)
SARA 313: 1.0 % de minimis concentration

Ethylbenzene (100-41-4)
SARA 313: 0.1 % de minimis concentration
CERCLA: 1000 lb final RQ; 454 kg final RQ

Benzene (71-43-2)
SARA 313: 0.1 % de minimis concentration
CERCLA: 10 lb final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule); 4.54 kg final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule)

Hexane (110-54-3)

SARA 313: 1.0 % de minimis concentration
CERCLA: 5000 lb final RQ; 2270 kg final RQ

SARA Section 311/312 – Hazard Classes

Acute Health	Chronic Health	Fire	Sudden Release of Pressure	Reactive
X	X	X	--	--

Component Marine Pollutants

This material contains one or more of the following chemicals required by US DOT to be identified as marine pollutants.

Component	CAS #	
Gasoline, motor fuel	86290-81-5	DOT regulated marine pollutant

State Regulations

Component Analysis - State

The following components appear on one or more of the following state hazardous substances lists:

Component	**CAS**	**CA**	**MA**	**MN**	**NJ**	**PA**	**RI**
Gasoline, motor fuel	86290-81-5	No	No	No	No	Yes	No
Toluene	108-88-3	Yes	Yes	Yes	Yes	Yes	No
Butane	106-97-8	Yes	Yes	Yes	Yes	Yes	No
Xylenes (o-, m-, p- isomers)	1330-20-7	Yes	Yes	Yes	Yes	Yes	No
Benzene, 1,2,4-trimethyl-	95-63-6	No	Yes	Yes	Yes	Yes	No
Ethyl alcohol	64-17-5	Yes	Yes	Yes	Yes	Yes	No
Ethylbenzene	100-41-4	Yes	Yes	Yes	Yes	Yes	No
Benzene	71-43-2	Yes	Yes	Yes	Yes	Yes	No
Hexane	110-54-3	No	Yes	Yes	Yes	Yes	No

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.
WARNING! This product contains a chemical known to the state of California to cause reproductive/developmental effects.

Component Analysis - WHMIS IDL

The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

Component	CAS #	Minimum Concentration
Toluene	108-88-3	1 %
Butane	106-97-8	1 %
Benzene, 1,2,4-trimethyl-	95-63-6	0.1 %
Ethyl alcohol	64-17-5	0.1 %
Ethylbenzene	100-41-4	0.1 %
Benzene	71-43-2	0.1 %
Hexane	110-54-3	1 %

Additional Regulatory Information

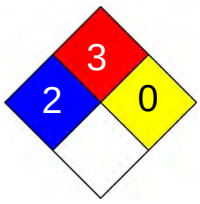
Component Analysis - Inventory

Component	CAS #	TSCA	CAN	EEC
Gasoline, motor fuel	86290-81-5	No	DSL	EINECS
Toluene	108-88-3	Yes	DSL	EINECS
Butane	106-97-8	Yes	DSL	EINECS
Xylenes (o-, m-, p- isomers)	1330-20-7	Yes	DSL	EINECS
Benzene, 1,2,4-trimethyl-	95-63-6	Yes	DSL	EINECS
Ethyl alcohol	64-17-5	Yes	DSL	EINECS
Ethylbenzene	100-41-4	Yes	DSL	EINECS
Benzene	71-43-2	Yes	DSL	EINECS
Hexane	110-54-3	Yes	DSL	EINECS

* * * Section 16 - Other Information * * *

NFPA® Hazard Rating

Health	2
Fire	3
Reactivity	0



HMIS® Hazard Rating

Health	2	Moderate
Fire	3	Serious
Physical	0	Minimal
		*Chronic

Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act; ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration., NJTSR = New Jersey Trade Secret Registry.

Literature References

None

Other Information

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

End of Sheet

SAFETY DATA SHEET

Isobutylene

Section 1. Identification

GHS product identifier : Isobutylene

Chemical name : 2-methylpropene

Other means of identification : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

Product use : Synthetic/Analytical chemistry.

Synonym : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

SDS # : 001031

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE GASES - Category 1
GASES UNDER PRESSURE - Liquefied gas

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Extremely flammable gas.
May form explosive mixtures with air.
Contains gas under pressure; may explode if heated.
May cause frostbite.
May displace oxygen and cause rapid suffocation.

Precautionary statements

General : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.

Prevention : Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Response : Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage : Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Disposal : Not applicable.

Hazards not otherwise classified : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : 2-methylpropene

Other means of identification : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

CAS number/other identifiers

CAS number : 115-11-7

Product code : 001031

Ingredient name	%	CAS number
Isobutylene	100	115-11-7

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Section 4. First aid measures

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Isobutylene	**ACGIH TLV (United States, 3/2015).** TWA: 250 ppm 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Section 8. Exposure controls/personal protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas. [Liquefied compressed gas.]

Color : Colorless.

Molecular weight : 56.12 g/mole

Molecular formula : C4-H8

Boiling/condensation point : -6.9°C (19.6°F)

Melting/freezing point : -140.7°C (-221.3°F)

Critical temperature : 144.75°C (292.6°F)

Odor : Characteristic.

Odor threshold : Not available.

pH : Not available.

Flash point : Closed cup: -76.1°C (-105°F)

Burning time : Not applicable.

Burning rate : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.

Lower and upper explosive (flammable) limits : Lower: 1.8%
Upper: 9.6%

Vapor pressure : 24.3 (psig)

Vapor density : 1.94 (Air = 1)

Specific Volume (ft^3/lb) : 6.6845

Gas Density (lb/ft^3) : 0.1496 (25°C / 77 to °F)

Relative density : Not applicable.

Solubility : Not available.

Solubility in water : 0.263 g/l

Partition coefficient: n-octanol/water : 2.34

Auto-ignition temperature : 465°C (869°F)

Decomposition temperature : Not available.

SADT : Not available.

Section 9. Physical and chemical properties

Viscosity : Not applicable.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Incompatible materials : Oxidizers

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Isobutylene	LC50 Inhalation Vapor	Rat	550000 mg/m³	4 hours

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Section 11. Toxicological information

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Isobutylene	2.34	-	low

Section 12. Ecological information

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1055	UN1055	UN1055	UN1055	UN1055
UN proper shipping name	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE
Transport hazard class(es)	2.1	2.1	2.1	2.1	2.1
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	**Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: Forbidden. **Cargo aircraft** Quantity limitation: 150 kg **Special provisions** 19, T50	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2). **Explosive Limit and Limited Quantity Index** 0.125 **ERAP Index** 3000 **Passenger Carrying Ship Index** Forbidden **Passenger Carrying Road or Rail Index** Forbidden **Special provisions** 29	-	-	**Passenger and Cargo Aircraft**Quantity limitation: 0 Forbidden **Cargo Aircraft Only** Quantity limitation: 150 kg

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Section 14. Transport information

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

United States inventory (TSCA 8b): This material is listed or exempted.

Clean Air Act (CAA) 112 regulated flammable substances: isobutylene

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Fire hazard
Sudden release of pressure

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Isobutylene	100	Yes.	Yes.	No.	No.	No.

State regulations

Massachusetts : This material is listed.

New York : This material is not listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

International regulations

International lists

National inventory

Australia : This material is listed or exempted.

Canada : This material is listed or exempted.

China : This material is listed or exempted.

Europe : This material is listed or exempted.

Japan : This material is listed or exempted.

Malaysia : Not determined.

Section 15. Regulatory information

New Zealand : This material is listed or exempted.

Philippines : This material is listed or exempted.

Republic of Korea : This material is listed or exempted.

Taiwan : This material is listed or exempted.

Canada

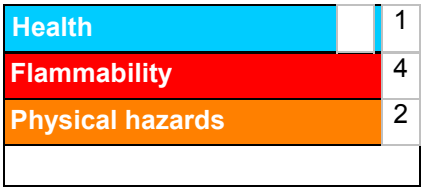
WHMIS (Canada) : Class A: Compressed gas.
Class B-1: Flammable gas.

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

Canada Label requirements : Class A: Compressed gas.
Class B-1: Flammable gas.

Hazardous Material Information System (U.S.A.)



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
Flam. Gas 1, H220 Press. Gas Liq. Gas, H280	Expert judgment Expert judgment

History

Date of printing : 7/11/2016

Date of issue/Date of revision : 7/11/2016

Date of previous issue : No previous validation

Section 16. Other information

Version : 0.01

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

MATERIAL SAFETY DATA SHEET

ALCONOX®

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Union REACH Regulations

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME:	**ALCONOX®**
CHEMICAL FAMILY NAME:	Detergent.
PRODUCT USE:	Critical-cleaning detergent for laboratory, healthcare and industrial applications
U.N. NUMBER:	Not Applicable
U.N. DANGEROUS GOODS CLASS:	Non-Regulated Material
SUPPLIER/MANUFACTURER'S NAME:	Alconox, Inc.
ADDRESS:	30 Glenn St., Suite 309, White Plains, NY 10603. USA
EMERGENCY PHONE:	**TOLL-FREE in USA/Canada** 800-255-3924
	International calls 813-248-0585
BUSINESS PHONE:	914-948-4040
DATE OF PREPARATION:	May 2011
DATE OF LAST REVISION:	February 2008

SECTION 2 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This product is a white granular powder with little or no odor. Exposure can be irritating to eyes, respiratory system and skin. It is a non-flammable solid. The Environmental effects of this product have not been investigated.

US DOT SYMBOLS

Non-Regulated

CANADA (WHMIS) SYMBOLS

EUROPEAN and (GHS) Hazard Symbols

Signal Word: **Warning!**

EU LABELING AND CLASSIFICATION:

Classification of the substance or mixture according to Regulation (EC) No1272/2008 Annex 1
EC# 205-633-8 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 268-356-1 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 231-838-7 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 231-767-1 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 207-638-8 Index# 011-005-00-2
EC# 205-788-1 This substance is not classified in the Annex I of Directive 67/548/EEC

GHS Hazard Classification(s):

Eye Irritant Category 2A

Hazard Statement(s):

H319: Causes serious eye irritation

Precautionary Statement(s):

P260: Do not breath dust/fume/gas/mist/vapors/spray
P264: Wash hands thoroughly after handling
P271: Use only in well ventilated area.
P280: Wear protective gloves/protective clothing/eye protection/face protection/

Hazard Symbol(s):

[Xi] Irritant

Risk Phrases:
R20: Harmful by inhalation
R36/37/38: Irritating to eyes, respiratory system and skin

Safety Phrases:
S8: Keep container dry
S22: Do not breath dust
S24/25: Avoid contact with skin and eyes

HEALTH HAZARDS OR RISKS FROM EXPOSURE:

ACUTE: Exposure to this product may cause irritation of the eyes, respiratory system and skin. Ingestion may cause gastrointestinal irritation including pain, vomiting or diarrhea.

CHRONIC: This product contains an ingredient which may be corrosive.

TARGET ORGANS: ACUTE: Eye, respiratory System, Skin CHRONIC: None Known

SECTION 3 - COMPOSITION and INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS:	CAS #	EINECS #	ICSC #	WT %	HAZARD CLASSIFICATION; RISK PHRASES
Sodium Bicarbonate	144-55-8	205-633-8	1044	33 - 43%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	268-356-1	Not Listed	10 – 20%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Tripolyphosphate	7758-29-4	231-838-7	1469	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Tetrasodium Pyrophosphate	7722-88-5	231-767-1	1140	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Carbonate	497-19-8	207-638-8	1135	1 - 10%	HAZARD CLASSIFICATION: [Xi] Irritant RISK PHRASES: R36
Sodium Alcohol Sulfate	151-21-3	205-788-1	0502	1 – 5%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Balance of other ingredients are non-hazardous or less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).					

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard *JIS Z 7250: 2000*.

SECTION 4 - FIRST-AID MEASURES

Contaminated individuals of chemical exposure must be taken for medical attention if any adverse effect occurs. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with contaminated individual.

EYE CONTACT: If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.

SKIN CONTACT: Wash skin thoroughly after handling. Seek medical attention if irritation develops and persists. Remove contaminated clothing. Launder before re-use.

INHALATION: If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention if breathing dificulty continues.

INGESTION: If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or MSDS with the victim to the health professional.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing skin, or eye problems may be aggravated by prolonged contact.

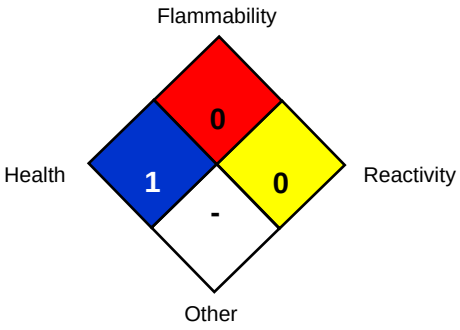
RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and reduce over-exposure.

SECTION 5 - FIRE-FIGHTING MEASURES

FLASH POINT: Not Flammable
AUTOIGNITION TEMPERATURE: Not Applicable
FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): NA Upper (UEL): NA
FIRE EXTINGUISHING MATERIALS: As appropriate for surrounding fire. Carbon dioxide, foam, dry chemical, halon, or water spray.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This product is non-flammable and has no known explosion hazards.
Explosion Sensitivity to Mechanical Impact: Not Sensitive.
Explosion Sensitivity to Static Discharge: Not Sensitive
SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING SYSTEM



HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD (BLUE)	1
FLAMMABILITY HAZARD (RED)	0
PHYSICAL HAZARD (YELLOW)	0

PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8

For Routine Industrial Use and Handling Applications

Hazard Scale: **0** = Minimal **1** = Slight **2** = Moderate **3** = Serious **4** = Severe * = Chronic hazard

SECTION 6 - ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Personnel should be trained for spill response operations.
SPILLS: Contain spill if safe to do so. Prevent entry into drains, sewers, and other waterways. Sweep, shovel or vacuum spilled material and place in an appropriate container for re-use or disposal. Avoid dust generation if possible. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations).

SECTION 7 - HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing dusts generated by this product. Use in a well-ventilated location. Remove contaminated clothing immediately.

STORAGE AND HANDLING PRACTICES: Containers of this product must be properly labeled. Store containers in a cool, dry location. Keep container tightly closed when not in use. Store away from strong acids or oxidizers.

SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/GUIDELINES:

Chemical Name	CAS#	ACGIH TWA	OSHA TWA	SWA
Sodium Bicarbonate	144-55-8	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium Tripolyphosphate	7758-29-4	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Tetrasodium Pyrophosphate	7722-88-5	5 mg/m³	5 mg/m³	5 mg/m³
Sodium Carbonate	497-19-8	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium Alcohol Sulfate	151-21-3	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust

Currently, International exposure limits are not established for the components of this product. Please check with competent authority in each country for the most recent limits in place.

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided below. Use local exhaust ventilation to control airborne dust. Ensure eyewash/safety shower stations are available near areas where this product is used.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Based on test data, exposure limits should not be exceeded under normal use conditions when using Alconox Detergent. Maintain airborne contaminant concentrations below guidelines listed above, if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Use chemical resistant gloves to prevent skin contact.. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: Use body protection appropriate to prevent contact (e.g. lab coat, overalls). If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

SECTION 9 - PHYSICAL and CHEMICAL PROPERTIES

PHYSICAL STATE:	Solid
APPEARANCE & ODOR:	White granular powder with little or no odor.
ODOR THRESHOLD (PPM):	Not Available
VAPOR PRESSURE (mmHg):	Not Applicable
VAPOR DENSITY (AIR=1):	Not Applicable.
BY WEIGHT:	Not Available
EVAPORATION RATE (nBuAc = 1):	Not Applicable.
BOILING POINT (C°):	Not Applicable.
FREEZING POINT (C°):	Not Applicable.
pH:	9.5 (1% aqueous solution)
SPECIFIC GRAVITY 20°C: (WATER =1)	0.85 – 1.1
SOLUBILITY IN WATER (%)	>10% w/w
COEFFICIENT OF WATER/OIL DIST.:	Not Available
VOC:	None
CHEMICAL FAMILY:	Detergent

SECTION 10 - STABILITY and REACTIVITY

STABILITY: Product is stable
DECOMPOSITION PRODUCTS: When heated to decomposition this product produces Oxides of carbon (COx)
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong acids and strong oxidizing agents.
HAZARDOUS POLYMERIZATION: Will not occur.
CONDITIONS TO AVOID: Contact with incompatible materials and dust generation.

SECTION 11 - TOXICOLOGICAL INFORMATION

TOXICITY DATA: Toxicity data is available for mixture:

CAS# 497-19-8 LD50 Oral (Rat)	4090 mg/kg
CAS# 497-19-8 LD50 Oral (Mouse)	6600 mg/kg
CAS# 497-19-8 LC50 Inhalation (Rat)	2300 mg/m³ 2H
CAS# 497-19-8 LC50 Inhalation (Mouse)	1200 mg/m³ 2H
CAS# 7758-29-4 LD50 Oral (Rat)	3120 mg/kg
CAS# 7758-29-4 LD50 Oral (Mouse)	3100 mg/kg
CAS# 7722-88-5 LD50 Oral (Rat)	4000 mg/kg

SUSPECTED CANCER AGENT: None of the ingredients are found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC and therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies.
IRRITANCY OF PRODUCT: Contact with this product can be irritating to exposed skin, eyes and respiratory system.
SENSITIZATION OF PRODUCT: This product is not considered a sensitizer.
REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

SECTION 12 - ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.
ENVIRONMENTAL STABILITY: No Data available at this time.
EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this product's effects on plants or animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

SECTION 13 - DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.

SECTION 14 - TRANSPORTATION INFORMATION

US DOT; IATA; IMO; ADR:

THIS PRODUCT IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.
PROPER SHIPPING NAME: Non-Regulated Material
HAZARD CLASS NUMBER and DESCRIPTION: Not Applicable
UN IDENTIFICATION NUMBER: Not Applicable
PACKING GROUP: Not Applicable.
DOT LABEL(S) REQUIRED: Not Applicable
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): Not Applicable
MARINE POLLUTANT: None of the ingredients are classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B)

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS:
This product is not classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:
This product is not classified as Dangerous Goods, per regulations of Transport Canada.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA):
This product is not classified as Dangerous Goods, by rules of IATA:

INTERNATIONAL MARITIME ORGANIZATION (IMO) DESIGNATION:
This product is not classified as Dangerous Goods by the International Maritime Organization.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR):

This product is not classified by the United Nations Economic Commission for Europe to be dangerous goods.

SECTION 15 - REGULATORY INFORMATION

UNITED STATES REGULATIONS

SARA REPORTING REQUIREMENTS: This product is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act., as follows: None

TSCA: All components in this product are listed on the US Toxic Substances Control Act (TSCA) inventory of chemicals.

SARA 311/312:

Acute Health: Yes Chronic Health: No Fire: No Reactivity: No

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): None

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): None of the ingredients are on the California Proposition 65 lists.

CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: All of the components of this product are on the DSL Inventory

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: No component of this product is on the CEPA First Priorities Substance Lists.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: This product is categorized as a Controlled Product, Hazard Class D2B as per the Controlled Product Regulations

EUROPEAN ECONOMIC COMMUNITY INFORMATION:

EU LABELING AND CLASSIFICATION:

Classification of the mixture according to Regulation (EC) No1272/2008. See section 2 for details.

AUSTRALIAN INFORMATION FOR PRODUCT:

AUSTRALIAN INVENTORY OF CHEMICAL SUBSTANCES (AICS) STATUS: All components of this product are listed on the AICS.

STANDARD FOR THE UNIFORM SCHEDULING OF DRUGS AND POISONS: Not applicable.

JAPANESE INFORMATION FOR PRODUCT:

JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS: The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:

Asia-Pac:	Listed
Australian Inventory of Chemical Substances (AICS):	Listed
Korean Existing Chemicals List (ECL):	Listed
Japanese Existing National Inventory of Chemical Substances (ENCS):	Listed
Philippines Inventory if Chemicals and Chemical Substances (PICCS):	Listed
Swiss Giftliste List of Toxic Substances:	Listed
U.S. TSCA:	Listed

SECTION 16 - OTHER INFORMATION

PREPARED BY: Paul Eigbrett Global Safety Management, 10006 Cross Creek Blvd. Suite 440, Tampa, FL 33647

Disclaimer: To the best of Alconox, Inc. knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness is not guaranteed and no warranties of any type either express or implied are provided. The information contained herein relates only to this specific product.

ANNEX:

IDENTIFIED USES OF ALCONOX® AND DIRECTIONS FOR USE

Used to clean: Healthcare instruments, laboratory ware, vacuum equipment, tissue culture ware, personal protective equipment, sampling apparatus, catheters, tubing, pipes, radioactive contaminated articles, optical parts, electronic components, pharmaceutical apparatus, cosmetics manufacturing equipment, metal castings, forgings and stampings, industrial parts, tanks and reactors. Authorized by USDA for use in federally inspected meat and poultry plants. Passes inhibitory residue test for water analysis. FDA certified.

Used to remove: Soil, grit, grime, buffing compound, slime, grease, oils, blood, tissue, salts, deposits, particulates, solvents, chemicals, radioisotopes, radioactive contaminations, silicon oils, mold release agents.

Surfaces cleaned: Corrosion inhibited formulation recommended for glass, metal, stainless steel, porcelain, ceramic, plastic, rubber and fiberglass. Can be used on soft metals such as copper, aluminum, zinc and magnesium if rinsed promptly. Corrosion testing may be advisable.

Cleaning method: Soak, brush, sponge, cloth, ultrasonic, flow through clean-inplace. Will foam—not for spray or machine use.

Directions: Make a fresh 1% solution (2 1/2 Tbsp. per gal., 1 1/4 oz. per gal. or 10 grams per liter) in cold, warm, or hot water. If available use warm water. Use cold water for blood stains. For difficult soils, raise water temperature and use more detergent. Clean by soak, circulate, wipe, or ultrasonic method. Not for spray machines, will foam. For nonabrasive scouring, make paste. Use 2% solution to soak frozen stopcocks. To remove silver tarnish, soak in 1% solution in aluminum container. RINSE THOROUGHLY—preferably with running water. For critical cleaning, do final or all rinsing in distilled, deionized, or purified water. For food contact surfaces, rinse with potable water. Used on a wide range of glass, ceramic, plastic, and metal surfaces. Corrosion testing may be advisable.

SAFETY DATA SHEET

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Hydrochloric Acid, 31 – 36%

Product Name: Hydrochloric Acid, 31 – 36.7%

Identified Uses: acid etching, steel pickling, oil and gas, ore and mineral, food processing, pharmaceutical, organic chemical synthesis

Company Information:
ASHTA Chemicals Inc.
P.O. Box 858
Ashtabula Ohio 44005
Phone: (440) 997-5221
Fax: (440) 998-0286
24-hour Emergency Phone: CHEMTREC: (800) 424-9300

SECTION 2: HAZARDS IDENTIFICATION

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

GHS label elements, including precautionary statements:

Signal Word: **Danger**

Pictogram(s):

Hazard Statements	
H290	May be corrosive to metals.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H335	May cause respiratory irritation.

Precautionary Statements	
P234	Keep only in original container.
P261	Avoid breathing dust/ fume/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water. Shower.

P304 + P340 + P310	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/ physician.
P363	Wash contaminated clothing before reuse.
P390	Absorb spillage to prevent material damage.
P403 + P233	Store in a well-ventilated place. Keep container with a resistant inner liner.
P405	Store locked up.
P406	Store in corrosive resistant stainless steel container with a resistant inner liner.
P501	Dispose of contents/ container to an approved waste disposal plant.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms:

CHEMICAL NAME:	Hydrochloric acid
TRADE NAME:	Hydrochloric acid, 31 – 36%
SYNONYMS:	Muriatic acid, Chlorohydric acid, Hydrogen Chloride
C.A.S:	7647-01-0
EC:	231-595-7
WHMIS:	D2A, E
CHEMICAL FORMULA:	HCl (in aqueous solution)
CHEMICAL FAMILY:	Inorganic Acid

SECTION 4 FIRST AID MEASURES

Description of first aid measures:
Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. If breathing is difficult, give humidified air. Give oxygen, but only by a certified physician. Consult a physician.

In case of skin contact
Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Remove contact lenses if present and easy to do. Continue rinsing eyes during transport to medical facility.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth thoroughly with water. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Consult a physician.

SECTION 5 FIRE FIGHTING MEASURES

Flash Point (Method):	Non-combustible.
Extinguishing Media:	Use extinguishing agents compatible with acid and appropriate for the burning material. Use water spray to keep fire-exposed containers cool.
Auto Ignition Temp:	Non-combustible.
Special Fire Fighting Procedures:	Wear self-contained breathing apparatus and full protective clothing. In case of fire and/or explosion do not breathe fumes. Use standard firefighting procedures and consider the hazards of other involved materials.
Unusual Fire/Explosion Hazards:	Releases flammable hydrogen gas when reacting with metals.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Environmental Precautions:
Use closed systems when possible. Provide local exhaust ventilation where vapor or mist may be generated. Avoid discharge into drains, water courses or onto the ground.

Containment and Cleaning:
Follow preplanned emergency procedures. Only properly equipped, trained, functional personnel should attempt to contain a leak. All other personnel should be evacuated from the danger area. Using full protective equipment, apply appropriate emergency device or other securement technology to stop the leak if possible.

Small Spill:	Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: neutralize the residue with a dilute solution of sodium carbonate.
Large Spill:	Corrosive liquid. Stop leak if without risk. Do not touch spilled material. Use water spray curtain to knock down vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that vapor is not present at a concentration level above TLV.

SECTION 7: HANDLING AND STORAGE

Precautions to be taken for handling and storage:
Wear appropriate personal protective equipment. Do not get in eyes, on skin, on clothing. Do not breathe mist or vapor. Observe good industrial hygiene practices. Do not empty into drains. Use caution when combining with water; DO NOT add water to acid, ALWAYS add acid to water while stirring to prevent release of heat, steam and fumes. Store in a well-ventilated place. Store away from incompatible materials. Store closed containers in a clean, cool, open or well ventilated area. Keep out of sun.

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Principal Component: Hydrochloric Acid
Occupational Exposure Limits:
Regulatory Limits:

Component	OSHA Final PEL TWA	OSHA Final PEL STEL	OSHA Final PEL Ceiling
Hydrochloric Acid Mixture	---	---	5 ppm 7.59 mg/m^3

ACGIH TLV = 5 ppm (7.59 mg/m^3) TWA

NIOSH IDLH = 50 ppm (as HCl, 2010)

Exposure Controls:

Eye Protection: Tightly fitting safety goggles. Face shield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Respiratory Protection: Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multipurpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Other Protection: Complete suit protecting against chemicals. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Ventilation Recommended: Exhaust ventilation is required to meet PEL limits.

Glove Type Recommended: Wear neoprene, nitrile, butyl rubber or PVC gloves to prevent exposure.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties:

Appearance	Colorless to light yellow liquid
Odor	Pungent (irritating/strong)
Odor Threshold	0.3ppm (can cause olfactory fatigue)
pH	<1 (in aqueous solution)
Melting point/freezing point	-30°C (-22°F)
Initial boiling point	>100°C (>212°F)
Flash point	Not applicable
Auto-ignition Temp	Not applicable
Evaporation rate	No data available

Decomposition temperature	No data available
Flammability (solid, gas)	Not combustible
Upper/lower flammability or explosive limits	Not combustible
Water solubility	100%
Molecular Weight	36.46
Relative Density (Specific Gravity)	1.16 (32% HCl solution) 1.19 (36.5% HCl solution)
Bulk Density	8.75 lbs/gal (32% HCl solution) 9.83 lbs/gal (36.5% HCl solution)
Vapor Density (air = 1)	1.267 at 20 °C
Vapor Pressure	84 mm Hg @ 20°C
Partition Coefficient: n-octanol/water	No data available

SECTION 10: STABILITY AND REACTIVITY

Stability: Hydrochloric acid is stable under normal conditions and pressures.

Conditions to avoid: Incompatible materials, metals, excess heat, bases.

Incompatibility: Bases, amines, metals, permanganates, (e.g. potassium permanganate), fluorine, metal acetylides, hexalithium disilicide.

Hazardous decomposition products: Hydrogen chloride, chlorine, hydrogen gas.

Polymerization: Hazardous polymerization WILL NOT occur.

SECTION 11: TOXICOGICAL INFORMATION

Information on likely routes of exposure:

Inhalation: Vapors and mist will irritate throat and respiratory system and cause coughing.

Skin contact: Causes skin burns.

Eye contact: Causes eye burns.

Ingestion: Harmful if swallowed. Causes digestive tract burns. Ingestion may produce burns to the lips, oral cavity, upper airway, esophagus and possibly the digestive tract.

Symptoms related to the physical, chemical and toxicological characteristics:

Contact with this material will cause burns to the skin, eyes and mucous membranes. Permanent eye damage including blindness could result.

Information on toxicological effects:

Acute toxicity: Harmful if swallowed.

Skin corrosion/irritation: Causes severe skin burns and eye damage.

Serious eye damage/eye Irritation: Causes serious eye damage.

Respiratory sensitization: Not available.

Skin sensitization:	No data available.
Germ cell mutagenicity:	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity:	This product is not considered to be a carcinogen by IARC, ACGIH, NTP or OSHA.
Reproductive toxicity:	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure:	May cause respiratory irritation.
Specific target organ toxicity - repeated exposure:	No data available.
Aspiration hazard:	Not available.
Chronic effects:	Prolonged inhalation may be harmful.

Components Species Test Results:
Hydrochloric acid (CAS# 7647-01-0)

Rat - Inhalation LC_{50}:	3124 ppm, (1 hour)
Rabbit - Dermal LD_{50}:	5010 mg/kg

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity:	Because of the low pH of this product, it would be expected produce significant ecotoxicity upon exposure to aquatic organisms and aquatic systems.
Aquatic Toxicity:	This material is toxic to fish and aquatic organisms. Most aquatic species do not tolerate pH lower than 5.5 for any extended period.
Fish Toxicity:	Fish LC_{50} Mosquito fish: 282 mg/l, 96 hours Fish LC_{50} Bluegill: 3.6 mg/l, 48 hours
Persistence and degradability:	Not biodegradable. Hydrochloric acid will likely be neutralized to chloride by alkalinity present in natural environment..
Bioaccumulative Potential:	No data available.
Mobility in soil:	Hydrochloric acid will be neutralized by naturally occurring alkalinity. The acid will permeate soil, dissolving some soil material and will then neutralize.
Other adverse effects:	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation

SECTION 13: DISPOSAL CONSIDERATIONS

Collect and reclaim or dispose in sealed containers at a properly licensed waste disposal site. This material , if not neutralized, must be disposed of as hazardous waste. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national or international regulations.

SECTION 14: TRANSPORT INFORMATION

Shipping:

Usual Shipping Containers:	Tank cars, bulk tankers.
Usual Shelf Life:	Indefinite (life of containers).
Storage/Transport Temperatures:	Ambient.

Suitable Storage:

Materials/Coatings:	Teflon, Tygon, Rubber, PVC and polypropylene materials.

D.O.T. Information:

Labeling:	Corrosive
D.O.T. Identification Number	UN 1789
D.O.T. Shipping Name:	Hydrochloric Acid
Hazard Class:	8
Packing Group:	II
Hazard Guide:	157
Placard:	UN 1789

SECTION 15 REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:
Hydrochloric Acid CAS#: 7647-01-0

SARA 311/312 Hazards
Acute health hazard, reactive hazard.

Massachusetts Right To Know Components
Hydrochloric Acid CAS#: 7647-01-0
Pennsylvania Right To Know Components
Hydrochloric Acid CAS#: 7647-01-0
New Jersey Right To Know Components
Hydrochloric Acid CAS#: 7647-01-0

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects or any other reproductive harm.

OSHA PSM/RMP Threshold for Accidental Release:
CAS# 7647-01-0 is regulated under OSHA PSM ***only*** if anhydrous HCl.
CAS# 7647-01-0 is regulated under EPA RMP ***only*** if $\geq$ 37% HCl.

Toxic Substances Control Act (TSCA):
Hydrochloric Acid CAS#: 7647-01-0

Comprehensive Environmental Response Compensation Liability Act: (CERCLA)
Hydrochloric Acid CAS#: 7647-01-0

SECTION 16 OTHER INFORMATION

NFPA Rating:
Health hazard: 3
Fire Hazard: 0
Reactivity Hazard: 1

This information is drawn from recognized sources believed to be reliable. ASHTA Chemicals, Inc. Makes no guarantees or assumes any liability in connection with this information. The user should be aware of changing technology, research, regulations, and analytical procedures that may require changes herein. The above data is supplied upon the condition that persons will evaluate this information and then determine its suitability for their use. Only U.S.A regulations apply to the above.

Version 1.0	For the new GHS SDS Standard	Revision Date: 12/31/2014
Version 1.1	Graphics updated	Revision Date: 3/9/2015
Version 1.2	Title updated	Revision Date: 6/2/2015
Version 1.3	Section 9 changes	Revision Date: 7/30/2015
Version 1.4	Section 1, 15 changes	Revision Date: 4/15/2016

Fisher Scientific

Part of Thermo Fisher Scientific

SAFETY DATA SHEET

Creation Date 12-Mar-2009 **Revision Date** 28-Nov-2016 **Revision Number** 5

1. Identification

Product Name **Nitric acid (65 - 70%)**

Cat No. : **A198C-212, A200-212, A200-212LC, A200-500, A200-500LC, A200-612GAL, A200C-212, A200S-212, A200S-212LC, A200S-500, A200SI-212, A467-1, A467-2, A467-250, A467-500, A483-212; S719721**

Synonyms Azotic acid; Engraver's acid; Aqua fortis

Recommended Use Laboratory chemicals.

Uses advised against No Information available

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number
CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Oxidizing liquids	Category 3
Corrosive to metals	Category 1
Skin Corrosion/irritation	Category 1 A
Serious Eye Damage/Eye Irritation	Category 1
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word
Danger

Hazard Statements
May intensify fire; oxidizer
May be corrosive to metals
Causes severe skin burns and eye damage
May cause respiratory irritation

Precautionary Statements
Prevention
Do not breathe dust/fume/gas/mist/vapors/spray
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep/Store away from clothing/ other combustible materials
Take any precaution to avoid mixing with combustibles
Keep only in original container
Response
Immediately call a POISON CENTER or doctor/physician
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
Ingestion
IF SWALLOWED: Rinse mouth. DO NOT induce vomiting
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Spills
Absorb spillage to prevent material damage
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Store in corrosive resistant polypropylene container with a resistant inliner
Store in a dry place
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified

3. Composition / information on ingredients

Component	CAS-No	Weight %
Nitric acid	7697-37-2	65 - 70
Water	7732-18-5	30 - 35

4. First-aid measures

General Advice Immediate medical attention is required. Show this safety data sheet to the doctor in attendance.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required.

Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Remove and wash contaminated clothing before re-use. Call a physician immediately.
Inhalation	If breathing is difficult, give oxygen. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Remove from exposure, lie down. Call a physician immediately.
Ingestion	Do not induce vomiting. Never give anything by mouth to an unconscious person. Clean mouth with water. Call a physician immediately.
Most important symptoms/effects	Causes burns by all exposure routes. Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation: Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	CO_2, dry chemical, dry sand, alcohol-resistant foam.
Unsuitable Extinguishing Media	No information available
Flash Point	Not applicable
Method -	No information available
Autoignition Temperature	No information available
Explosion Limits	
Upper	No data available
Lower	No data available
Oxidizing Properties	Oxidizer
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors. The product causes burns of eyes, skin and mucous membranes. Oxidizer: Contact with combustible/organic material may cause fire. May ignite combustibles (wood paper, oil, clothing, etc.).

Hazardous Combustion Products
Nitrogen oxides (NOx) Thermal decomposition can lead to release of irritating gases and vapors
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
4	0	0	OX

6. Accidental release measures

Personal Precautions	Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Ensure adequate ventilation. Use personal protective equipment.
Environmental Precautions	Should not be released into the environment. Do not flush into surface water or sanitary sewer system. See Section 12 for additional ecological information.
Methods for Containment and Clean Up	Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Sweep up and shovel into suitable containers for disposal.

7. Handling and storage

Handling Use only under a chemical fume hood. Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Do not ingest. Do not breathe vapors or spray mist. Keep away from clothing and other combustible materials.

Storage Keep containers tightly closed in a cool, well-ventilated place. Do not store near combustible materials.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Nitric acid	TWA: 2 ppm STEL: 4 ppm	(Vacated) TWA: 2 ppm (Vacated) TWA: 5 mg/m³ (Vacated) STEL: 4 ppm (Vacated) STEL: 10 mg/m³ TWA: 2 ppm TWA: 5 mg/m³	IDLH: 25 ppm TWA: 2 ppm TWA: 5 mg/m³ STEL: 4 ppm STEL: 10 mg/m³

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Nitric acid	TWA: 2 ppm TWA: 5.2 mg/m³ STEL: 4 ppm STEL: 10 mg/m³	TWA: 2 ppm TWA: 5 mg/m³ STEL: 4 ppm STEL: 10 mg/m³	TWA: 2 ppm STEL: 4 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166. Tightly fitting safety goggles. Face-shield.

Skin and body protection Long sleeved clothing.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Keep away from food, drink and animal feeding stuffs. When using, do not eat, drink or smoke. Contaminated work clothing should not be allowed out of the workplace. Provide regular cleaning of equipment, work area and clothing. Avoid contact with skin, eyes and clothing. For environmental protection remove and wash all contaminated protective equipment before re-use. Wear suitable gloves and eye/face protection.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Clear Colorless, Light yellow
Odor	Strong Acrid
Odor Threshold	No information available
pH	< 1.0 (0.1M)
Melting Point/Range	-41 °C / -41.8 °F
Boiling Point/Range	Not applicable
Flash Point	Not applicable

Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	0.94 kPa (20°C)
Vapor Density	No information available
Specific Gravity	1.40
Solubility	miscible
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	HNO3
Molecular Weight	63.02

10. Stability and reactivity

Reactive Hazard Yes

Stability Oxidizer: Contact with combustible/organic material may cause fire.

Conditions to Avoid Incompatible products. Combustible material. Excess heat. Exposure to air or moisture over prolonged periods.

Incompatible Materials Combustible material, Strong bases, Reducing agents, Metals, Powdered metals, Organic materials, Aldehydes, Alcohols, Cyanides, Ammonia, Strong reducing agents

Hazardous Decomposition Products Nitrogen oxides (NOx), Thermal decomposition can lead to release of irritating gases and vapors

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Oral LD50 Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.

Dermal LD50 Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.

Vapor LC50 Based on ATE data, the classification criteria are not met. ATE > 20 mg/l.

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Nitric acid	Not listed	Not listed	LC50 = 2500 ppm. (Rat) 1h
Water	-	Not listed	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Causes severe burns by all exposure routes

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Nitric acid	7697-37-2	Not listed	Not listed	Not listed	Not listed	Not listed
Water	7732-18-5	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation: Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Do not empty into drains. Large amounts will affect pH and harm aquatic organisms.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Nitric acid	Not listed	LC50: = 72 mg/L, 96h (Gambusia affinis)	Not listed	Not listed

Persistence and Degradability Miscible with water Persistence is unlikely based on information available.
Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its water solubility.

Component	log Pow
Nitric acid	-2.3

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No UN2031
Proper Shipping Name NITRIC ACID
Hazard Class 8
Subsidiary Hazard Class 5.1
Packing Group II

TDG

UN-No UN2031
Proper Shipping Name NITRIC ACID
Hazard Class 8
Subsidiary Hazard Class 5.1
Packing Group II

IATA

UN-No UN2031
Proper Shipping Name NITRIC ACID
Hazard Class 8
Subsidiary Hazard Class 5.1
Packing Group II

IMDG/IMO

UN-No	UN2031
Proper Shipping Name	NITRIC ACID
Hazard Class	8
Subsidiary Hazard Class	5.1
Packing Group	II

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Nitric acid	X	X	-	231-714-2	-		X	X	X	X	X
Water	X	X	-	231-791-2	-		X	-	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Nitric acid	7697-37-2	65 - 70	1.0

SARA 311/312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	Yes

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Nitric acid	X	1000 lb	-	-

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Nitric acid	-	TQ: 500 lb

CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive

Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Nitric acid	1000 lb	1000 lb

California Proposition 65 This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Nitric acid	X	X	X	X	X
Water	-	-	X	-	-

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product contains the following DHS chemicals:

Component	DHS Chemical Facility Anti-Terrorism Standard
Nitric acid	2000 lb STQ

Other International Regulations

Mexico - Grade No information available

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class
C Oxidizing materials
E Corrosive material
D2B Toxic materials

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

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Revision Date 28-Nov-2016
Print Date 28-Nov-2016
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

Appendix C Field Forms

Task Hazard Assessment

S3AM-209-FM6

Instructions

1. **This form or other applicable region- or business line-specific form is to be completed in accordance with SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.**
2. **Task Hazard Assessments (THA)s are required for any field work involving AECOM activities outside of the office and must be used onsite to review site hazards and confirm necessary controls are in place.**
3. **The THA must be reviewed in its entirety and modified at the work site (as needed) immediately prior to commencement of work to account for actual conditions and any changes (weather, scope of work, simultaneous operations, etc.). All necessary revisions must be written on the THA.**
4. **Acknowledgement of THAs must be recorded via electronic or physical signature as part of the Daily Safety Meeting – refer to Daily Safety Meeting – Americas.**
5. **The completed form must be retained in the project files.**

Project Name and Number	Chem-Trol Site; 60779298 ….	**Overall Risk (Highest Post-Mitigation Risk)**	LOW
Task Name	General Hazards	**Date**	2/2/2026
Work Location	4818 Lake Ave., Buffalo, NY 14219	**Client**	SC Holdings, Inc.

Does this include High Hazard Tasks (HHTs)? (Refer to Table 1 of SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.)	☐ No	☒ Yes – Specify HHT procedure number(s) and any permits/plans:	See Appendix D

Required PPE	☒ Hard Hat	☒ Eyewear (with side shields)	☒ High-Visibility Vest	☒ Ankle Height Footwear	☒ Gloves	☒ Hearing Protection
	Specify type: ☒ Type I (standard) ☐ Type II (climbing style)	Choose 1 or 2 as required: ☒ Safety glasses ☐ Spoggles ☐ Safety goggles ☐ Face shield	Choose type: ☒ Class 2 ☐ Class 3	Choose 1 or more as required: ☐ Work boots ☐ Steel toe ☒ Composite toe ☐ Metatarsal guard ☐ Electric rated	Choose 1 or 2 as required: ☒ Nitrile ☐ Cut- resistant ☐ Thermal ☐ Vibration ☐ Electrical	Choose 1 or both as required: ☐ Ear plugs ☐ Earmuffs
	Other:	Click or tap here to enter text.				

Note: Employees must have gloves readily available, even if the task does not require their use.
Note: All employees must wear shirts with sleeves that cover their shoulders and long pants at a minimum.

Tools and Equipment (Examples: air/noise monitoring equipment, tools, generators, traffic control devices, fire prevention equipment, etc.)	Click or tap here to enter text.

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REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!			
Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
Trip to the site	Route hazards/accident	M	Consider the safest method of travel – use public transport where available and practical. Choose the safest routes Avoid conspicuous displays of personal valuables. Only use licensed local taxis – check before you travel. Request the taxi driver not to use a mobile phone while driving.	L
On-Site Edits:				
Manual Handling	Get injured when handling tools or equipment	M	Minimize or avoid manual handling activities and loads. When having to transport and lift items: ○ Be aware of potential back injuries and ensure correct techniques for lifting and bending are used. Use lifting aids where practical, e.g., trolleys. Do not lift more than 50 pounds – evaluate maximum. weight to lift depending on activity. Use proper tools for each task. Avoid using tools in bad conditions; replace them if observed. Use proper gloves Get help from co-workers as needed.	L
On-Site Edits:				

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Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
Any	Fatigue Management	M	Identify factors in the workplace that may contribute to fatigue. Inform employees of potential fatigue-producing activities and how to manage them. Re-evaluate work tasks periodically to control fatigue. Monitor employees for the signs and symptoms of fatigue. Provide employees with sufficient breaks for food, water, and rest throughout the workday. Calling for unscheduled breaks/meals where fatigue factors are evident may be necessary. Getting adequate, undisturbed, regular, and consistent amounts of sleep each night. A minimum of 7 hours is recommended. Eating well-balanced and nutritious meals at regular intervals. Ensuring adequate consumption of water throughout the day.	L
On-Site Edits:				

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Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
Any	Slips, Trips and Falls.	M	Slip-Trip-Fall hazards are common at field sites due to various obstructions, weather conditions, and human error. While it is difficult to eliminate all slip-trip-fall hazards, the risk of injury can be minimized by using safe work practices and following the procedures outlined below: • Keep cell phone camera and clipboard/writing items tucked in your pants and/or safety vest pocket. • Avoid uneven terrain and wet surfaces • Keep the work area free of obstructions • Plan your path and watch where you step • Monitor work area for good housekeeping practices. • Be alert to weather conditions. • Use designated walkways and routes. • Wear appropriate safety footwear – with good grip, ankle support, toe and mid sole protection, etc. • Ensure there is sufficient light for the tasks being undertaken. • Hold the handrail when using stairs. • Avoid stepping on debris, loose sheets, temporary hole covers or manhole covers. • Do not undertake tasks whilst walking; e.g. note taking / talking on mobile phone. • Review site conditions including areas of uneven pavement, oily staining, tight openings, stairs, etc. , do not run. • Stay off steep hillside, loose soils/gravel on a hill or parking lot, and stained/wet areas. • Stay proper distance from open service pits on main floor level (no closer than 6 ft from edge)	L
On-Site Edits:				

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Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
Any	Unknown hazardous activities and site arrangements	H	• Liaise with those in charge of the site regarding current key site hazards and other work activities. • Attend site induction (if provided) and adhere to site rules and instructions. Sign in and out as required by site security. Stay with your guide (if provided) and follow their instruction in case of any emergency. • Ensure you are familiar with alarms and evacuation procedures and assembly points for the location. • Ensure correct PPE is worn. • If any site hazards are not covered in the JSA or have changed, complete a THA card and brief the team. • Use '4Sight' before starting each task. Use 'Stop Work Policy' – if you feel uncomfortable about anything, stop and resolve the issue before starting work.	L
On-Site Edits:				

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Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt?* *What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
Any	Weather Related hazards	M	Monitor weather conditions and changes to weather during work. In inclement weather a review of the tasks and procedures should be made, and if necessary work should be stopped and advice sought from the PM prior to re-commencing activities. Heat and **cold stress** may vary based upon work activities, PPE/clothing selection, geographical locations, and weather conditions. To reduce the potential of developing heat/cold stress, be aware of the signs and symptoms of heat/cold stress and watch fellow employees for signs of heat/cold stress. Use vehicles or covered area for shelter and take breaks as needed In **hot weather** keep hydrated, prevent over exposure to the sun with clothing or use of sun cream and take frequent breaks out of the sun. Use the "buddy system" to monitor effects of heat stress Create shaded work areas if appropriate Use a strong sunscreen and wear a full-brimmed hat when in the sun to protect the back of the neck and shoulders In **cold/wet weather**, be aware of potentially slippery surfaces (wet or icy). Wear warm / waterproof clothing and take breaks in a warm location. In **inclement weather** stop work if necessary and seek advice sought from the PM prior to re-commencing activities.	L
On-Site Edits:				

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Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt?* *What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
Any	Personal Security	H	• Assess area and potential risk of confrontation prior to starting work and only begin work if considered safe to do so. • Avoid potentially confrontational situations. Remain calm and do not raise voice. • Avoid carrying valuable items. • Keep mobile phones, cameras etc., out of general sight when not in use. • Report incidences of strangers entering the site to security or the client. • Avoid capturing the general public in photographs – ask their permission to be photographed. If you feel threatened, stop work, leave site, retreat to a safe place and telephone the project manager / police.	L
On-Site Edits:				

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Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
Any	Biological Hazards – (diseases, insects, animals, etc.)	M	Mosquitos, poisonous plants, and other biological hazards will most likely be present on or around the site where work will be performed. It is important for AECOM personnel to follow the outlined procedures below: • Identify relevant biological hazards • Wear long sleeves/ trousers/ gloves to cover the body as far as possible • Tape them in case it is assessed necessary. • Use insect repellents to reduce potential for bites. • Ensure Tetanus and other relevant inoculations are current. • Be aware of surrounding elements and do your best to avoid places hazards might be present • Speak up if you see any person that might be in danger from a biological hazard • Implement body inspections for ticks when field work is completed in areas where they are prevalent. • All cuts and grazes will be covered with a suitable dressing before going on site. • Always wash face and hands before drinking or eating. • Do not attempt to manually clear debris or items at ground level or in vegetation - keep hands / arms away from areas where used syringe needles may be present. • Avoid contact with hazardous plants. • Remain vigilant for bulls, dogs, and other animals in the work area. • If flu-like symptoms experienced after contact with static bodies of water, visit doctor and make aware of possible contact with Weil's disease.	L
On-Site Edits:				

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Driving - Vehicle	Vehicle accident	H	• Driver to be fully licensed and comply with all driving and safety regulations. • Driving online modules or hands-on defensive driver course. • Leave enough time to arrive at your destination without hurrying • Use defensive driving techniques. Maintain situational awareness. Allow sufficient stopping distance between vehicles. • Understand procedures for breakdown assistance and have appropriate contact numbers available for summoning assistance. • Stay away from flooded roadways – Turnaround • Use caution when entering roadways • Check vehicle safety equipment (use approved vehicle). Use defensive driving techniques, avoid distracted driving; no use of mobile communication devices when driving (driving includes time spent in traffic or while stopped at red lights or stop signs). GPS units and GPS units on smart phones may only be used if factory installed or secured to the vehicle with a bracket that allows the driver to view the image without having to take their eyes off the road; rest stops when needed. ANSI Class 2, retro-reflective vest in the vehicle. • Secure all loads, including equipment within the vehicle • Wear seat belts at all times • Select appropriate vehicle for the task (vans have a bulkhead between the rear and passenger cabins). • Vehicle to be checked before setting off and to correct any noted deficiencies: o lights, mirrors, tires, windscreen, etc. are fully operational. o The vehicle is roadworthy and appears in good mechanical order; • Where the hire vehicle is found to be unsuitable it should not be accepted and a suitable replacement requested. • Make sure each vehicle is equipped with a first aid kit • Drivers will not operate vehicles when fatigued or under the influence of alcohol or medication. A 15-minute break at least every 2 hours is recommended - more breaks will be taken if the driver feels tired. No employee should operate a vehicle if they have worked 14 consecutive hours within a 24-hour period. Refer to • S3AM-009-PR1 Fatigue Management. • Cars will be parked so as not to cause a hazard or obstruction and in accordance with site or local parking requirements. • When practicable, drivers will always reverse park or choose a space that they can drive out of in a forward direction. • Check the parking area before maneuvering / seek assistance in maneuvering if needed.	M
On-Site Edits:				

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REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!					
Job Steps *List all steps required to perform a task in the sequence they are performed*		**Potential Hazards** *How could you be hurt?* *What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
On-Site Edits:					
On-Site Edits:					
Additional Notes					

….

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All Employees

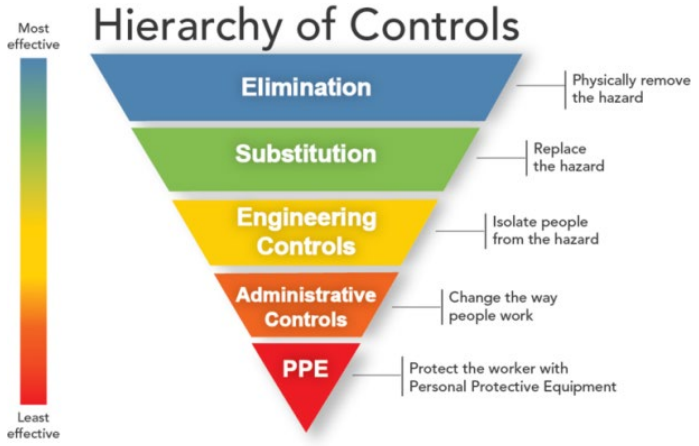
STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

Use **4-Sight**, AECOM's last minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

- ***What am I about to do?***
- ***What can go wrong?***
- ***What can be done to make it safer?***
- ***What have I done to communicate the hazards?***

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



- ***Most hazards need more than one control***
- ***What should you do? Stack your controls***
- ***PPE can NEVER be your only means of protection***

Probability	Severity				
	5 - Catastrophic	4 – Critical	3 – Major	2 – Moderate	1 - Minor
5 – Frequent	25	20	15	10	5
4 – Probable	20	16	12	8	4
3 – Occasional	15	12	9	6	3
2 – Remote	10	8	6	4	2
1 - Improbable	5	4	3	2	1

Risk Rating (Probability x Severity)	Risk Acceptance Authority
1 to 4 (Low)	Risk is tolerable, manage at local level
5 to 9 (Medium)	Risk requires approval by Supervisor or equivalent
10 to 25 (High)	Risk requires the approval of the Project Manager & SH&E Director

Send THA improvement suggestions to
DCSA.THA.Library@AECOM.com
Include a copy of the new THA or a photo of the THA modifications as appropriate.

Severity – Potential Consequences				
	People	Property Damage	Environmental Impact	Public Image/Reputation
Catastrophic	Fatality, Multiple Major Incidents	>$1M USD, Structural collapse	Offsite impact requiring remediation	Government intervention
Critical	Permanent impairment, Long term injury/illness	>$250K to $1M USD	Onsite impact requiring remediation	Media intervention
Major	Lost/Restricted Work	> $10K to $250K USD	Release at/above reportable limit	Owner intervention
Moderate	Medical Treatment	> $1K to $10K USD	Release below reportable limit	Community or local attention
Minor	First Aid	</=$1K USD	Small chemical release contained onsite	Individual complaint

Probability		
Frequent	Expected to occur during task/activity	9/10
Probable	Likely to occur during task/activity	1/10
Occasional	May occur during the task/activity	1/100
Remote	Unlikely to occur during task/activity	1/1,000
Improbable	Highly unlikely to occur, but possible during task/activity	1/10,000

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Task Hazard Assessment

S3AM-209-FM6

Instructions

1. **This form or other applicable region- or business line-specific form is to be completed in accordance with SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.**
2. **Task Hazard Assessments (THA)s are required for any field work involving AECOM activities outside of the office and must be used onsite to review site hazards and confirm necessary controls are in place.**
3. **The THA must be reviewed in its entirety and modified at the work site (as needed) immediately prior to commencement of work to account for actual conditions and any changes (weather, scope of work, simultaneous operations, etc.). All necessary revisions must be written on the THA.**
4. **Acknowledgement of THAs must be recorded via electronic or physical signature as part of the Daily Safety Meeting – refer to Daily Safety Meeting – Americas.**
5. **The completed form must be retained in the project files.**

Project Name and Number	Chem-Trol Site; 60779298 ….	**Overall Risk (Highest Post-Mitigation Risk)**	MEDIUM
Task Name	Remediation Systems Operation, Maintenance, Inspection, Decommissioning	**Date**	2/2/2026
Work Location	4818 Lake Ave., Buffalo, NY 14219	**Client**	SC Holdings, Inc.

Does this include High Hazard Tasks (HHTs)? (Refer to Table 1 of SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.)	☐ No	☒ Yes – Specify HHT procedure number(s) and any permits/plans:	See Appendix D

Required PPE	☒ Hard Hat	☒ Eyewear (with side shields)	☒ High-Visibility Vest	☒ Ankle Height Footwear	☒ Gloves	☐ Hearing Protection
	Specify type: ☒ Type I (standard) ☐ Type II (climbing style)	Choose 1 or 2 as required: ☒ Safety glasses ☐ Spoggles ☐ Safety goggles ☐ Face shield	Choose type: ☒ Class 2 ☐ Class 3	Choose 1 or more as required: ☒ Work boots ☒ Steel toe ☐ Composite toe ☐ Metatarsal guard ☐ Electric rated ☐ Other - Specify: ….	Choose 1 or 2 as required: ☒ Nitrile ☒ Cut- resistant ☐ Thermal ☐ Vibration ☐ Electrical ☒ Other - Specify: Leather	Choose 1 or both as required: ☐ Ear plugs ☐ Earmuffs
	Other:	Click or tap here to enter text.				

Note: Employees must have gloves readily available, even if the task does not require their use.
Note: All employees must wear shirts with sleeves that cover their shoulders and long pants at a minimum.

Tools and Equipment (Examples: air/noise monitoring equipment, tools, generators, traffic control devices, fire prevention equipment, etc.)	Reciprocating Saw, Straps or chains/load binders, Fork lift, Hand Tools, camera, Interface probe, Sampling equipment, Fire extinguisher, SVE/AS System, Monitoring equipment, Bag filters, 5 gallon bucket, Carbon Vacuum, cones/barricades, ladder (check for Ladder THA), Gas meter, Decon supplies,

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Access trailer and collect system measurements	Cuts and lacerations to hands from sharp edges.	M	Note and remove/shield/avoid components with sharp edges. Wear leather gloves to protect hands from cuts/lacerations.	**L**
	Pinch points, cuts, lacerations		Wear leather gloves to protect hands from cuts/lacerations when handling components with sharp edges.	
	Exposure to noise causing hearing damage/loss		Measure interior with decibel meter/app. Wear hearing protection while collecting system measurements inside or adjacent to SVE system. Readings >105 dBA require double hearing protection (plugs and muffs)	
	Stuck by SVE vapor sampling syringe needle.		Use needle-stick resistant gloves to prevent sharps injuries. Handle sampling syringes with care. Do not assemble the sampling syringe until ready to collect vapor samples. Carefully disassemble used sampling syringes and dispose of sharps in a suitable container. Do not dispose of loose sharps with regular trash.	
On-Site Edits:				

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De-energize the system	Electrical shock	**H**	Turn off power to system and implement Lock Out Tag Out procedures at electrical service on the pole prior to conducting any maintenance. Complete and obtain approvals for LOTO permit. Use insulated tools when working on electrical components. Verify the absence of voltage before starting work. Keep fire extinguishers accessible and ensure they are regularly inspected. Avoid smoking or open flames/sparks, non intrinsically safe tools near the system.	**L**
	Unexpected movement of system components, pinch points		Ensure all equipment guards are in place. Do not initiate work until you verify system is de-energized.	
	Exposure to noise		Wear hearing protection while powering down equipment.	
On-Site Edits:				

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Maintenance	Equipment damage from improper maintenance	M	Read and understand operators manual and/or ask for assistance if you are unsure of how the SVE system operates. Check tightness of equipment fittings to prevent loss. Do not restart system if any broken or worn components could compromise personnel safety or safe equipment operation. Schedule repairs as necessary or take equipment out of service until repairs can be made.	**L**
	Entanglement in equipment		Ensure all equipment guards are in place and functioning. Ensure all system warning placards are visible and understood prior to beginning work. Do not wear loose clothing or jewelry, or long hair that could get caught in rotating equipment.	
	Pinch points		Note pinch points. Mark with warning stickers as applicable and remain out of the line of fire. Wear leather or mechanic gloves when performing system O&M.	
	Exposure to noise		Wear hearing protection while system is operating. Readings >105 dBA require double hearing protection (plugs and muffs)	
	Burns from contact with hot surfaces		Note location of hot surfaces, mark with warning sticker/placard. Wear leather gloves when handling components to protect against burns.	
	Contact with contaminated fluids		Check hoses/piping and fittings for damage and wear and replace as needed. Wear nitrile gloves over leather gloves when inspecting/replacing hoses and fittings, changing grease/oil, etc. Ensure safety glasses are on in case of chemical spray, and ensure eye wash is located nearby.	
	Spills		Have absorbent pads available to clean up spills. Don nitrile gloves	
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Inspect and maintain wells	Injury from stinging or biting insects or animals	M	Inspect well lid, pad, and area around well pad for biological hazards. Gently tap on the closed protective casing and listen for signs of insect activity; avoid suddenly opening protective well casing to prevent tearing open a bee or wasp nest. Have appropriate insecticide, or other suitable product, on hand to manage stinging/biting insects. Do not attempt to handle snakes, or other animals, present at the wells.	L
	Contact with contaminated fluids or inhalation		Wear nitrile gloves to prevent contact with contaminated fluids. Stand upwind when opening well lid to avoid inhaling any accumulated vapors. Allow the well sufficient time to off-gas any accumulated vapors before inspecting well. Ensure proper ventilation when working with volatile substances.Continuously monitor air quality for volatile organic compounds (VOCs) when inspecting wells	
	Pinch points; sharp edges		Wear leather gloves when opening and closing well vaults or connecting and disconnecting SVE hoses to well heads.	
	Hand injury from falling well vault lids		Wear leather gloves when opening and closing well vaults. Ensure you have a firm grip on lids to avoid unexpected release and contact with hands.	
On-Site Edits:				
Re-energize the system	Unexpected movement of system components, pinch points	H	Do not re-start the system until you verify all equipment guards are in place. Conduct a thorough inspection to ensure all components are properly installed and secured before re-energizing.	L
	Electrical shock		Verify all work has been completed before discontinuing LOTO procedures. Close out LOTO permit.Ensure clear communication among team members during the re-energizing process.	
	Exposure to noise		Wear hearing protection when restarting equipment.	
	Spills		Following maintenance, inspect system components for proper operation and leaks before demobilizing from site. Have absorbent pads available to clean up spills.	
	Contact with contaminated groundwater or NAPL.		Wear nitrile gloves to prevent contact with contaminated groundwater or NAPL.	
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Inspection of Sub-Slab Depressurization System / Vapor Intrusion Mitigation System	Skin rash or allergic reaction due to contact with poisonous plants	H	Identify poisonous plant in immediate work area.. STOP WORK and communicate the identification of poisonous plants to the team and Project Manager (PM). Don safety glasses and leather gloves. Upgrade to a Tyvek suit to maximize protection.	L
	Allergic reaction due to contact with insects		Do not approach and vacate the area if an insect infestation is present. Perform a visual inspection from a distance if necessary and conduct an insect check post-inspection. Utilize specific insect repellent (poison) or call a professional to remove the nest. Call the supervisor before using any spray.	
	Physical threat due to contact with owners/tenants		Make contact with the tenant/owner prior to entering the exterior portion of the property to ensure your presence is known. No lone worker is allowed without approval from the Project Manager (PM) or Health, Safety, Security, and Environment (HSSE) team. Wear high-visibility PPE to be visible. Leave immediately if a threat is present.	
	Bites or scratches to hands, arms or legs due to contact with domesticated pet(s)		Ensure that owner/tenant pet(s), if present, have been secured and/or removed from the area. Leave the area immediately if pet(s) are not secured; do not approach, and do not attempt to pet or play with pets. Be aware of surroundings and know that an unsecured pet, whether belonging to the owner or not, can be a hazard.	
	Physical threat due to contact with owners/tenants		Ensure that all residents are aware of your presence inside the home/basement. Be professional and polite; answer questions to the best of your knowledge. Leave immediately if a threat is sensed or present. Be aware of surroundings and all exit points.	
	Allergic reaction due to contact with insects (fleas and bedbugs)		Discuss with the owner before using chemical insect repellants (option: citrus-based repellants). Scan the area for signs of insects (cleanliness, damp or dark areas within the home) upon entry and exit to ensure a possible infestation is quickly identified and treated. If historical evidence of past infestations is known, perform exterior inspection only; do not enter the interior. Conduct inspections of person and tools/equipment to ensure no insects.	

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		Bites or scratches to hands, arms or legs due to contact with domesticated pet(s)		Explain to the tenant/owner that entry is required and to secure all animals away from the work/inspection area. Leave the area immediately if pets are not secured; do not approach or attempt to play with pets. Be aware of surroundings and understand that an unsecured pet, whether belonging to the owner or not, can be a hazard. Request an exterior inspection if the refusal to secure pets is ignored.	
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SVE - Position vehicle close to well location and open wells	Severe injury from being struck by moving vehicle	M	Be alert to other vehicles or pedestrians if work area is in an area with public access. Communicate with any heavy equipment operators in the area to ensure they know where you and the equipment are located. Chock tires and set emergency brake. Don high visibility vest.	L
	Pinch points/abrasion from opening well lid		Remove and replace manhole covers carefully to avoid pinching fingers. Use a screwdriver or crowbar as appropriate, and wear work gloves to prevent hand injuries. Use kneeling pads when kneeling on hard surfaces.	
	Back strain from improper bending and lifting well lid		Utilize proper lifting procedure when removing covers. Bend down at the knees and lift with your legs rather than bending and/or lifting with your back	
	Shoulder strain resulting from using a socket wrench to loosen and remove bolts from the lid		Always keep your wrist straight when using a wrench. Ensure the opening of the socket is in full contact with the bolt before applying pressure. Pull, don't push, and use a slow, steady motion. If the bolt cannot be loosened with normal force, use the correct breaking bar; do not place a pipe on the end of the wrench to improve leverage. Protect yourself from losing balance if the wrench slips or a bolt breaks. Kneel on a solid surface with one foot firmly planted on the floor and avoid leaning into the work. Never use hand sockets with power or impact wrenches. Replace sockets showing cracks or wear.	
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SVE - Connect to the AS/SVE wells	Slip/Trip/Fall causing sprain/broken bone	H	Set-up equipment away from marked hazards. Check area immediately around work zone to confirm area has been cleared of hazards.	L
	Biological hazards causing bites, stings or other injury.		Examine ground surface and inside of well vaults/manways for biological hazards. Use insect repellent and check clothing for ticks periodically when applicable. Check for ticks regularly.	
	Exposure to chemicals causing dermal injury/irritation or eye injury		Secure all pipe clamps, camlocks, cords, hoses, and appropriate fittings prior to startup. Check all lines for leaks during setup. Wear eye protection, long pants, nitrile gloves, a hard hat, and steel-toed boots.	
On-Site Edits:				
SVE - Operate AS/SVE system and remove connections	Slip/Trip/Fall causing sprain/broken bone	H	Check area around work zone to confirm no new hazards have occurred during operation of system. Watch for hose, cable, equipment placement. Where possible, walk around instead of over equipment.	L
	Mechanical failure of equipment causing severe injury		Check equipment before operation. Confirm all fluids are at appropriate levels and cables are secured. During start up, monitor liquid and vapor carbon drums for any signs of bulging to assure drums are not under pressure. Don safety glasses.	
	Burns to hands from hot parts		Note and avoid hot equipment. Wear heat-protective or leather gloves if required to touch hot parts.	
	Hearing damage from noise		Screen the sound level with a decibel meter or phone app to determine initial sound levels. Setup away from noisy operations (>85 dBA). Don't be near the system when not required. Wear hearing protection.	
	Burn to hands from hot parts		Allow equipment to cool before touching. Wear heat-protective or leather gloves.	
	Back strains from improper lifting		Bend down at the knees and lift with your legs rather than bending and lifting with your back when pulling equipment from wells.	
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Unload Carbon	Cuts or hand injuries from pinch points	M	Inspect equipment for damage and sharp edges, replace all broken or damaged equipment. Wear cut resistant gloves at all times and watch hand placement to avoid sharp edges and pinch points. Keep face, hands, fingers, and feet out of the line of fire of moving parts and tools	L
	Back strain/ overexertion when unloading equipment		Stretch before working. Bend and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds. If removing from the back of a truck, slide the case to the tailgate and lift from tailgate and not from the side of the truck bed.	
On-Site Edits:				
Set up work zone for carbon changeout	Struck by vehicle or equipment traffic	M	Establish work zone using traffic control devices, signs, cones, etc. in advance of initiating carbon changeout activities. Restrict access to observers and passersby.	L
	Slip, Trip or Fall		Maintain good housekeeping in work area, do not carry equipment where visibility of ground is impaired, remove or mark all trip hazards in work area.	
On-Site Edits:				
Open and/or remove carbon vessel lid/port	Pinch points	M	Note and avoid pinch points. Wear leather gloves when handling the lids.	L
	Muscle strain		Use buddy system to lift and open and or remove lids from carbon vessels.	
	Potential for explosive environment.		Monitor breathing zone with 4 gas multi-meter and record LEL measurements prior to and during carbon change out activities and understand action levels for the monitoring equipment being used, per HASP.	
	Falls from heights or dropping material or tools on workers below		Workers must wear a full body harness when working at heights above 4 ft. and should be tied off to designated tie off point using a lanyard with safety hooks. Workers on the ground must use caution and stay clear from those working above them.	
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Operate vacuum equipment to remove carbon from vessel and transfer to drums	Injury from contacting moving parts and vacuum suction.	M	Do not stand in the way of vacuum or moving parts while equipment is operating. Avoid loose clothing and keep hands and limbs away from vacuum nozzle and moving parts. Ensure unauthorized personnel maintain an appropriate distance from operator.	L
	Noise from vacuum operation.		Limit duration of exposure. Don hearing protection. Double up (plugs and muffs) if noise exceeds 100 dBA	
	Chemical vapors and dust particles.		Wear a dust mask or half face respirator.	
	Muscle strain		Stretch before working. Bend and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds.	
	Falls from heights or dropping material or tools on workers below		Workers must wear a full body harness when working at heights above 4 ft. and should be tied off to designated tie off point using a lanyard with safety hooks. Workers on the ground must use caution and stay clear from those working above them.	
On-Site Edits:				
Containerize carbon to be sampled or removed	Exposure to contaminated carbon and groundwater.	M	Pour slowly. Label storage containers properly, and coordinate proper and timely off-site disposal. Wear nitrile gloves if in contact with carbon or groundwater while containerizing it to be sampled or removed.	L
	Muscle strain		Use proper lifting techniques when lifting carbon in buckets and use buddy system if items >50 pounds.	
	Chemical vapors and dust particles.		Pouring carbon will stir up dust particles and chemical vapors. Wear a dust mask or a half-face respirator.	
	Spilling carbon resulting in waste or dust.		Pour carbon from buckets carefully and slowly into funnel leading into carbon vessel port. Pouring too quickly may result in spilled carbon.	
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Operation and Maintenance (Bag Filter Maintenance)	Splash of system water	M	Remove the filter carefully as it may contain system water at this stage of the task. If possible, remove water from the filter housing prior to removing the bag filter (e.g., use a pump, being aware of the hazardous area classification and rating of the pump being used—may require system de-energization). While lifting the filter, watch for contact with system water. Wear safety glasses and nitrile gloves. Place the filter into a bucket to capture residual fluids (this can be heavy if all the liquid hasn't drained out).	L
	Muscle strain/back injury		Use proper lifting mechanics (lifting with your legs and avoid twisting during the lift).	
	Contact with system water; iron fouling		Wipe down the cage/basket, o-ring, and lid. Wear safety glasses and nitrile gloves.	
	Improper fit can create a leak potential		Lift the cage/basket and filter back into the housing. Swing the lid back onto the housing. Secure the lid with the supplied bolts, wingnuts, or other positive sealing device. Close the sample port and drain valve. Open the isolation valves and check for leaks following restart to ensure that none are present.	
	Contaminated water contact		Replace basket/filter slowly to avoid splashing**.** Wear safety glasses and nitrile gloves.	
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Dismantling remediation system components	Injury from tool use	M	Look around and behind you before starting. Inspect tools prior to use. Repair or replace broken or worn tools. Use tools for their intended purpose to avoid unexpected failure. Do not swing or apply tools until the area is free of bystanders. Do not use extreme force. Use controlled motions and avoid having prying tools "break free." Don all required PPE listed above.	L
	Eye or body injury from flying debris		1c. Wear safety glasses/face shield when using tools that may generate sparks/flying debris	
On-Site Edits:				
Debris handling and disposal	Cuts and abrasions and pinch points during debris handling	M	Note pinch points and sharp edges on concrete, well vaults, protective casings, metal skirts, and bollard debris and avoid. Don leather gloves	L
	Ergonomic Injury from lifting heavy objects		Stretch before working. Bend at knees and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds	
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Loading out equipment (Forklift)	Unsafe forklift condition leading to mechanical failure or accident	H	Inspect the entire vehicle and confirm that the forklift is in a safe operating condition	M
	Tipping or injury from lifting and moving of large system components		Ensure forklift operator is qualified and familiar with the make/model if forklift. Inspect the route prior to moving system equipment from the shed to the truck. Ensure that equipment is capable of properly lifting large equipment. Use a spotter to ensure that no objects/personnel will be in the planned route.	
	Severe injury or property damage when loading system components on trailer for removal		Ensure that the cargo trailer is of the appropriate size to move the equipment. Inspect the vehicle prior to loading to ensure it is in safe working condition. Chock the tires on the trailer to prevent movement. Ensure equipment is properly secured on the trailer prior to removal from the site. Do not throw tie-down straps or chains over the load as they may strike someone on the other side. Wear hard hats, hi-vis vests, leather gloves, safety toe boots, and safety glasses.	
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Additional Notes				

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All Employees

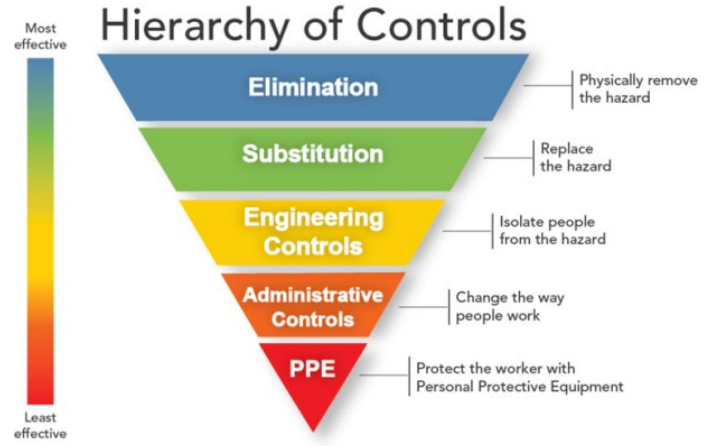
STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

Use **4-Sight**, AECOM's last minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

- ***What am I about to do?***
- ***What can go wrong?***
- ***What can be done to make it safer?***
- ***What have I done to communicate the hazards?***

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



- ***Most hazards need more than one control***
- ***What should you do? Stack your controls***
- ***PPE can NEVER be your only means of protection***

Probability	Severity				
	5 - Catastrophic	4 – Critical	3 – Major	2 – Moderate	1 - Minor
5 – Frequent	25	20	15	10	5
4 – Probable	20	16	12	8	4
3 – Occasional	15	12	9	6	3
2 – Remote	10	8	6	4	2
1 - Improbable	5	4	3	2	1

Risk Rating (Probability x Severity)	Risk Acceptance Authority
1 to 4 (Low)	Risk is tolerable, manage at local level
5 to 9 (Medium)	Risk requires approval by Supervisor or equivalent
10 to 25 (High)	Risk requires the approval of the Project Manager & SH&E Director

Send THA improvement suggestions to
DCSA.THA.Library@AECOM.com
Include a copy of the new THA or a photo of the THA modifications as appropriate.

Severity – Potential Consequences				
	People	Property Damage	Environmental Impact	Public Image/Reputation
Catastrophic	Fatality, Multiple Major Incidents	>$1M USD, Structural collapse	Offsite impact requiring remediation	Government intervention
Critical	Permanent impairment, Long term injury/illness	>$250K to $1M USD	Onsite impact requiring remediation	Media intervention
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Probability		
Frequent	Expected to occur during task/activity	9/10
Probable	Likely to occur during task/activity	1/10
Occasional	May occur during the task/activity	1/100
Remote	Unlikely to occur during task/activity	1/1,000
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Americas

Task Hazard Assessment

S3AM-209-FM6

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Project Name and Number	Chem-Trol Site; 60779298	**Overall Risk (Highest Post-Mitigation Risk)**	LOW
Task Name	Monitoring Well Sampling	**Date**	2/2/2026
Work Location	4818 Lake Ave., Buffalo, NY 14219	**Client**	SC Holdings, Inc.

Does this include High Hazard Tasks (HHTs)? (Refer to Table 1 of SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.)	☐ No	☒ Yes – Specify HHT procedure number(s) and any permits/plans:	See Appendix D

Required PPE	☒ Hard Hat	☒ Eyewear (with side shields)	☒ High-Visibility Vest	☒ Ankle Height Footwear	☒ Gloves	☒ Hearing Protection
	Specify type: ☒ Type I (standard) ☐ Type II (climbing style)	Choose 1 or 2 as required: ☒ Safety glasses ☐ Spoggles ☐ Safety goggles ☐ Face shield	Choose type: ☒ Class 2 ☐ Class 3	Choose 1 or more as required: ☐ Work boots ☒ Steel toe ☐ Composite toe ☐ Metatarsal guard ☐ Electric rated ☐ Other - Specify: ….	Choose 1 or 2 as required: ☒ Nitrile ☒ Cut- resistant ☐ Thermal ☐ Vibration ☐ Electrical ☒ Other - Specify: Leather	Choose 1 or both as required: ☐ Ear plugs ☐ Earmuffs
	Other:	Knee Pads				

Note: Employees must have gloves readily available, even if the task does not require their use.
Note: All employees must wear shirts with sleeves that cover their shoulders and long pants at a minimum.

Tools and Equipment (Examples: air/noise monitoring equipment, tools, generators, traffic control devices, fire prevention equipment, etc.)	Click or tap here to enter text.

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REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!				
Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
Visually clear proposed sampling locations	Exposure to biologic hazards: insects, poisonous plants and animals. Injuries could include anaphylactic shock, allergic reaction, rabies	H	Identify and avoid hazardous plants and animals on site. Look for signs (spider webs, droppings, etc.). Wear cut resistant gloves, insect repellant; use a broom or a rake to move vegetation, not your hand or foot; move slowly	L
	Damage to equipment or vehicles due to surface / subsurface obstructions		Investigate travel path. Look for surface obstructions such as rubble, debris, old foundations or rebar. Use spotter is available or park in such a manner as to not have to back-up.	
On-Site Edits:				
Opening and closing well casings / flush-mount covers and well plug lock	Cuts / lacerations / crushing, bruises	M	Avoid touching sharp materials/ edges. Wear cut resistant ANSI 2 gloves. Keep face, hands, fingers, and feet clear when opening and closing well cover. Inspect ground before kneeling, don knee pads.	L
	Back strain		Stretch before working. DO NOT use awkward positioning. Keep back straight. Take regular rest/stretch breaks. Change position regularly.	
	Vapor exposure resulting in inhalation hazards or illness		Stand upwind from the well opening to avoid vapor exposure. Loosen well cap slowly, keeping control if pressure is released due to vapors. Keep face out of line-of-fire.	
On-Site Edits:				

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Gauge water level of well	Aches and strains from repetitive motion	**L**	Do not use awkward positioning. Keep back straight, take regular rest/stretch breaks. Change position regularly.	**L**
	Exposure to chemical hazards in groundwater resulting in skin irritation or illness		Use smooth movements to avoid splashes. Don nitrile gloves over cut resistant gloves and safety glasses with side shields. Check gloves for damages/ rips.	
	Cross contamination of equipment		Clean the tape and probe using non-phosphate soap and distilled water. Wipe with clean paper towel. Collect decontamination materials for waste disposal. Wear disposable nitrile gloves.	
	Trips / falls from entanglement in measuring tape		Check for location of measuring tape before walking or moving around.	
On-Site Edits:				
Insert sampling device (bailer, tubing, hydrosleeve) into well	Cuts/lacerations/crushing, bruises	M	Avoid touching sharp material/edges. Keep face, hands, fingers feet clear when cutting tubing and setting up equipment. Wear cut resistant ANSI 2 gloves with disposable nitrile over gloves.	L
	Pressurized systems		Bleed pressure off when making connections and disconnections from pump regulator assembly. Check pressures – operate within proper range. Cylinder should be transported upright, secured, with regulator removed.	
On-Site Edits:				

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Sample well	Exposure to chemical hazards in groundwater resulting in splash or inhalation hazard or illness	L	Stay upwind to avoid vapor exposure. Retrieve sampling device at a steady controlled rate to avoid splashing. Wear safety glasses and nitrile gloves.	L
	Cuts/lacerations/bruises to knee (flush mount)		Don knee pads and inspect ground before kneeling down and take frequent breaks to stand and stretch	
On-Site Edits:				
Gather sampling equipment and tools, place in work vehicle	Cuts/lacerations/crushing/bruises from gathering or dropping equipment	L	Maintain a secure grip on equipment and only carry manageable amount of equipment when demobilizing.	L
	Aches and strains from improper lifting		Bend and lift with legs. Keep back straight. Take regular rest/stretch breaks. Change position regularly. Team lift is required for items over 50 lbs (or awkward items)	
On-Site Edits:				

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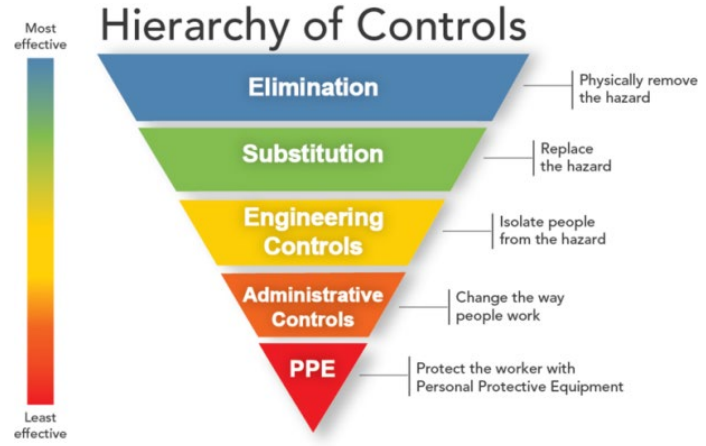

- ***Most hazards need more than one control***
- ***What should you do? Stack your controls***
- ***PPE can NEVER be your only means of protection***

Probability	Severity				
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4 – Probable	20	16	12	8	4
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2 – Remote	10	8	6	4	2
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Risk Rating (Probability x Severity)	Risk Acceptance Authority
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Severity – Potential Consequences				
	People	Property Damage	Environmental Impact	Public Image/Reputation
Catastrophic	Fatality, Multiple Major Incidents	>$1M USD, Structural collapse	Offsite impact requiring remediation	Government intervention
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Task Hazard Assessment

S3AM-209-FM6

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Project Name and Number	Chem-Trol Site; 60779298	**Overall Risk (Highest Post-Mitigation Risk)**	LOW
Task Name	Water Sampling	**Date**	2/2/2026
Work Location	4818 Lake Ave., Buffalo, NY 14219	**Client**	SC Holdings, Inc.

Does this include High Hazard Tasks (HHTs)? (Refer to Table 1 of SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.)	☐ No	☒ Yes – Specify HHT procedure number(s) and any permits/plans:	See Appendix D

Required PPE	☒ Hard Hat	☒ Eyewear (with side shields)	☒ High-Visibility Vest	☒ Ankle Height Footwear	☒ Gloves	☐ Hearing Protection
	Specify type: ☒ Type I (standard) ☐ Type II (climbing style)	Choose 1 or 2 as required: ☒ Safety glasses ☐ Spoggles ☐ Safety goggles ☐ Face shield	Choose type: ☒ Class 2 ☐ Class 3	Choose 1 or more as required: ☐ Work boots ☒ Steel toe ☐ Composite toe ☐ Metatarsal guard ☐ Electric rated ☐ Other - Specify: ….	Choose 1 or 2 as required: ☒ Nitrile ☒ Cut- resistant ☐ Thermal ☐ Vibration ☐ Electrical ☐ Other - Specify: ….	Choose 1 or both as required: ☐ Ear plugs ☐ Earmuffs
	Other:	Click or tap here to enter text.				

Note: Employees must have gloves readily available, even if the task does not require their use.
Note: All employees must wear shirts with sleeves that cover their shoulders and long pants at a minimum.

Tools and Equipment (Examples: air/noise monitoring equipment, tools, generators, traffic control devices, fire prevention equipment, etc.)	Click or tap here to enter text.

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Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
Inspect area of approach	Slips, trips, fall hazards	M	Evaluate approach: • Investigate planned approach for rocks, branches, debris and other slip/trip/fall hazards. • Evaluate angle of approach and minimize as best as possible. If necessary, secure self to a stationary object using a body harness to provide additional stability. • Have a buddy system in place. • Use a pack to secure tools, sample jars, etc. to have hands free • Wear safety toed boots with slip resistant tread, may upgrade to slip resistant safety toed rubber muck boots.	L
	Falls associated with unstable terrain or stream banks causing injury		Use the buddy system. Check stability of stream banks. Maintain awareness of surroundings and maintain communication between team members; identify potential hazards prior to entering area and avoid, when possible.	
	Exposure to water/drowning from falling into water		Use the buddy system. Stay back from the water's edge as far as possible. Wear a PFD if within 6' of water 3' deep or deeper. Maintain awareness of surroundings and maintain communication between team members; identify potential hazards prior to entering area and avoid, when possible.	
	Confrontation with property owner		For residential potable well sampling, obtain permission to access well tap. Perform sampling and site access with 2 people until personnel feel safe with property owner / inhabitants	
On-Site Edits:				

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Collect water sample (storm water, surface water, potable well)	Exposure to sample preservatives causing burns to skin/eyes	M	Avoid contact with preservatives. If contacted: • Flush skin/eyes with water. • Refer to the SDS for specific information relating to the type of preservative • Wear long sleeves, nitrile gloves over cut-resistant gloves and safety glasses	L
	Cuts to skin from cracked or broken glassware		Inspect all glassware before handling. Wear cut resistant gloves when handling broken glassware.	
On-Site Edits:				
Soak/spray durable equipment to prevent cross-contamination	Exposure to decontamination chemicals	M	Avoid contact with all decontamination chemicals including (Liquinox, Simple Green, Methanol and any other solvents used on sampling equipment. Avoid splashing. Wear disposable nitrile gloves.	L
On-Site Edits:				

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Removing/replacing man hole covers (if applicable)	Pinch Points/Abrasion	H	Remove and replace manhole covers so that they do not pinch fingers or toes. Use a manhole cover hook or hydraulic lifter and wear work gloves to prevent injuries to hands and steel toe boots to prevent injury to feet. For hinged catch basins, Use a pickaxe with the longest handle possible to increase leverage, remove accumulated debris around hinges before opening.	L
	Back strain		Determine if you can use a thin diameter sampling device to collect sample instead of opening the cover. Utilize proper lifting procedure when removing covers; bend down at the knees, keep core engaged and lift with your legs rather than bending and lifting with your back. For hinged catch basins, insert tool as far as possible from hinge and keep your hands at the end of your tool. Ensure catch basin lid is open past 90 degrees. If catch basin lid starts to drop, let it go and do not try to stop it.	
	Animals/Insect bites		Inspect inside of manhole/catch basin for small animals and keep hands away from bottom of manhole cover without using work gloves to avoid spider bites or wasp stings	
	Serious injury or death from O2 deficient/toxic atmosphere		Do not enter or place head into manhole./ break plane of entry	
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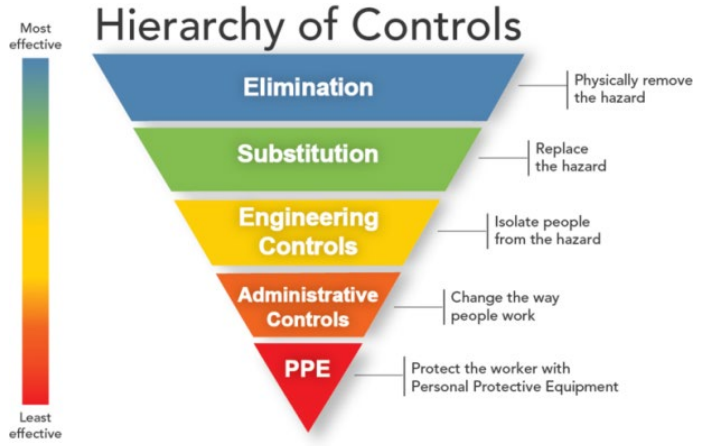

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Project Name and Number	Scott Figgie LLC West of Plant 2 Site; 60771775	**Overall Risk (Highest Post-Mitigation Risk)**	MEDIUM
Task Name	Hand and Power Tools	**Date**	2/2/2026
Work Location	4818 Lake Ave., Buffalo, NY 14219	**Client**	SC Holdings, Inc.

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Tools and Equipment (Examples: air/noise monitoring equipment, tools, generators, traffic control devices, fire prevention equipment, etc.)	Click or tap here to enter text.

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Use of tools	Broken bones or cuts due to improper tools for task	**H**	Inspect tools prior to use. Broken or worn tools should be repaired or replaced. Use tools for their intended purpose to avoid unexpected failure. Don leather gloves and safety glasses when inspecting tools.	**M**
	Cuts, contusions or sprains to various body parts due to tool use		Look around and behind you before starting. • Inspect tools prior to use. Broken or worn tools should be repaired or replaced. Use tools for their intended purpose to avoid unexpected failure. • Ensure work area is free of clutter or other workers which may interfere with ability to handle tools safely. • Do not swing or apply tool (sledge hammer, shovel, digging bar) until area is free of bystanders. • Do not use extreme force. Use controlled motions and avoid having prying tool "break free". • Ensure limbs such as hands, and digits such as fingers and toes, are out of the "line of fire" prior to undertaking the task. • Review and understand manufacturer's instructions and ensure they are followed. • Use tools only for tasks they were designed/intended, not as stand-in for tools unavailable. • Don safety glasses, leather gloves	
	Eye or body injury from flying debris		Observers should maintain a 2' distance from the area of work, have donned protective PPE, and are outside of the "line of fire". Remain vigilant as a support to the worker handling the tools, and do not distract or interfere abruptly with that worker.	
On-Site Edits:				

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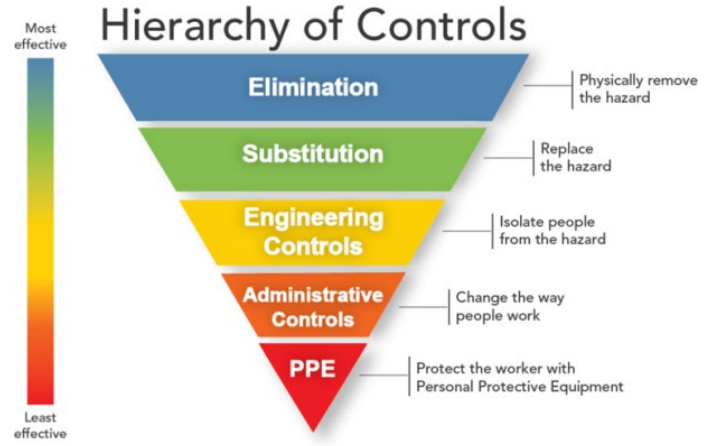

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2. **Task Hazard Assessments (THA)s are required for any field work involving AECOM activities outside of the office and must be used onsite to review site hazards and confirm necessary controls are in place.**
3. **The THA must be reviewed in its entirety and modified at the work site (as needed) immediately prior to commencement of work to account for actual conditions and any changes (weather, scope of work, simultaneous operations, etc.). All necessary revisions must be written on the THA.**
4. **Acknowledgement of THAs must be recorded via electronic or physical signature as part of the Daily Safety Meeting – refer to Daily Safety Meeting – Americas.**
5. **The completed form must be retained in the project files.**

Project Name and Number	Chem-Trol Site; 60779298	**Overall Risk (Highest Post-Mitigation Risk)**	HIGH
Task Name	Investigation Derived Waste Management	**Date**	2/2/2026
Work Location	4818 Lake Ave., Buffalo, NY 14219	**Client**	SC Holdings, Inc.

Does this include High Hazard Tasks (HHTs)? (Refer to Table 1 of SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.)	☐ No	☒ Yes – Specify HHT procedure number(s) and any permits/plans: See Appendix D

Required PPE	☒ Hard Hat	☒ Eyewear (with side shields)	☒ High-Visibility Vest	☒ Ankle Height Footwear	☒ Gloves	☐ Hearing Protection
	Specify type: ☒ Type I (standard) ☐ Type II (climbing style)	Choose 1 or 2 as required: ☒ Safety glasses ☐ Spoggles ☐ Safety goggles ☐ Face shield	Choose type: ☒ Class 2 ☐ Class 3	Choose 1 or more as required: ☐ Work boots ☐ Steel toe ☒ Composite toe ☐ Metatarsal guard ☐ Electric rated	Choose 1 or 2 as required: ☒ Nitrile ☐ Cut- resistant ☐ Thermal ☐ Vibration ☐ Electrical	Choose 1 or both as required: ☐ Ear plugs ☐ Earmuffs
	Other:	Click or tap here to enter text.				

Note: Employees must have gloves readily available, even if the task does not require their use.
Note: All employees must wear shirts with sleeves that cover their shoulders and long pants at a minimum.

Tools and Equipment (Examples: air/noise monitoring equipment, tools, generators, traffic control devices, fire prevention equipment, etc.)	Click or tap here to enter text.

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REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!				
Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
Prepare work area	Trips & falls	M	Clear any trip/fall hazards from work area. Scan ground prior to moving or walking	L
	Tools and emergency equipment not present		Obtain tools and emergency equipment and stage adjacent to work area	
On-Site Edits:				
Remove drum lid	Pinch points at drum ring	M	Use socket set to loosen drum ring, avoid placing fingers in to pinch points. Make sure cut-resistant gloves fit properly (not too big so fingertips get caught)	L
	Sharp edges on drum ring or rim		Evaluate rim and ring for sharp edges, avoid handling as much as possible. Wear cut resistant gloves	
On-Site Edits:				

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Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
Load soil into drums	Exertion/sprains/strains	M	Exertion/sprains/strains • Use proper lifting techniques; this consists of bending your knees and lifting with your back straight. • Shovel loads heavier than 50 lbs or awkward to handle use a mechanical loading device or ask for help. • Grasp shovel handle properly: Position one hand at base of shovel handle and your other hand near the top of the handle. • Rotate task with others if needed and take breaks.	L
	Exposure to contaminants		Exposure • Set up upwind of drum. • Wear PPE (e.g., eye protection-goggles, long pants, Nitrile exam gloves, Nitrile over-gloves (11-mil), long wrist) Tyvek coveralls, shirt with sleeves, steel-toed shoes with boot covers, half-face air purifying respirator fitted with an organic vapor, acid, HEPA filter combination cartridge). • Perform air monitoring as per HASP. **STOP WORK** if action level is exceeded.	
	Slips/trips/falls		Be alert for uneven and slippery terrain. Keep tools and equipment away from walking paths.	
	Sharp edges on drum rim		Inspect rim for sharp and rough edges, avoid leaning into drum or placing hands onto rim edge Wear cut-resistant gloves	
On-Site Edits:				

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REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!				
Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
Replacing drum ring	Pinch Points	M	Use socket set to tighten drum ring, avoid placing fingers in to pinch points. Make sure gloves fit properly (not too big so fingertips get caught)	L
On-Site Edits:				
Moving/relocating drums	Exertion	M	Exertion • If drums must be moved utilize a drum dolly. • DO NOT ATTEMPT TO "WALK" or "ROCK" DRUMS TO MOVE THEM. • Drums can become unstable and easily tip-over causing possible damage and personal injury as well as releasing the material contained.	L
	Trips and Falls		Clear any trip/fall hazards from work area. Scan ground prior to moving or walking	
On-Site Edits:				

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REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!					
Job Steps *List all steps required to perform a task in the sequence they are performed*		**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
On-Site Edits:					
On-Site Edits:					
Additional Notes					

….

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All Employees

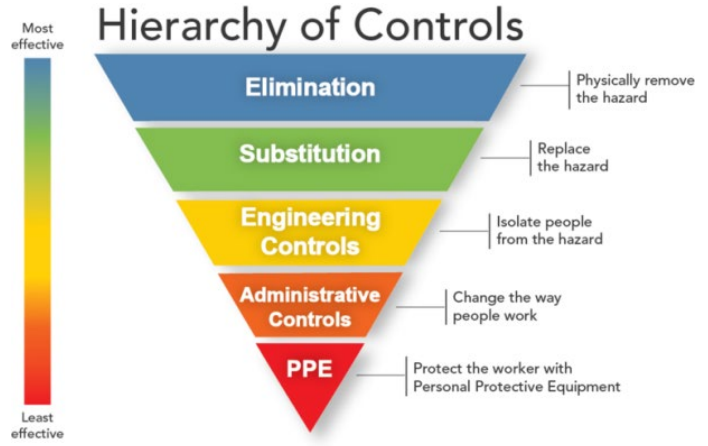
STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

Use **4-Sight**, AECOM's last minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

- ***What am I about to do?***
- ***What can go wrong?***
- ***What can be done to make it safer?***
- ***What have I done to communicate the hazards?***

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



- ***Most hazards need more than one control***
- ***What should you do? Stack your controls***
- ***PPE can NEVER be your only means of protection***

Probability	Severity				
	5 - Catastrophic	4 – Critical	3 – Major	2 – Moderate	1 - Minor
5 – Frequent	25	20	15	10	5
4 – Probable	20	16	12	8	4
3 – Occasional	15	12	9	6	3
2 – Remote	10	8	6	4	2
1 - Improbable	5	4	3	2	1

Risk Rating (Probability x Severity)	Risk Acceptance Authority
1 to 4 (Low)	Risk is tolerable, manage at local level
5 to 9 (Medium)	Risk requires approval by Supervisor or equivalent
10 to 25 (High)	Risk requires the approval of the Project Manager & SH&E Director

Send THA improvement suggestions to
DCSA.THA.Library@AECOM.com
Include a copy of the new THA or a photo of the THA modifications as appropriate.

Severity – Potential Consequences				
	People	Property Damage	Environmental Impact	Public Image/Reputation
Catastrophic	Fatality, Multiple Major Incidents	>$1M USD, Structural collapse	Offsite impact requiring remediation	Government intervention
Critical	Permanent impairment, Long term injury/illness	>$250K to $1M USD	Onsite impact requiring remediation	Media intervention
Major	Lost/Restricted Work	> $10K to $250K USD	Release at/above reportable limit	Owner intervention
Moderate	Medical Treatment	> $1K to $10K USD	Release below reportable limit	Community or local attention
Minor	First Aid	</=$1K USD	Small chemical release contained onsite	Individual complaint

Probability		
Frequent	Expected to occur during task/activity	9/10
Probable	Likely to occur during task/activity	1/10
Occasional	May occur during the task/activity	1/100
Remote	Unlikely to occur during task/activity	1/1,000
Improbable	Highly unlikely to occur, but possible during task/activity	1/10,000

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Task Hazard Assessment

S3AM-209-FM6

Instructions

1. **This form or other applicable region- or business line-specific form is to be completed in accordance with SH&E Risk Assessment and Planning – Americas S3AM-209-PR2.**
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4. **Acknowledgement of THAs must be recorded via electronic or physical signature as part of the Daily Safety Meeting – refer to Daily Safety Meeting – Americas S3AM-209-FM5.**
5. **The completed form must be retained in the project files.**

Project Name and Number	Chem-Trol Site; 60779298 ….	**Overall Risk (Highest Post-Mitigation Risk)**	Choose an item.
Task Name	Click or tap here to enter text.	**Date**	2/2/2026
Work Location	4818 Lake Ave., Buffalo, NY 14219	**Client**	SC Holdings, Inc.

Does this include High Hazard Tasks (HHTs)? (Refer to Table 1 of SH&E Risk Assessment and Planning – Americas S3AM-209-PR2.)	☐ No	☒ Yes – Specify HHT procedure number(s) and any permits/plans:	See Appendix D

Required PPE	☒ Hard Hat	☒ Eyewear (with side shields)	☒ High-Visibility Vest	☒ Ankle Height Footwear	☒ Gloves	☒ Hearing Protection
	Specify type: ☒ Type I (standard) ☐ Type II (climbing style)	Choose 1 or 2 as required: ☒ Safety glasses ☐ Spoggles ☐ Safety goggles ☐ Face shield	Choose type: ☒ Class 2 ☐ Class 3	Choose 1 or more as required: ☐ Work boots ☐ Steel toe ☒ Composite toe ☐ Metatarsal guard ☐ Electric rated ☐ Other - Specify: ….	Choose 1 or 2 as required: ☒ Nitrile ☐ Cut- resistant ☐ Thermal ☐ Vibration ☐ Electrical ☐ Other - Specify: ….	Choose 1 or both as required: ☐ Ear plugs ☐ Earmuffs
	Other:	Click or tap here to enter text.				

Note: Employees must have gloves readily available, even if the task does not require their use.
Note: All employees must wear shirts with sleeves that cover their shoulders and long pants at a minimum.

Tools and Equipment (Examples: air/noise monitoring equipment, tools, generators, traffic control devices, fire prevention equipment, etc.)	Click or tap here to enter text.

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On-Site Edits:					
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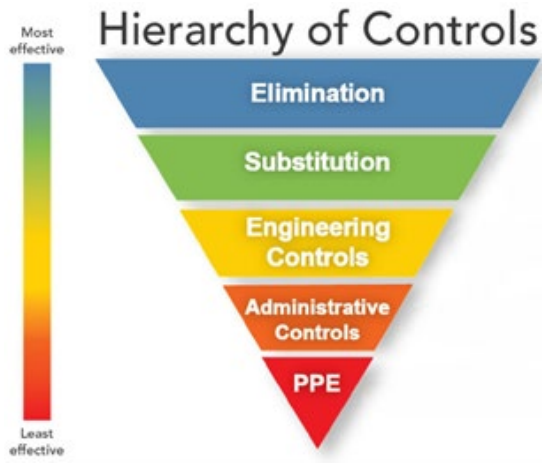

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Americas

Daily Safety Meeting

S3AM-209-FM5

Instructions

1. **Complete this form or equivalent in accordance with SH&E Risk Assessment and Planning – Americas S3AM-209-PR2.**
2. **Conduct the Daily Safety Meeting at the start of each shift. Require attendance of all AECOM employees and subcontractors. Invite personnel from simultaneous operations for coordination purposes. Retain the completed form in the project files.**

AECOM Project Manager	Jim Kaczor PG		**Phone #**	(716) 866-0522	
AECOM SH&E Contact	Caroline Lee (Env East)		**Phone #**	(445) 345-3568	
Meeting Leader	….	**Project Name/Location**	Chem-Trol Site / 4818 Lake Avenue, Buffalo, NY 14219	**Project #**	60779298
Date …..	**Today's Scope of Work**	….			
Simultaneous Ops	☐ No ☐ Yes - **Specify impacts:** ….				
☐ **List Task Hazard Assessments (THAs; e.g., FLRAs) completed and reviewed for today's tasks**	….				

Muster Point Location:	**First Aid Kit Location:**	**Fire Extinguisher Location:**	**Spill Kit Location:**
….	….	….	….

1. Required Topics - Employees & Managed Subcontractors (Check if completed)

☐	Fitness for Duty requirements (all sign in/sign out)	☐	Personal Protective Equipment (PPE) (Required items per THAs are in good condition / in use by all.) **Specify Specialized PPE Needs:** ….
☐	Required training (including task specific) completed and current		
☐	SH&E Plan onsite (understood, reviewed, signed by all)	☐	Work area set up and demarcation/ barricades in place to protect workers, site staff, and the public
☐	STOP WORK Right & Responsibility (all task changes/changed conditions must be reassessed with THA)	☐	Short Service Employees (SSE) (mentor/ oversight assignment for employees with less than 6 months experience working in the industry of the work to be performed)
☐	Requirement to report to supervisor any incidents (e.g., injury, illness, damage, near miss, unsafe act / condition)	☐	Required checklists/records available and understood **Describe:** ….
☐	Emergency Response Plan (including muster point, first aid kit, fire extinguisher, and clinic/hospital location)		

2. Discuss if Applicable to Today's Work (Check 'Yes' if reviewed, or 'NA' if Not Applicable. Work marked with [*] is considered high hazard work.)

Yes	NA		Yes	NA		Yes	NA	
☐	☐	Ergonomics (lifting, body position)	☐	☐	Hazardous Substances and Communication	☐	☐	Weather Hazards / Heat Stress / Cold Stress
☐	☐	Biological Hazards	☐	☐	* Railroads	☐	☐	* Hazardous Energy Control
☐	☐	*Ground Disturbance	☐	☐	* Underground Work	☐	☐	* Hand and Power Tools
☐	☐	*Work at Height	☐	☐	*Confined Spaces	☐	☐	* Working On, In or Near Water
☐	☐	*Highway & Road Work	☐	☐	*Heavy Equipment & Machines	☐	☐	Subcontractor Management (Review subcontractor plans and THAs)
☐	☐	* Required Work Permits/Plans are in place and understood. **Identify/ attach:** ….	☐	☐	Other Topics **Describe/ attach:** ….	☐	☐	Client Specific Requirements **Describe/ attach:** ….

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3. Daily Check-Out by Site Supervisor

Describe incidents, near misses, observations, or Stop Work interventions from today	....	**Describe lessons learned / improvement areas from today**	....

The site is being left in a safe condition and work crew checked out as fit unless otherwise specified as above.

....		....
Site Supervisor Name	**Signature**	**Date/Time**

4. Worker Acknowledgement and Sign In/Sign Out

SITE WORKERS (including AECOM Employees and Managed Contractors/Subcontractors): Your signature below indicates you understand the requirement to:

- Participate in creating, reviewing, & updating task hazard assessments (THAs) for all your tasks.
- Understand and continuously reassess tasks, hazards and mitigations, amending THAs as needed.
- Follow permit to work requirements if applicable to the work you are about to perform.
- Communicate any changes in personnel or conditions at the worksite to the supervisor.
- Exercise your authority and obligation to "Stop Work", intervene, and speak up / listen up if you are concerned or uncertain about safety or hazards, or if additional precautions are not recorded on the THA.

  Note: If you identify an imminent danger related to a contractor for which AECOM does not have contractual oversight, remove yourself and communicate your concerns to the contractor, site representative, and AECOM management immediately.

Your initials below certify you arrived and departed fit for duty, and have reported all incidents/near misses, meaning:

- You are physically and mentally fit for duty and have inspected your required PPE to ensure it is in satisfactory condition.
- You are not under the influence of any medication, drugs, or alcohol that could affect your ability to work safely.
- You are aware of your responsibility to immediately report any illness, injury (regardless of where or when it occurred); or impairment/fatigue issue to the AECOM Supervisor.
- You signed out as fit and uninjured unless you have otherwise informed the AECOM Supervisor.

Print Name & Company	Signature	Initials & Sign In Time	Initials & Sign Out Time
....		In & Fit	Out & Fit ....
....		In & Fit	Out & Fit ....
....		In & Fit	Out & Fit ....
....		In & Fit	Out & Fit ....
....		In & Fit	Out & Fit ....
....		In & Fit	Out & Fit ....
....		In & Fit	Out & Fit ....
....		In & Fit	Out & Fit ....

Attach additional Site Worker sign-in/out sheets if needed. Identify the number of attached sheets: ....

5. Site Visitor / Site Representative Sign In/Sign Out

Print Name & Company	Signature	Arrival Time	Departure Time
....		....	....
....		....	....
....		....	....
....		....	....

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Appendix D Applicable SH&E Procedures

Safety Health and Environment

1. Purpose and Scope

The purpose of this procedure is to define methods for project execution in accordance with the AECOM Global Corporate SH&E policies and programs. It has been developed to enable EC employees, to fully understand, and commit to this corporate responsibility.

All EC Employees are required to comply with and ensure adherence to fundamental office safety, health, and environmental requirements. When EC staff are seconded to a Lead Team office, they will work under the Lead Team office SH&E Management System.

This procedure applies to all projects undertaken by EC and all EC offices, and is based on five areas of emphasis:

a. Management Leadership: As one of the 9 AECOM life preserving principles, the importance of our leadership team to exhibit safety as a core value is paramount. There are specific responsibilities for management outlined herein.

b. Safety for Life: AECOM's "culture of caring" sets the vision and expectation for each employee, contractor, and business partner to take personal responsibility for keeping ourselves, colleagues, and others associated with our work safe and personally adopt safety as a core value. "Safety for Life" defines our commitment to achieving zero work-related injuries and/or illnesses, preventing damage to property and the environment, and maintaining an environment friendly and sustainable workplace.

c. Planning: A comprehensive action plan supporting SH&E Policy – AECOM Global objectives is provided.

d. Implementation and Operation: Systematic controls for implementing the SH&E Management System are provided. Training for effective SH&E implementation will be provided.

e. Monitoring and Continuous Improvement: SH&E performance is continuously monitored and evaluated. Corrective action is taken as appropriate.

f. Management Review: SH&E performance is reviewed on an on-going basis by EC senior management to assure continuous improvement and application of best practices.

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2. Procedure

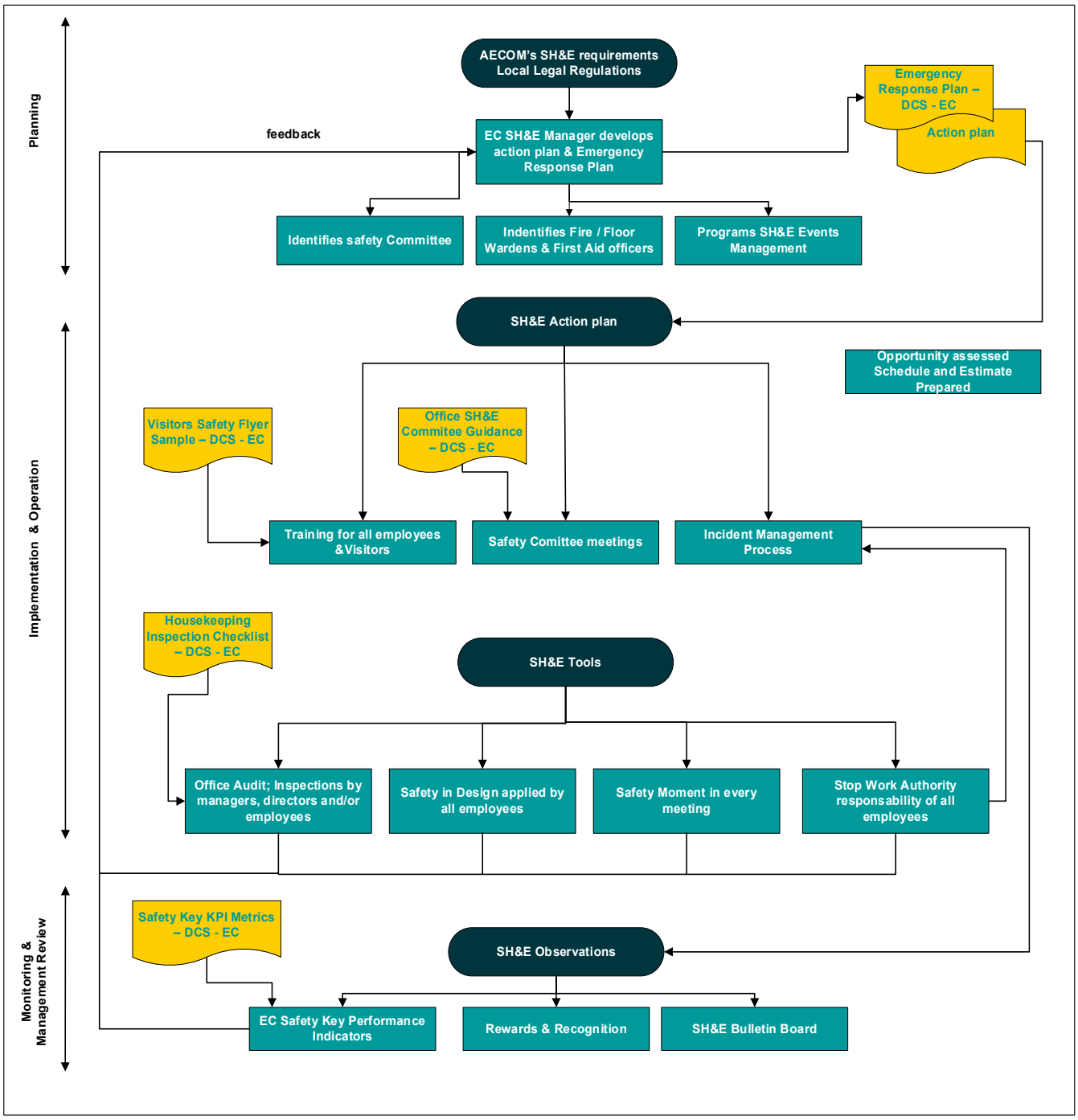

Figure 1 SH&E Processes and Tools

All employees are expected to promote safety, perform, and document safety inspections, and implement appropriate corrective actions to minimize risk and enhance SH&E performance. Each office shall assess the potential for violation and establish appropriate security procedures consistent with building manager's protocol.

3. Terms and Definitions

a.	Emergency Response Plan	A Specific Emergency Response Plan shall be developed at each EC office for an emergency evacuation of the office. All employees shall be familiar with the Emergency Evacuation Plan as part of their Induction Training. They shall know what to do in an emergency and how to obtain assistance, and follow the directions provided by the floor wardens and proceed to the designated assembly area. In the event of: – natural disasters, fire, medical incident, hazardous chemical spill, elevator malfunction, security incident, power failure, or any other situation which you judge as an emergency – notify your Supervisor and SH&E Manager as soon as practicable. SH&E Manager shall ensure that the appropriate resources are allocated and that the Emergency Response Plan is implemented. EC Leadership will decide the need for periodical testing across each office. Refer to Emergency Response Plan Template – DCS – EC.
b.	Fire / Floor Wardens and First Aid Officers / Providers	In the event of a medical, fire, or natural disaster emergency, fully trained and competent First Aid Officers and Floor wardens are to be in their designated location to provide assistance. In some localities, the property management provides appropriately trained Floor Wardens. A legible copy of the list of floor wardens (Fire Marshals & First Aiders) shall be maintained at respective EC office location by facilities discipline. Floor wardens shall be easily identified by a high visibility vest or other similar highly visible identification. A legible copy of list, inventory, and distribution record of First aid kit shall be maintained at respective EC office location by facilities discipline. Purchase of First Aid Kit shall be from an approved source.
c.	Safety Key Performance Indicator Metrics	Metrics established by EC Management for implementation, monitoring, and continual improvement of SH&E at EC offices. Refer to Safety KPI Metrics– DCS – EC. The leading metrics target is set by the local safety team in conjunction with EC management. However, the lagging metrics is governed by the regional AECOM SH&E guidelines.
d.	Safety Committee	The Safety Committee is a group of employees chosen to represent SH&E principles at each EC. They shall meet periodically to help assure that our "Safety for Life" commitment is visible to all employees, to collect and make decisions to ensure offices are safe places to work and uphold and proactively manage SH&E concerns with the collaborative participation of all employees. Refer to Office SH&E Committee Guidance – DCS - EC.
e.	Safety in Design (SiD)	Safety in design shall be incorporated in the design and building aspects of facilities, structures, and processes to minimize risk to people, and capitalize on intrinsic efficiencies of an enhanced design process from concept to completion, including proposals and marketing, engagement of sub-consultants, and subsequent operation.
f.	ESG/Safety Moment	Every meeting of five or more attendees (employees and non-employees) shall start with a Safety or Wellbeing Moment intended to share a Safety topic with all attendees. Meeting organizers are responsible for identifying an attendee to present or facilitate the Safety Moment (preferably other than an SH&E professional). Meeting agendas shall identify Safety Moments as a meeting item and meeting minutes shall include the Safety Moment topic.

g.	SH&E Bulletin Board	Bulletin board dedicated to SH&E showing updated, relevant materials regarding Life-Preserving Principles as well as any other local legislative or geography-specific information. All postings shall be in the appropriate local language and in English.
h.	Management Sponsored SH&E Events	EC provides an environment where employees are encouraged to voice their concerns on any SH&E issues within the business through participation in SH&E campaigns and awareness programs. Safety communication and advisory shall be shared with employees to keep them informed of SH&E matters that may contribute to maintaining a safe and healthy working environment. From time-to-time management will sponsor various communication and participation events to highlight various SH&E topics and help improve the overall core value of safety. Employees with suggestions about such events should use the employee observation box or speak directly to their supervisor.
i.	Stop Work Authority	All employees have the responsibility and authority to stop work by using the Safety Time-Out card if they believe a danger exists for any persons, property, or the environment in any kind of work. Prior to commencing a formal Stop Work, the affected employees shall immediately discuss the concern and attempt to remove, mitigate, or isolate the hazard in coordination with the supervisor and SH&E manager. Work associated with the affected area or operation shall not resume unless all corrective actions identified have been resolved to an acceptable level. Employees shall never be penalized for exercising their responsibility to Stop Work.
j.	Observation and Incident Management Process	Observations and Incidents shall be reported by employees. AECOM makes available to all employees a reporting system which encourages the raising of observations related to safe/unsafe behavior/condition or other SH&E incident. Employees may raise an observation related to SH&E in several ways, including online (Lifeguard tool on Ecosystem), Safety Observation Cards, or even verbally with their supervisor or local office management. Employees may report an incident through IndustrySafe. Refer to the SH&E Management System Manual – AECOM Global for incident management.
k.	Visitors Safety	Visitors shall be made aware of the Emergency Response Plan. Offices shall have identifiable means of designating office visitor(s). The badge is used to identify visitors and shall be worn for the duration of the visit. Refer to 208-02, Visitor Safety Flyer Sample.
l.	Office Audits	Periodic office inspections shall be performed, preferably on a twice monthly basis as well as prior to the occupation of any new facility, when new tasks that were not previously performed at this location are now performed, when new hazards are introduced to the office environment, or when office conditions or local regulations require an inspection. Actions to eliminate or reduce hazards and risks are to be implemented immediately or referred to the Safety Committee and/or Senior Management dependent upon severity. All inspections and walkthrough shall be documented and retained as required. Refer to Housekeeping Inspection Checklist – DCS - EC.
m.	Senior Management Safety “Walk Downs”	A periodic “walk down” of the work areas shall be made by senior management. Best practice is to have an employee accompany the senior manager during the safety “walk down.” Please utilize LifeGuard for Senior Management Assessment.

n.	Rewards & Recognition	All levels of supervision are encouraged to recognize the SH&E initiatives, milestones, and efforts made by those who work with them on an ongoing basis. This recognition could be publicly thanking an employee. This recognition may also include team, project, and office recognition of achievements in SH&E

4. References

a. SHE Policy – AECOM Global S1-001-PL1

b. Safety, Health and Environment Management System Manual – AECOM Global S2-001-SM1

c. Life Preserving Principles – AECOM Global S2-001-WI1

d. Safety for Life Program - Ecosystem.

e. Project Document and Records Control - DCS Q2[DCS]-222-PR1

f. Office SH&E Committee Guidance – DCS – EC S4[DCS](EC)-001-WI1

g. Visitor Safety Flyer Sample – DCS – EC S4[DCS](EC)-013-WI1

5. Records

Copies of all SH&E Management System documents and data shall be managed and retained in accordance with Safety Key Performance Indicators Metrics – DCS – EC.

a. Housekeeping Inspection Checklist – DCS – EC S4[DCS](EC)-013-FM1

b. Emergency Response Plan – DCS – EC S4[DCS](EC)-209-FM1

c. Visitor Safety Flyers

6. Issue Authorization and Maintenance for Use

The applicable EC Functional Leader is responsible for the maintenance of this procedure and will review the procedure annually to determine any necessary updates. Should an individual employee have a suggestion for improvement or modification to this procedure, they may mark-up a copy of the document and send to the applicable EC Functional Leader for review. Changes to the procedure will be distributed to other functional leads for their input prior to finalizing changes to this procedure.

7. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	05-Dec-2022	Initial release as S4[DCS](EC)-001-PR1	All
1	14-Oct-2024	2024 Review; updated references by removing the “GEP” number from titles and linking to “DCS” level Quality Management procedures and forms as part of the EC/DCS Integration project; minor edits and updated links.	Section 3, 4, 5

AECOM

AECOM Global

Minimum Global Safety, Health & Environment Requirements

S2-001-WI3

Table of Contents

0. SH&E Essentials 1

0.1 Stop Work 1

0.2 Induction / Orientation and Training 1

0.3 Newly Hired or Transferred Employee 2

0.4 Fit for Duty 2

0.5 Fatigue Management 3

0.6 Drugs & Alcohol (Including Prescription Medication) 3

0.7 Emergency Planning 4

0.8 Incident Reporting, Notifications, Investigation, and Injury Management 4

0.9 Ground Transportation / Motor Vehicles 5

0.10 Consultation & Communication 6

0.11 Recognition and Rewards 7

1 Exposure Management 7

1.1 Toxic and Hazardous Substances 7

1.2 Industrial Hygiene & Medical Screening 7

2 Planning & Oversight 8

2.1 Safety in Design 8

2.2 Hazard Identification and Risk Management 8

2.3 Personal Protective Equipment (PPE) 11

2.4 Permit Required Activities 11

2.5 Oversight of AECOM Subcontractors / Subconsultants 11

2.6 Environmental Procedures 12

2.7 Regulatory Agency Visits 12

2.8 Office Safety 13

3 Field 13

3.1 Confined Space Entry 13

3.2 Working at Heights / Fall Protection 14

3.3 Demolition 14

3.4 Energy Isolation 14

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3.5 Electrical Safety 15
3.6 Excavation & Trenching 15
3.7 Underground Work / Tunneling 16
3.8 Heavy Equipment 16
3.9 Lifting Operations 16
3.10 Working Alone 17
3.11 Temporary Works 17
3.12 Unmanned Aircraft Systems (UAS) 18
3.13 Working on or Near Water 18
3.14 Marine Safety & Vessel Operations 18
3.15 Rail Corridors 18
3.16 Munitions & Explosives of Concern / Unexploded Ordnance (MEC/UXO) 19
4 Change Log 19

Global

Minimum Global Safety, Health & Environment Requirements

S2-001-WI3

Global Safety, Health and Environment (SH&E) requirements have been developed and shall be implemented as the minimum requirements to be met by AECOM operations. Global SH&E documents are identified with document numbers beginning with S2. Supplementary SH&E procedures to the Global SH&E Requirements shall be developed and implemented when additional detail is necessary based on differences in services offered by Business Lines, and in laws and statutes across geographies and regions. These supplementary SH&E procedures are identified with document numbers beginning with S3 for documents applying to the super-geographies, (Americas [AM], Asia-Pacific [APAC], Europe, Middle East & Africa [EMEA]), and with S4 for Region, Business Line, or country-specific documents.

The Global SH&E Requirements are as follows:

0. SH&E Essentials

0.1 Stop Work

a. All employees have the authority and responsibility to stop work if SH&E is being compromised without fear of reprisal or retribution. Nothing is ever so urgent or important that we cannot take the time to do it safely.

b. Work associated with the affected area or operation will not resume unless the corrective actions identified have been resolved to an acceptable level and management approval obtained to restart.

c. AECOM's Safety Red Card is a tangible reminder of stop work authority for AECOM employees and subcontractors. The cards are designed to be paired with Company and / or customer ID badges; every employee shall have or have access to their own Red Card. An equivalent tool shall be established where the red card cannot be used (e.g., cultural significance of red, conflicts with client badging, etc.).

0.2 Induction / Orientation and Training

a. Each employee shall be trained and competent to perform tasks that may impact on SH&E in the workplace and as required by legislation, company procedures and client expectations.

   i. Assessment of competence and training will consider responsibility, ability, literacy and exposure to risk.

   ii. Comprehension of training shall be appropriately verified (e.g., demonstration of skills, quiz, etc.).

b. Potential employees are required to bring evidence of their qualifications to job interviews. Project Managers or supervisors, in coordination with Human Resources (HR), use employee training records and resumes to confirm potential employees have the required skills, knowledge, training and experience for the proposed tasks. Where appropriate, resumes are included in job tenders for client perusal.

c. Within one week of starting at AECOM, project managers or supervisors are responsible for ensuring each new employee receives induction / orientation training to set the expectations of the AECOM Safety for Life program including incident reporting, stop work authority, accessing SH&E resources and tools, and a clear expectation of zero injuries.

d. Employees shall also complete any applicable site-specific field or office orientations.

e. Supervisors shall confirm visitors complete an orientation appropriate to the location or site they are to visit, supplemented by appropriate visual material (e.g., handout, iPad, etc.) and subsequently abide by AECOM SH&E policies and procedures when visiting our premises or sites.

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f. Visitors to AECOM premises or sites shall be escorted by an AECOM employee who shall confirm local security arrangements are applied, appropriate Personal Protective Equipment (PPE) is provided, and the visitor is aware of SH&E management requirements, including those for emergency response and incident reporting.

g. Project Managers and Supervisors shall complete appropriate training to support AECOM's Culture of Caring and to enable effective execution of our Safety for Life program.

h. The responsibility for ensuring that employees receive adequate SH&E training rests with the operation leaders based on the requirements of these minimum requirements and the jurisdiction's applicable SH&E procedures.

    i. Supervisors are responsible for confirming that each employee within their direct control is competent to undertake their job as specified.

    ii. AECOM Regional and Business Line leadership shall develop a training matrix for employees of their area of responsibility. Managers are required to arrange the appropriate training as identified in the training matrix and on a timely basis (e.g., upon hire, or upon commencement of a new task).

    iii. On-going employee competence and training needs are assessed as part of our annual performance and review process.

    iv. SH&E training needs may also be identified through individual risk assessments, incident investigations, observed non-compliance, or when procedures change. As required, appropriate training will be arranged, and may be provided through AECOM University courses, safety meetings, and / or classes delivered by internal or external providers. Employees identifying a particular training requirement are expected to discuss this with their managers if the requirement cannot wait until their next appraisal.

    v. Employees are encouraged to take part in continuing professional development activities to enable retention, competency, and remaining abreast of emerging techniques and processes.

i. Supervisors shall confirm employee training is adequately documented and records are maintained.

0.3 Newly Hired or Transferred Employee

Employees who have been newly hired or transferred to a different position in the company shall be:

a. Trained to AECOM procedures and client requirements prior to performing work.

b. Supervised by a competent person.

c. Visually identifiable and their presence in field locations recorded.

0.4 Fit for Duty

a. Employees shall come to work in a fit state that does not place themselves or others at risk due to physical, mental, and emotional factors.

b. Employees who come to work in an unfit state shall inform their supervisor so that adjustments to their activities can be made accordingly. This may include but is not limited to:

    i. Temporary conditions (e.g., fatigue, stress)

    ii. Physical limitations (e.g., eyesight, hearing, flexibility, lifting restrictions)

    iii. Cognitive limitations (e.g., brain damage)

    iv. Psycho-social factors (e.g., depression, anxiety, fears)

c. Employees who observe another employee that may be working in an impeded manner or unfit state are expected to inform a supervisor immediately.

d. Employees who have experienced an off-the-job injury should consult their supervisor, Human Resources (HR) business partner and/or AECOM's Occupational Health Team for assistance in assessing their scope of work to determine any potential for risk of further complications. Adjustments to activities may be appropriate to facilitate a return to full health.

e. Specific work environments and/or activities may warrant a fitness for duty assessment program to assess employees' / candidates' fitness for duty prior to assignment to identify potential physical, mental, and emotional risk to the individual, and to take appropriate action given the identified risk.

   When risks indicate a fitness for duty assessment program is necessary, an appropriate program shall be developed specific to that identified risk through consultation with Regional HR, Legal (labor and employment counsel) and SH&E (including the Occupational Health Team) and approved by the applicable Regional Executive and AECOM's Corporate labor and employment counsel. Programs shall identify:

   i. Assessment requirements (including methods to restrict results to those needed to assess the risk).

   ii. Involved parties and associated responsibilities.

   iii. Methods to maintain confidentiality in accordance with Global Privacy Notice – AECOM Global.

   iv. Actions appropriate to the assessment results and the risk prior to assignment (e.g., who is consulted when a risk to the individual is identified).

   v. Fitness for duty assessment prior to assignment shall involve informing the employee / candidate of the work environment and/or activity's exposures and expectations.

f. Where an incident has occurred and there is reason to believe the individual may not have been fit for duty the local SH&E team and HR business partner shall be contacted immediately.

0.5 Fatigue Management

a. The responsible manager or supervisor shall assess the activity and task specific risks, duration and exertion level as appropriate, and mitigate them to an appropriate level to enable the employee to effectively manage fatigue hazards.

b. Employees shall work within prescribed guidelines, including a maximum of 14 hours a day, 60 hours a week, unless additional risk management strategies are implemented, such as increased supervision or additional rest breaks, to combat the effects of fatigue.

c. The SH&E Plan shall address fatigue issues as part of the risk assessment.

0.6 Drugs & Alcohol (Including Prescription Medication)

a. AECOM prohibits employee use, possession, presence in the body, distribution, manufacture, concealment, transportation, promotion or sale of the following items or substances when providing services on behalf of AECOM or when on or in AECOM / client property:

   i. Illegal drugs (or their metabolites), designer and synthetic drugs, mood- or mind-altering substances and drug use related paraphernalia unless authorized for administering currently prescribed medication.

   ii. Controlled substances that are not used in accordance with physician instructions or non-prescribed controlled substances.

   iii. Alcoholic beverages while at work or while on any customer or AECOM controlled property. This prohibition on alcohol applies whenever an employee is on-duty, including during meal or break periods, while on Company premises, or while representing AECOM. AECOM may make exceptions and permit the consumption of alcohol beverages at work-related events, such as Company-sponsored or approved business meals, conferences, or holiday events. Employees who choose to consume alcohol on approved occasions are expected to exercise good judgment and to refrain from becoming intoxicated or impaired. If an employee has consumed alcohol and needs transportation home, the Company will reimburse the cost of a taxicab or other reasonable costs of transportation so that the employee may avoid driving.

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b. AECOM does not prohibit lawful use and possession of current medication prescribed in the employee's name or over-the-counter medications. Employees are expected to consult with their health care provider about any prescribed medication's effect on their ability to perform work safely and/or any associated work restrictions.

c. An employee whose ability to perform work safety may be impaired due to consumption of a prescribed or over-the counter medication shall disclose to their supervisor, HR business partner, or Occupational Health Team, only those effects or restrictions applicable to safe performance of work.

0.7 Emergency Planning

a. Each AECOM office and worksite SH&E Plan shall include a site-specific Emergency Response Plan (ERP) suitable to the location and local requirements. The author of the ERP shall check with applicable stakeholders (e.g., client, site owner, building manager, landlord, etc.) regarding the various parties' current emergency procedures and will incorporate these, as appropriate, into the AECOM Emergency Response Plan.

b. Project Managers are responsible for emergency planning regarding SH&E risks on project work and for recording their arrangements within the project documentation. Plans shall include confirming appropriately trained personnel are on site as required, and emergency equipment and supplies are available and in operable condition. Inspection, testing and maintenance of emergency and first aid equipment shall be identified, scheduled and undertaken in accordance with local legislative and manufacturer requirements. Affected personnel shall be briefed on the arrangements, trained in their roles and responsibilities, and be knowledgeable about alarm and communication requirements. Testing and evaluation of the plan is achieved through review of actual incidents and mock drills.

c. SH&E Plans shall comply with client requirements and specifications, shall be appropriately posted, and will typically contain the following:

   i. Reporting Procedures for Fires, Environmental Incidents and Other Emergencies.
   ii. Alarm System and Security Measures.
   iii. Evacuation Routes, Assembly Points, Shelter In Place Procedures.
   iv. Extreme / Severe Weather Planning.
   v. Natural Disaster Planning (e.g., earthquake, flood, etc.).
   vi. Critical Equipment / Operations Procedures.
   vii. Assisting Disabled or Medically Restricted Personnel.
   viii. Personnel Accounting Procedures.
   ix. Rescue and Medical Duties.

d. Emergency response personnel (e.g., evacuation coordinators, first aid responders, fire wardens, etc.) shall be identified in accordance with potential emergencies, legislation, and requirements of the site-specific SH&E Plan.

e. The number of first aid persons / appointed persons and standard of qualifications will differ due to the varying risk level associated with different environments and activities. First aid or appointed persons shall be identified to meet first aid requirements in accordance with legislation and the requirements of the site-specific SH&E Plan.

0.8 Incident Reporting, Notifications, Investigation, and Injury Management

a. All work-related injuries, illnesses and incidents, including those of employees and subcontractors under direct AECOM control, shall be reported to an AECOM supervisor immediately. Any associated regulatory notification requirements of the applicable jurisdiction shall be met.

b. Injuries, illness and incidents shall be entered into IndustrySafe using the initial incident form within one business day of the event.

c. For company-wide SH&E statistics, OSHA recordkeeping requirements shall be used in all Regions / Business Lines. To comply with local regulations, additional SH&E reporting and statistics may be required to be maintained.

d. Where required, injury logs shall be signed by senior management of Operations.

e. A formal investigation process (e.g., Why Tree, 5-Why) shall be utilized to determine root causes and contributing factors for all recordable and high potential incidents ([HiPos] assessed at a risk rating of 10 or above using the AECOM Risk Matrix). Refer to section 'Hazard Identification & Risk Management' for an explanation of the AECOM Risk Matrix.

f. All records applicable to an incident shall be retained as defined in the AECOM Records Retention Procedure and as necessary to manage any future action associated with the incident.

g. Executive Incident Reviews shall be performed for all high potential or high actual consequence (HiPo) incidents.

h. The Executive Incident Review (EIR) shall be presented by the respective Project Manager to the appropriate executive / leadership (Geography, Business Line, Region, Legal, Human Resources, etc.) and Regional SH&E Director. The following table provides direction concerning EIR content:

Required EIR Content
Cover slide
Project Description / Scope
Incident Summary - Overview and Actual Risk
Investigation - Investigation Team / Interviewees
Investigation - Applicable Photos / Sketches
Investigation - Timeline / Details
Immediate Incident Response and Care Management
Ongoing Care Management
Why Tree or other Root Cause Analysis
Results - Corrective and Preventative Actions
Results - Lessons Learned Summary
Discussion / Questions / Comments

Optional EIR Content
Agenda
Invitee Guidance
Incident Summary - Potential Risk
Incident Summary - Involved Employee Background
Investigation - Hazard Assessment (Photo of document)
Investigation - Project Planning & Execution Efficacy
Results - Cost
Invited / Attended

i. Injuries shall be managed in accordance with the procedure(s) applicable to the jurisdiction.

j. When possible and unless restricted by local regulation or law, labor agreement or client provided treatment, a supervisor (or designee) should escort an injured employee to the initial physician visit. The Supervisor shall confirm that the Company's return to work policy is followed and assist in communication between the injured employee and management.

0.9 Ground Transportation / Motor Vehicles

a. When traveling for business purposes (excluding commute to and from work), two-wheeled modes of transportation (e.g., bicycles, motorbikes, etc.) are prohibited unless specified and approved in the applicable SH&E Plan.

b. The below requirements apply to employees who operate motor vehicles that are owned, rented, or leased by AECOM and to employees who use personal, client or government-supplied vehicles while conducting AECOM business.

   i. Motor vehicles shall be selected, equipped, operated, and maintained in a way that protects personnel from harm.

   ii. At-risk driving behavior by AECOM employees shall be identified and managed appropriately (e.g., retraining, driving restrictions, disciplinary action, etc.).

iii. Motor vehicle operators shall adhere to all local laws including, signs, postings, regulations, ordinances, and codes applicable for the jurisdiction in which the motor vehicle is being operated.

iv. Commercial motor vehicles and operators are required to meet the jurisdiction's applicable commercial motor vehicle regulatory requirements.

v. Only licensed and appropriately insured drivers, who are fit for duty, shall operate a motor vehicle.

vi. Travel shall be assessed to allow for safe management of the journey.

1. Drivers who are to undertake trips in excess of 250 miles (400 km) each way, drive in remote or hazardous areas, or when otherwise deemed necessary, shall develop and document a Journey Management Plan.

2. Plans typically include the route, location of route hazards, timing, rest periods and locations, communications, emergency response and security arrangements.

3. Appropriate planning shall include, but not be limited to, personal protective equipment, competence in vehicle recovery, positive communications, and ensuring adequate drinking water and supplies are available in the event personnel become stranded.

vii. The use of electronic devices that may distract the driver while driving is prohibited. This includes cell phones, two-way radios and other items whether hand-held or hands-free.

1. GPS units and devices (e.g., smart phones, tablets) used for navigation may only be used if factory installed or secured to the vehicle with a bracket that allows the driver to view the image without having to take their eyes off the road.

2. Electronic devices shall be setup for operation prior to commencing driving activities and shall not be changed by the driver while driving.

viii. Motor vehicle occupants are required to wear seatbelts at all times when the vehicle is in operation.

ix. When driving in off-road conditions employees shall confirm they have a fit for purpose vehicle and have experience or training for the conditions.

0.10 Consultation & Communication

a. AECOM shall provide appropriate resources, time, training, and methods to facilitate SH&E communication and consultation between management and employees. Any identified barriers to effective communication and consultation, such as language barriers, or fear of reprimand, shall be appropriately addressed and removed to allow for employee participation.

b. AECOM leadership shall promote awareness of SH&E issues in AECOM offices, facilities, and worksites through such approaches as the use of banners, SH&E notice boards, AECOM's intranet, newsletters, alerts (including those issued by clients), key performance indicators and other SH&E-related material.

c. Communication and coordination amongst key stakeholders (e.g., AECOM personnel, subcontractors, clients, teaming partners, regulatory bodies, etc.) shall be conducted as appropriate throughout the lifecycle of a project to safeguard our employees, subcontractors, the public and the environment.

d. Values moments should be shared in every meeting via webcast, telephone, video conference, or live. When the Values moment is not safety-related, safety should be included in the agenda.

e. As appropriate, employees shall be consulted during SH&E activities. Associated SH&E documentation shall be completed and provided to affected personnel as a method of SH&E communication (e.g., SH&E hazard assessments, plans, permits, inspections, investigations, lessons learned, etc.).

f. All personnel are encouraged to discuss any SH&E concerns, good practices or ideas with their Supervisor, and to enter SH&E observations within LifeGuard or IndustrySafe. Content shall be monitored by the SH&E Team and appropriate response or close–out action taken.

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g. Regular SH&E meetings shall be conducted between management and employees. Frequency as established in the applicable SH&E Plan shall be met.

h. AECOM encourages the establishment of SH&E committees, including Safety Leadership Teams (SLTs), with the aim of allowing a direct interface between management, SH&E team, and other employees.

i. Where established, the requirements of these committees or SLTs should be developed; basic agenda, membership composition, frequency of meetings (at least quarterly), with meeting minutes published and posted for employees to access.

j. Requests for information from external interested parties shall be reviewed and dealt with on a case-by-case basis and in accordance with legal, AECOM and client requirements. Project related requests shall be managed by the associated Project Manager, with necessary assistance provided by the SH&E Team.

0.11 Recognition and Rewards

a. Rewards and recognition programs shall be developed and implemented to recognize individuals, teams, projects, and offices that meet established criteria in SH&E performance. Project rewards and recognition programs shall be included in the project's SH&E Plan.

b. All levels of supervision are encouraged to recognize the SH&E initiatives, milestones and efforts made by those who work with them on an ongoing basis. This recognition may be as simple as publicly thanking an employee for reporting hazards, taking the time to do a job safely, participating in SH&E Committees, or refusing unsafe work. This recognition will also include team, project, and office recognition of achievements in SH&E.

1 Exposure Management

1.1 Toxic and Hazardous Substances

a. Where there is a risk of exposure to toxic and hazardous substances, the activity and task shall be assessed for employee exposure and, as applicable, appropriate hazard controls developed, implemented, communicated, and maintained.

    i. While hazardous substances commonly encountered on worksites include asbestos, silica, benzene, cadmium, chromium (VI), hydrogen sulfide, and lead, any other toxic or hazardous substances that may be encountered by AECOM employees (e.g., ammonia, arsenic, coal dust, isocyanates, mercury, etc.) shall also be assessed.

b. When the assessment identifies the potential hazard of toxic or hazardous substance exposure, medical screening and surveillance requirements shall be defined if applicable to the substance and jurisdiction.

c. Employees shall be informed of the hazards of the chemicals to which they may be exposed in the course of their work (e.g., container labeling, training, etc.). The Global Harmonization System shall be applied in alignment with the applicable jurisdictional requirements.

d. Appropriate training and guidance shall be provided to employees to eliminate or control occupational exposures to toxic or hazardous substances (gas, vapor, aerosol [dust], mist, fume, fog, fiber, smoke) to the lowest level practicable.

1.2 Industrial Hygiene & Medical Screening

a. Industrial hygiene hazards shall be identified, including as applicable, toxic and hazards substances, physical agents (acoustic, thermal, etc.) and biological airborne contaminants. To the extent possible, the associated risks shall be reduced to as low as reasonably practicable, given the available technology and known toxicological or adverse human health effects.

b. Only competent and trained personnel shall perform work where employees and subcontractors are exposed to industrial hygiene hazards.

c. Current exposure limits identified by the *American Conference of Governmental Industrial Hygienists* (ACGIH) shall be used as the maximum exposure limit. Exposure limits established by local regulatory standards or consensus standards that are more conservative than those identified by ACGIH shall be applied in the applicable jurisdiction.

d. Medical screening and surveillance shall be conducted as necessary based on potential exposures and regulatory requirements.

e. Appropriate hazard control measures shall be in place where exposures will be above established occupational exposure levels.

f. Project SH&E Plans shall specify exposure limits and action levels.

2 Planning & Oversight

2.1 Safety in Design

- Safety in design shall be incorporated into the design and constructability aspects of temporary and permanent facilities, structures, and processes from concept to completion, including proposals and marketing, engagement of subcontractors, construction operations and subsequent operation, maintenance, and demolition of the product.
- Where the principles of safety in design are not required by law, the practices of safety in design shall be incorporated in the design and building aspects of temporary and permanent facilities, structures and processes to minimize risk to people, and capitalize on intrinsic efficiencies of an enhanced design process.

2.2 Hazard Identification and Risk Management

a. The Project Manager shall confirm risk assessment processes are conducted to identify hazards and manage the associated risks applicable to the location. Risk assessment processes shall be utilized throughout the lifecycle of the project:

   i. SH&E risk assessment during the pre-bid stage of a project is conducted to inform the go / no go decision as well as identify potential SH&E planning, budgetary and staffing requirements. Please refer to *S2-001-ATT4 Catastrophic and Critical Consequences Guidance* for a listing of potential events or outcomes to be considered in relation to a project's work scope.

   ii. Project start-up activities require appropriate SH&E planning prior to work commencing, including identification of hazards, associated risk, and appropriate controls for each task and operation found in the work scope. Completed risk registers / hazard assessments shall be incorporated into the Project's SH&E Plan.

   iii. Project execution activities shall confirm the Project SH&E Plan is reviewed and hazards are further assessed given current conditions. To capture nuances or site-specific conditions immediately present that are otherwise unacknowledged, task hazard assessments (THAs, also known as Safe Work Method Statements, Field Level Risk Assessments, Risk Assessment Method Statements, etc.) must be completed and reviewed immediately prior to initiating the task at the work location by those conducting the task.

   iv. SH&E performance reviews at close-out of a project shall be conducted to identify successes and any potential improvement opportunities. As appropriate, preventive actions shall be developed with the goal of continual improvement to industry-, client-, or location-specific SH&E activities, as well as the AECOM SH&E Management System.

b. The manager shall plan required SH&E activities and incorporate SH&E procedures into the location or project SH&E Plan. The SH&E documentation for any project lasting twelve (12) months or longer will be reviewed at periodic intervals, but at least annually.

c. Where necessary, the Project Manager shall seek input from the relevant SH&E team and affected workers into the planning process.

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d. Risk assessment processes shall identify the hazards and mitigations or controls required to eliminate or reduce the associated risk to as low as reasonably practical for each hazard.

e. Those involved in a documented risk assessment shall include trained and competent personnel in hazard identification and use of risk management tools and processes.

f. Results shall be communicated to affected personnel (e.g., SH&E Plans, Tailgate meetings, daily safety huddles, review of documented assessments, etc.).

g. Risk mitigations or controls shall be monitored on an ongoing basis for effectiveness.

h. A risk ranking shall be performed for pre- and post-mitigation efforts. The risk ranking shall be completed using the following AECOM Risk Matrix:

	Severity				
Probability	5 - Catastrophic	4 – Critical	3 – Major	2 – Moderate	1 - Minor
5 – Frequent	**25**	**20**	**15**	**10**	**5**
4 – Probable	**20**	**16**	**12**	**8**	**4**
3 – Occasional	**15**	**12**	**9**	**6**	**3**
2 – Remote	**10**	**8**	**6**	**4**	**2**
1 - Improbable	**5**	**4**	**3**	**2**	**1**

i. If the final risk rating is a 5-9 (medium risk) or 10-25 (high risk), additional hazard controls shall be identified and applied until the final risk rating is reduced to 4 or below. If the final risk rating cannot be reduced to 4 or lower, additional approvals, as shown below, are required before the activity can begin.

Risk Rating (Probability x Severity)	**Risk Acceptance Authority**
1 to 4 (Low)	Risk is tolerable, manage at local level
5 to 9 (Medium)	Risk requires approval by Supervisor or equivalent
10 to 25 (High)	Risk requires the approval of the Project Manager & SH&E Director

Severity – Potential Consequences				
	People	**Property Damage**	**Environmental Impact**	**Public Image/Reputation**
Catastrophic	Fatality, Multiple Major Incidents	>$1M USD, Structural collapse	Offsite impact requiring remediation	Government intervention
Critical	Permanent impairment, Long term injury/illness	>$250K to $1M USD	Onsite impact requiring remediation	Media intervention
Major	Lost/Restricted Work	> $10K to $250K USD	Release at/above reportable limit	Owner intervention
Moderate	Medical Treatment	> $1K to $10K USD	Release below reportable limit	Community or local attention
Minor	First Aid	</=$1K USD	Small chemical release contained onsite	Individual complaint

Probability		
Frequent	Almost certain to occur during task/activity	9/10
Probable	Likely to occur during task/activity	1/10
Occasional	May occur during the task/activity	1/100
Remote	Unlikely to occur, though possible during task/activity	1/1,000
Improbable	Highly unlikely to occur during task/activity	1/10,000

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j. The Project Manager shall review the risk assessments incorporated in the SH&E Plan on site and modify them if circumstances are different or change during the work. Site personnel shall sign the SH&E Plan initially and after any changes to show they have read and understood it.

k. Situations may arise that were not foreseen or accounted for when the operating procedures or plans were developed. The purpose of Management of Change is to protect personnel from hazards caused by major changes in the scope of work. Stop work shall be initiated and appropriate changes in the way the operations are conducted shall be identified so the work can recommence and be performed safely. The changes may be temporary or permanent. A record of the Management of Change shall be documented and employee training on the change completed before work restarts.

l. Mitigation of Hazards

i. Supervisors shall refer to the SH&E Plan to confirm task-based risks are managed in accordance with the hierarchy of controls.

ii. Advance planning enables Safety in Design to be applied to systems, equipment and work areas in order to eliminate, substitute, or apply engineering controls to the hazard.

iii. When determining appropriate controls to mitigate the risk presented by each hazard, the most effective controls (ordered from the most effective at the top of the image above to the least effective at the bottom) shall be assessed and applied as is practicable, with PPE considered the last line of defense.

iv. Layers of control or redundancy shall be established whenever possible (utilizing multiple means e.g., engineered control further supplemented by safe work practices and PPE).

v. When PPE is required, specific basic and/or specialized PPE shall be identified in the SH&E Plan. Supervisors will verify workers and visitors have access to the appropriate PPE and that workers and visitors are properly trained and competent in the use and requirements related to the given PPE. Advice on the use, care, storage and maintenance of PPE is available on the company intranet, or from the SH&E Team.

vi. Managers shall assess the workplace for potential violence scenarios and incorporate findings into the emergency preparedness and response planning where applicable.

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2.3 Personal Protective Equipment (PPE)

a. The following basic PPE is required to be worn at all times on industrial sites:

   i. Hard hat/ bump cap (selected based on applicable hazards), safety glasses with side-shields, work boots, full length trousers, shirt with sleeves, gloves.

   ii. All personnel shall have gloves in their immediate possession 100% of the time when in a shop or on a work site. Appropriate gloves shall be worn when employees work with or near any materials or equipment that present the potential for hand injury due to sharp edges, corrosives, flammable and irritating materials, extreme temperatures, splinters, etc.

   iii. PPE shall be worn at all times on industrial sites unless the employee is in an area clearly marked and the differing PPE requirements defined, in which case the area's requirements shall be met.

b. All personal protective equipment required for the identified hazards shall meet applicable standards (e.g., approved safety glasses worn in environments presenting eye hazards [meaning prescriptive eyewear shall also meet applicable safety standards when eye hazards are present], appropriate class / type of hard hat in a high voltage electrical environment, etc.).

c. All personal protective equipment shall be in good working condition and maintained to manufacturer's specifications. Defective or damaged equipment shall be discarded and replaced.

2.4 Permit Required Activities

a. All work activities shall be evaluated to determine if work permits or specific plans are required.

b. Activities requiring a completed permit or specific plans before work begins (e.g., confined space, lockout / tagout, electrical, hot work, fall protection, radiation, blasting and explosives, temporary protection, critical lifts, excavation, underground work) to safely perform work shall be planned, managed, and executed by competent personnel.

c. Additional tasks (e.g., core drilling, perimeter work, elevator shaft work, stair installation, etc.) shall be assessed based on risk, regulatory requirements and client requirements to determine whether Permit to Work processes are required.

d. The responsibilities, accountabilities, training and competency requirements for the permit issuer, individual permit holders and persons performing permitted tasks shall be clearly defined.

e. All personnel undertaking work requiring a permit shall be made aware of the hazards, how the hazards are being controlled, and the permit conditions that are required to be met.

2.5 Oversight of AECOM Subcontractors / Subconsultants

a. Subcontractors / subconsultants that work for or on behalf of AECOM will be selected/ prequalified in accordance with AECOM's subcontractor management procedure / process.

b. Subcontractor / subconsultant SH&E plans and applicable procedures shall be reviewed prior to initiation of work.

c. Subcontractors / subconsultant SH&E plans and applicable procedures shall comply with the client and AECOM site specific SH&E plan.

d. AECOM shall monitor performance and conduct and report on routine inspections of work activities of subcontractors / subconsultants. Feedback shall be provided as appropriate.

e. Subcontractors / subconsultants shall immediately report all incidents to AECOM and investigate as appropriate.

f. Subcontractors / subconsultants shall follow equivalent due diligence processes for any lower-tiered subcontractors.

2.6 Environmental Procedures

a. AECOM project and office SH&E Plans shall document the identification and assessment of the various environmental aspects and impacts resulting from our business activities. These can be positive or adverse, direct (under AECOM direct control) or indirect (e.g., those created by the activities of our partners and contractors / suppliers).

b. Full account is taken at each stage of office and project activities including under normal / abnormal operating conditions and contingencies (incidents, emergency situations), past / present / foreseeable activities, partner / supplier activities and so on.

c. As applicable to the activities and tasks, the environmental impacts and aspects shall each be assessed for significance to develop, document, and implement suitable and sufficient controls, emergency arrangements, and procedures for identifying, assessing, and managing environmental sustainability for the following considerations:

- Air Quality and Pollution.
- Contaminated Land.
- Ecology, Archaeology and Cultural Heritage.
- Noise.
- Resource Consumption.
- Statutory Nuisance.
- Traffic Management.
- Waste Management.
- Water Quality and Pollution.
- Dust Control Measures.
- Storm Water Management.
- Spill Response.
- Delivery, Storage and Refueling of Fuel, Oil and Chemicals.
- Energy and Water Use, Recycling.

d. In addition, when planning new processes, the environmental risks and impacts are re-assessed in light of any specific, new, or changed factors posed by the proposed new activity and location in accordance with the procedures for risk management and management of change.

   i. The results of these assessments are collated into a country-specific Register of Environmental Aspects and Impacts (as applicable) which is reviewed upon major activity change and / or at least annually and updated accordingly.

2.7 Regulatory Agency Visits

a. Visits or inspections by regulatory agencies for the purpose of these requirements include:

   i. Any non-routine announced or unannounced visit or inspection of an AECOM office or project site by a regulatory agency involved with Occupational Health and Safety and Environmental laws and regulations.

   ii. Periodic visits from service or local agencies to project sites to approve certain activities such as utility hook-up, utility clearance, etc. are not considered regulatory visits or inspections.

b. The Project Manager shall:

   i. Confirm a senior AECOM employee meets with the agency representative to obtain copies of credentials, determine the purpose of the visit or inspection and to request applicable documentation.

   ii. Confirm the visit or inspection is reported in IndustrySafe as an incident within one business day.

   iii. Confirm notification of the relevant Regional SH&E Director and SH&E Manager of the visit or inspection.

   iv. Notify the client a regulatory visit or inspection is occurring on their project site so the client may have representation during the visit or inspection, at their discretion.

   v. Confirm an appropriate AECOM escort is identified and accompanies the agency representative at all times to address questions, observe activities and monitor evidence gathering (this may include obtaining duplication of evidence, such as dual photos and split samples).

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vi. Confirm copies of the visit record and other documents or postings that the agency representative may issue are obtained.

vii. Request a debrief session.

viii. Where a citation, violation, or penalty was issued:

1. Confirm direction is given to the local employees to stop the performance of the cited activity until the appropriate corrective actions are implemented.

2. Confirm any required posting is completed in accordance with the directions outlined by the agency.

3. Confirm a formal response is submitted to the issuing agency and facilitate payment of any associated monetary fine after approval from Counsel.

4. As applicable, serve, or designate an appropriate individual to serve, as AECOM's informal and formal agency negotiation meeting representative to discuss the citation, violation, or penalty.

2.8 Office Safety

a. Each AECOM office will develop an Office SH&E Plan in accordance with the template provided on the company intranet.

b. Managers shall confirm that employees understand any specific risks, are briefed in the correct emergency response procedures, and have access to emergency equipment.

c. All visitors to the office shall sign in and be given an SH&E orientation / induction.

d. All offices shall have an SH&E noticeboard in place with current relevant materials posted to include but are not limited to the AECOM SH&E Policy, Life Preserving Principles as well as any other local regulatory or geography specific information.

e. Offices shall be inspected to identify and address any specific hazards. Hazards shall be controlled or have actions in place to mitigate the risk.

f. Safety committees shall be established in accordance with jurisdictional requirements and as a minimum, in AECOM offices of more than 50 employees.

g. All office equipment and workstation design and installation shall take ergonomic performance into account. Equipment and workstations shall be, as far as practicable, designed and installed to suit the individual(s) interacting with them.

h. Workplace ergonomic hazard assessments shall be performed when necessary and required controls implemented as far as practicable.

3 Field

3.1 Confined Space Entry

a. All confined spaces shall be evaluated and classified by a competent person as permit or non-permit.

b. Efforts shall be made to eliminate the need to enter a confined space where practicable.

c. Confined space entries shall be planned and managed by competent personnel.

d. Only trained, authorized, and fit for duty personnel shall enter, or attend the entry of, a confined space.

e. No entry shall occur without an assessment that includes hazard identification and appropriate hazard control measures (e.g., suitable atmospheric testing requirements defined, inspection requirements to confirm equipment is fit for purpose, etc.).

f. A rescue plan shall be prepared and communicated to the entry and rescue teams.

g. Confined space entry shall never be conducted alone.

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h. Atmospheric testing is required for all permit-required confined spaces, and if necessary to confirm absence of atmospheric hazards in non-permit confined spaces.

3.2 Working at Heights / Fall Protection

a. An assessment shall be completed prior to the start of working at heights.

b. Where practicable eliminate the need to work at heights. Alternatively, a safe working platform shall be a priority (e.g., elevated lift or scaffolds). Fall prevention shall take preference over fall arrest systems.

c. As a minimum standard, fall protection is required and will be provided for any work/job/task to be performed above the normal walking/working surface at heights of 6 feet (2 meters) or greater in the construction, mining, and demolition industry, and 4 feet (1.2 meters) or greater in all other industries. Local regulatory standards or consensus standards that are more conservative than this minimum standard shall be applied in the applicable jurisdiction.

d. Only competent / qualified / trained personnel shall select and use personal fall prevention/arrest systems or access equipment that provides appropriate protection from falls (e.g., aerial lift, scaffold).

e. Edges shall be considered when evaluating proper fall protection.

f. Only competent / A rescue plan for personal fall arrest systems shall be in place for work at heights.

g. Material and tools used at heights shall be adequately secured or prevented from falling and an appropriate exclusion zone shall be established when working at heights.

h. Three points of contact (two hands and one foot, one hand and two feet) shall be maintained when accessing ladders or other structures. Ladders shall not be used as a working platform.

3.3 Demolition

a. Demolition operations shall be planned and managed by competent personnel. Where appropriate to accurately identify applicable hazards, an engineering survey of the structure shall be incorporated into the work planning (e.g., planning for mechanical equipment, debris containment, etc.).

b. Applicable permit to work processes shall be followed prior to demolition work commencing.

c. An assessment shall be completed that identifies and documents the hazards and controls associated with the planned demolition activities.

d. The demolition structure shall be assessed for the presence of harmful materials. Methods for monitoring, testing and management of potential exposures to atmospheric contaminants will be established and evaluated by a qualified person.

e. All activities involving demolition equipment, explosives and blasting shall be managed by competent and authorized personnel.

f. All sources of energy including, but not limited to, electric, gas, water, steam, sewer, and other service lines shall be isolated.

3.4 Energy Isolation

a. Where the release of energy during major replacement, repair, renovation, or modification of machinery, equipment, or systems or during installation of new machines, equipment or systems may cause injury to personnel, an assessment shall be conducted.

b. Lockout tagout (LOTO) activities are required when:

   i. An unexpected energization or start-up of machines and/or equipment would result in the release of stored energy which could cause injury to an employee.

   ii. Any employee (or contractor) is required to remove or bypass a guard or other safety device.

iii. Any employee (or contractor) is required to place any part of their body into the mechanism of a piece of equipment or path of hazardous energy.

c. No work shall be initiated (including LOTO procedures) prior to obtaining any required work permits.

d. Only qualified and licensed personnel shall be allowed to work on energized systems including testing and tagging of equipment.

e. Competent personnel shall verify systems are de-energized prior to conducting work activities.

f. Locks shall not be removed without proper authorization.

g. Identify and communicate to all affected personnel and to all employees whose work operations may be in an area where LOTO procedures may be utilized.

h. LOTO procedures shall include requirements applicable to:

i. Shut-down of equipment or request for de-energization of an energy source(s).

ii. Lockout of energy source(s) and tagging to identify the lockout controls and parties involved.

iii. Inspection and verification of de-energization, and application of locks and tags.

iv. Methods to coordinate multiple locks and the continuation of LOTO protection through shift or personnel changes.

v. Control and accountability of locks and tags, including processes for emergency lock removal.

vi. Equipment-specific LOTO procedures.

3.5 Electrical Safety

a. All applicable electrical codes, SH&E procedures and manufacturer's specifications shall be followed to eliminate the need to directly work on live electrical systems where practicable.

b. Electrical work, (meaning work associated with equipment or systems of 50 volts or greater, or a current of 20 amps or greater) shall be assessed, planned, and managed by competent personnel.

c. Only competent and authorized personnel shall perform work on live electrical system components.

d. Written and approved justification is required to work on energized systems and is only authorized when de-energizing introduces additional or increased hazards or is infeasible due to equipment design or operational limitations (life supporting interruptions, deactivation of emergency alarms, shutdown of ventilation equipment in hazardous location).

e. A permit to work process shall be established and implemented for live electrical work.

3.6 Excavation & Trenching

a. Excavation and trenching operations shall be planned, managed, and executed by competent personnel.

b. Applicable permit to work processes shall be followed prior to excavation or trenching activities commencing.

c. Before any excavation work is undertaken, an assessment shall be conducted to identify, assess, and manage the hazards present.

d. Overhead obstructions and underground utilities / installations shall be clearly identified.

e. Appropriate control measures to prevent contact with overhead obstructions and underground utilities / installations, including establishing suitable clearances, shall be in place prior to work commencing.

f. Fit-for-purpose equipment, protective systems (e.g., barriers, lighting, signage, etc.), and means of access/egress shall be selected, installed, operated, and maintained in a way that minimizes the risk of injury to personnel and the public, and damage to property.

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g. Inspection of excavations (as a minimum, any excavation greater than 1.5 meters [5 feet]) and any protective systems shall be undertaken by a competent person as appropriate to the conditions and in compliance with regulatory requirements.

3.7 Underground Work / Tunneling

a. Tunneling operations shall be planned, managed, and executed by competent personnel.

b. Project managers or supervisors are responsible for confirming employees involved in underground work possess any required training, registrations, or certifications.

c. Applicable permit to work processes shall be followed prior to underground work / tunneling activities commencing.

d. Before any underground work is undertaken, an assessment shall be conducted to identify, assess and manage the hazards present.

e. A safe means of access to and egress from all work locations shall be provided and access to all openings controlled to prevent unauthorized entry.

3.8 Heavy Equipment

Heavy equipment (also referred to as mobile equipment) includes, but is not limited to, equipment such as backhoes, excavators, skid steers, graders, loaders, dozers, tractors, cranes, drills, and draglines.

a. Verify that employees comply with applicable regulatory, client and supplier requirements relevant to operating heavy equipment.

b. Tower cranes and personnel hoists shall be inspected by an independent third party both at the third party's facility and at the site prior to mobilization.

c. Heavy equipment shall be selected, equipped, operated, inspected, and maintained in a way that enables safe operation, protects personnel from harm, and conforms with regulatory and manufacturer requirements.

d. Ground guides / spotters shall be used to facilitate safe movement of heavy equipment near personnel, equipment and utilities, and when obstructions or congestion present hazards to safe operation.

e. Back up alarms or equivalent means to allow for safe reverse movement, are required on all heavy equipment.

f. Daily documented inspections shall be completed on all heavy equipment prior to operation.

g. Only authorized operators who are fit for duty and meet jurisdictional requirements shall operate heavy equipment.

h. All local laws including signs, postings, regulations, and codes applicable for the jurisdiction in which the equipment is being operated shall be observed.

i. Heavy equipment operations shall be adequately separated from light vehicles, workers and pedestrians. If separation is not possible, appropriate procedures shall be implemented to maintain the safety and health of personnel involved.

j. Positive communication shall be implemented between ground personnel and heavy equipment operators.

3.9 Lifting Operations

a. Lifting operations shall be planned, managed, and executed by competent personnel.

b. Operators, riggers, banks-man, and inspectors shall be certified according to jurisdictional requirements to carry out their work as it relates to lifting operations.

c. Fit-for-purpose lifting equipment shall be selected, positioned, installed, operated, and maintained in a way that minimizes the risk of injury to personnel or property damage. This is to include equipment used for incidental lifts.

d. Inspection and testing of lift equipment shall be undertaken by a qualified person.

e. No lifts shall commence without a lift plan in place and approval by a qualified person.

f. Critical lifts require a formal, written plan. A critical lift is a non-routine crane lift (e.g., more than one crane or hoisting device, lifts over structures or equipment, load may be out of the operator's view, hoisting personnel, etc.) requiring detailed planning and additional or unusual safety precautions.

g. Lift plans shall specify wind restrictions in accordance with jurisdictional requirements, manufacturer requirements. As a minimum 30 mph (48 km/h) shall be the maximum wind speed for material hoisting, and 20 mph (32 km/h) for hoisting of personnel.

h. Audible alarms or equivalent communications means shall be utilized to alert personnel in the area immediately prior to the imminent lifting operation.

i. Appropriate exclusion zones shall be defined and in place prior to lifting operations commencing so as to prevent the risk of injury from the equipment or the load falling or striking personnel, and may be comprised of physical barriers, warning signs, signage and/or spotters.

j. Taglines shall be used to control load movement. If tagline usage poses a safety hazard this shall be reflected in the planned procedure and the task hazard assessment, and a short line of suitable length shall be attached to allow the worker to catch the load.

3.10 Working Alone

a. An employee is considered a lone worker if he / she is performing work with no line of sight or direct voice communication with another person who is aware of their assignment and capable of initiating emergency response.

b. When traveling alone, staff shall take appropriate precautions, including notifying their manager of the travel plans, check in times, as well as carrying a communication device and appropriate safety equipment.

c. Managers shall plan work to restrict personnel from working alone on any site without an appropriate risk assessment, controls, and approvals. If an employee will be out of contact with other personnel, the manager shall establish a buddy system or check-in procedure with another employee or responsible person.

d. Employees shall not conduct permit required or high residual risk tasks (e.g., confined space entry, work on an energized system) while working alone.

e. Where employees are undertaking office / computer-based work alone outside of normal working hours, they shall confirm security measures are in place (e.g., lock doors), support can be contacted and provided in the event of an emergency, and where appropriate, check-in procedures are established.

3.11 Temporary Works

Temporary works are the structures and installations enabling permanent construction to take place (e.g., formwork, false work, precast, shoring, scaffolding, back propping, temporary structures, etc.).

a. Temporary works shall be identified, designed and independently verified by appropriately qualified persons, and shall be installed in accordance with the design. Installation shall be verified by an appropriately qualified and competent person prior to initial use and loading.

b. Temporary works shall be regularly inspected by competent persons.

c. No changes to installed temporary works shall be made without prior acceptance of the designer, and if necessary, further design certification and independent verification of the changes.

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d. Temporary works shall be physically protected and secured where there is a risk of collision, or damage through adverse weather conditions or adjacent work practices.

3.12 Unmanned Aircraft Systems (UAS)

All AECOM operations using UAS shall be properly planned, managed, and executed to enable compliance to applicable requirements and prevent harm. AECOM has established the UAS Working Group; a team comprised of SH&E, Insurance, Operations, and UAS expertise. The UAS Working Group provides oversight of UAS operations to:

a. Provide expertise and support for commercial UAS operations within AECOM to enable compliant, professional, and responsible operations.

b. Review proposed UAS activities in AECOM for adherence to established procedures and operating guidelines, approval of personnel, performance in accordance with project work plans, and approval by UAS subject matter experts.

c. Approve UAS operations as appropriate and coordinate approved UAS activities with the Insurance function for appropriate insurance coverage.

d. Confirm field-level risk mitigation strategies are developed and integrated with the project work plans, and that flight safety briefings with all project personnel are conducted prior to the flights.

3.13 Working on or Near Water

a. Work activities that entail operations on, above, under or near water shall be assessed for hazards and the hazards appropriately mitigated.

b. If applicable to the identified hazards, a rescue plan and communication arrangements shall be established.

c. The hiring or leasing of watercraft shall take into consideration the seaworthiness of the vessel and that only licensed personnel can operate the craft.

d. Diving activities are prohibited unless specifically approved by the applicable Regional SH&E Director or designee (e.g., Diving Board).

3.14 Marine Safety & Vessel Operations

a. Project managers shall confirm boats / vessels selected are appropriate to the planned work activities and vessel operators are licensed to operate in the applicable jurisdiction.

b. All boats and vessels shall be properly equipped and operated by a qualified vessel operator (e.g., Marine Operations Superintendent, Master Mariner, Barge Captain, or similar authority and title) in accordance with the applicable jurisdiction’s Marine Safety Laws.

c. A site-specific SH&E Plan, Float Plan and any other SH&E planning documents shall be developed and in place prior to vessel operation.

3.15 Rail Corridors

a. AECOM employees shall not enter a railroad right of way without appropriate coordination and approval by a local railway employee (or representative of the railway owner) with knowledge of the operation and means and authority to enable on track safety.

b. Prior to performing work in a railroad right of way or railyard, AECOM employees will be provided with clear instructions applicable to the specific railroad operations, associated hazards, procedures, and requirements to enable employee safety associated with occupying the railroad right-of-way / fouling of tracks and the means of communication.

c. AECOM employees and equipment shall not foul the track (be in such proximity to a track that the individual or equipment could be struck by a moving train or on-track equipment) without securing appropriate approvals.

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d. An on-site safety briefing shall be conducted at the start of the shift, after work breaks, and any time there is a change in the nature of the work, a change in method of on-track safety being provided, or a change in the work area environment. Additional parties shall be engaged and included as required and appropriate (e.g., host railroad employee with the means and authority to provide on track safety protection).

e. Written documentation of the on-site safety briefing shall be provided by the AECOM employee-in-charge (EIC) of the work being performed on railway property.

3.16 Munitions & Explosives of Concern / Unexploded Ordnance (MEC/UXO)

a. Prior to beginning any activities on a site suspected of MEC / UXO, every effort shall be made to determine whether munitions-related activities ever occurred on the specific work area or within waters on which AECOM operations/activities will take place.

b. All MEC / UXO encountered or suspected on AECOM jobsites shall be treated as extremely dangerous. Employees shall not touch the suspected material and shall retreat. Employees shall identify the location, notify other team members, keep all employees out of the area, and report the finding to their supervisor.

c. MEC support activities, including surface and subsurface removal activities, shall be handled by UXO-qualified personnel only.

4 Change Log

Rev #	Change Date	Description of Change	Location of Change
1	15-Jun-2015	Complete rewrite – integration of URS & AECOM programs	Various locations
2	01-Aug-2016	Refer to SH&E Management System Manual Edit Summary – August 2016	Various locations
3	01-Aug-2017	Refer to SH&E Management System Manual Edit Summary – August 2017	Various locations
4	14-Jan-2019	Rewrite and restructure into 1 manual and 3 attachments (this document as ATT3). Refer to SH&E Management System Manual Edit Summary – January 2019	Various locations
5	03-May-2019	Added reference to S2-001-ATT4 SH&E High Risk Events Guidance	Section 2.2
6	14-Jun-2023	Revisions throughout to align with current organizational terminology. Renumber from ATT3 to WI3.	Various locations
7	13-Dec-2023	Remove EIR Template reference and revise required / optional EIR content.	Section 0.8 h
8	21-Mar-2024	Added new bullet (e) and sub-bullets to section 0.4 Fit for Duty	Section 0.4 e
9	22-July-2025	Updated core value reference. Updated hazard assessment content and probability table.	Section 0.10 and Section 2.2
10	13-Nov-2025	Revised Risk Acceptance Authority for Medium Risk to “Risk requires approval by Supervisor or equivalent”	Section 2.2 (h.i.)

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SH&E Training

S3AM-003-PR2

1. Purpose and Scope

a. This procedure establishes the minimum Safety, Health, and Environment (SH&E)-related orientation and training requirements for employees to identify and control SH&E risks in their work, dictated by the work each employee performs (or is expected to perform), and the geographic area(s) where the Employee performs these activities.

b. This procedure outlines the process and minimum requirements for classifying an AECOM employee as a "Competent Person" to oversee and/or self-perform work activities. Local law may contain alternate definitions for Competent Person, and it is the responsibility of the Project Manager, in conjunction with an SH&E Manager/Director to determine and resolve conflicts, if any, existing between AECOM and applicable regulatory definitions.

c. This procedure defines recordkeeping requirements, aims to maintain consistency in SH&E training content, and provides a framework to assess participant competency and understanding.

d. This procedure applies to all AECOM Americas-based employees and operations, as well as contracted personnel required to comply with this document's content.

2. Procedure

2.1 New Employee SH&E Orientation

a. Employees must complete the required SH&E training assigned through Learning Management System (LMS) – AECOM University (AECOM U) or other approved platform.

b. Employees must complete a "new hire" SH&E orientation on the AECOM SH&E systems including hazard reporting, risk management, and accessing procedures/resources.

c. Employees must also be provided with a local office-specific orientation to include information on safety reporting, emergency response plans, and other office-specific SH&E topics.

d. Orientation should be completed within 1 week, but no longer than 1 month, from the employee's hire date and must be completed prior to undertaking any field work.

e. New Employee SH&E Orientation – Americas form or equivalent may be used to document new employee SH&E orientation progress.

2.2 Project- / Site-Specific SH&E Orientation

a. Employees must complete a relevant project- and/or site-specific orientation provided by AECOM, the controlling contractor, and the client, where applicable, within the specified timeframes of the project and before initiating site work.

b. Staff and AECOM-managed subcontractors must not enter a site unless they have received the relevant orientation.

c. The Project Manager is responsible for confirming that the on-site orientation for AECOM employees and AECOM-managed subcontractors has been completed prior to the commencement of work.

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d. Orientation requirements can be outlined in the project-specific SH&E Plan / Safe Work Plan (SWP) / Task Hazard Assessment (THA ; e.g., Field Level Risk Assessment [FLRA] in Canada) and should, at a minimum, cover the following items:

   i. Scope of work / project overview;

   ii. Key personnel;

   iii. Local law, client, and any other requirements;

   iv. Incident reporting and management process including the importance of near miss and observation reporting to enhance safety awareness and culture - refer to SH&E Incident Response and Investigation – Americas;

   v. Communication and consultation arrangements, including the safety escalation and resolution process - refer to SH&E Communication and Consultation – Americas;

   vi. Site-specific safety procedures and rules (as applicable) regarding minimum personal protective equipment (PPE) requirements, alcohol and drugs policy, smoking areas, parking, deliveries, visitors, exclusion zones, permits, hours of work and fatigue policy, etc. - refer to SH&E Risk Assessment and Planning – Americas and Safety Gear – Americas;

   vii. Risk management processes, such as critical risks and critical controls, SH&E plans/SWPs/THAs (e.g., FLRAs in Canada), and 4-Sight - refer to SH&E Risk Assessment and Planning – Americas;

   viii. Red Card – Stop Work Authority - refer to Safety Tenets and Stopping Work – Americas;

   ix. Key workplace hazards/risks and control requirements;

   x. Emergency management;

   xi. Environment, community, and stakeholder requirements; and

   xii. Safety observations.

e. The Project Manager must maintain a record (e.g., acknowledgement page of the SH&E Plan, orientation sign-off page) of all site orientations conducted (including AECOM-managed subcontractors) in the project folder.

2.3 Risk-Based Approach to SH&E Training

a. Assessment of SH&E Training Requirements – Americas should be used as a guideline for providing SH&E training to employees per the requirements of their role, in relation to the specific risks posed by their work activity, and in accordance with legal, client, and industry requirements. Other applicable region-, business line-, or project-specific training assessments should also be consulted.

b. In Canada, project-specific training is identified and listed in the Project-Specific SH&E Plan – DCS – Americas – Canada.

c. All employees who will perform work outside of the office setting must discuss and develop their training needs with their direct supervisor within 1 week of hire and annually thereafter. Employees should review their SH&E training requirements in conjunction with their annual performance review.

d. SH&E training needs may be identified through individual risk assessments, incident investigations, observed non-compliance, when procedures change, or through the annual staff appraisals process. As required, appropriate training must be arranged and may be provided through LMS – AECOM U courses, safety meetings, and/or classes delivered by internal or external providers.

e. All personnel who are required to fulfill a designated emergency response role must be trained in their responsibilities and be well-versed in the specific Emergency Response Plan for the workplace. Minimum training requirements are detailed in Assessment of SH&E Training Requirements – Americas.

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f. All workers and visitors at AECOM-controlled workplaces must be trained (workers) or briefed (visitors) on emergency evacuation and response protocols during the orientation process and must be required to participate in any emergency-related training as required (e.g., evacuation drills and simulated response exercises).

g. For larger scale projects, a site-specific training matrix can be developed to identify specific training requirements, including competency, licensing, and qualifications, for specific project personnel including contractors if applicable. It is the responsibility of the Project Manager to confirm that this document is maintained.

h. Project managers must review the relevant training and certification records of all employees on their projects prior to mobilization into the field to confirm that they have current and appropriate training.

2.4 Visitors and Delivery Drivers

a. Where visitors to project sites are required to enter operational work areas, it is recommended that they receive a brief site-specific orientation and always be supervised by fully orientated and safety trained site personnel while on site.

b. Where delivery drivers are required to enter an operational project zone, it is recommended they participate in a brief delivery driver orientation to familiarize themselves with the site specifics.

c. Where regular deliveries are expected on the project, the Project Manager should make early contact with the transport companies involved to arrange for orientation to be programmed well in advance of deliveries commencing.

2.5 Short Service Employees (SSE)

a. An employee is designated as an SSE if they are undertaking work in the field and have less than 6 months of experience working in the industry of the work to be performed.

b. An employee is not considered an SSE if they have more than 6 months of fieldwork experience in a similar industry and can demonstrate competency in AECOM's safety management system and processes.

c. Former employees who return to AECOM within 12 months and are placed into the same job assignment may not be designated as SSEs.

d. Specific circumstances may warrant the extension of the SSE designation, reduction of the required time identified in the schedule, or an exemption. Project managers must consult the Regional SH&E Manager with any SSE schedule variance or exemption requests, if applicable. Refer to SH&E Management System Variance Request – Americas.

e. SSEs must receive all required training and certification prior to being mobilized into a field environment. Until training has been provided, SSEs may only attend work sites under the direct supervision of a trained employee who is competent to perform the work activity. This supervision must continue until the SSE has received training and is deemed competent to undertake the task.

f. Where specific training is not immediately required, a training plan must be established. The training plan should outline the schedule for the required training to be achieved prior to the SSE being mobilized into a field environment.

g. SSEs must not be assigned to field projects unless they are supervised on site by safety oriented and trained personnel. It is the responsibility of the Project Manager to ensure that all new employees are suitably supervised by a Competent Person in all situations where they may be exposed to harm and while performing high risk work, until such time as they have had sufficient training and/or have demonstrated competence.

h. SSEs are not permitted to work alone or away from their field team at any time.

i. As required, project managers must notify the client and/or host facility when an SSE will be working at their site.

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j. An identification system (e.g., green hard hats) to readily differentiate SSEs from other employees must be implemented when required by the client and/or local law.

2.6 Competency

a. A designation of Competency may be required for certain tasks. The competencies required for a particular employee must be established by the Employee's Supervisor at the time of orientation and whenever new equipment or tasks are introduced to the workplace.

b. The Competent Person Designation – Americas form or equivalent must be used for documenting Competent Person designations. Documentation must be filled out completely and updated as necessary. Project-specific competency designation requirements may be defined in the SH&E Plan, SWP, and/or THA (e.g., FLRA in Canada).

c. Employees are not allowed to carry out high-risk work unless they have the required certificates/licenses for the type of work being conducted (refer to the SH&E Manager for further information). High-risk work license/training records must be available for review.

d. Where competency is not yet established, the Supervisor or Project Manager must confirm that gaps are documented on the training plan. The Employee must be provided with sufficient instruction and an opportunity to undertake the task under supervision by a Competent Person until their competency is established.

e. All training records, work licenses, and certificates must be maintained by each Supervisor or Project Manager in the project files.

2.7 Safety Training – General Requirements

a. Training Competency Levels

   i. Awareness Level: The primary goal of awareness-level training is to transfer basic knowledge to enable employees to recognize and avoid hazards. Additionally, employees must learn what precautions are necessary when they are exposed to hazards, and the precautions may necessitate additional training. Training typically takes the form of instructor-led discussions, presentation of related video content, and/or self-directed e-learning modules. Comprehension may be assessed through discussion of the training topic with the participants and/or a simple quiz.

   ii. Performance Level: Performance-level training must build upon the awareness-level training for certain high-risk tasks. The goal of performance-level training is to have employees successfully demonstrate they can apply the knowledge discussed during training and perform the desired skills necessary to perform higher-risk tasks. Training materials are provided and discussed and must incorporate a demonstration of the skills to be completed. The instructor must gauge the level of understanding through interactive discussion with participants and a pass/fail designation of demonstrated skills by the employees. A test or quiz of moderate difficulty must be provided followed by the successful demonstration of the desired skill to receive certification.

b. Training Delivery

   i. Internal Training: Internal training is performed by AECOM's internal resources and may include online webinar and classroom-based training. Peer-reviewed AECOM training materials must be used for training whenever they are available to facilitate consistency in content and duration of training. AECOM-based training materials can be supplemented as appropriate with content specific to the program, project, customer, office, or geographic unit. Trainers should be approved by an SH&E Manager. Training format and material must be appropriate to the topic and audience. Course content must be periodically reviewed and updated as appropriate, or multiple versions of training may be developed for rotating use to provide participants with new learning materials and avoid stagnation or to meet specific regulatory requirements.

   ii. External Training: External vendors must be pre-approved by an SH&E Manager to conduct training not available through internal training sources. This training may be classroom, web seminar, or online training.

c. Training Evaluation

   i. At the conclusion of a training event, participants should be provided with the opportunity to anonymously evaluate the training session. Instructors must review evaluations at the conclusion of training, and information from the evaluations must be considered when revising training content.

d. Ongoing Training Maintenance

   i. Training should be tracked electronically using LMS – AECOM U or Workday whenever possible.

   ii. Training may expire in accordance with requirements specified in applicable local law or policy.

   iii. If training required by AECOM or local law expires, employees must be disqualified from performing associated tasks until training has been renewed.

   iv. Refresher training may be provided in the following circumstances if:

      1. an employee is observed working or operating equipment in an unsafe manner
      2. an employee is involved in an incident
      3. an employee is assigned a new task or type equipment; or
      4. a condition in the workplace changes in a manner affecting personal safety or the safe operation of equipment.
      5. As required by local law.

3. Training

Individuals administering LMS – AECOM U SH&E training are required to undertake LMS training from the implementation team.

4. Terms and Definitions

a.	Competent Person	An employee who, through education, training, and experience, has knowledge of applicable regulatory requirements, is capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.
b.	LMS – AECOM U	Learning Management System – AECOM University – An electronic training delivery and data management system utilized to implement and document the SH&E training program.
c.	SH&E	Safety, Health, and Environment.
d.	SSE	Short Service Employee – SSEs are those who have been newly hired or transferred to a different position in the company (e.g., one with new and possibly unfamiliar hazards and safe operating procedures).

5. References

a. Safety Tenets and Stopping Work – Americas S3AM-001- PR2

b. SH&E Incident Response and Investigation – Americas S3AM-004-PR2

c. SH&E Communication and Consultation – Americas S3AM-006-PR2

d. Safety Gear – Americas S3AM-208-PR2

e. SH&E Risk Assessment and Planning – Americas S3AM-209-PR2

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6. Records

a. Records include the following:

   i. Assessment of SH&E Training Requirements – Americas S3AM-003-FM1

   ii. New Employee SH&E Orientation – Americas S3AM-003-FM6

   iii. Orientación de seguridad y salud para nuevos empleados - Américas S3AM-003-FM6(ES)

   iv. Competent Person Designation – Americas S3AM-003-FM7

   v. Daily Safety Meeting – Americas S3AM-209-FM5

   vi. Project-Specific SH&E Plan – DCS – Americas – Canada S4[DCS]AM(CA)-209-FM1

   vii. SH&E Management System Variance Request – Americas S3AM-215-FM2

b. Completion of the orientation provided by AECOM must be documented, initialed, or signed by the orientee and stored in the project folder or in a local (office) folder.

c. On or prior to completion of the orientation, copies of the orientee's safety training certificates must be collected as appropriate to their scope of work. Employees are also required to keep copies of certificates and provide these as requested by the SH&E team, their supervisors, or project managers.

d. Companywide training must be captured and recorded through LMS – AECOM U. LMS - AECOM U can also be used to deploy and track local courses as required.

e. External training must be tracked through use of LMS – AECOM U where an applicable course code has been established, or it is acceptable to capture this through business line or other local training registers or in Workday. These must be reviewed periodically for accuracy.

f. Courses denoted in Assessment of SH&E Training Requirements – Americas or commonly required training must be tracked in LMS – AECOM U when completed. Employee training tracked in LMS – AECOM U must be retained for the duration of the Employee's employment.

g. Classroom training must be documented using an attendance record and course agenda.

h. For training provided by customers/vendors, training documentation must be entered into a training database, and documentation must be maintained by the Employee.

i. In some cases, objective evidence of comprehension is required (passing a test), and this information may be tracked in addition to the course information.

j. Attendance sheets, agendas, course evaluations, completed tests, and copies of certificates must be maintained and filed in program or project training files by course.

k. Locations, projects, and programs must maintain records on any project-, program-, location-, or site-specific training requirements.

l. Managers should verify that employees have the required training prior to assigning or authorizing specific roles and responsibilities to each employee.

7. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	01-Dec-2025	Initial release as S3AM-003-PR2; consolidated portions of the contents from the following retired documents: SH&E Training – Americas S3AM-003-PR1, Newly Hired or Transferred Employees – Americas S3AM-015-PR1, and Competent Person Designation – Americas S3AM-202-PR1.	All

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Driving

S3AM-005-PR2

1. Purpose and Scope

a. This procedure establishes requirements for when operating:

   i. AECOM-owned, rented, or leased vehicles, client- or customer-owned vehicles, and personal vehicles used by AECOM employees on AECOM business.

   ii. Off-Highway Vehicles (OHVs), including all-terrain vehicles (ATVs), utility task vehicles (UTVs), and snowmobiles used to transport AECOM site personnel.

b. This procedure applies to all AECOM Americas-based employees and operations, as well as contracted personnel required to comply with this document's content.

c. Additional driving requirements are set forth in the Travel Policy – AECOM Global..

1.1 Critical Controls

The following is a list of the minimum required critical controls to be implemented as applicable by the Project Manager or Designee to prevent high potential/significant incidents:

a. Only Authorized Drivers are to operate a motor vehicle on AECOM business (this applies to rental, personal, client- or customer-owned, and AECOM-owned or leased vehicles). An Authorized Driver is an employee who receives Supervisor/Manager and, as applicable, Fleet Manager approval following evaluation of driver criteria to drive and maintain an AECOM-owned, leased, or rented vehicle, a client- or customer-owned vehicle, or a personal vehicle while conducting AECOM business.

b. Authorized Drivers must maintain a valid and current driver's license with full privileges applicable to the vehicle to be operated and location. AECOM-owned, rented, or leased vehicles are for official business use only and are not to be used for personal activities.

c. Personal vehicles driven by Authorized Drivers on AECOM business must satisfy the registration and insurance legal requirements. Refer to the Travel Policy – AECOM Global, local travel procedures, and local Employee Handbook (refer to the Employee Handbooks Ecosystem page) for any additional requirements or approvals for personal vehicle use.

d. The Manager/Supervisor must work with the Safety, Health, and Environment (SH&E) Manager to determine driver training and qualifications specific to the project and vehicle. Refer to Section 3 - Training for additional information.

e. Prior to use of electric or hybrid electric vehicles, employees must review manufacturer charging instructions.

f. The use of fully autonomous, self-driving features is prohibited.

g. Employees with conditional licenses are prohibited from operating vehicles on AECOM business.

h. Drivers must follow all traffic laws and are prohibited from being under the influence of alcohol or drugs or improperly using medication in a way that could diminish an employee's ability to drive. Refer to Substance Abuse Prevention – Americas.

i. Authorized Drivers must immediately report the following:

   i. A change or limitation(s) to their operating license to the appropriate AECOM Human Resources Representative or Manager/Supervisor.

   ii. Receipt of a legal summons associated with a moving violation related to the use of a company vehicle to the appropriate Manager/Supervisor and SH&E Manager.

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j. All Authorized Drivers must perform a walk-around inspection of the vehicle prior to operation on company business and confirm the vehicle is in good working condition before operating. Pre-operation vehicle inspections can be documented by Authorized Drivers utilizing Vehicle Inspection Checklist – Americas or similar.

k. A roadside assistance service should be identified prior to operation of a vehicle on AECOM business. Employees must never change tires or make repairs to vehicles in the field unless this activity is covered in an approved project-specific SH&E plan, with justification provided.

l. The use of portable electronic devices, consumption of food, smoking, or other activities that may distract the driver while driving is prohibited. Electronic devices include, but are not limited to, all mobile phones, laptops, radios, GPS units, DVD players, tablets, and other portable electronic devices that can cause driver distraction whether hand-held or hands-free.

   Note: GPS units and devices (e.g., smart phones, tablets) used for navigation may only be used if factory installed or secured to the vehicle with a bracket that allows the driver to view the image without having to take their eyes off the road. Consult jurisdictional requirements and with the SH&E Manager.

m. The vehicle may not move until the driver:

   i. and all passengers have fastened their restraints in the proper manner.

   ii. has adjusted their seat, all mirrors, steering wheel, and any other adjustable driver devices.

   iii. has adequately secured all transported cargo.

n. Authorized Drivers are responsible for monitoring their assigned AECOM-owned/leased/rented vehicle for any service or maintenance requirements and are expected to coordinate repairs and service through their respective Fleet Manager. Vehicles are to be maintained according to manufacturers' specifications, local law, and the applicable environmental and operating factors (e.g., winterized with appropriate fluids, winter tires installed, and appropriate coolant for hot climates).

o. AECOM-owned or leased vehicles are to have a first aid kit, portable fire extinguisher, safety triangle, and two reflective safety vests. If not available, contact the Project Manager/Supervisor or SH&E Manager to determine how to obtain a kit. The kit should be modified based upon the project Task Hazard Assessment (THA; e.g., field level risk assessment [FLRA] in Canada) or client requirements, with additional equipment such as additional means of communication for remote locations.

p. Motorcycles may not be operated on AECOM business unless specific written approval is received from the SH&E Manager.

q. Reverse parking of vehicles while on business is recommended. A spotter must be used when the backing of trucks and heavy equipment presents a risk of collision.

r. AECOM-owned/rented/leased vehicles, personal vehicles, and specialty vehicles must not be modified beyond manufacturer's specifications without relevant approvals from SH&E.

s. When practical, alternatives to road travel including teleconferencing/video conferencing, the use of public transportation, or carpooling should be evaluated.

t. Employees must never operate motor vehicles while excessively fatigued. Refer to Fitness for Duty – Americas.

1.2 Journey Management

a. Drivers who will undertake trips more than 250 miles (400 km) each way, drive in remote or hazardous areas, or when otherwise deemed necessary or specified in project-specific requirements, must develop and document a journey management plan (JMP) using Journey Management Plan - Americas or equivalent.

b. Refer to SH&E Risk Assessment & Planning – Americas for additional requirements.

c. A JMP typically includes the route; location of route hazards; timing; rest periods and locations; and communications, emergency response, and security arrangements.

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1.3 Commercial Motor Vehicles

Prior to operating a Commercial Motor Vehicle (CMV), an SH&E Manager must be engaged to clarify and confirm that CMV operator requirements have been met. This may include the following:

a. Additional training.

b. Driver's logs.

c. Appropriate marking of vehicles.

d. Medical exams.

e. Drug and alcohol testing requirements.

1.4 Off-Highway Vehicles (OHVs)

a. Prior to operation, employees must obtain approval to operate OHVs from the Project Manager and SH&E Manager. Examples of OHVs include ATVs, utility task vehicles (UTVs), and snowmobiles.

b. For OHVs, the following minimum personal protective equipment (PPE) must be worn and equipment available:

   i. Helmet including the appropriate institute label.

   ii. Eye and face protection (conduct THA for appropriate selection).

   iii. Ear protection as needed.

   iv. Gloves.

   v. Clothing: Wear protective over-the-ankle footwear with low heels, sturdy jackets and pants. Dress for cold and wind chill as appropriate (e.g., face guard, helmet liner, etc.). Do not wear scarves or loose clothing that could potentially become entangled with moving parts.

   vi. OHVs with seating for more than one person must be manufacturer-equipped with seat belts and rollover protection systems.

   vii. First aid kit.

   viii. Small fire extinguisher, as required.

c. Refer to Safety Gear – Americas for additional PPE requirements.

d. Prior to starting an OHV, the entire vehicle must be inspected using Off-Highway (OHV) Inspection – Americas or equivalent to confirm that the OHV is in a safe operating condition.

2. Training

a. Authorized Drivers must review this procedure and complete required training. Refer to SH&E Training – Americas and its associated Assessment of SH&E Training Requirements – Americas for training requirements.

b. Vehicles such as ATVs, four-wheel drive vehicles, motorized carts, snowmobiles, box vans, and trailers (towing) require specialized training and supervision.

c. All OHV operators must be trained by an SH&E Manager or approved training vendor. Training must include at a minimum:

   i. The operator's pre-trip inspection,

   ii. Use of personal protective apparel,

   iii. Operating skills according to the OHV manufacturer's specifications,

   iv. Basic mechanical requirements, and

   v. Loading and unloading the vehicle.

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vi. Employees unfamiliar with OHVs will also receive hands-on instruction on site by experienced and trained personnel.

3. Terms and Definitions

a.	AECOM Business	Any activity performed in the name of AECOM. This includes, but is not limited to, vehicle travel between work locations, client sites, and meeting locations as well as driving performed as a part of work-related travel (e.g., driving to and from airports, hotels, train stations), and all other reimbursable travel. AECOM business does not include driving part of a daily routine commute from home to an AECOM location.
b.	AECOM Owned/Leased Vehicle	A vehicle that is purchased or leased by AECOM for business use.
c.	ATV	All-Terrain Vehicle. An ATV can also be referred to as a quad, quad bike, three wheeler (illegal), or four wheeler. The ATV is defined by the American National Standards Institute (ANSI) as “a vehicle that travels on low pressure tires, with a seat that is straddled by the operator, along with handlebars for steering control.” This type of ATV requires an active rider and includes snowmobiles. For the purpose of this procedure and in alignment with various jurisdictions, the definition of ATV also includes all-terrain vehicles that instead require a passive rider and utility vehicles such as Argos, Gators, etc.
d.	Authorized Driver	An AECOM employee who receives Supervisor/Manager and, as applicable, Fleet Manager approval following evaluation of driver criteria to drive and maintain an AECOM-owned, leased, or rented vehicle, a client or customer-owned vehicle, or a personal vehicle operated while conducting AECOM business. Authorized Drivers must maintain a current driver’s license with full privileges applicable to the vehicle to be operated.
e.	Client- or Customer-Owned Vehicle	A vehicle that is owned by a client or customer—not AECOM—but is used for AECOM business.
f.	CMV	Commercial motor vehicle. Any self-propelled or towed motor vehicle used for AECOM business (e.g., to transport passengers or property) when the vehicle is one of the following: i. Has a gross vehicle weight rating (GVWR) or gross combination weight rating equal to or greater than the weight specified by the applicable jurisdiction; or ii. Is designed or used to transport more than the number of passengers specified by the applicable jurisdiction, including the driver, for compensation; or iii. Is designed or used to transport more than the number of passengers specified by the applicable jurisdiction, including the driver, and is not used to transport passengers for compensation; or iv. Is used in transporting hazardous material in quantities specified by the applicable jurisdiction at any time.
g.	Collision	Any incident in which a motor vehicle (whether in motion, temporarily stopped, or parked) makes contact with another vehicle or pedestrian, or results in property damage and/or bodily injury, regardless of who was injured, what property was damaged, or who was responsible.
h.	Distracted Driving	An activity that takes the driver’s attention away from the primary task of driving.
i.	Local Laws	Signs, postings, laws, regulations, ordinances, and codes applicable to the jurisdiction in which the motor vehicle is being operated.
j.	Personal Vehicle	A motorized vehicle owned or leased by an employee.
k.	PPE	Personal protective equipment.

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l.	Portable Electronic Device	A mobile electronic device that is used to receive or communicate voice, email, internet, and/or public media. The device requires user interaction (typing, dialing, reading, keying, etc.) that distracts the motor vehicle operator. Example devices include, but are not limited to, Mobile Communication Devices (MCDs); Personal Data Assistants (PDAs); iPads, iPods, or other tablet models; computers; and Global Positioning System (GPS) receivers.
m.	Rental Vehicle	A vehicle that is rented from AECOM's preferred suppliers and reserved through a Company-approved travel management company or Company-approved online booking tool.
n.	Spotters	Trained personnel may provide guidance when maneuvering in close and/or complex situations in order to avoid the occurrence of an incident.

4. References

a. SH&E Training – Americas S3AM-003-PR2

b. Fitness for Duty – Americas S3AM-008-PR2

c. Substance Abuse Prevention – Americas S3AM-019-PR1

d. Safety Gear – Americas S3AM-208-PR2

e. SH&E Risk Assessment and Planning – Americas S3AM-209-PR2

f. Travel Policy – AECOM Global TR1-001-PL1

g. Employee Handbooks – Ecosystem page

5. Records

a. Journey Management Plan – Americas S3AM-005-FM1

b. Vehicle Inspection Checklist – Americas S3AM-005-FM2

c. Off-Highway Vehicle (OHV) Inspection – Americas S3AM-005-FM3

d. Assessment of SH&E Training Requirements – Americas S3AM-003-FM1

6. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	01-Dec-2025	Initial release as S3AM-005-PR2; consolidated portions of the contents from the following retired documents: Driving – Americas S3AM-005-PR1, Authorized Driver Safety – Americas S3AM-005-ATT1, All-Terrain Vehicles – Americas S3AM-319-PR1, ATV Safety – Americas S3AM-319-ATT1, and Commercial Motor Vehicles – Americas S3AM-320-PR1.	All

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AECOM

Americas

Journey Management Plan

S3AM-005-FM1

Instructions

1. **This form or equivalent must be completed in accordance with Driving – Americas S3AM-005-PR2.**
2. **This form or equivalent must be completed by drivers who will undertake trips more than 250 miles (400 km) each way, drive in remote or hazardous areas, or when otherwise deemed necessary or specified in project-specific requirements.**
3. **All Journey Management Plans shall be reviewed and acknowledged by the driver and the Driver's Manager / Supervisor.**
4. **Once completed, copies of this form or equivalent must remain with the Driver and the Manager/Supervisor for the duration of the journey. A copy must also be retained in the project files.**

Project Name	....	**Project Number**	....	
Project Specific Requirements	....			
Driver Name	....	**Driver training completed**	☐ Yes	☐ No

Vehicle Information

Type	☐ Company Owned	☐ Rental/Leased	☐ Personal		
Year	....	**Make**	....	**Model**	....
Color	....	**Vehicle License No.**	....		

Trip Information

Purpose of the trip	....	**Estimated distance**	....	
Single or reoccurring trip	☐ Single trip	☐ Reoccurring trip		
Have alternate modes of travel (telepresence, public transportation, air, train) been evaluated?	☐ Yes	☐ No		
Has a site-specific SH&E plan or hazard assessment been completed and attached?	☐ Yes	☐ No	☐ NA	
Route of travel (Insert map or give detailed instructions. Assess gas stations/chargers in the route to avoid running out of gas/battery.)	....			
Is the return route of travel the same?	☐ Yes	☐ No		

	Destination Name	**Departure**		**Arrival**	
		Date	**Time**	**Date**	**Time (ETA)**
1.	....	.....	....	.....	....
2.	....	.....	....	.....	....
3.	....	.....	....	.....	....
4.	....	.....	....	.....	....

Additional comments	....

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Special Conditions/Hazards (Check all that may apply)

☐ Night driving	☐ Rugged terrain (4 x 4)
☐ Weather	☐ Large vehicles
☐ Road conditions (e.g., construction, ice, snow)	☐ Animals
☐ Rush hour / heavy traffic	☐ Towing (e.g., trailer)
☐ Long driving / fatigue (over 2 hours)	☐ Other: ….
☐ Potential for distraction	

Additional conditions/hazards details	….
Weather forecast (Driver and passengers to review weather and road conditions immediately prior to journey.)	….

Contact Information

	Name	Phone Number
Traveler 1 (Driver)	….	….
Traveler 1 Emergency Contact	….	….
Traveler 2	….	….
Traveler 2 Emergency Contact	….	….
Traveler 3	….	….
Traveler 3 Emergency Contact	….	….
Traveler 4	….	….
Traveler 4 Emergency Contact	….	….
Check-In Contact	….	….
Alternate Check-In Contact	….	….
Destination Contact (if applicable)	….	….
Other ….	….	….
Other ….	….	….

Check-In Procedure

Check-in interval	….

- Advise Manager and any other applicable personnel of travel plans and supply with a copy of this form (including attachments)
- Confirm availability of Manager or Check-In Contact. Confirm check-in interval with Manager or Check-In Contact.
- Discuss with contacts the possibility of travel within a cell phone “dead zone”.
- Advise Manager or Check-In Contact of departure.
- Call Manager or Check-In Contact upon arrival at destination (e.g. worksite, office, home).
- If multiple destinations, the process is repeated.

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Missed Check-In Procedure for Manager

- Attempt to call traveler(s) using contact number(s) listed above.
- Contact traveler's emergency contact listed above.
- If unsuccessful, discuss options with Manager, Check-In Contact (is anyone nearby who can be sent out along the route to destination, how much daylight remains, etc.?).
- Call 911 or local police.

Emergency Planning

AECOM Supervisor Name	….	**Phone Number**	….
AECOM Manager Name	….	**Phone Number**	….

Roadside Service Phone Number	….		
Emergency Phone Number	☐ 911	☐ Other:	….
Incident Reporting Hotline	☐ For DCS: 800-348-5046	☐ For CM: Contact the Occupational Health Team using the AECOM-dedicated line at 512-419-5016.	

General Procedure for Vehicle Incidents

The Employee(s) involved in a collision must:

a. Assess the situation to confirm everyone is safe and remove any vehicle occupants from harm's way if safe to do so.
b. Turn on the vehicle's flashers to warn other motorists.
c. Call or have someone else call the appropriate local emergency phone number (e.g., 911) immediately when necessary.
d. As appropriate, remain at the scene of a collision for police to arrive. If the scene is unsafe, immediately leave to a safe place of refuge proximate to the incident.
e. As applicable, consider moving the vehicle out of the traffic flow if it is safe to do so. Do not operate a damaged vehicle if its:
    i. safety is questionable,
    ii. operating condition is illegal per applicable local law, or
    iii. condition is such that further damage would likely result from its operation.
f. Obtain:
    i. Names, phone numbers, and addresses of owner(s), driver(s), and occupants of the other car(s) involved.
    ii. Other party's insurance company's name, address, phone number, policy number, and insurance agent.
    iii. Names, phone numbers, and addresses of all witnesses.
    iv. Photographs of the accident scene when safe to do so.
g. Do not discuss liability (e.g. who is at fault), agree to pay for damage, or sign a document related to an incident except as required by local law.
h. If requested, provide information to the police. Obtain the officer's jurisdiction, name, and badge number, as well as a copy of the police report.

Note: If contacted by a third party, do not answer any questions. Immediately report this contact to the Project Manager and AECOM Legal.

Approvals

….		…..
Driver Name	**Signature**	**Date**
….		…..
Supervisor or Manager Name	**Signature**	**Date**

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Americas

Vehicle Inspection Checklist

S3AM-005-FM2

Instruction

1. **This form or equivalent is to be completed in accordance with Driving – Americas S3AM-005-PR2.**
2. **This Vehicle Inspection Checklist is intended to be completed by the vehicle's driver prior to departing on a trip.**
3. **Checking boxes in the "Yes" column means that item is present and functioning.**
4. **Deficiencies that affect or could potentially affect the safe operation of the vehicle must be repaired or corrected before departure.**
5. **This checklist is not intended to replace a regular, comprehensive vehicle maintenance program.**
6. **The completed form must be retained in the project files.**

Vehicle Tag No	Mileage	Date	Time	Driver Name	Location
….	….	…..	….	….	….

	Item	Yes	No	N/A
1.	**General**			
a.	Proof of insurance and registration available and current?	☐	☐	☐
b.	Is the date of the last regular maintenance known, or is the mileage/date of next scheduled maintenance known?	☐	☐	☐
c.	Is the overall condition of the vehicle good (no body damage, unusual sounds, leaks, odors, etc.)?	☐	☐	☐
2.	**Tires**			
a.	Do all tires have sufficient tread for driving conditions? Legal limit: 2/32" (for rain/snow: > 4/32")	☐	☐	☐
b.	Are tires sufficiently inflated for driving conditions?	☐	☐	☐
c.	Are the lug nuts and stem caps present and tight for each tire?	☐	☐	☐
d.	Is the spare tire and jack present and in good condition?	☐	☐	☐
3.	**Vehicle Interior**			
a.	Are the brake and accelerator pedal pads in good condition?	☐	☐	☐
b.	Are the floor mats in good condition and not interfering with the brake or accelerator pedals?	☐	☐	☐
c.	Is the seat properly adjusted (including the headrest)?	☐	☐	☐
d.	Is the seatbelt in good condition?	☐	☐	☐
e.	Are the mirrors in good condition (not broken, dirty)?	☐	☐	☐
f.	Are the dashboard/instrument lights working?	☐	☐	☐
g.	Is the dashboard free of warning lights and do the gauges appear to work when the car is started?	☐	☐	☐
h.	Does the horn work?	☐	☐	☐
i.	Are distractions such as cell phones and GPS units secured so they do not encourage use?	☐	☐	☐
4.	**Lights and Signals**			
a.	Do the headlights and high beams work?	☐	☐	☐
b.	Do the tail lights function properly?	☐	☐	☐
c.	Do the turn signals work (front and rear)?	☐	☐	☐

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	Item	Yes	No	N/A
d.	Do the brake lights work (including high light in the rear window if applicable)?	☐	☐	☐
e.	Do the hazard lights (emergency flashers) work?	☐	☐	☐
f.	Do back up / reverse lights work?	☐	☐	☐
g.	If equipped with a back-up alarm, can it be heard clearly?	☐	☐	☐
5.	**Mechanical**			
a.	Do the brakes work and feel solid (not soft)?	☐	☐	☐
b.	Does the parking/emergency brake work?	☐	☐	☐
c.	Is the steering in good working condition (not loose)?	☐	☐	☐
d.	Is the engine oil level full or in the operating zone?	☐	☐	☐
e.	Excessive vehicle bounce going over bumps reported (possible sign of worn shock absorbers)?	☐	☐	☐
f.	Is the fuel level full or at an adequate level for the proposed usage?	☐	☐	☐
6.	**Windows and Windshield**			
a.	Is the windshield clean and unbroken?	☐	☐	☐
b.	Are the wiper blades in good condition (front and rear)?	☐	☐	☐
c.	Are all the windows clean and unbroken and windshield fluid available and operational?	☐	☐	☐
7.	**Emergency Equipment (as needed per conditions/project requirements)**			
a.	Is there a “Safety Kit” (fire extinguisher, first aid, safety triangle and 2 reflective vests)?	☐	☐	☐
b.	Is survival gear and equipment available (blanket, water, heat source, flashlight, etc.)?	☐	☐	☐
c.	Is a means for emergency communication available?	☐	☐	☐
8.	**Other Equipment (as needed per conditions/project requirements)**			
a.	Is there a means to secured loads (cargo next, container)?	☐	☐	☐
b.	Are cones or other warning devices available?	☐	☐	☐
c.	Is weather specific equipment (snow chains, tired etc.)?	☐	☐	☐
d.	Does the vehicle have a snow brush/ice scraper?	☐	☐	☐
9.	**Comments**			
….				

….		…..
Inspector Name	**Signature**	**Date**

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Safety Gear

S3AM-208-PR2

1. Purpose and Scope

a. The purpose of this procedure is to define the process and criteria for the selection, issuance, and maintenance of personal protective equipment (PPE) and other safety equipment, including emergency safety equipment.

b. PPE must be used when identified hazards cannot be eliminated through substitution, engineering, or administrative controls or to provide additional protection (see Safety, Health, and Environment (SH&E) Risk Assessment and Planning – Americas).

c. This procedure applies to all AECOM Americas-based employees and operations as well as personnel contractually required to comply with this document's content.

2. Procedure

2.1 Determining the Need for PPE

a. The Project Team must:

   i. Identify necessary PPE-related control measures in task-specific risk assessments. Refer to SH&E Risk Assessment and Planning – Americas for risk assessment requirements.

   ii. Include PPE requirements in the applicable SH&E plan and task hazard assessments (THAs; e.g., field level risk assessments [FLRAs] in Canada).

b. Prior to entering any controlled or restricted work area, employees must review the project-specific SH&E plan and corresponding THA(s) to confirm that they are equipped with the required PPE appropriate to the specific work area's hazards.

c. As required, the Project Team and SH&E Manager should evaluate employee use of PPE and adequacy of PPE protection on a routine basis. This may be documented using Personal Protective Equipment (PPE) Inspection – Americas, or equivalent.

2.2 Minimum PPE Requirements

a. Minimum PPE requirements for employees working at locations outside of an AECOM office include:

- Safety glasses
- Hardhat
- Sleeves that cover the shoulders and long pants or coveralls
- Class 2 high-visibility reflective vests
- Work boots with defined heel and over-ankle support
- Protective gloves, carried on the person

b. PPE must also:

   i. Properly fit the Employee's body, with consideration given to gender-specific gear and sizing.

   ii. Be selected and used in accordance with recognized standards (e.g., applicable American National Standards Institute [ANSI]/Canadian Standards Association [CSA] standards) and provide effective protection. Employees must follow instructions and manufacturers' specifications on the care, use, and storage of PPE.

   iii. Not in itself create a hazard to the wearer.

   iv. Be compatible so one item of PPE does not interfere with another.

v. Be maintained in good working order and in a sanitary condition. Employees must inspect their required PPE prior to use. Worn out, expired, damaged, and/or defective equipment must be removed from service and replaced.

vi. Not be altered in any way.

a. Employees must obtain basic PPE (e.g., safety glasses, hardhat, reflective vest, gloves, and hearing protection) and required specialized PPE (e.g., fall protection equipment and respirators) from AECOM at no charge. Reimbursement approvals for any additional PPE (e.g., prescription safety glasses, safety-toed work boots, etc.) must be in accordance with employee's regional and/or business line policy, and legal requirements.

b. AECOM locations must maintain, or otherwise have readily accessible, a supply of PPE of appropriate types and sizes, such as hardhats, high-visibility vests, safety glasses, gloves, hearing protection, and chemical-resistant clothing as applicable to the nature of their field activities. The Project Manager or designee will be responsible for maintaining this inventory.

c. AECOM locations should review their PPE program on at least an annual basis.

d. Deviation from these minimum requirements may be allowed if the risk assessment deems appropriate and this deviation is approved by the Project Manager and SH&E Manager via the completion of SH&E Management System Variance Request– Americas or equivalent documentation.

2.3 Eye and Face Protection

a. AECOM employees must use appropriate eye and face protection when eye or face hazards are present or there is a potential for flying particles, molten metal, liquid chemicals, acid and caustic liquids, chemical gases or vapors, injurious light radiation, or arc flash when working on or near exposed energized apparatus.

b. The level of eye and face protection will be based on the risk assessment. Refer to Table 1 for several types of eye and face protection to consider.

c. Contact lenses must not be worn in areas where there is potential exposure to a welding arc or in chemical environments as required by the safety data sheet (SDS).

Table 1. Types of Eye and Face Protection

Type of Eye and Face Protection	Specifications and Usages
Safety glasses	The most used form of eye protection is safety glasses. To prevent lateral exposure to impact fragments, safety glasses should be equipped with side shields. Depending on the hazard, side shields can be either a cup-type or flat-folded. The cup-type provides more complete protection. Prescription safety glasses may be provided to employees who require vision correction and are working in areas where eye protection is mandatory. Alternatively, safety glasses designed to go over prescription glasses can be worn, when allowed by law.
Spoggles (foam or rubber lines)	Spoggles are safety glasses that include foam seals on frames to improve sealing against the face. They should be used when there is a potential for flying particles small enough to enter behind standard safety glasses.
Safety goggles (direct, indirect, or non-vent)	Goggles form a complete seal around the eye area, providing more coverage than safety glasses, and are more appropriate for chemical hazards and conducting tasks such as power washing or when working in an area or at a process involving high dust or particulate concentrations.

Type of Eye and Face Protection	Specifications and Usages
Face shields	Face shields should be used when there is danger from impact from flying particles or chemical splash. Face shields are secondary protectors and must be worn over safety glasses or goggles when using welding, cutting, chipping, grinding, or buffing tools. Hazards associated with drilling or operations involving striking should also be assessed for the need for dual eye protection.
Dual eye protection	This may be required to be worn by any employee undertaking or in proximity to a task producing projected particles or material due to hand tool use as determined by the project-specific risk assessment and/or THAs.

2.4 Head Protection

a. The main type of head protector is the hardhat. Hardhats are designed to protect employees from impact and penetration caused by objects hitting their head. The shell of the hardhat is designed to absorb some of the impact. The suspension, which consists of a headband and strapping, not only holds the hardhat in place but is critical for absorbing and distributing impact shock loads. Refer to Table 2 for types of hardhats.

b. Employees must:

   i. Not use bump caps as protection against head injury.

   ii. Use hardhats designed for a face shield attachment for tasks requiring face shields. Some hardhats also include attachment slots for hearing protection muffs.

   iii. Only wear AECOM-approved hardhats (cowboy style are not acceptable).

   iv. Avoid storing a hardhat in direct sunlight (e.g., vehicle back window), as it will be subjected to unnecessary UV exposure.

   v. Wear hardhats in the forward position. A hardhat can be worn backwards with written verification and instructions from the hardhat manufacturer indicating the hardhat has been tested and found compliant.

   vi. Wear hardhats whenever there is a danger of falling objects.

   vii. Avoid any contact of the hardhat with insect repellant. Some insect repellants can degrade hardhat materials.

Table 2. Head Protection Types

Type of Hardhat	Specifications and Usages
Type I	• Provides crown protection from penetration and impact. • Intended to reduce the force resulting from a blow only to the top (crown) of the head.
Type II	• Provides crown and lateral penetration and impact protection. • Intended to reduce the force resulting from a blow received off center or to the top of the head. • Typically lined on the inside with thick, high-density foam.

2.5 Foot Protection

a. Safety-toed (steel or composite) boots with a minimum of 6 inches (15.2 centimeters) of ankle support, an oil-resistant sole, and a distinctive heel must be the minimum footwear requirement of all employees engaged in construction, operation, maintenance, or when hazards to feet are present or have the potential to be present (this includes impact, puncture, cut, electrical, thermal, or chemical hazards).

b. Employees assigned to field projects who are not required to wear specified protective footwear (e.g., steel-toed boots) will wear substantial, high-sided work boots.

2.6 Hand Protection

a. Employees must have gloves in their immediate possession whenever they are on a work site.

b. Employees must use appropriate hand protection when their hands are exposed to hazards such as skin absorption of harmful substances, severe cuts or lacerations, severe abrasions, punctures, chemical burns, thermal burns, harmful temperature extremes, high hand vibration, and sharp objects.

c. Gloves must be sized correctly for the Employee.

d. After physical guards, gloves provide the most common hand protection.

e. In most cases there are trade-offs between hazard protection and functional performance of a glove. These factors are equally important. The higher the severity of the hazard, the more important hazard protection is. Table 3 offers additional guidance on key considerations when selecting a glove for certain protection and performance properties.

Table 3. Key Considerations and Selection Criteria for Gloves

Category	Properties	Protection and Performance Needs	Key Considerations and Selection Criteria
Mechanical	Cut Resistance	Protection from sharp edges, blades, and other cutting hazards	**Testing Standard: American Society for Testing and Materials (ASTM) F1790 and ASTM F1970-05** There are 5 levels of cut resistance; 5 is the highest.
	Puncture Resistance	Protection from sharp objects like nails, pins, needles, and wire	**Testing Standard: EN 388:2003** This testing measures the force required to pierce the sample with a standard sized point.
	Abrasion Resistance	Durability and resistance to abrasive objects or materials	**Testing Standard: ASTM D3389-05 and ASTM D3884-09** Abrasion resistance testing measures how well the glove material resists loss of material from rubbing on rough surfaces.
	Shielding	Protection from impact, ricochet, and small projectiles	Some gloves have thick padding or hard guards around the back of the hand or knuckles. These can offer good protection against impact.
Chemical	Degradation & Absorption Resistance	Durability and resistance to breaking down and/or permeating the glove from exposure to chemicals	Identify products/chemicals that present potential exposure risks. Refer to the chemical's SDS and glove manufacturer's specifications for the appropriate glove choice.
Thermal	Heat Resistance	Thermal protection from hot objects or materials	**Testing Standard: ASTM F1060-08** This testing measures the insulation provided by the glove when contacting a hot surface. Higher temperatures reported indicate a glove with greater insulation.
	Cold Resistance	Thermal protection from cold weather, objects, or materials	**Testing Standard: EN 511:1994 (for ambient temperature)** **Testing Standard: International Organization for Standardization (ISO) 5085:1989-1 (for cold surfaces)** Choosing the right glove depends on whether protection is needed from cold weather or cold surfaces.

Category	Properties	Protection and Performance Needs	Key Considerations and Selection Criteria	
Vibration	Anti-Vibration	Vibration reduction from operating certain tools and equipment	**Testing Standard: ANSI S2.73-2002 (R2007)** This testing method measures the vibration transmission of the glove.	
Electrical	Insulation	If performing work on electrical equipment, this must be the top priority	**Testing Standard: ASTM D120-09** Glove protection depends on the maximum voltage of energized components:	
			50 – 480 V	Class 00 with Leather Protectors
			480 – 600 V	Class 0 with Leather Protectors
			600 V and above	Class 0 or higher (depending on maximum voltage) with Leather Protectors
Function	Dexterity	Ability to manipulate objects and control hands in the desired manner	**Testing Method: EN 420:2003** This testing method assesses the wearer's ability to pick up small diameter pins lying on a flat surface with their thumb and forefinger. If high dexterity is needed, and the hazards are relatively low to the forefinger and thumb, consider a glove that is tipless for those two digits.	
	Tactility	Ability to sense objects by touch	There is no standard test. However, a common field test is to determine if the wearer can feel a pulse while wearing the glove. This is affected by the thickness of the glove, presence of liners, glove surface characteristics, and properties of the coating material.	
	Grip	Ability to exert pressure on an object when holding it	**Testing Standard: National Fire Protection Association (NFPA) 1971 (Grip)**	

2.6.1 Hazardous Substances

a. Review SDSs for project or task-specific chemicals to determine appropriate gloves. Consult with an SH&E Manager for assistance, as needed.

b. Review glove manufacturer specifications for both physical and chemical protection.

c. When both chemical and physical protection is of concern, wear the chemical protection gloves (e.g., nitrile) inside the physical protection gloves (e.g., leather, Kevlar®).

d. Nitrile or equivalent chemical-resistant gloves must always be used for protection from hazardous fluids or non-corrosive chemicals.

2.6.2 Cuts, Lacerations, and Punctures

a. If cut or laceration hazards are present, appropriate gloves with the applicable ANSI/CSA cut resistance rating for the task should be selected.

b. Gloves providing cut resistance may be constructed of leather, synthetic materials (e.g., polyester and nylon), high-performance materials (e.g., Kevlar®), or metal mesh.

Note: Not all gloves providing cut/laceration resistance provide equal puncture resistance. Thus, when selecting a glove for puncture protection, review the manufacturer's specifications specific to puncturing.

2.6.3 Abrasions

a. Leather gloves offer some abrasion protection but should only be selected for light abrasion protection. Appropriate activities for leather gloves may include moving light equipment where cuts and lacerations are of minimal concern.

b. Gloves with abrasion-resistant surfaces in high contact areas (e.g., knuckles and palm) should be considered for tasks involving high potential for abrasion hazards (e.g., construction activities).

2.6.4 Vibration

Gloves meeting the applicable ANSI/CSA standard for vibration reduction (also known as anti-vibration gloves) should be selected if performing activities requiring handling of vibrating tools (chainsaw, jackhammer, grinder, etc.). Anti-vibration gloves should completely cover the fingers.

2.7 High-Visibility Apparel

a. "High-visibility safety apparel" means personal protective safety clothing intended to provide conspicuity during both daytime and nighttime usage and meeting ANSI/International Safety Equipment Association (ISEA)/CSA standards. Refer to Table 4 for more information on high-visibility apparel.

b. The color of apparel (orange or lime) may be client or project specific.

c. Work conducted at night may require that the minimum level of safety apparel worn be ANSI/CSA Class 3, and in accordance with local law.

Table 4. High-Visibility Safety Apparel

Class Type	Specification	Usage	Examples of Pedestrian Workers
2	Provides superior visibility for the wearers by the additional coverage of the torso.	• Inclement weather conditions • Complex backgrounds • Work activities near vehicle traffic 0 mph to 25 mph (40 kph)	• Construction managers/inspectors • Survey crews • Bridge inspectors • Utility workers • Environmental samplers • Resident engineers
3	• Offers greater visibility to the wearer in both complex backgrounds and through a full range of body movements. • Visibility is enhanced beyond Class 2 by the enhancement of background and reflective materials to arms and/or legs. • Typically consists of coveralls, jumpsuits, long- or short-sleeved jackets, or long-sleeved shirts with retro-reflective bands.	• High vehicle speeds (50 mph [80 kph] or more) • Reduced sight distances • Worker and vehicle operator have high task loads, clearly placing the worker in danger • The wearer must be conspicuous through a full range of body motions at a minimum of 1,280 feet (390 m)	

d. Other high-visibility apparel includes Class E and headwear:

   i. Class E apparel includes trouserss that are part of a Class 3 apparel ensemble. Frequently a Class 2 vest is paired with Class E trousers, creating an overall ensemble that meets Class 3 apparel requirements. Class E garments are not intended to be worn without Class 2 or 3 garments.

   ii. Headwear is considered an important accessory and compliments the overall visibility of the wearer. High-visibility headwear enhances visibility of the head of a moving worker in daylight and helps define the shape of the human form during nighttime.

2.8 Personal Clothing

a. Employees on a project site must wear full-length trousers and shirts covering shoulders.

b. For personal safety on the job site, do not wear:

   i. Loose or unsecured clothing or loose-fitting cuffs;

   ii. Greasy or oily clothing, gloves, or boots;

   iii. Torn or ragged clothing; or

   iv. Jewelry (e.g., rings, bracelets, neck chains) when working around moving parts.

c. Long hair must be tied back or otherwise confined when there is a risk of entanglement with moving parts.

d. Cotton or wool fabrics are recommended for general use.

e. Shoes made of leather, canvas, tennis, deck, or other types of non-protective material, including sandals and high-heeled shoes, are not allowed on field project sites. Refer to Section 2.5 for requirements.

2.9 Specialized PPE

In addition to basic PPE, additional specialized PPE may be required to provide appropriate protection to the Employee. Protective equipment must be of heat-, fire-, chemical-, and/or electrical-resistive material when conditions require protection against such hazards. Refer to applicable law, related SH&E procedures, and the SH&E Manager for additional information on PPE requirements.

2.9.1 Temperature Extremes

Refer to the Heat and Cold Stress – Americas for detailed requirements related to temperature extremes.

2.9.2 Chemical-Resistant Clothing

a. The Project Team must consult the SDS of the material(s) being handled, as well as the SH&E Manager and subject matter experts (e.g., Certified Industrial Hygienist), as needed, to appropriately select chemical-resistant clothing, gloves, and boots.

b. The objective of chemical-resistant clothing is to separate the person from a hazardous material. Whenever there is a potential for chemical exposures, chemical-resistant clothing (e.g., latex or nitrile gloves, Tyvek coveralls or aprons, and chemical-resistant boots) should be considered during the risk assessment.

c. Consideration must be given to allergies, and alternatives must be provided if necessary.

2.9.3 Fall Protection

a. Selection and use of fall arrest equipment/systems must be planned and established by a competent person as defined in applicable local law, code of practice, or standards. Personal fall protection equipment and systems (to include fall arrest, positioning, and restraint) must be used when a person is working at heights and/or exposed to a fall hazard. Integral chinstraps should be worn when working overhead.

b. Refer to Work at Height – Americas for detailed requirements related to fall protection and arrest system requirements.

c. Confined space hazards may necessitate the use of specific harnesses attached to retrieval lines to facilitate rescue. Refer to Confined Spaces – Americas.

2.9.4 Respiratory Protection

a. Respiratory protection must be selected based on the contaminant and concentration to which the Employee will be exposed. The use of respirators is required when occupational exposure levels approach or exceed Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs) or American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs), and engineering or administrative exposure controls are not feasible to implement.

b. For specific requirements, refer to Respiratory Protection – Americas, the task- or project-specific hazard assessments, and the applicable SDSs.

2.9.5 Hearing Protection

a. Noise levels in the work environment that cannot be eliminated or reduced to acceptable levels by elimination or engineering controls require employees to be protected from exposure. Hearing protection devices must be able to attenuate noise to acceptable levels (i.e., 85 dBA for continuous [steady-state] noise). If necessary to hear audible warnings, hearing protection devices should not attenuate hearing levels below an individual's hearing threshold.

b. Dual hearing protection (i.e., earplugs and a second method such as earmuffs worn concurrently) must be based on the attenuation of the specific hearing protection. Generally, double hearing protection should be used whenever employees are exposed to continuous noise greater than 115 dBA.

c. The attenuation of the specific hearing protection must be determined using the National Institute for Occupational Safety and Health (NIOSH) de-rating scheme. Ear insert devices, to include disposable, pre-formed, or custom-molded earplugs, must be fitted to the exposed individual. Plain cotton is not an acceptable hearing protection device.

d. Refer to Noise – Americas for additional information.

2.9.6 Protection from Drowning

Whenever there exists the possibility of falling into water, personnel must wear personal flotation devices (PFDs) or life jackets. Refer to Work On, In, or Near Water – Americas for requirements on PFDs and related PPE.

2.9.7 Fire-Resistant Clothing (FRC)

a. Fire-resistant clothing (FRC) is required to be worn by all personnel under the following circumstances:

   i. Where they are exposed to hot work in hazardous areas unless deemed unnecessary through risk assessment.

   ii. Where there is a risk of exposure to an electrical arc flash (e.g., work in electrical substations).

   iii. FRC use is mandated by the client or site owner/operator.

b. FRC should be worn as the outermost layer of clothing.

2.9.8 Electrical Safety

a. Work on or around electrical utilities and equipment should only be done in accordance with Hazardous Energy Control – Americas.

b. PPE must be appropriate for the level of electrical hazard present based on a risk assessment conducted according to the applicable standard (e.g., National Fire Protection Association [NFPA] 70E Standard for Electrical Safety in the Workplace and Canadian Standards Association [CSA] Z462 Workplace Electrical Safety Standard), which also specify PPE requirements based on hazard risk classifications.

c. Synthetic clothing must not be worn; synthetic clothing includes acetate, nylon, polyester, and rayon (either alone or in blends with cotton).

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d. Gloves made from layers of flame-resistant material provide the highest level of protection.

e. Leather glove protectors should be worn over voltage-rated rubber gloves.

f. Dielectric overshoes are required where electrically insulated footwear is used for protection against step and touch potential.

g. Safety shoes/boots must be in good condition with no evidence of exposed metal such as steel toe-caps.

2.9.9 Limb Protection

a. Employees must wear the appropriate chainsaw chaps when operating a chainsaw and snake chaps if potentially exposed to snake bites. Protective leg chaps must meet ASTM specifications.

b. Limb and body protection should not be modified without manufacturer's approval, as the protective qualities may be compromised.

c. Boots providing metatarsal protection provide above-the-toe protection from rolling or crushing hazards, as well as punctures or cuts from equipment such as chainsaws.

2.10 Emergency Safety Equipment

2.10.1 First Aid Supplies

a. All AECOM locations must maintain an adequate amount of first aid supplies in an easily identifiable and accessible location. All locations must be equipped with a complete first aid kit appropriate to the number of staff, location of work, and site hazards, according to applicable law.

b. First aid kits must be inspected to confirm the contents meet legal requirements given the number of staff, work location, and potential hazards prior to being placed in the determined location or sent to a job site and, as a minimum, monthly thereafter.

c. An inventory (listing required and approved items) and inspection form must be included with each first aid kit. Any items not listed on the inventory (listed as required or approved for the kit) will be removed during the inspection unless specifically approved by a health care professional for inclusion and added to the inventory.

d. At no time will over-the-counter medications such as antacids, aspirin, cold or cough drops, or other sundry items be stored in the kits without the prior approval of a health care professional (where permitted by local law) and inclusion in the kit's listed inventory.

e. Each item in first aid kits must be individually sealed to protect the contents from contamination. The first aid equipment and supplies must be maintained in a clean, dry, and serviceable condition, contained in a material that protects the contents from the environment, and clearly identified as first aid equipment and supplies.

2.10.2 Automated External Defibrillator (AED)

a. While locations are not mandated to acquire AEDs, an AED should be considered based on the number of employees, response time of local Emergency Medical Services (EMS), and access to other AED units (e.g., those provided by the office building management).

b. The selection of AED equipment will be based on the most current listing of approved AED manufacturers as provided by the American Heart Association, Heart and Stroke Foundation of Canada, or country equivalent.

c. Local law may require notification to EMS of AED locations. This allows the servicing or responding agency to know that an AED is at a particular location.

d. AEDs should be placed in a location that optimizes the fastest response time for an individual walking at a rapid pace to reach the victim. A general rule of thumb by the American Heart Association is that it should take no longer than 3 minutes to retrieve an AED and return to the victim. The AED should be in an easily accessible position with the location well-communicated to all staff.

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e. To confirm readiness for use and integrity of the device, AEDs must be inspected monthly, and maintained, cleaned, serviced, and tested according to manufacturer's specifications. All documentation (e.g., inspections, service records) will be delivered to the Designated Individual and maintained in the applicable project/location files.

f. AEDs must be used in conjunction with cardiopulmonary resuscitation (CPR) according to training and the equipment's operating directions when a victim is unresponsive and not breathing.

2.10.3 Eyewash and Body Flush (Shower) Facilities

a. If corrosive, irritating, or otherwise hazardous materials are used, review applicable SDSs to assist in determining whether eyewash and body flush (shower) facilities must be provided. This may include permanent or portable eyewash stations.

b. Employees who may be exposed to corrosive, irritating, or otherwise hazardous materials must be instructed in the location and proper use of emergency eyewash units and body flush (shower) facilities.

c. Eyewash and body flush (shower) facilities must be assembled and installed in accordance with the manufacturer's specifications.

d. These facilities must be readily available and should be highly visible, clearly identified, and, if possible, within 10 seconds of the hazard. The water source / flushing fluid must be tepid, pressure controlled, and maintained to prevent freezing and contamination of the fluid.

e. All eyewash and body flush (shower) equipment must be inspected for compliance with applicable ANSI and CSA standards, as well as the manufacturer's specifications.

2.10.4 Fire Extinguishers

a. Portable fire extinguishers must be selected, located, inspected, maintained, and installed in accordance with local law and building and fire life safety code.

b. Fire extinguishers must be readily available wherever the potential for fire exists, properly maintained, regularly inspected, and promptly recharged and replaced immediately after use.

c. Class B (or ABC) fire extinguishers must also be available in locations where flammable or combustible liquids are stored, handled, or used.

d. In the event of a fire, follow the emergency response plan (ERP) outlined in the applicable SH&E plan to contact the appropriate firefighting personnel (e.g., local fire department, plant fire crew). Refer to SH&E Risk Assessment and Planning – Americas for ERP and SH&E plan requirements.

e. Only trained employees should use a fire extinguisher, and only if operation does not endanger the user.

f. Portable extinguishers must be of suitable types and sizes. Refer to Table 5 for the different fire extinguisher classifications and what types of fires they are meant for.

Table 5. Fire Extinguisher Classifications

Classification	Type of Fire
Class A	Combustible materials
Class B	Flammable liquid, gas, or grease
Class C	Electrical equipment
Class D	Combustible metal

g. The use or discharge of any fire extinguisher by an AECOM employee must be immediately reported to the Supervisor and in accordance with SH&E Incident Response and Investigation – Americas.

h. Extinguishers must be inspected monthly to ensure that they are still in the proper location, have not been used or tampered with, are still properly charged, and have no obvious external damage. The initials of the inspector and the date of inspection must be noted on the tag attached to the extinguisher.

i. A thorough inspection will be performed annually by personnel specifically trained in the inspection (e.g., extinguisher supplier).

3. Training

a. If PPE is planned to be used for a high-risk task, the person approving the purchase and issue of PPE must consult with the SH&E Manager. The SH&E Manager must provide or arrange for appropriate training.

b. Where training on the use and maintenance of specific PPE has been identified, the PPE must only be used by employees who have undergone training or have been assessed as competent by holding the relevant certification.

c. Training and demonstrated competency is mandatory prior to using any specialized PPE.

d. Employees will receive adequate instruction on the correct use, limitations, and assigned maintenance duties for the equipment to be used. The following information, at a minimum, will be covered during PPE training:

   i. What, when, and why PPE is required.

   ii. How to properly don, doff, adjust, and wear the PPE described.

   iii. The limitations of the PPE, including its expected useful life.

   iv. How to properly care for, maintain, and dispose of the PPE.

e. Retraining may be required as applicable (e.g., observed non-compliance, changes in procedure).

f. Employees must confirm they have reviewed and understand the manufacturer's specifications for the relevant PPE before work commences.

g. For training on the use of first aid supplies, AEDs, and fire extinguishers, refer to SH&E Incident Response and Investigation – Americas and Assessment of SH&E Training Requirements– Americas.

4. Terms and Definitions

a.	ANSI	American National Standards Institute
b.	ASTM	American Society for Testing and Materials
c.	CSA	Canadian Standards Association
d.	NFPA	National Fire Protection Association
e.	PPE	Personal Protective Equipment
f.	SDS	Safety Data Sheet
g.	SH&E	Safety, Health, and Environment
h.	THA	Task Hazard Assessment

5. References

a. SH&E Incident Response and Investigation – Americas S3AM-004-PR2

b. Heat and Cold Stress – Americas S3AM-112-PR2

c. Noise – Americas S3AM-118-PR1

d. Respiratory Protection – Americas S3AM-123-PR1

e. SH&E Risk Assessment and Planning – Americas S3AM-209-PR2

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f. Confined Spaces – Americas S3AM-301-PR1

g. Hazardous Energy Control – Americas S3AM-302-PR2

h. Work at Height – Americas S3AM-304-PR2

i. Work On, In, or Near Water – Americas S3AM-315-PR2

j. NFPA 70E – U.S. Standard for Electrical Safety in the Workplace

k. CSA Z462 – Canadian Standard for Electrical Safety in the Workplace

6. Records

a. Personal Protective Equipment (PPE) Inspection – Americas S3AM-208-FM2

b. Assessment of SH&E Training Requirements – Americas S3AM-003-FM1

c. SH&E Management System Variance Request – Americas S3AM-215-FM2

7. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	01-Dec-2025	Initial release as S3AM-208-PR2; consolidated portions of the contents from the following retired documents: Personal Protective Equipment – Americas S3AM-208-PR1, Eye & Face Protection – Americas S3AM-208-ATT1, Head Protection – Americas S3AM-208-ATT2, Foot Protection – Americas S3AM-208-ATT3, Hand Protection – Americas S3AM-208-ATT4, Limb & Body Protection – Americas S3AM-208-ATT5, High Visibility Safety Apparel – Americas S3AM-208-ATT6, Fire Protection – Americas S3AM-011-PR1, Portable Fire Extinguishers – Americas S3AM-011-ATT1, First Aid – Americas S3AM-012-PR1.	All

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Heat and Cold Stress

S3-AM-112-PR2

1. Purpose and Scope

a. Provide guidance to employees on the effects of heat and cold stress and controlling exposure to hot and cold working conditions.

b. This procedure applies to all AECOM Americas-based employees and operations, as well as contracted personnel required to comply with this document's content.

2. Procedure

2.1 Critical Controls

a. The Project Manager must monitor weather forecasts and current conditions and identify potentially hazardous heat or cold exposures. If potential for hazardous heat or cold exposure exists, the Project Manager must develop a heat/cold stress exposure control plan, incorporate the plan in the project-specific Safety, Health, and Environment (SH&E) plan, and confirm implementation in the field. Refer to SH&E Risk Assessment and Planning – Americas.

b. During a task hazard assessment (THA; e.g., field level risk assessment [FLRA] in Canada), potential heat and cold stress hazards must be evaluated, and appropriate control measures must be implemented to mitigate associated risks. Refer to SH&E Risk Assessment and Planning – Americas.

c. Employees must not be exposed to levels exceeding those specified for the given work level and work-rest regimen.

d. Employees must immediately report any signs or symptoms of heat or cold stress they may experience or observe in fellow employees. Refer to SH&E Incident Response and Investigation – Americas. Project managers should use such information to adjust the work-rest schedule.

e. Initiate emergency response procedures when necessary, including contacting emergency medical services as appropriate and in accordance with the project-specific SH&E plan. If an employee shows signs or reports symptoms of heat or cold stress, they must be removed from the hot or cold environment and treated by a first aid-trained person or by a physician, as needed.

f. The Project Manager should include costs in project budgets for specialized equipment and supplies needed to complete the field activities.

2.2 Heat Stress Planning and Prevention

a. Requirements for working in extreme heat may be triggered by regulatory criteria (e.g., state law in California, Washington, Oregon, Nevada, and Maryland) or as a result of a hazard analysis assessing various contributing factors.

b. Monitor ambient temperatures and conduct heat stress monitoring, as required, in accordance with the project-specific SH&E plan. Revise the heat stress monitoring and controls if there are any reports of discomfort due to heat stress.

c. Monitor temperatures in each unique environment in which employees perform work. Follow manufacturer's specifications on proper use of the thermometer.

d. Assess and apply as is practicable the hierarchy of controls (ordered by level of effectiveness) to reduce employees' exposure.

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2.2.1 Engineering Controls

a. Wherever possible, a designated break area should be established in an air-conditioned space, or in shaded areas where air conditioning is impractical.

b. The break area should be equipped to allow employees to loosen or remove protective clothing, and sufficient seating should be available for all employees.

c. If shade is not available, shaded areas must be constructed. This same type of canopy can be set up to shade personnel performing various types of work in hot weather.

d. Cooling measures other than shade (e.g., misting, air-conditioned break areas, and air-conditioned vehicles) can be used in lieu of shade provided it can be demonstrated they are at least as effective in cooling employees.

e. Employees should have access to these rest areas at break times and at any other time when suffering from heat illness or believing a preventive recovery period is needed.

2.2.2 Administrative Controls

a. Employees must:

   i. Review the heat stress exposure control plan within the SH&E plan and/or THAs.

   ii. Confirm a reliable method of communication is in place to allow for contact with supervision.

   iii. Take frequent short breaks in areas sheltered from direct sunlight, frequently eat and drink small amounts, and avoid performing manual labor during breaks (other than paperwork or similar light tasks).

   iv. Avoid strenuous physical activity outdoors during the hottest part of the day.

   v. Avoid sudden changes of temperature.

   vi. Avoid working alone in extreme heat and instead use the buddy system.

   vii. Air out a hot vehicle before getting into it.

   viii. Obtain medical direction if taking diuretics during hot weather (a lower dose may be necessary).

   ix. Perform a self-assessment to evaluate their body's reaction to the heat and work conditions.

b. The Project Manager must:

   i. Develop appropriate work-rest schedules based on recognized technical standards (e.g., those published by National Institute for Occupational Safety and Health [NIOSH], American National Standards Institute [ANSI], and American Conference of Governmental Industrial Hygienists [ACGIH]) or as required by the most stringent applicable local law. Appendix 1– Heat Stress Work-Rest Schedule, adapted from ACGIH guidelines, may be used as a reference where no conflicting local law exists. The frequency and length of work breaks should be based on the ambient temperature, amount of sunshine, humidity, the amount of physical labor being performed, the physical condition of the employees (e.g., acclimated or unacclimated), and protective clothing being used.

   ii. Once a work-rest schedule is established, continually evaluate its effectiveness through observation of employees for signs/symptoms of heat stress such as dizziness, heat cramps, and/or extreme thirst.

   iii. Consider physiological monitoring of each employee's vitals (pulse, blood pressure, and temperature) and engage with SH&E and the Occupational Health Team in support of the assessment and implementation. Physiological monitoring can provide additional information in determining if the schedule is adequate or needs to be adjusted. Physiological monitoring of heat stress may be documented using Heat Stress Monitoring Log – Americas, or equivalent.

      Note: Monitoring of the extent of water loss may be considered. Water loss may be monitored by weighing the Employee at the start and end of each workday. A weight loss exceeding 1.5% of total body weight indicates the need for increased fluid intake.

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iv. Allow for acclimatization when work is performed by new and returning employees (absent 1 week or more) who have not had time to acclimatize, as they may be more susceptible to heat-related illnesses.

1. Minimize workload and gradually increase as tolerance is built up.
2. Allow for more frequent breaks.
3. While acclimatization normally takes approximately 5 to 7 days, heightened monitoring of these employees must be maintained for the first 14 days.
4. When possible, employees should begin hydrating at least 3 days prior to working in high heat conditions.

v. Try scheduling work at night or during the cooler parts of the day.

vi. Have cool (not cold), fresh, potable water available in the break area, and in the work area itself unless hygiene/chemical exposure issues prevent it.

vii. Have dry clothing or towels available to minimize chills when taking breaks.

2.2.3 Personal Protective Equipment (PPE)

a. Auxiliary cooling should be considered when ANY of the following conditions exist:

i. Ambient temperature is over 80°F (26°C).

ii. Employees are wearing impermeable garments (i.e., Tyvek, Saranex, and Chemrel).

iii. It is desirable to have long work shifts with minimum interruption.

b. If cooling devices are worn, only physiological monitoring must be used to determine work activity.

c. Cooling devices should be worn beneath protective garments, but over any underclothing.

d. Heat/flame-resistant gloves or mittens, tested in accordance with legal standards, should be selected when handling extremely hot or cold materials.

2.3 Cold Stress Planning and Prevention

a. Requirements for working in extreme cold may be triggered by regulatory criteria or because of a hazard analysis assessing various contributing factors.

b. Monitor ambient temperatures and implement controls in accordance with the project-specific SH&E plan. Revise the cold stress controls if there are any reports of discomfort due to cold stress.

c. Assess and apply as practicable the hierarchy of controls (ordered by level of effectiveness) to reduce employees' exposure.

2.3.1 Engineering Controls

a. The Project Manager can make shelters or screens available around the work area to provide protection from wind and rain and insulation from the ground. If a shelter is not readily available, consider supplying temporary shelters.

b. Prevent body heat loss by providing appropriate sources of heat (e.g., warm packs and portable heaters) and/or using insulating materials on equipment handles. Adequate protection, such as general ventilation, must be incorporated into any warming shelter design to prevent carbon monoxide poisoning.

2.3.2 Administrative Controls

a. Employees must:

   i. Review the cold stress exposure control plan within the SH&E plan and/or THAs.

   ii. Confirm a reliable method of communication is in place to allow for contact with supervision.

   iii. Get adequate rest and nutrition. Eat high-calorie snacks to maintain body metabolism and replenish energy stores.

   iv. Drink plenty of warm liquids to avoid dehydration.

   v. Limit time of exposure to the cold. Take advantage of heat from the sun and stay out of the wind as much as possible.

   vi. Take frequent short breaks in warm dry areas to allow the body to warm up.

   vii. For a wind chill below 10°F or -12°C, adopt a “buddy system” of constantly watching the faces of others in the party for white skin tissue, which is evidence of frostbite (frostnip).

   viii. Be informed of the hazards associated with unstable snow or ice build ups.

b. The Project Manager must:

   i. Develop appropriate work-to-warming-break periods based on ambient temperature, wind speed for workers wearing dry clothing, wind chill temperature (refer to Appendix 2– Wind Chill Temperature Index), physical exertion, and acclimatization.

   ii. Confirm appropriate protection measures are in place.

   iii. Confirm walking and working surfaces are cleared of ice and snow to prevent slips and falls.

   iv. Allow for acclimatization when work is performed by new and returning employees (absent 1 week or more) who have not had time to acclimatize, as they may be more susceptible to cold-related illnesses.

   v. Make special provisions to prevent hypothermia and freezing of damaged tissue in addition to providing for first aid treatment.

   vi. Confirm extra blankets or sleeping bags are on site and provide opportunities for employees to change into dry clothing when heavy work is performed.

   vii. Specify, make available, and confirm supplies are regularly inspected/restocked when necessary, including heating/cooling enclosures, de-icing, traction aids, warm or replenishing drinks, and batteries.

2.3.3 Personal Protective Equipment

a. Wear multiple layers of insulating clothing to help prevent cold stress. When applicable, PPE should include:

   i. An outer layer to break the wind and allow some ventilation.

   ii. Head coverings and gloves or mittens for cold, wet, and windy conditions.

   iii. A hat or hard hat liner.

   iv. Insulated footwear with adequate traction to prevent slips and falls. Traction devices may need to be applied to the soles of work boots if the Employee may be walking on icy surfaces. Confirm the addition of ice cleats or other traction devices do not pose additional hazards.

   v. A change of dry clothing available in case work clothes become wet.

   vi. Eye and face protection when working outdoors in a snow and/or ice-covered terrain.

   vii. Sunglasses (with UVA and UVB protection) and sunscreen when there is a persistent combination of snow and direct sun.

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viii. Special safety goggles to protect against potential eye hazards such as blowing ice crystals, snow, ultraviolet light, and glare.

ix. Face guards to protect skin in cold, windy conditions, including riding in an unshielded vehicle.

b. Avoid cotton, especially blue jeans.

c. Confirm these items are approved and do not introduce additional unacceptable hazards (e.g., insufficient visibility and conductivity).

3. Training

a. All employees potentially exposed to heat or cold stress, including their supervisors, will receive the appropriate training prior to work commencing. Refer to SH&E Training – Americas for additional training requirements.

b. Training will include, but is not limited to:

i. Sources of exposure

ii. Use and impact of protective clothing

iii. Importance of acclimatization

iv. Safe work practices

v. Recognition of heat- or cold-related illness symptoms

vi. Preventive/corrective measures

vii. Weather monitoring

viii. Proper eating and drinking practices

ix. Buddy system

x. Proper use of PPE.

xi. First aid and emergency response procedures for symptoms on heat- or cold-related stress

4. Terms and Definitions

a.	Acclimatization	The process of physiologically adjusting or becoming accustomed to a new climate or environment.
b.	ACGIH	American Conference of Governmental Industrial Hygienists.
c.	Auxiliary Cooling	Cooling devices worn beneath protective garments, but over any underclothing.
d.	BEI	Biological Exposure Index.
e.	Cold Stress	The physiological effects due to cold temperatures and/or wind chill.
f.	Heat Cramps	A form of heat stress brought on by profuse sweating and the resultant loss of salt from the body.
g.	Heat Rash	A heat-induced condition characterized by a red, bumpy rash with severe itching.
h.	Heat Stress	The combination of environmental and physical work factors that constitute the total heat load imposed on the body. Symptoms include heavy sweating, headache, dizziness, nausea, and fast heart rate.
i.	Hypothermia	Condition of reduced core body temperature to 95°F (35°C) resulting in loss of dexterity, loss of mental alertness, collapse, and possible death.
j.	TLV	Threshold Limit Value.
k.	Wind Chill	The combined effect of air temperature and wind velocity. Wind chill on exposed skin can cause heat loss.

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5. References

a. SH&E Training – Americas S3AM-003-PR2

b. SH&E Incident Response and Investigation – Americas S3AM-004-PR2

c. Safety Gear – Americas S3AM-208-PR2

d. SH&E Risk Assessment and Planning – Americas S3AM-209-PR2

e. Work On, In, Or Near Water – Americas S3AM-315-PR2

6. Records

a. Heat Stress Monitoring Log – Americas S3AM-112-FM1

7. Appendices

a. Appendix 1 – Heat Stress Work-Rest Schedule

b. Appendix 2 – Wind Chill Temperature Index

8. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	01-Dec-2025	Initial release as S3AM-112-PR2; consolidated portions of the contents from the following retired documents: Cold Stress – Americas S3AM-112-PR1, Temperature Thresholds – Americas S3AM-112-ATT1, Heat Stress – Americas S3AM-113-PR1, and Temperature Thresholds – Americas S3AM-113-ATT1.	All

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Appendix 1 Heat Stress Work-Rest Schedule

a. ACGIH defines heat stress as the net heat load to which a worker may be exposed from the combined contributions of metabolic heat, air temperature, air movement, humidity, radiant energy, and clothing. The ACGIH gives these limits in units of WBGT (wet bulb globe temperature) degrees Celsius (°C), which considers environmental factors such as air temperature, humidity, and air movement (see Table 1). WBGT values are not the same as humidex values. In some workplace situations, solar load (heat from radiant sources) is also considered in determining the WBGT.

Table 1. ACGIH Screening Criteria for Heat Stress Exposure (WBGT values in °C) for 8-Hour Work Day 5 Days per Week with Conventional Breaks

Allocation of Work in a Work/Rest Cycle	Acclimatized				Action Limit (Unacclimatized)			
	Light	Moderate	Heavy	Very Heavy	Light	Moderate	Heavy	Very Heavy
75-100%	31.0	28.0	--	--	28.0	25.0	--	--
50-75%	31.0	29.0	27.5	--	28.5	26.0	24.0	--
25-50%	32.0	30.0	29.0	28.0	29.5	27.0	25.5	24.5
0-25%	32.5	31.5	30.5	30.0	30.0	29.0	28.0	27.0

Note: Assumes 8-hour workdays in a 5-day workweek with conventional breaks.
Threshold Limit Values (TLVs) assume that workers exposed to these conditions are adequately hydrated, are not taking medication, are wearing lightweight clothing (long-sleeve shirts and pants), and are in generally good health.

Examples of workloads:

Rest – sitting (quietly or with moderate arm movements)

Light work – sitting or standing to control machines; performing light hand or arm work (e.g., using a table saw); occasional walking; driving

Moderate work – walking about with moderate lifting and pushing or pulling; walking at moderate pace; e.g., scrubbing in a standing position

Heavy work – pick and shovel work, digging, carrying, pushing/pulling heavy loads; walking at fast pace; e.g., carpenter sawing by hand

Very heavy – very intense activity at fast to maximum pace; e.g., shoveling wet sand

Source: Adapted from 2024 TLVs® and BEIs® - Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati, Ohio: American Conference of Governmental Industrial Hygienists (ACGIH), 2024, pp. 236 and 237.

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b. The ACGIH exposure limits are intended to protect most workers from heat-related illnesses. If you are wearing heavier clothing, then the exposure limit should be lowered per ACGIH recommendations suggested in Table 2.

Table 2. Correction of TLV for Clothing (Values cannot be added when wearing multiple layers)

Clothing Type	WBGT Correction (°C)
Work clothes (long-sleeve shirt and pants)	0
Cloth (woven material) coveralls	0
SMS (Spunbonded – Meltdown – Spunbonded) polypropylene coveralls	+ 0.5
Polyolefin coveralls	+ 1
Double-layer woven clothing	+ 3
Limited-use vapor-barrier coveralls	+ 11

Note: These values are not to be used for completely encapsulating suits. Coveralls assume only modest clothing is underneath, not a second layer of clothing.

Source: Adapted from 2024 TLVs® and BEIs®: Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati, Ohio: American Conference of Governmental Industrial Hygienists (ACGIH), 2024, p. 235.

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Appendix 2 Wind Chill Temperature Index

Table 3 gives temperatures for various combinations of wind and air temperature, as well as guidelines on the danger of skin exposure.

Table 3. Wind Chill Temperature Index

Wind Chill Temperature Index
(Frostbite Times Are for Exposed Facial Skin)

Air Temperature (°C)

Wind Speed (km/h)	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50
5	4	-2	-7	-13	-19	-24	-30	-36	-41	-47	-53	-58
10	3	-3	-9	-15	-21	-27	-33	-39	-45	-51	-57	-63
15	2	-4	-11	-17	-23	-29	-35	-41	-48	-54	-60	-66
20	1	-5	-12	-18	-24	-30	-37	-43	-49	-56	-62	-68
25	1	-6	-12	-19	-25	-32	-38	-44	-51	-57	-64	-70
30	0	-6	-13	-20	-26	-33	-39	-46	-52	-59	-65	-72
35	0	-7	-14	-20	-27	-33	-40	-47	-53	-60	-66	-73
40	-1	-7	-14	-21	-27	-34	-41	-48	-54	-61	-68	-74
45	-1	-8	-15	-21	-28	-35	-42	-48	-55	-62	-69	-75
50	-1	-8	-15	-22	-29	-35	-42	-49	-56	-63	-69	-76
55	-2	-8	-15	-22	-29	-36	-43	-50	-57	-63	-70	-77
60	-2	-9	-16	-23	-30	-36	-43	-50	-57	-64	-71	-78
65	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79
70	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-80
75	-3	-10	-17	-24	-31	-38	-45	-52	-59	-66	-73	-80
80	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81

FROSTBITE GUIDE

Increasing risk of frostbite for most people in 10 to 30 minutes of exposure

High risk for most people in 5 to 10 minutes of exposure

High risk for most people in 2 to 5 minutes of exposure

High risk for most people in 2 minutes of exposure or less

Source: Adapted from 2024 TLVs® and BEIs®: Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati, Ohio: American Conference of Governmental Industrial Hygienists (ACGIH), 2024, p. 226.

AECOM

Americas

Heat Stress Monitoring Log

S3AM-112-FM1

Instructions

1. **This form is to be completed in accordance with Heat and Cold Stress – Americas S3AM-112-PR2.**
2. **The purpose of this form is to monitor employees for heat illness when applicable.**
3. **It is the responsibility of the Foreman or Supervisor-in-Charge to confirm that each person completes the required information.**
4. **The completed form shall be retained in the project files.**

Details

Project Name	….		**Date**	…..	**Foreman/Supervisor Name**	….	
Work/Rest Duration:	….	Work (minutes)	….	Rest (minutes)	**Temperature Measured in**	☐ Celsius	☐ Fahrenheit

Employee Name	Water Provided[1]		Acclimated[2]		Vitals[3]	Period 1		Period 2		Period 3		Period 4	
	Yes	No	Yes	No		In	Out	In	Out	In	Out	In	Out
….	☐	☐	☐	☐	**P**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**BP**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**Temp**	….	….	….	….	….	….	….	….
….	☐	☐	☐	☐	**P**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**BP**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**Temp**	….	….	….	….	….	….	….	….
….	☐	☐	☐	☐	**P**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**BP**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**Temp**	….	….	….	….	….	….	….	….

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Employee Name	Water Provided[1]		Acclimated[2]		Vitals[3]	Period 1		Period 2		Period 3		Period 4	
	Yes	No	Yes	No		In	Out	In	Out	In	Out	In	Out
….	☐	☐	☐	☐	**P**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**BP**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**Temp**	….	….	….	….	….	….	….	….
….	☐	☐	☐	☐	**P**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**BP**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**Temp**	….	….	….	….	….	….	….	….
….	☐	☐	☐	☐	**P**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**BP**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**Temp**	….	….	….	….	….	….	….	….

[1] Each employee should be provided a sufficient amount of water or sports drink before entering the hot zone. Drinks such as coffee and cola should be discouraged.

[2] An employee is “acclimated” if he/she has worked in a hot environment for at least 5 - 7 consecutive days. If an employee is acclimated, check “Yes.” If an employee is not acclimated, check “No” and reduce the work duration by 50 percent for that Employee until the 5 – 7 -day period is reached.

[3] P = pulse rate, BP = blood pressure, Temp = body temperature

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Noise

S3AM-118-PR1

1. Purpose and Scope

a. This procedure establishes requirements for the following:

   i. An effective hearing conservation program.

   ii. Confirming that personal noise exposure remains within acceptable limits.

b. This procedure applies to all AECOM Americas-based employees and operations, as well as contracted personnel required to comply with this document's content.

2. Procedure

2.1 Critical Controls

The following is a list of minimum mandatory critical controls to be implemented, as applicable, by the Project Manager or Designee to prevent high potential and/or significant incidents:

a. Safety, Health, and Environment (SH&E) plans and task hazard assessments (THAs; e.g., field level risk assessments [FLRAs] in Canada) must identify:

   i. Applicable hazards related to noise exposure via established exposure limits and action levels specified by local law.

   ii. In the absence of specifications, an 8-hour time-weighted average (TWA) of 85 decibels A (dBA) as the action level.

   Note: Refer to SH&E Risk Assessment and Planning – Americas.

b. When processes or areas present potential or actual noise exposures at or above the action level identified by local law, a trained and competent individual must conduct a noise survey and interpret results to measure the extent of the hazard.

c. Resulting documentation (e.g., noise maps, and results of the sound level survey data) must be communicated to affected employees in writing within 15 days from receipt of results, or less where required by local law, and posted or available at the location.

d. Noise assessments must be repeated when there is any change in processes or equipment affecting the noise level or the exposure duration.

e. Eliminate noise sources or use engineering controls to reduce noise levels when practicable prior to implementing hearing protection personal protective equipment (PPE).

f. Where practicable, a clearly visible warning sign must be posted at every approach to an area in the workplace where the sound level regularly exceeds 85 dBA.

2.2 Hearing Protectors

The Project Manager is responsible for confirming the following:

a. At a minimum, hearing protectors must provide a level of protection bringing actual or anticipated exposure below the established exposure limit in accordance with local law.

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b. Hearing protection is mandatory for all employees who:

   i. Work on or near heavy equipment unless personal dosimetry or other techniques have been used to document actual exposure is below the action level;

   ii. Are exposed to 85 dBA or higher at any time; and/or

   iii. Have experienced a standard threshold shift (STS).

c. Hearing protection must be made available at no cost to all employees exposed to the action level.

   Note: At least two types of hearing protectors must be available to employees free of charge, and the type of hearing protector must be suitable to the task and in accordance with local law.

d. Hearing protectors must be used in accordance with manufacturer's specifications to effectively protect hearing.

e. Refer to Safety Gear – Americas for additional information.

2.3 Audiometric Testing

a. Employees with exposure greater than the action level must be enrolled in the medical surveillance program at no cost to the employees, which includes that the enrolled employees receive:

   i. Baseline audiograms within 6 months of the first exposure (consult local law for more stringent timelines).

   ii. Audiograms annually and compared with the baseline exam to determine if the audiogram is valid, and if there is an STS.

   iii. Audiograms during their exit physicals.

b. For more information on medical surveillance, refer to Fitness for Duty – Americas.

c. Audiometric testing and employee notification of results must be in accordance with local law.

2.4 Employee Monitoring

a. When information indicates employees' exposure may equal or exceed the applicable action level, the Project Manager and SH&E Manager must develop and implement a site-specific monitoring program to identify inclusion in the hearing conservation program and enable the proper selection of hearing protectors.

b. Noise surveys must be conducted in a manner reasonably reflecting the exposure of affected employees. Surveys must be conducted under supervision of a competent person.

3. Training

a. All employees with potential exposure above the applicable action levels, or who otherwise utilize any type of hearing protector, must participate in a hearing conservation training program.

b. Training must occur with 30 days of enrollment into the hearing conservation program and address the use of hearing protectors. Refer to SH&E Training – Americas and its associated Assessment of SH&E Training Requirements – Americas for additional training requirements.

c. Hearing protection training must be conducted annually for all affected employees or more frequently for employees who do not properly use hearing protectors or otherwise fail to comply with this policy.

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4. Terms and Definitions

a.	Action Level	May also be referred to as Monitoring Level. An 8-hour, time-weighted average established by local law, measured on the A-scale, slow response. Depending on local law, this can vary anywhere from 74 dBA to 85 dBA, and may additionally be defined as 50% of the allowable noise dose. In the absence of an action level specified by local law, 85 dBA must be used as the default action level.
b.	dB	Decibel – Logarithmic unit of measurement of sound level.
c.	Established Exposure Limit	The maximum regulatory noise exposure to which an individual may be exposed to for an 8-hour time weighted average (TWA). This limit is referred to by different terminology depending upon local law (e.g., Permissible Exposure Limit [PEL], Contamination Limit, Occupational Exposure Limit [OEL], Threshold Limit Value [TLV], etc.). Acceptable methods of adjusting this limit to correspond to a different exposure period (e.g., 10 hours) vary by local law.
d.	PPE	Personal Protective Equipment.
e.	SH&E	Safety, Health, and Environment.
f.	STS	Standard Threshold Shift – When one's hearing threshold has changed (relative to the baseline audiogram) an average of 10 dB or more at 2000, 3000, or 4000 Hz in either ear.
g.	TWA Sound Level	Time-Weighted Average Sound Level – The average noise level a person is exposed to over a specific period of time, usually an 8-hour workday, taking into account variations in the noise level during that time. It considers both noise levels and how long the employee is exposed at each noise level.

5. References

a. SH&E Training – Americas S3AM-003-PR2

b. Fitness for Duty – Americas S3AM-008-PR2

c. SH&E Risk Assessment and Planning – Americas S3AM-209-PR2

d. Safety Gear – Americas S3AM-208-PR2

6. Records

a. Noise exposure measurement records, surveys, and site-specific hearing conservation plans must be retained at the project or facility for the duration of the project.

b. Audiogram records must be retained in the employee's medical records.

c. Assessment of SH&E Training Requirements – Americas S3AM-003-FM1

7. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	01-Mar-2016	Initially released as S3NA-118-PR1	
1	31-July-2019	Re-released as S3AM-118-PR1	
2	01-Dec-2025	2025 review; comprehensive revision as part of the Americas SH&E IMS simplification; converted to new IMS Procedure Template and AECOM Style.	All

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Hazardous Energy Control

S3AM-302-PR2

1. Purpose and Scope

a. The purpose of this procedure is to outline the safe working requirements for personnel operating, inspecting, maintaining, cleaning, or working in the vicinity of machines or equipment containing hazardous energy sources such as:

   i. Electrical circuits (e.g., overhead lines)

   ii. Fluid systems (water and liquid product)

   iii. Pneumatic systems

   iv. Hydraulic systems

   v. Flammable systems (including liquid and gaseous fuels)

   vi. Thermal systems (steam)

   vii. Gravity systems (e.g., suspended or dropped objects) and energy stored in springs

b. This procedure provides the safe work requirements where overhead obstructions (e.g., those carrying hazardous energy such as electricity, water, and gas), overhead utilities, or other lines are present at a work location, including, but not limited to, electric power lines, electrical apparatuses, or any energized (exposed or insulated) parts, communication wires, or any other overhead wire or cable.

c. This procedure establishes the requirements to perform hazardous energy control through lockout and tagout (LOTO) operations. If the Client or facility has a LOTO procedure, it may be used if it meets or exceeds the AECOM procedure.

d. This procedure must be implemented in accordance with legal requirements, with the most stringent standards being applied.

e. This procedure applies to all AECOM Americas-based employees and operations, as well as contracted personnel required to comply with this document's content.

2. Procedure

2.1 Critical Controls

The following is a list of the minimum required critical controls to be implemented by the Project Manager or Designee to prevent high potential and/or significant incidents:

a. All wires, pumps, and pressurized equipment are to be considered and treated as live, unless locked and tagged out, and verified to be in a zero-energy state by a Qualified Person.

b. All permanent and temporary power sources, receptacles, and power hand tools must be protected with Ground Circuit Fault Interrupters (GFCIs), as required, and installed in accordance with manufacturer instructions.

c. Equipment, cords, or receptacles showing damage or defects that affect safe operation are not to be used. This applies to visual inspections made before, during, and after use. Such items must be tagged "Out of Service" and replaced before being returned to use.

d. Temporary and permanent electrical systems must be installed, tested, and commissioned to current legal and industry standards and verified as such by a Qualified Person.

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e. Signage and labels on electrical panels, enclosures, and buildings containing electrical equipment must be consulted for access requirements and to identify and control arc flash and shock hazards.

f. Suitable temporary barriers or barricades must be installed when access to opened enclosures containing exposed energized equipment is not under the control of an authorized person.

g. All potential harmful energy sources requiring isolation and LOTO must be identified by a competent person and specific to the worksite, system, and/or equipment.

h. Minimum Approach Distances (MAD) must be maintained between equipment, its occupants, and their tools and energized overhead lines, electrical apparatuses, or any energized parts – refer to Appendix 2.

i. Only fiberglass or wood ladders are permitted when working near live electrical sources.

j. Air hoses used under pressurized conditions must be reinforced with whip checks and safety clips or other wire-type retainers at all points of connection to prevent uncoupling.

k. Rotating/reciprocating/moving parts of equipment are to be guarded if such parts are freely accessible to contact by employees or otherwise create a hazard. Examples of such parts include belts, gears, shafts, pulleys, sprockets, spindles, drums, fly-wheels, or chains. Refer to Heavy Equipment and Machines – Americas.

2.2 Hazardous Energy Sources

2.2.1 Live Electrical

a. Working near live electrical sources includes any of the following:

   i. Potential direct physical contact.

   ii. Contact by means of tools or equipment.

   iii. Working close enough to the energized part to draw an arc.

b. Safe approach distances to live energy sources (refer to Appendix 2), a risk assessment (refer to SH&E Risk Assessment and Planning –Americas), and other safety protocols must be established and documented through consultation with the asset owner, a Qualified Person, and/or equipment manufacturer before any work commences.

c. The Project Manager must inform the client/owner/controlling authority/contractor, of hazards presented by the work conducted by AECOM, hazards identified during work not previously identified, and measures in place to control hazards identified by AECOM, client/owner, or host employer.

d. The Qualified Person must confirm the following before commencing work on live electrical sources:

   i. Adequate lighting and clearance space.

   ii. Insulating equipment (including hot-line tools, protective barriers, or shields where applicable) designed for the voltage levels to be encountered is available for use.

   iii. Safety devices, tools, personal protective equipment (PPE), and other equipment is inspected before each day's use and promptly after an incident that can reasonably be suspected of having caused damage.

   iv. Tested equipment is marked to identify either the most current test date or the next date testing is due.

   v. Conductive articles of jewelry and clothing are not worn if they might contact exposed energized parts.

e. Arc flash protection protocols must be in place for work around circuits of 50 volts or higher.

f. Test instruments used to test for the absence of voltage must be verified to be in proper working order before and after an absence of voltage test is performed.

g. If safe approach distances cannot be maintained, the energy source must be locked and tagged out and verified to be in a zero-energy state by a Qualified Person. (See Section 2.3 on LOTO) Any person working around live equipment must use the appropriate PPE (see Safety Gear – Americas).

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h. Tools/equipment capable of conducting electricity must not be used near live electrical installation/equipment.

i. Only a Qualified Person must work on live electrical sources (including troubleshooting, testing, and voltage measuring) and only when the following circumstances are all met:

   i. When it is deemed necessary.

   ii. Where the energy supply cannot be interrupted.

   iii. When discussed, coordinated, and authorized by workplace management and with all personnel that may be working within or near the safe approach distances.

j. Work on energized circuits can only be done under special circumstances using an energized electrical work permit completed and issued by the Qualified Person. This permit considers the voltage levels, known electrical hazards, communication requirements (including notification to the controlling authority), insulated mats and tool requirements, and need for watch persons.

2.2.2 Overhead Lines and Obstructions

a. Work on or near electrical utilities may only be performed by authorized/qualified personnel.

b. Overhead lines and obstructions are presumed to be energized and uninsulated unless the overhead line owner/operator or a Qualified Person confirms they have been and continue to be de-energized, visibly grounded at the worksite, and/or insulated.

c. Coordinate with overhead lines/obstructions owners or operators to identify all overhead line hazards.

d. If work is to be done or equipment is operated within 50 feet (15.25 meters) of an energized overhead line, contact the overhead line owner/operator (i.e., local utility company) in advance, to determine the voltage and establish the appropriate MAD.

e. Until the voltage of the overhead electrical line is known, an exclusion zone must be created at ground level beneath and 50 feet (15.25 meters) perpendicular to the overhead electric power lines on each side. The exclusion zone must be demarcated with visual indicators (e.g., signage, flagging, paint, cones).

f. Confirm the overhead electrical line owner/operator(s) are fully informed as to when the operations are to begin, end, and when any location changes are planned, if applicable.

g. Coordinate and perform a walk-through of the site and/or review of the work area/travel route with the Supervisor, employees, and other applicable personnel (e.g., client, other on-site contractors) to identify any overhead lines and obstructions that may be impacted by the work. Refer to Heavy Equipment and Machines – Americas.

h. The appropriate signs must be affixed to equipment warning operators to stay away from overhead power lines.

i. All low-hanging communication lines near energized lines must be clearly identified.

j. Project Managers must complete a site-specific emergency response plan as part of their project-specific SH&E plan for all operations during which equipment is operated within 50 feet (15.25 meters) of an energized overhead electrical line or conductor. This plan must identify the following information:

   i. The importance to the operator's safety of remaining inside the cab except when there is an imminent danger of fire, explosion, or other emergency that necessitates leaving the cab.

   ii. The safest means of evacuating from equipment that may be energized.

   iii. The potentially energized zone around the equipment.

   iv. The need for crew in the area to avoid approaching or touching the equipment and the load.

   v. The means to de-energize the electrical line or live conductor.

   vi. The contact information for the utility overhead electrical line owner/operator and emergency services.

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2.2.3 Extension Cords

Extension cords must:

a. Not be placed across aisles, through windows or doors, through holes in a wall, or in areas where the cord may be damaged and/or create an electrical/shock hazard.

b. Only be used for temporary installations not to exceed 90 days.

c. Be of adequate length. “Daisy chaining” or connecting a series of extension cords together is not permitted.

d. Not be fastened with staples or otherwise hung in a manner that could damage the outer jacket or insulation.

e. Be of the three-wire grounding type and rated for the intended load, and listed by Underwriters Laboratories, Inc.

f. Have clamps or other securing means at plug receptacles, tools, equipment, etc. and cord jackets that are securely held in place.

2.2.4 Temporary Electric Power, Lights, and Task Lights

a. A temporary electrical plan is to be submitted for AECOM-controlled project sites utilizing temporary power. The electrical contractor responsible for installation of the temporary electrical service is required to provide a certification letter attesting the temporary service has been installed in accordance with all applicable codes.

b. Electrical equipment installed to provide electric power and lighting at worksites (both temporary and permanent) must contain markings durable to the expected environment to inform workers of the equipment’s:

   i. Manufacturer, trademark, or party responsible for the equipment.

   ii. Voltage, wattage, and current ratings.

   iii. Any other ratings as necessary.

c. Only use equipment/installations that are appropriately marked.

d. Electrical outlets used to supply power for electrical equipment during field operations must be of the three-wire grounding type.

e. Temporary wiring must be protected to prevent accidental contact by workers’ equipment and accidental damage and must not be suspended by the cord unless designed by the manufacturer to do so.

f. A vertical clearance above walkways for temporary wiring must not be less than 10 feet (3 meters) from circuits carrying 600 volts or less.

g. Temporary lights, and other lights that present a shock or burn hazard, must be equipped with bulb protectors unless they are installed at least 7 or more feet overhead and promptly replaced if broken or defective.

2.2.5 Circuit Breakers

a. Disconnecting switches and circuit breakers must be labeled to indicate their use or equipment served.

b. Circuit breakers must clearly indicate whether they are in the “ON” or “OFF” position.

c. Electrical switches and breakers (rated 440 volts or greater) must be provided with a means for locking them out in the “OFF” position.

d. The appropriate markings for arc flash hazards must be on each panel or distribution box.

e. Circuit breaker panels must not have any openings or uncovered knockouts and must be kept covered except during testing or repairs.

f. Circuit breakers accessible to personnel must be protected from physical damage and located away from ignitable material.

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g. All live parts of electrical equipment operating at 50 volts or more must be properly guarded against accidental contact by approved cabinets or enclosure.

h. Weatherproof cabinets or enclosures must be used when switches, circuit breakers, fuse panels, and motor controllers are in a wet or outside location.

i. A readily accessible, manually operated switch must be provided for each incoming service or supply circuit rated less than 5 kilovolts.

j. Electrical raceways and enclosures must be securely fastened in place.

k. Overcurrent protection must be provided for fuses or circuit breakers for each feeder and branch circuit.

l. Insulting fuse tongs or extractors must be used when removing fuses from circuits rated 50 to 600 volts.

m. Fuse cabinets must have close-fitting doors that can be locked.

2.2.6 Hydraulic, Mechanical, and Pneumatic Sources

a. More than one source of energy may be involved with these systems. Follow the LOTO requirements below when applicable.

b. Compressed air may not be used for cleaning unless the pressure is reduced below 30 pounds per square inch.

c. Compressed air equipment must be inspected, and safety valves must be tested according to manufacturer's instructions.

d. All air receivers must be equipped with indicating pressure gauges and be drained frequently.

2.3 Lockout/Tagout (LOTO)

a. LOTO must be conducted when:

   i. An unexpected energization or startup of machines and/or equipment would result in the release of stored energy that could cause injury to an employee.

   ii. Any employee (or contractor) is required to remove or bypass a guard or other safety device.

   iii. Any employee (or contractor) is required to place any part of his or her body into the mechanism of a piece of equipment or path of hazardous energy.

b. Project Managers must ensure a diligent approach to planning is implemented for all work on or near systems.

c. Planning must consider the inherent risk associated with a system's energy source (i.e., working close to or on systems in hazardous zones, or with flammable/explosive properties) and reduce any sources of ignition (refer to Hazardous Substances and Communication – Americas and Heavy Equipment and Machines – Americas.

d. Only Qualified and/or Authorized Employees trained in LOTO procedures will be involved with the LOTO of all potential sources of energy on energized systems.

e. Where the number of energy control activities is extensive or the scope of energy controls is complex, the Qualified Person may choose to use the Lockout Tagout Permit – Americas as an aid.

f. Consideration must also be given to any specific legal requirements (e.g., Ontario - equipment protection by using Hold-Off tags to restrict device operation to previously agreed limits).

g. Written procedures for LOTO must be developed and approved by the Qualified Person and must be implemented prior to performing work. Where client requirements and programs exist, AECOM procedures must incorporate the most stringent requirements.

h. The site-specific procedures must be understood and followed by all affected staff prior to the performance of work on energized systems.

i. No work must be initiated (including LOTO procedures) prior to obtaining any required permits.

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j. The site-specific emergency response plan must be in place and reviewed with all potentially affected personnel.

k. It is the responsibility of managers and/or supervisors to identify when their work requires the isolation and control of a hazardous energy source.

l. For LOTO equipment (e.g., lock and tag) criteria, refer to Appendix 1.

2.3.1 General Procedures

a. Managers must confirm that their site-specific written LOTO procedures are audited at least annually including the observation of workers performing the procedure.

b. Refer to Table 1 for the general LOTO steps that must be addressed in site-specific written LOTO procedures.

c. Under no circumstances is an Authorized Employee allowed to work on machine or equipment that does not contain their own lock (even if the energy is isolated and locked and tagged by another employee).

d. Authorized Employees must work only on protected source(s) to which they have applied their individual lock (at the isolation point(s) or on the associated lockbox). Locks and tags will remain in place until the work has been completed.

e. The locks, tags, and equipment must not be tampered with by any employee.

f. Refer to Table 2 for restoring equipment to service.

Table 1. General LOTO Steps

Step	Action
1	**Employee Notification** Inform all Affected Employees LOTO is necessary and the reason for the LOTO.
2	**Energy Source Identification** Identify the type and magnitude of all energy sources and the respective method of control.
3	**Equipment Shutdown** Shut down the machine/equipment by the normal stopping procedure (depressing the stop button, open switch, close valve, etc.).
4	**Applying Energy Isolating Device** Apply all energy isolating devices so the machine/equipment is isolated from all energy sources and brought to a zero-energy state.
5	**Lockout and Tagout** All involved Authorized Employees place their assigned individual lock(s) on all appropriate energy isolating devices. All involved Authorized Employees place their assigned individual tag(s) on the associated lock(s) or, as appropriate, on all applicable energy isolating devices.
6	**Energy Dissipation** Dissipate/restrain all stored/residual energy (such as in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, air, steam, or water pressure) by methods such as grounding, repositioning, blocking, bleeding down, etc.
7	**Zero-Energy State Verification** Verify that the equipment is disconnected from all energy sources by first checking that no personnel are exposed, then verifying the isolation of the equipment by operating the push button or other normal operating controls.

Table 2. Restoring Equipment to Service

Step	Action
1	**Job Completion Verification** Check the machine/equipment and immediate area to confirm that nonessential items have been removed and the machine/equipment components, including guards, are operationally intact.
2	**Personnel Verification** Notify all Affected Employees of the intent to remove LOTO devices, verify the personnel are safely positioned or removed from the area, and verify all controls are in neutral.
3	**Lockout Removal and Equipment Startup** All involved Authorized Employees remove their assigned individual LOTO devices and the machine is re-energized.
4	**Employee Notification** Notify all Affected Employees that the LOTO is complete and that the machine/equipment is ready for use

2.3.2 Group Lockout

a. If more than one employee is involved in the LOTO procedure (group lockout) for the given machine or equipment, the following must be done:

   i. The locks, tags, and isolation points must be documented by the Qualified Person using Lock and Tag Log – Americas or equivalent.

   ii. Either each Authorized Employee must apply their own individually identifiable lock to a LOTO device capable of accepting multiple locks at the isolation point(s), OR energy isolation and LOTO must be performed by the Qualified Person.

b. If energy isolation and LOTO is to be performed by the Qualified Person, the following must be done:

   i. The Qualified Person applies the locks and tags at the various isolation points. Depending on the jurisdiction or client requirements, two Qualified Person(s) may be required to apply the locks and tags.

   ii. After each involved Authorized Employee has verified energy isolation and complete LOTO by the Qualified Person(s), the key(s) to the isolation point lock(s) is placed in a lockbox.

   iii. Each Authorized Employee applies their own individually identifiable lock to the lockbox.

   iv. The Lock and Tag Log – Americas or equivalent, must be attached to the outside of the lockbox.

c. In cases of complex group lockout scenarios (multiple group lockouts, use of additional locks/lockout devices beyond the available keyed alike locks etc.), equipment-/site-specific procedures must be developed by a competent/qualified worker and reviewed and implemented by all involved Authorized Employees to achieve a zero-energy state.

2.3.3 Shift Change Procedures

a. If ongoing work requires carryover from shift to shift, or transfer of responsibility between Authorized Employees, the following procedure will be implemented:

   i. The Authorized Employee(s) who originally performed the lockout will walk through the lockout/isolation steps with the new Authorized Employee(s).

   ii. At each isolation point, the original Authorized Employee must remove their LOTO device(s), to be immediately replaced by the new Authorized Employee's device(s).

   iii. Upon transfer of the LOTO equipment, the new Authorized Employee(s) must verify that the equipment is still isolated prior to continuation of work.

b. Under no circumstances must the original LOTO devices remain in place and just the keys transferred.

c. For a supervisor and Qualified Person conducting group lockouts, the same procedure must be used with the oncoming Supervisor or Qualified Person.

2.3.4 Removal of Unattended LOTO Devices

a. Only the person(s) who placed the LOTO devices on the system can remove the devices, unless:

   i. The Manager has verified that the Authorized Employee is not on site and is not available to return to the site to remove the lock.

   ii. All reasonable efforts have been made to contact the Authorized Employee to verify that the work is complete, and the devices are about to be removed.

   iii. The Manager inspects the LOTO device and confirms that the appropriate steps in preparation of safely re-energizing the machine or equipment have been completed.

b. If all the above applies, the locks and tags will be removed only at the direction of the Manager. The Manager must document the event prior to removing the lock and store the document in the project/location files.

c. The Manager must confirm the affected machine, or equipment is monitored to confirm no one returns while re-energizing.

d. Unauthorized removal of a LOTO device will result in immediate dismissal from the project site and potential termination.

e. The Authorized Employee whose LOTO device was removed must be informed of the removal prior to resuming work.

2.3.5 Equipment-Specific LOTO Procedures

a. Written procedures will be developed for the LOTO of each piece of equipment that has potentially hazardous energy sources. Refer to Equipment-Specific LOTO Process Template – Americas or equivalent.

b. Each procedure must be reviewed and approved by the SH&E Department prior to implementation.

c. Equipment-specific written LOTO procedures are not required if ALL following conditions are met:

   i. The equipment's only energy source is electrical

   ii. The unexpected startup of equipment is controlled by unplugging the equipment from its electrical source; and

   iii. The plug or switch is under the exclusive control of the person performing the work.

d. Additionally, written equipment-specific LOTO procedures are not required if ALL the following apply:

   i. The machine has no potential for stored or residual energy, or re-accumulation of stored energy after shutdown (i.e., contains a capacitor to store electrical energy or pressurized tank to store air/gas)

   ii. The machine has a single energy source that can be readily identified and isolated

   iii. The lockout and isolation of the energy source completely de-energizes and deactivates the equipment

   iv. Servicing of the machine requires that its energy source must previously have been locked out and tagged out in accordance with general LOTO procedures as established in this document; and

   v. A single lockout device achieves a locked-out condition.

3. Training

a. Employees who have potential exposures to electrical hazards must be trained in and be familiar with the electrical safety-related work practices required by this procedure and applicable law/client requirements.

b. Affected Employees, supervisors, and managers will be trained in the following areas before being involved in de-energizing or shutdown of equipment, LOTO, affected by LOTO, or to work on equipment requiring LOTO:

   i. Recognition of hazardous energy sources.

   ii. Types and magnitudes of energy sources located in the workplace.

   iii. Procedures for energy isolation and control, including specific procedures developed for specific machines and equipment (e.g., valve lockout and electrical lockout).

   iv. Recognition of when to use LOTO procedures.

   v. Purpose and use of the energy control (LOTO) procedures, equipment, and devices.

   vi. Prohibitions and penalties for attempting to restart or re-energize equipment that has been locked out/tagged out, or to work on equipment without following the LOTO procedures.

c. A Qualified Person is limited to those supervisors, managers, and selected employees who have successfully completed all the required training and are familiar with the construction and operation of the proposed equipment and the hazards involved.

d. Authorized Employees must also be adequately trained and competent in relation to the skills required to perform the LOTO procedure (e.g., all electrical work must be performed by a qualified electrician).

e. All employees whose work operations may be in an area where LOTO procedures may be utilized will be trained about the procedure and about the prohibition relating to attempts to restart or re-energize machines or equipment that are locked out/tagged out. These personnel are not required to be familiar with specific procedures for machines and equipment.

f. Retraining or refresher training for a Qualified Person, Authorized Employees, and/or Affected Employees will be conducted whenever one of the following exists:

   i. The Employee has a change in job assignment.

   ii. There has been a change in the equipment or process.

   iii. There has been a change in the energy-control procedure or new hazards arise.

   iv. When evaluation of applied LOTO procedures reveals a need for additional training.

   v. An incident occurs as a result of unexpected energy release.

g. Refer to SH&E Training – Americas and its associated Assessment of SH&E Training Requirements – Americas for training requirements.

4. Terms and Definitions

a.	Affected Employee	A trained person whose job requires the operation/use of a machine or equipment on which servicing or maintenance is being performed under LOTO, or whose job requires working in an area in which such servicing or maintenance is being performed. The Affected Employee is not performing work under LOTO, but rather is potentially affected by the work being performed by the Authorized Employee(s).
b.	Arc Flash	A dangerous condition associated with the release of energy during an electrical arc.
c.	Authorized Employee	A person who is appropriately trained and handles LOTO of a machine or equipment to perform servicing, construction, or maintenance on that machine or equipment.
d.	Electrical Hazard	A dangerous condition such that contact or equipment failure can result in electric shock, arc flash burn, thermal burn, or blast.
e.	Energized	Connected to an energy source or containing residual or stored energy.

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f.	Flash Hazard	A dangerous situation associated with the release of energy caused by an electric arc.
g.	GFCI	Ground Fault Circuit Interrupter – An electrical device that is designed to prevent electrocution from electrical leakage. GFCIs sense imbalances or differences along the electrical circuit and shut it down when needed.
h.	Isolation	A physical activity using a device that prevents the transmission or release of energy. Examples of energy isolating devices include valves, breakers, switches, blank flanges for piping systems, and restraining devices to prevent movement of parts.
i.	Locking Device	A device that utilizes a lock and key to hold an energy-isolation device in the safe position for the purpose of protecting personnel.
j.	Lockout	The use of a locking device to confirm that an energy isolating device and the equipment it controls cannot be operated until the lockout device is removed.
k.	LOTO	Lockout tagout.
l.	LOTO Specific Procedure	A written procedure developed specifically for each piece of machinery or equipment capable of unexpectedly releasing energy. This procedure outlines in detail of how LOTO will be performed.
m.	MAD	Minimum Approach Distance – The closest distance any employee or any part of the operating equipment is permitted to approach an energized or a grounded object.
n.	Normal Production Operations	The use of a machine or equipment to perform its intended production function.
o.	PPE	Personal protective equipment.
p.	Qualified Person	Individual who has specific and documented training and has demonstrated skills and knowledge in the construction and operation of electric equipment and installations to avoid the hazards of working on or near energized electrical equipment. Qualified Persons must have been specifically permitted to be near exposed and energized parts. Even an experienced electrician is unqualified unless he or she knows the particular equipment and has received specific safety training on the potential hazards involved. These personnel will meet all qualification requirements mandated by law as well as applicable electrical associations and trade bodies (e.g., NFPA 70E – refresher training in safety related practices and any changes to the NFPA standard must be completed at intervals not exceeding 3 years).
q.	Servicing and/or Maintenance	Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or unjamming of machines or equipment, and adjusting or making tool changes where employees could be exposed to the unexpected energization or startup of the equipment or a release of hazardous energy.
r.	Shock Hazard	A dangerous situation associated with the possible release of energy caused by contact or approach to live parts.
s.	Tagout	Use of a warning device, such as a tag and its means of attachment, to establish that an energy isolating device and the equipment it controls may not be operated until the tagout device is removed.

5. References

a. Safety Tenets and Stopping Work – Americas S3AM-001-PR2

b. SH&E Training – Americas S3AM-003-PR2

c. Hazardous Substances and Communication – Americas S3AM-110-PR2

d. Safety Gear – Americas S3AM-208-PR2

e. SH&E Risk Assessment and Planning – Americas S3AM-209-PR2

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f. Hand and Power Tools – Americas S3AM-305-PR2

g. Heavy Equipment and Machines – Americas S3AM-309-PR2

6. Records

The following must be documented and retained in the project files:

a. Proof of training and orientation completions.

b. List of personnel maintained at each project/office who are trained in accordance with their designations (Qualified Person, Authorized Employees, and Affected Employees).

c. All inquiries regarding electric utilities with confirmation of the outage/isolation prior to the start of a task with potential to impact a utility.

d. Lock and Tag Log – Americas S3AM-302-FM3

e. Lockout Tagout Permit – Americas S3AM-302-FM4

f. Equipment-Specific LOTO Process Template – Americas S3AM-302-FM5

g. Assessment of SH&E Training Requirements – Americas S3AM-003-FM1

7. Appendices

a. Appendix 1 – LOTO Equipment

b. Appendix 2 – Minimum Approach Distance (MAD) and Alternate Procedures

8. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	01-Dec-2025	Initial release as S3AM-302-PR2; consolidated portions of the contents from the following retired documents: Electrical Safety – Americas S3AM-302-PR1, Live Electrical Work – Americas S3AM-302-ATT1, Electrical Hazard Checklist – Americas S3AM-302-FM2, Overhead Lines and Obstructions– Americas S3AM-322-PR1, Lockout Tagout – Americas S3AM-325-PR1, Sample Tags – Americas S3AM-325-ATT1, and LOTO Verification Checklist S3AM-325-FM2.	All

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Appendix 1 LOTO Equipment

a. Locking devices must be:

   i. Traceable to an individual person using a tag, picture, number, or other unique identifier.

   ii. Made of durable non-conducting material and distinguishable from locks used for any other purpose.

   iii. Substantial and secured in such a way as to prevent inadvertent removal without excessive force.

   iv. Standardized within the facility (color, shape, or size) and placed in a conspicuous location.

   v. A keyed (NOT combination styled) lock. Keyed requirements may vary per jurisdiction and client requirements.

b. A multiple lockout device must be used when various Authorized Employees will be working on a machine/equipment. The multiple lockout device is applied to the point of isolation or to a lockbox, with each Authorized Employee applying their individual lock to the multiple lockout device. Use of the lockbox is coordinated by the Qualified Person.

c. Other additional equipment may be used to adequately secure the point of isolation. Examples include:

- Chains
- Lockout pins
- Plug lockouts
- Valve lockouts
- Toggle locks
- Electrical socket lockouts
- Pneumatic lockout devices
- Lockout bags
- Blanks and blinds

d. Tags must be:

   i. Placed at the same point as the lock.

   ii. Substantial and secured in such a way as to prevent inadvertent removal without excessive force. The attachment means must be of a non-reusable type, attachable by hand, self-locking, and non-releasable.

   iii. Made to withstand environmental conditions and legible.

   iv. Consistent within the facility/site in color, shape, or size, and with print and format standardized.

   v. Labeled with clear warnings and the name of the person responsible for the device (e.g., Figure 1). Additional information may be added when appropriate.

e. Where lockout with a keyed lock is not possible, tags containing the above-mentioned information must be:

   i. In place (e.g., steering wheel lockout) at the point of isolation or as close as safely possible; and

   ii. Highly visible and adequately identify the point of isolation and the associated hazards.

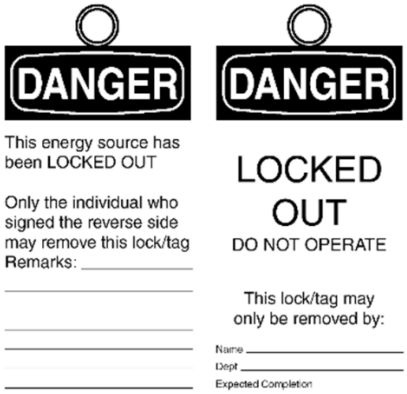

Figure 1. Sample Tag

Appendix 2 Minimum Approach Distance (MAD) and Alternate Procedures

a. Unqualified employees must maintain a safe clearance distance in accordance with the established MAD when working in an elevated position near energized overhead lines. The MADs in Table 3 must be maintained and are applicable to all AECOM operations. Legally required minimum distances must take precedence if more stringent.

Table 3. Minimum Approach Distances (MAD)

Voltage Range (Kilovolts) (Phase-to-Phase)	MAD in Feet (Meters)
Personnel must allow for equipment movement and electrical line swaying when establishing a MAD	
0 – 50	10 (3)
Over 50 – 200	15 (5)
Over 200 – 350	20 (6)
Over 350 – 500	25 (8)
Over 500 – 750	35 (11)
Over 750 – 1,000	45 (14)

Note: This requirement applies except where client or legal requirements are more stringent.
Source: American National Standards Institute, Publication B30.5.

b. An appropriate distance must be kept between equipment, its occupants, and their tools and energized overhead lines, electrical apparatus, or any energized parts. Some options to consider when maintaining a safe distance include:

   i. Install overhead warning devices and signs. Signs should be hung from guy wires to act as a clearance warning.

   ii. Place a combination of pylons and high-visibility tape underneath the electrical line.

   iii. Install telescopic, nonconductive posts and flagging across the right-of-way at the minimum allowable clearance as allowed by law for the line voltage.

   iv. Position signs or other devices to determine the "Danger Zone."

   v. Inform all job site personnel of the danger zone and the safe distances required.

c. Beware of atmospheric conditions, such as temperature, humidity, and wind, which can dictate more stringent safety procedures.

d. Signs, pylons, high-visibility tape, and/or signalers must not be removed until the last piece of AECOM equipment has traveled under the overhead electrical line.

e. Where any work task will not allow the MAD to be maintained, alternate procedures of protection must be implemented by the Project Manager and approved by the SH&E Manager.

f. A planning meeting with the Project Manager, SH&E Manager, and the overhead electrical line owner/operator must be held to determine the most effective alternative procedures. In order of preference, acceptable procedures are:

   i. De-energize Overhead Lines – Elimination of electrical power provides the most acceptable means of ensuring safety of personnel. Temporary site overhead lines under the control of the Site Manager can be de-energized locally, while electrical distribution and transmission lines must be de-energized only by the overhead electrical line owner/operator. Managers must confirm with the utility overhead electrical line owner/operator that the overhead line has been de-energized and visibly grounded at the job site.

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ii. Insulating Barriers – They must be rated for the voltage line being guarded. These barriers may not be part of or attached to the equipment. The MAD must only be reduced within the designed working dimensions of the insulating barrier. This determination must be made by a Qualified Person.

iii. Dedicated Line Spotters – They must be trained to enable them to effectively perform their task, including training on the applicable law. When a line spotter is required, the individual must wear reflective striping (coveralls or vest) and carry an air horn or other appropriate means of emergency communication.

g. Alternative procedures must meet all client/legal requirements and will be conducted by qualified and competent individuals, following the alternative written safe work procedures. All others are restricted from entering the MAD.

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Lockout Tagout Permit

S3AM-302-FM4

Instructions

1. **This form must be completed in accordance with Hazardous Energy Control – Americas S3AM-302-PR2.**
2. **Where the number of energy control activities is extensive or the scope of energy controls is complex, the Qualified Person may choose to use this permit as an aid.**
3. **Once completed, this form must be retained in the project files.**

Details					
Equipment/System to Be Isolated	….				
Building	….	**Floor**	….	**Column**	….
Other Location	….				
Purpose of Isolation	….				
Type of Isolation	….				
Authorized Employee Name	….			**Date**	…..
Special Instructions	….				
Lockout/Tagout Performed	….				

Tag No.	Device ID	Bldg/Floor/Col.	Installed By	Removed By
….	….	….	….	….
….	….	….	….	….
….	….	….	….	….
….	….	….	….	….
….	….	….	….	….
….	….	….	….	….
….	….	….	….	….

Verification That System Is Safe for Specified Work to Start		
….		….
Authorized Employee Name	Signature	Date/Time

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Accountability		Accepts Protection
....		....
Qualified Person Name	Signature	Date/Time

Accountability		Releases Protection
....		....
Qualified Person Name	Signature	Date/Time

Lockout/Tagout Removal Authorization		
....		....
Authorized Employee Name	Signature	Date/Time

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Equipment-Specific LOTO Process Template

S3AM-302-FM5

Details				
Process Reference Number	….			
Equipment	….			
Equipment Number	….	**Location**	….	
Developed by	….			….
	Name	**Signature**		**Date**

1. Purpose

This seven-step process establishes the minimum requirements for the lockout of energy isolating devices whenever servicing or maintenance is done on facility equipment. This process document is to be completed and retained in accordance with Hazardous Energy Control – Americas S3AM-302-PR2. This process document should be placed on or near equipment and must be used to confirm that the equipment is stopped, isolated from all potentially hazardous energy sources, and locked out before employees perform any maintenance during which the unexpected energization or startup of the equipment or release of energy could cause injury.

2. Compliance with This Process

All employees are required to comply with the restrictions and limitations imposed on them during the use of this process. The Qualified Person (if applicable) and Authorized Employees are required to perform the lockout in accordance with this process. Other employees, upon observing a piece of equipment that is locked and/or tagged out, will not attempt to start, energize, or use said equipment.

3. Sequence of Lockout/Tagout

3.1 Employee Notification

a. All Affected Employees will be notified that the equipment must be shut down and locked out to perform servicing or maintenance.

b. **Specific Instructions:**

….

3.2 Energy Source Identification

a. The Qualified Person (if applicable) or Authorized Employee will identify the type and magnitude of the energy that the equipment utilizes, will understand the hazards of the energy, and will know the methods to control the energy.

b. Energy sources:

….	Electrical (44V)	….	Natural Gas	….	Spring
….	Hydraulic	….	Gravity	….	Steam
….	Chemical	….	Pneumatic	….	Thermal
….	Radiological	….	Residual	….	Other

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3.3 Equipment Shutdown

a. Shut down operating equipment by the normal stopping procedures (depress stop button, open switch, close valve, etc.).

b. **Specific Instructions:**

….

3.4 Applying Energy Isolating Device

a. Apply the energy isolating device(s) so that the equipment is isolated from the energy sources(s).

b. **Specific Instructions:**

….

3.5 Lockout and Tagout

a. Authorized Employee(s) lockout and tagout the energy isolating devices(s) with assigned individual locks and tags.

b. **Lockout Equipment Needed:**

….

3.6 Energy Dissipation

a. Dissipate any stored or residual energy (such as that in capacitors; springs; hydraulic systems; and air, steam, or water pressure, etc.) by methods such as grounding, repositioning, blocking, bleeding down, etc.

b. **Specific Instructions:**

….

3.7 Zero-Energy State Verification

a. Ensure that the equipment is disconnected from the energy source(s) by first checking that no personnel are exposed, then verify the isolation of the equipment by operating the normal operating control(s) or by testing to make certain the equipment will not operate. CAUTION: Return controls to “OFF” after verification. THE EQUIPMENT SHOULD NOW BE LOCKED OUT AT A ZERO-ENERGY STATE.

b. The zero-energy state should be verified via start-up attempts, visual observations, and testing. For electrical verification, place local on/off switch to “ON” position and verify equipment will not operate. Return the switch to “OFF” position and commence work.

c. **Specific Instructions:**

….

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Hand and Power Tools

S3AM-305-PR2

1. Purpose and Scope

a. The purpose of this procedure is to provide a set of minimum controls for the use of hand and power tools, including portable and powered equipment used on sites such as chain saws, brush cutters, powder-actuated tools, and similar high-hazard implements.

b. This procedure applies to all AECOM Americas-based employees and operations, as well as contracted personnel required to comply with this document's content.

2. Procedure

2.1 Critical Controls

The following is a list of the minimum required critical controls to be implemented as applicable by the Project Manager or Designee to prevent high potential/significant incidents.

a. All tools and equipment used by employees or managed subcontractors to conduct work on projects or sites under AECOM control must be maintained and operated in compliance with local law and the manufacturer's specifications.

b. No employee or subcontractor must use any hand or power tool unless they are familiar with the use and operation of the equipment and have received specific instruction on its use and operation.

c. A task hazard assessment (THA; e.g., field level risk assessment [FLRA] in Canada) or equivalent must be completed, reviewed, and approved before beginning any activity involving tools, machines, and/or equipment. Any task involving high-risk work requires review and approval by a Safety, Health, and Environment (SH&E) Manager. See SH&E Risk Assessment and Planning – Americas.

d. All tools must be used for the jobs for which they were designed and in accordance with manufacturer's specifications. Do not use tools for jobs they are not intended for. For example, do not use a slot screwdriver as a chisel, pry bar, wedge, or punch, or use wrenches as hammers.

e. Confirm lockout devices (padlocks, multiple lock hasps, tags) are utilized as necessary. Refer to Hazardous Energy Control – Americas.

2.2 General Requirements

a. Use approved tools only. Never modify or use makeshift tools.

b. Keep surfaces and handles clean and free of excess oil and grease to prevent slipping.

c. Do not carry sharp tools (e.g., knives, chisels, screwdrivers) in pockets; this practice may cause puncture wounds.

d. All tools must be properly maintained. Clean, dry, lubricate, and repair tools as applicable, and return to a suitable toolbox, room, rack, or other storage area upon completion of a job.

e. All tools designed to accommodate guards must have the guard(s) in place when the tool is in use. Do not modify, remove, or disable any machine guards.

f. Do not allow loose clothing, long hair not tied up, loose jewelry, rings, and chains to be worn while working with power tools.

g. Utilize good housekeeping practices to confirm tools do not present a tripping hazard.

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h. Do not throw tools from place to place or from person to person or drop tools from heights. Hand them, handle first, directly to other workers.

i. Screens must be set up to protect nearby workers from being struck by flying fragments around chippers, riveting guns, staplers, or air drills.

j. Confirm that proper ergonomic principles are being observed when using hand and power tools, such as but not limited to:

   i. Avoid static and awkward positions when possible by doing the following:

      1. Move at intervals to reduce muscle fatigue.

      2. Consider tools with a trigger strip, rather than a trigger button. This strip exerts force over a greater area of the hand that, in turn, reduces muscle fatigue.

   ii. Do not apply excessive force or pressure on tools.

   iii. If possible, use tools with comfortable grips that are designed to allow the wrist to stay straight. Avoid using a bent wrist.

   iv. Choose hand tools that have a center of gravity within or close to the handle.

   v. Frequently used tools weighing more than 1 pound (0.45 kilograms) should be counterbalanced.

   vi. Position the body properly when using a tool to prevent slips or falls in the event of unanticipated tool behavior (slip, kickback, etc.). Avoid over-reaching.

   vii. Pull on tools such as wrenches or pliers whenever possible. Loss of balance is more likely when pushing if the tool slips. If pushing is necessary, hold the tool with an open palm.

   viii. Reduce power to the lowest setting that can complete the job safely. This action reduces hand-arm vibration exposure associated with the use of hand tools.

   ix. Consider the need for controls such as limiting time of use.

   x. If safe to do so, adjust to a looser but stable grip, and use anti-vibration gloves.

   xi. Use of heavy tools such as jackhammers can cause fatigue and strains. Heavy rubber grips can reduce these effects by providing a secure handhold.

   xii. Do not increase a tool's leverage by adding sleeved additions (e.g., a pipe) to increase tool handle length.

k. Avoid placing fingers and hands in danger zones by doing the following:

   i. Confirm hands and fingers have enough clearance in the event the tool slips.

   ii. Confirm stability of the workpiece. Use workpiece holders (e.g., vice and chisel holder) whenever possible to prevent injury to hands or deflection of tool or workpiece.

   iii. Use push sticks or guides when cutting or machining smaller material.

l. If the task presents electrical hazards, the Employee must be competent and/or qualified and use the appropriate insulated tools to perform work that includes the risk of electrical shock. Cushioned grip handles do not protect against electrical shock. Refer to Hazardous Energy Control – Americas.

m. Secure or tether tools when working from heights to prevent them from falling. Never leave tools on ladders, scaffolds, or overhead work areas when they are not in use. Refer to Work at Height – Americas.

n. Make provisions to prevent tools from automatically restarting upon restoration of power. Refer to Hazardous Energy Control – Americas.

o. Use non-sparking and intrinsically safe tools in atmospheres with flammable or explosive characteristics and where highly volatile liquids and other explosive substances are stored or used. Refer to Hazardous Substances and Communication – Americas.

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2.3 Cutting Tools

a. When using cutting tools, employees must fully observe the following precautions when possible:

   i. Use the correct tool and correct size tool for the job. Tubing cutters, snips, self-retracting knives, concealed blade cutters, and related tools are task specific and minimize the risk of hand injury. For more information about cutting tools, see Appendix 1 – Alternative Cutting Tools.

   ii. Cut in a direction away from yourself and not toward other workers in the area. Direct the tools away from aisle areas and away from other employees working in proximity whenever possible.

   iii. Maintain the noncutting hand and arm toward the body and out of the direction of the cutting tool if it were to slip out of the material being cut.

   iv. Confirm the tool is sharp and clean; dirty and dull tools typically cause poor cuts and more hazard than a sharp, clean cutting tool.

   v. Store these tools correctly with covers in place or blades retracted, as provided by the manufacturer. Place sharp tools on benches so sharp points or edges face away from the edge.

   vi. On tasks where cutting may be very frequent or last all day (e.g., liner samples), consider cut-resistant (e.g., Kevlar®) gloves in the Personal Protective Equipment (PPE) evaluation for the project. Refer to Safety Gear – Americas.

b. Paper cutters must always be kept in a locked position when not in use. Do not remove guards on paper cutters.

c. Fixed open-blade knives (FOBKs) are prohibited from use during AECOM work. A FOBK is a tool with an exposed, prominent, sharp-edged blade that is fixed or can be locked into a fixed position. Examples of FOBKs include pocket knives, multi-tools, hunting knives, and standard utility knives.

   Note: Any exception to this requirement requires approval of the Project Manager and SH&E Manager via SH&E Management System Variance Request – Americas or an equivalent form.

2.4 Battery Powered Tools

a. Use only the type of battery specified by the tool manufacturer for the battery-powered tool to be used.

b. Recharge a battery or battery-powered tool only with a charger specified for the battery.

c. Store battery packs safely to prevent contact between the battery terminals and metal objects such as nails, screws, or wrenches. Such contact could cause a short circuit, potentially resulting in sparks, fire, or burns.

d. Battery storage and charging areas should be located in designated spaces that are dry, well-ventilated, and free from potential hazards such as combustible materials or incompatible substances. These areas should also include fire protection, adequate ventilation, and protection from foot or vehicle traffic.

2.5 Personal Protective Equipment (PPE)

a. Use PPE appropriate to the task: gloves, safety-toed boots, hard hats, safety glasses with side shields, goggles, hearing protection, respiratory protection, etc. Refer to SH&E Risk Assessment and Planning – Americas and Safety Gear – Americas.

b. Head and face protection is recommended for employees working with pneumatic tools.

c. Noise hazard is associated with pneumatic and many other tools. Working with noisy tools such as jackhammers requires proper, effective use of appropriate hearing protection. Refer to Noise – Americas.

2.6 Inspections

a. Inspect all hand tools on a regular basis and always prior to use. Defective tools must be immediately removed from service and tagged or destroyed to prevent further use.

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b. Where hand tools are identified as not fit for purpose, an observation report must be raised along with a corrective action. The corrective action must confirm that any non-compliant items identified during the inspection are rectified.

c. All tools must be inspected to confirm compliance with manufacturer's specifications. All tools must be inspected to ascertain all safety devices are present and functioning properly.

3. Training

a. Instruction in the proper use, safe handling, and maintenance of tools must be provided to employees unfamiliar with the tool. Training must include applicable manufacturer's specifications.

b. Employees must demonstrate knowledge and competency in the use, safe handling, and maintenance of the applicable tool prior to operation, especially in relation to the use of powered tools.

c. Refer to SH&E Training – Americas and its associated Assessment of SH&E Training Requirements – Americas for additional training requirements.

4. Terms and Definitions

a.	High Potential/Significant Incident	An incident with potential or actual consequences assessed at a severity level of Major, Critical or Catastrophic using the Severity Table found in SH&E Risk Assessment and Planning – Americas.
b.	PPE	Personal Protective Equipment.
c.	THA	Task Hazard Assessment.

5. References

a. SH&E Training – Americas S3AM-003-PR2

b. Hazardous Substance and Communication – Americas S3AM-110-PR2

c. Noise – Americas S3AM-118-PR1

d. Safety Gear – Americas S3AM-208-PR2

e. SH&E Risk Assessment and Planning – Americas S3AM-209-PR2

f. Hazardous Energy Control – Americas S3AM-302-PR2

g. Work at Height – Americas S3AM-304-PR2

h. Manufacturer's specifications

6. Records

a. The following documents, when applicable, must be maintained in the project file:

   i. Site briefings regarding appropriate use of tools and equipment.

   ii. Records of inspections of tools and equipment.

   iii. Copies of any required tool operating licenses (as applicable, e.g., powder-actuated tools).

   iv. Records of tools and equipment removed from service.

b. Assessment of SH&E Training Requirements – Americas S3AM-003-FM1

c. SH&E Management System Variance Request – Americas S3AM-215-FM2

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7. Appendices

a. Appendix 1 – Alternative Cutting Tools

8. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	01-Dec-2025	Initial release as S3AM-305-PR2; consolidated portions of the contents from the following retired documents: Hand and Power Tools – S3AM-305-PR1, Hand Safety – Americas S3AM-317-PR1, and Safe Alternative Tools – Americas S3AM-317-ATT1.	All

Appendix 1 Alternative Cutting Tools

The following are types of safety knives or alternative cutting tools:

Figure 1. Self-retracting utility knives (brands – OLFA, Martor, Allway Tools)

Figure 2. Guarded utility knives (brands – The Safety Knife Co., Martor)

Figure 3. Shears, snips, scissors (brands – Ridgid, Craftsman, Wolfcraft)

Figure 4. Concealed blade cutters (brands – The Safety Knife Co., Martor)

Figure 5. Pipe cutters (brands – Ridgid, Empire)

Figure 6. Specialty cutter (brand – Geoprobe)

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Biological Hazards

S3AM-313-PR2

1. Purpose and Scope

a. This procedure communicates the requirements and precautions to be taken by AECOM employees to protect against bloodborne pathogens, insects, arachnids, snakes, poisonous plants, feral animals, and other wildlife referred to herein collectively as “biological hazards.”

b. This procedure applies to all AECOM Americas employees and operations, as well as its contracted personnel required to comply with this document’s content.

2. Procedure

2.1 Critical Controls

a. The project team should identify potential biological hazard encounters during field work and develop a location-specific Safety, Health, and Environment (SH&E) plan and related task hazard assessments (THAs; e.g., field level risk assessments [FLRAs]) prescribing precautions to mitigate exposures and eliminate or reduce the severity of resulting illnesses. Refer to SH&E Risk Assessment and Planning – Americas.

b. The precautions to be taken by employees to decrease the risk of exposure to biological hazards can often directly increase the risk of heat-related illness due to thermal stresses. Refer to Heat and Cold Stress – Americas.

c. Employees must immediately notify their Project Manager or Supervisor of any biological hazard-related incident (e.g., imbedded tick, insect sting, animal bite, rash, abnormal reaction, or bloodborne pathogen-related exposure) and follow the reporting requirements found in SH&E Incident Response and Investigation – Americas. The Occupational Health Manager must be consulted in the event of any exposure incident.

d. Employees must be given information on how to respond to the applicable biological hazard-related incidents in their emergency response plan. Refer to SH&E Risk Assessment and Planning – Americas.

e. Employees with a history of severe allergic reactions to insect bites or stings should undertake work in areas infested with the allergens only after all required precautions are met. Specifically, such employees are encouraged to inform their project team of their allergies, avoid working alone, carry medications (e.g., Epi-pen) on them, and wear a medical identification bracelet or necklace.

2.2 Animals of Concern – General Requirements

a. Working in the field with or around small mammals, larger carnivores, and reptiles has inherent risks of injury or exposure to infectious diseases transmitted from animals to humans.

b. Wild animals can carry a variety of diseases that humans can contract i.e., viral, parasitic, bacterial, and protozoal. The risks can be either because of direct contact with a wild animal (i.e., break in the skin, or contact with the animal’s blood, saliva, or excrement) or through airborne diseases (e.g., hantavirus, histoplasmosis).

c. Full-length clothing, gloves, and a respiratory mask can greatly reduce the risk of exposure. Refer to Safety Gear – Americas and Respiratory Protection – Americas.

d. Wildlife biologists directly handling wildlife, dead or alive, or working with wildlife feces or in enclosed habitats (such as caves), have an increased risk of exposure to a wider range of zoonotic diseases and should take extra precautions. Any staff handling wildlife must be adequately trained and/or supervised by a wildlife biologist experienced in the task.

e. Employees must not work alone in areas where the risk of encounter with dangerous wildlife is high.

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2.2.1 Dogs

a. Treat unknown dogs encountered in field activities in the same manner as a wild animal.

b. Be conscious of behaviors indicating anxiety (e.g., tail under the belly), defensiveness, or aggressiveness, and attempt to leave the area if identified.

c. Gloves, catch sticks, caging, and other appropriate equipment should be considered and may be necessary.

2.2.2 Rodents

a. Rodents can carry a variety of diseases (e.g., hantavirus and bubonic plague). Although infections are rare, they can be fatal. Infection can be spread to humans when they:

   i. Breathe air contaminated by rodent saliva, urine, or feces containing infectious materials; or

   ii. Accidentally rub eyes, mouth, or broken skin with infected rodent mouse saliva, urine, or feces.

b. Rodent control measures must be employed at AECOM locations where there is a potential or evidence of rodent infestation. In these situations, the following precautions should be taken during field operations:

   i. Limit exposure to soil handling and use gloves where appropriate.

   ii. Wash or sanitize hands often throughout the day and before meals.

   iii. Equipment bags, storage areas, and vehicles should be frequently inspected for signs of mouse infestation.

   iv. Rodent-proof storage containers should be used when practical.

   v. Do not enter buildings infested with mice without adequate respiratory protection.

   vi. Droppings should never be removed by vacuuming or sweeping. Wetting down an area with a mixture of 1:9 household bleach and water solution will reduce risk of airborne exposure.

   vii. Repellent (i.e., DEET applied to skin or permethrin to clothing) should be used if there is potential exposure to rodent fleas.

2.2.3 Large Mammals – General Requirements

Most negative encounters with large mammals (e.g., bears, carnivores, and ungulates) can be avoided with a few key preventive measures:

a. When working in wilderness isolation, always travel in pairs and make lots of noise.

b. Always store food in air-tight containers away from sleeping areas (if camping), and never carry strong-smelling foods, which could attract animals.

c. Keep your eyes open for fresh animal signs that may indicate a dangerous situation.

d. Maintaining a distance of at least 100 feet (30 meters) allows large animals an escape route. If you notice any signs of aggression or behavioral changes, move away to a safe location. Wildlife should not be enticed by reaching out or simulating calls.

2.2.4 Bears

a. An encounter with a bear of any species can have a wide variety of outcomes, ranging from a simple sighting to a false charge, to a serious mauling or even death. Consequently, the risk of a bear encounter must be taken very seriously and can vary significantly depending on the location.

b. It is important to research the project area before field work commences to determine the expected probability of encountering bears and what type. Remoteness from urbanized areas should not be a criterion, as bears have been encountered within city limits, especially near landfills. The risk associated with a bear encounter also varies with the species of bear, the season, and the circumstances under which the bear is encountered.

c. The best defense against bears is to actively practice bear avoidance techniques when working in the field.

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2.2.5 Carnivores

a. Most wild carnivores in the feline family (cougars, lynx, and bobcat) or the canine family (wolves and coyotes) are more predictable than bears and are not predatory toward humans. However, all wild animals can be dangerous if they feel threatened or if they are sick or starving.

b. A fresh kill or carcass might indicate the presence of a carnivore that may become aggressive to defend its food.

2.2.6 Ungulates

a. Most ungulates (deer, moose, elk, and caribou) will avoid humans and will flee as soon as a human is sighted. However, females with young (during May and June) and males during mating season (September to November) can be very aggressive, especially if provoked.

b. Extensive fresh rubbing on branches in the fall might indicate the presence of a rutting male ungulate that may become aggressive to defend a potential mate.

2.2.7 Snakes

a. Staff working in areas known to be inhabited by venomous reptiles should take extra precautions, be able to identify the local species, and understand the best practices for administering first aid. Most venomous reptiles are non-aggressive and will only attack humans if immediately threatened.

b. The following precautions should be taken when there is a risk of a snake encounter:

   i. Be careful near heavy vegetation in or near the water's edge. This is where reptiles like to reside during the daylight hours.

   ii. Stay on trails where possible, and watch where you place your hands and feet, especially when climbing or stepping over fences, large rocks, and logs.

   iii. Take care when overturning any objects on the ground.

   iv. If you see a hazardous reptile, give it as much room as possible. Most snakes have a strike distance only half the length of their body.

   v. If venomous snakes are a risk, staff should contact local hospitals to determine availability of appropriate anti-venom and include all snakebite emergency response guidance in the applicable SH&E plan and THA.

2.2.8 Alligators

a. The chance of encountering an alligator is greatest during the animal's courtship and mating season (March to September). Also, July to September is when mother alligators are guarding their nests.

b. When trying to get past an alligator, do not walk between the alligator and the water in case the alligator gets frightened and runs toward the water. The alligator is not a natural runner and can tire out in a relatively short time. An alligator will often give up a chase when it sees the runner is moving away and too much effort is required.

2.3 Insects of Concern

Employees working outdoors may be exposed to a variety of insects, including but not limited to, ticks, mosquitos, spiders, and scorpions. Bites or stings from these insects may result in outcomes ranging from minor irritations to serious allergic reactions and/or illnesses.

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2.3.1 Flying Insects

Outdoor workers are at risk of being stung by flying insects (mosquitos, bees, wasps, and hornets). While most stings cause only mild discomfort, some may result in severe allergic reactions requiring immediate medical care and may cause death. As such, employees must take the following precautionary measures when working in habitat areas for flying insects:

a. Wear light-colored, smooth-finished clothing.

b. Avoid wearing perfume and cologne and strong-smelling deodorants, lotions, soaps, and shampoos.

c. Wear clean clothing and bath daily.

d. Wear clothing to cover as much of the body as possible.

e. Avoid flowering plants when possible.

f. Keep work areas clean. Some insects are attracted to discarded food.

g. Remain calm and still if a single stinging insect is flying around.

h. If an insect is inside your vehicle, stop slowly, and open all the windows.

i. Mosquitoes are known to breed in standing water; therefore, when standing water is found at a job site, actions should be taken to drain the water.

2.3.2 Ticks

a. The Centers for Disease Control and Prevention works with states, health authorities, and other experts on research to define and monitor the occurrence of disease-carrying ticks. See cdc.gov/ticks for additional information.

b. Employees working in or adjacent to areas where there are established tick populations must take the precautionary measures below.

   i. Before you go outdoors:

      1. Know where to expect ticks. Ticks live in grassy, brushy, or wooded areas, or even on animals. Avoid wooded and brushy areas with high grass and leaf litter and walk in the center of trails when possible.

      2. Treat clothing and gear with products containing 0.5% permethrin. Permethrin can be used to treat boots, clothing, and gear and remain protective through several washings. Alternatively, you can buy permethrin-treated clothing and gear.

      3. Tuck loose-cuff trousers into socks, wrap with duct tape completely around the cuff of the sock up to the surface of the pant leg to prevent entry of insects between the sock and pants, and preferably reverse wrap the tape with the sticky side out.

      4. Use government-approved repellants containing DEET, picaridin, IR3535, Oil of Lemon Eucalyptus (OLE), para-menthane-diol (PMD), or 2-undecanone. Always follow product instructions.

   ii. After you come indoors:

      1. Check your clothing for ticks. Ticks may be carried into the house on clothing. Turn clothing inside out and shake them at the end of day. Any ticks found should be removed. Tumble dry clothes in a dryer on high heat for 10 minutes to kill ticks on dry clothing after you come indoors. If the clothes are damp, additional time may be needed. If the clothes require washing first, hot water is recommended. Cold and medium temperature water will not kill ticks.

      2. Examine gear and pets. Ticks can ride into the home on clothing and pets, then attach to a person or pet later, so carefully examine pets, coats, and daypacks.

      3. Shower within 2 hours of coming indoors. Showering may help wash off unattached ticks and it is a good opportunity to do a tick check.

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4. Check your body for ticks. Conduct a full body check upon return from potentially tick-infested areas. Use a hand-held or full-length mirror to view all parts of your body. Check these parts of your body and your child's body for ticks:
    - Under the arms
    - In and around the ears
    - Inside belly button
    - Back of the knees
    - In and around the hair
    - Between the legs
    - Around the waist

    Note: Tick testing is not recommended because results are unreliable for treatment decisions, may give false reassurance, and symptoms typically appear before results are available.

2.3.3 Spiders

a. The most common venomous spiders are the black widow and the brown recluse. Venomous spiders can be dangerous to outdoor workers. Spiders are not usually aggressive, and most bites occur because a spider is trapped or unintentionally contacted. It's important to know the risk of exposure to venomous spiders and how to protect yourself and what to do if you are bitten.

b. Workers can take the following preventive steps:

    i. Inspect or shake out any clothing, shoes, towels, or equipment before use.

    ii. Wear protective clothing such as a long-sleeved shirt and long pants, hat, gloves, and boots when handling stacked or undisturbed piles of materials.

    iii. Minimize the empty spaces between stacked materials.

    iv. Remove and reduce debris and rubble from around the outdoor work areas.

    v. Trim or eliminate tall grasses from around outdoor work areas.

    vi. Store apparel and outdoor equipment in tightly closed plastic bags.

    vii. Keep your tetanus boosters up to date (every 10 years). Spider bites can become infected with tetanus spores.

2.3.4 Scorpions

a. Scorpions usually hide during the day and are active at night. They may be hiding under rocks, wood, or anything else lying on the ground. Some species may also burrow into the ground. Most scorpions live in dry, desert areas. However, some species can be found in grasslands, forests, and inside caves.

b. Workers can take the following preventive steps:

    i. Wear long sleeves and pants.

    ii. Wear leather gloves.

    iii. Shake out clothing or shoes before putting them on.

2.4 Plants of Concern

a. Employees working outdoors may be exposed to a variety of plants of concern, including but not limited to, poison ivy, poison oak, poison sumac, giant hogweed (giant cow parsnip), wild parsnip, devils club, and stinging nettle. This hazard still exists in the fall and winter in the form of stubble and roots.

b. Many plants are not harmful to the touch but may contain poisonous berries or foliage that could cause serious complications or death if they are ingested. Never eat any plants or berries, even if you are sure of their identity.

c. Workers should take the following preventive steps:

   i. Beware of your surroundings and the potential irritants in your work area.

   ii. Identify and avoid areas of poisonous plants.

   iii. Use skin guards to prevent the transfer of oils from clothes or equipment to skin.

   iv. If areas of poisonous plants need to be entered, consider clearing the area, when feasible, and wear protective clothing such as Tyvek.

2.5 Bloodborne Pathogens

There are a few activities for which potential occupational exposures to blood or other potentially infectious materials are of concern. These activities may include:

a. Investigations of properties receiving regulated wastes.

b. Site visits or audits at treatment, storage, and disposal facilities where wastewater or medical waste is handled.

c. Site visits or audits at medical or health care facilities.

d. Site work in areas where there is a potential risk for the presence of used hypodermic needles.

e. The provision of first aid or cardiopulmonary resuscitation (CPR).

   Note: First aid and CPR training is often on a voluntary basis and not directed by AECOM. As such, potential exposures may not be considered occupational exposures within the context of the OSHA Bloodborne Pathogens Standard.

f. Occasionally, potentially infectious material is encountered during an activity where none was expected. When this occurs, the work must be stopped, employee training conducted, and an exposure control plan prepared prior to resuming activities with potential exposures.

2.6 Exposure Control Plan for Bloodborne Pathogens

a. A site-specific exposure control plan (ECP) must be established for employees at risk for exposure to and possible transmission of infectious diseases from bloodborne pathogen sources. The ECPs must describe how employees are effectively informed of potential workplace health hazards, and the protective measures necessary to eliminate or effectively minimize the risk of bloodborne exposure incidents. ECPs for projects or programs extending over 1 year must be reviewed annually by the SH&E Manager and affected employees.

b. Sections 2.6.1 to 2.6.5 summarize key elements to be included in the ECP.

2.6.1 Potential Exposure Determination

Employees must consult with the Occupational Health Manager to determine if a Hepatitis A or B vaccination is appropriate given the site conditions and the proposed scope of work. These determinations should differentiate voluntary first-aid duties from occupational exposures as a component of the exposure determination.

2.6.2 Training

Refer to Section 3.

2.6.3 Hepatitis B Vaccination

a. Employees will be offered the Hepatitis B vaccination, at no cost to the employee, when assigned to tasks with potential occupational exposure to bloodborne pathogens or if incidental contact with potential sources of bloodborne pathogens occurs.

b. Employees choosing to take the vaccination series must sign a consent form. Employees who decline the Hepatitis B vaccine must sign a copy of a waiver form. All forms are to be stored by the Occupational Health Manager.

2.6.4 Engineering and Work Practice Controls

a. “Universal precautions” are a required method of control to prevent exposure to blood and body fluids. This term refers to the concept that all human blood and certain human body fluids are treated as if known to be infectious for human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV), and other bloodborne pathogens, regardless of the perceived risk status of another individual. Universal precautions apply to blood, and other body fluids containing visible blood. Universal precautions do not apply to feces, nasal secretions, saliva, sweat, tears, sputum, urine, and vomitus unless they contain visible blood.

b. Special provisions should be made so hand washing facilities are available on sites where bloodborne pathogens are suspected or present. If soap and running water are not available, an antiseptic hand cleaner in conjunction with clean paper towels or antiseptic towelettes are acceptable temporary alternatives to running water. When this alternative method is used, employees must wash their hands with soap and running water as soon as feasible.

c. Eating, drinking, smoking, applying cosmetics, and handling of contact lenses is prohibited in work areas where there is a reasonable likelihood of occupational exposure.

d. Fluorescent red or orange-red warning labels bearing the universal biohazard symbol and the legend BIOHAZARD must be firmly affixed to all containers (e.g., waste cans, sharps containers, and refrigerators) used for the storage or shipment of blood or other potentially infectious materials. Disposal manifests must be maintained in accordance with local law.

e. Any areas or equipment that are contaminated by potentially infectious material will be decontaminated using a 10% solution of household bleach. Utilize appropriate personal protective equipment to control exposure to the bleach (e.g. safety goggles, and gloves). Refer to Section 2.6.5.

2.6.5 Personal Protective Equipment

a. Personal protective equipment (PPE) will be provided at no cost to the employee and will be chosen based on the anticipated exposure to blood. PPE is considered appropriate if it does not permit blood or other potentially infectious materials to reach or pass through clothes, skin, or mucous membranes of the eyes or mouth under normal conditions of use, and for the duration of time the equipment is used.

b. Disposable single-use gloves must be used as a protective barrier in all situations in which contact with body fluids is anticipated. Gloves of the correct size will be provided. Disposable gloves must not be washed or disinfected for reuse and must be replaced between employees and if they become torn or punctured. Gloves are especially important if the Employee has cuts, abraded skin, chapped hands, or dermatitis.

c. Liquid-impermeable gowns, boots, and masks, in combination with eye-protective devices such as goggles and shatterproof glasses with solid-side shields or chin-length face shields, must be worn whenever splashing, spraying, or spattering of blood droplets or body fluids can be reasonably anticipated.

d. Disposable pocket mask ventilation devices must be provided in all first aid kits and used to avoid mouth-to-mouth contact during emergency cardiopulmonary resuscitation.

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e. Examples of recommended PPE include the following listed in Table 1 (depending on task, more PPE may be needed):

Table 1. PPE by Task

Task	Gloves	Gown	Mask	Goggles
Bleeding control w/ minimal bleeding	Yes	No	No	No
Bleeding control w/ spurting blood	Yes	Yes	Yes	Yes
Cardiopulmonary resuscitation	No	No	Yes	No
Decontamination/cleanup	Yes	No	No	No
Medical laboratory activities	Yes	Yes	Yes	Yes

2.6.6 Incident Response

a. All incidents in which an employee has been exposed to blood or other potentially infectious materials must be reported to the Employee's Supervisor and to the SH&E Manager immediately. The Occupational Health Manager must be consulted in the event of an exposure incident.

b. Post-exposure hepatitis vaccination will be offered to employees involved in an occupational exposure incident within 24 hours of possible exposure at no cost if required by the exposure determination.

3. Training

a. Employes must take appropriate training from AECOM University and third-party vendors to assist in the identification and control of biological hazards. Refer to SH&E Training – Americas and its associated Assessment of SH&E Training Requirements – Americas.

b. All personnel who will work on projects or programs that involve potential contact with bloodborne pathogens are required to attend a training class prior to the start of the project or program and annually for continuing projects or programs. Refer to SH&E Training – Americas.

c. The specific requirements and provisions of the written ECP will be provided to each employee and any managed subcontractor assigned to work at the program/project site.

4. Terms and Definitions

a.	Bloodborne Pathogen Exposure	Exposure to blood containing pathogens including, but not limited to, HBV, HIV, hepatitis C, malaria, syphilis, babesiosis, brucellosis, leptospirosis, arboviral infections, relapsing fever, human T-lymphotropic virus Type I, and viral hemorrhagic fever (Ebola).
b.	CPR	Cardiopulmonary resuscitation.
c.	ECP	Exposure Control Plan – A plan addressing the requirements applicable to specific AECOM projects and activities designed to eliminate or minimize employee exposure. The ECP must be incorporated into the location-specific SH&E Plan and must be accessible to all employees.
d.	Field Work	Any activity conducted in outdoor settings; or at a site containing brush, overgrown grass, leaf litter, or poisonous plants; or located near mosquito breeding areas, including work in structures where animals harboring fleas or ticks might exist or where spiders and mites could be present.
e.	HBV	Hepatitis B virus.
f.	HCV	Hepatitis C virus.
g.	HIV	Human immunodeficiency virus.

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h.	Occupational Exposure (Exposed)	Reasonably anticipated skin, eye mucous membrane, or parenteral contact with blood or other potentially infectious materials resulting from the performance of an employee's duties. Employees are considered to be potentially exposed, even if they are using the universal precautions specified for the project or program.
i.	Poisonous	Capable of harming or killing by poison; toxic or venomous.
j.	PPE	Personal Protective Equipment.
k.	SH&E	Safety, Health, and Environment.
l.	Universal Precautions	All body fluids and materials potentially contaminated by body fluids will be considered to be infectious unless the fluids were from the person performing the cleanup or decontamination activities. All employees coming in contact with another person's body fluids must assume that the fluids are infectious and must wear prescribed personal protective equipment.

5. References

a. SH&E Training – Americas S3AM-003-PR2

b. SH&E Incident Response and Investigation – Americas S3AM-004-PR2

c. Heat and Cold Stress – Americas S3AM-112-PR2

d. Safety Gear – Americas S3AM-208-PR2

e. SH&E Risk Assessment and Planning – Americas S3AM-209-PR2

f. Respiratory Protection – Americas S3AM-123-PR1

6. Records

a. Bloodborne pathogens training class records must be maintained for at least 3 years from the date of training. The records will include the date of the training class, a summary of the class contents, the names of the qualified instructors, and the names and job titles of personnel attending the training.

b. Assessment of SH&E Training Requirements – Americas S3AM-003-FM1

7. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	01-Dec-2025	Initial release as S3AM-302-PR2; consolidated portions of the contents from the following retired documents: Wildlife, Plants & Insects – Americas S3AM-313-PR1, Biological Hazard Assessment Decision Flowchart – Americas, S3AM-313-ATT01 , Ticks – Americas S3AM-313-ATT02, Poisonous Spider Identification – Americas S3AM-313-ATT03, Mosquito-Borne Diseases – Americas S3AM-313-ATT04, Plants of Concern – Americas S3AM-313-ATT05, Wild Parsnip Identification – Americas S3AM-313-ATT06, Alligators – Americas S3AM-313-ATT07, Bird Droppings Safe Practices – Americas S3AM-313-ATT08, Large Carnivores & Ungulates – Americas S3AM-313-ATT09, Bear Safety – Americas S3AM-313-ATT10, Small Mammals – Americas S3AM-313-ATT11, Snakes & Scorpions – Americas S3AM-313-ATT12, Bloodborne Pathogens – Americas S3AM-111-PR1, and Bloodborne Pathogens Exposure Control Plan – Americas S3AM-111-ATT1.	All

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Appendix 1A
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

Appendix 1B
Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.

2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.

3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:

(a) Objects to be measured: Dust, mists or aerosols;
(b) Measurement Ranges: 0.001 to 400 mg/m3 (1 to 400,000 :ug/m3);
(c) Precision (2-sigma) at constant temperature: +/- 10 :g/m3 for one second averaging; and +/- 1.5 g/m3 for sixty second averaging;
(d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
(e) Resolution: 0.1% of reading or 1g/m3, whichever is larger;
(f) Particle Size Range of Maximum Response: 0.1-10;
(g) Total Number of Data Points in Memory: 10,000;
(h) Logged Data: Each data point with average concentration, time/date and data point number
(i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
(j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
(k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
(l) Operating Temperature: -10 to 50^{o} C (14 to 122^{o} F);
(m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.

5. The action level will be established at 150 ug/m3 (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m3, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m3 continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM10 at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

(a) Applying water on haul roads;
(b) Wetting equipment and excavation faces;
(c) Spraying water on buckets during excavation and dumping;
(d) Hauling materials in properly tarped or watertight containers;
(e) Restricting vehicle speeds to 10 mph;
(f) Covering excavated areas and material after excavation activity ceases; and
(g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m3 action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

APPENDIX F – OPERATIONS AND MAINTENANCE MANUALS

(*Note: Operation, Maintenance, and Monitoring Plan contained in this section is from 2002 and updates to applicable procedures are made in the appropriate sections of this SMP*)

Job # project

Operation, Maintenance and Monitoring Plan Chem-Trol Site Groundwater Control Elements Site 9-15-015

Prepared for:

WASTE MANAGEMENT

SC Holdings, Inc.
4 Liberty Lane West
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Prepared by:

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Operation, Maintenance and Monitoring Plan Chem-Trol Site Groundwater Control Elements Site 9-15-015

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January 2002

TABLE OF CONTENTS

Chapter		Page
1.0	INTRODUCTION	1
2.0	PROJECT BACKGROUND	2
	2.1 SITE DESCRIPTION	2
	2.2 OPERATIONAL/DISPOSAL HISTORY	2
	2.2 SITE HYDROGEOLOGY	4
3.0	SITE REMEDIAL ACTION	5
	3.1 DESCRIPTION OF REMEDIAL ACTION	5
	3.2 GOALS OF REMEDIAL ACTION	5
4.0	SYSTEM COMPONENTS	6
	4.1 GROUNDWATER CONTAINMENT, TREATMENT, AND DISCHARGE SYSTEM	6
	4.1.1 Groundwater Containment	6
	4.1.2 Groundwater Treatment	6
	4.1.3 Groundwater Surface Discharge	6
5.0	MONITORING AND TESTING	7
	5.1 MONITORING PLAN	7
	5.2 TREATMENT SYSTEM PERFORMANCE MONITORING	7
	5.2.1 Groundwater Treatment System Sampling	7
	5.2.2 System Operating Parameter Monitoring	8
	5.2.2.1 Remote Monitoring	8
	5.2.2.2 Monthly Monitoring	9
	5.2.3 Water Level Monitoring	9
	5.3 GROUNDWATER MONITORING	9
	5.4 INSPECTION AND MAINTENANCE	9
	5.4.1 Monthly Check List	9
	5.4.2 Preventative Maintenance	11
6.0	SAMPLING AND ANALYSIS QUALITY CONTROL	12
	6.1 SAMPLE HANDLING PROTOCOL	12
	6.1.1 Sample Identification/Labeling	12
	6.1.2 Chain-of-Custody Protocol and Shipping Requirements	12
	6.2 QUALITY ASSURANCE OBJECTIVES	13
	6.2.1 Precision	13
	6.2.2 Accuracy	13
	6.2.3 Representativeness	14
	6.2.4 Comparability	14
	6.2.5 Completeness	14
	6.2.6 Sensitivity	14
	6.3 FIELD QUALITY ASSURANCE SAMPLES	14
	6.4 DATA QUALITY REVIEW	15
7.0	LABORATORY REPORTING AND DELIVERABLES	16
8.0	EVALUATION OF MONITORING RESULTS	17
9.0	DISPOSAL OF USED MATERIALS AND WASTES	18
10.0	REPORTS	19

11.0 PROJECT ORGANIZATION 20
12.0 RECORDS AND DRAWINGS 21

LIST OF FIGURES

Figure 1 Site Location Map

LIST OF TABLES

Table 1 Sampling and Analyses Requirements
Table 2 Site Specific Organic/Inorganic Analyses
Table 3 Summary of Discharge Limits

APPENDICES

Appendix A Operation, Maintenance & Monitoring Checklist
Appendix B Standard Operating Procedures
- Groundwater Treatment System: Start Up and Shut Down Procedures
- Groundwater Treatment System: Routine Maintenance/Measurement Procedures
- Groundwater Treatment System: Iron Removal System Cleaning Procedures
- Monitoring Well Purging and Sampling Procedures

1.0 INTRODUCTION

This operation, monitoring and maintenance plan (O&M Plan) has been prepared to assist with the general operation of the groundwater extraction and treatment system at the CHEM-TROL Site, Registry #9-15-015, located in the Town of Hamburg, Erie County, New York ("Site"). The O&M Plan was prepared by Earth Tech, Inc. (Earth Tech) for SC Holdings, Inc. the site owner.

This O&M Plan presents a brief description of the Site and its background, a general description of the remedial system components, operation, monitoring and maintenance recommendations, guidelines and requirements, and project remedial goals. The O&M Plan is intended to serve as a stand-alone document for use by qualified individuals to effectively monitor and maintain the CHEM-TROL Site groundwater treatment facility. Record drawings are provided as an attachment to the manual.

Specifically, the O&M Plan includes:

- a description of the groundwater treatment systems and its operation and maintenance requirements;
- a description of sample type, location and collection procedures, sample preservation methodology, and record keeping and reporting requirements for all environmental sampling and monitoring activities; and,
- a description of the types, location and frequency of all other facility monitoring and maintenance activities.

It is intended that the operator will update this manual as new information on system operation and maintenance becomes available.

2.0 PROJECT BACKGROUND

2.1 SITE DESCRIPTION

The Chem-Trol Site is located in western New York State in the Town of Hamburg, Erie County, See Figure 1-1. The property is located at 418 Lake Avenue, approximately 12 miles south of Buffalo. The Chem-Trol Site encompasses an area of approximately 17 ½ acres. The property is situated in an urban setting with industrial/commercial areas to the north and east, commercial development along Lake Avenue to the south, and residential areas to the west, across from the South Branch of Smokes Creek. The geographic coordinates are 42 47' 54" N. Latitude and 78 48' 12" W Longitude. It is listed in the NYSDEC Registry of Inactive Hazardous Waste Sites as Site 915015. The site boundaries include:

- North – Electro Abrasives Corporation
- East – Conrail (formerly the Baltimore and Ohio Railroad), The Cheese Factory, Inc. (4856 Lake Avenue)
- South – Lake Avenue
- West – South Branch of Smokes Creek and adjoining residential properties

2.2 OPERATIONAL/DISPOSAL HISTORY

In 1969, Chem-Trol Pollution Services purchased the property and began operations as a waste chemical processing facility. As depicted in Drawing No. 1, the boundaries of the former operations are essentially an on-site Smokes Creek tributary to the north and floodplain to the west.

In 1972, operations at this site were terminated, and the associated chemical waste inventory and processing equipment were relocated to a new Chem-Trol facility in Model City, New York. In October 1973, Chem-Trol was acquired by SCA Services, Inc. and in 1984, SCA Services was acquired as a subsidiary of Waste Management, Inc.

In 1977, Chem-Trol/SCA Services performed the following facility closure actions at the former operations area of the site:

- Removal of approximately 95 cubic yards of contaminated soil,
- Placement of a clean soil cover, and
- Seeding to establish a vegetative cover over the area.

Subsequent to the facility closure action, the following investigations and studies of this site were conducted:

June 1988:	Phase I Investigation;
April 1991:	Phase II Investigation;
November 1994:	Remedial Investigation (RI);

March 1995:	Feasibility Study (FS); and
October 1997:	Remedial Design Field Studies (RDFS)
XXXX 1999	Soil Vapor Extraction (SVE) System
June 1999	Conceptual Design for Groundwater Control Elements

Construction began in October, 2000. The groundwater treatment system was substantially completed in September, 2001, and consisted of installation of an artificial fracture zone trench system, excavation of soils from wetlands and construction of groundwater treatment system.

2.2 SITE HYDROGEOLOGY

Two surface water bodies are located on the Chem-Trol site, including the South Branch of Smokes Creek and the unnamed on-site tributary to the South Branch of Smokes Creek. The South Branch of Smokes Creek originates near the Village of Orchard Park, approximately 4 miles southeast of the site. NYSDEC has classified the South Branch as a Class C surface water indicating a best usage as "suitable for fishing and all other uses except as a source of drinking water". The on-site tributary to the South Branch of Smokes Creek flows generally from east to west through the northern portion of the site. The on-site tributary collects surface runoff from the railroad track area, the Electro Abrasives property (located north of the site) and the northern portion of the site.

The majority of the natural soils in the vicinity of the site were deposited by glacial processes during Pleistocene time about 10,000 to 15,000 years ago. Typically, soils to the north of the site are part of the Lake Erie plain. These soils were generally deposited by glacial lakes and they consist of interbedded clay, silt and fine sand. Areas south of the site are part of the Allegheny plateau consisting of non-sorted till deposits of dense silt, clay, sand and gravel. It is reported that groundwater wells in these deposits typically yield less than 10 gpm (LaSala, 1968).

The bedrock unit in the vicinity of the Chem-Trol site is the Ludlowville Formation of the Hamilton Group. This rock consists primarily of shale with occasional limestone and sandstone seams. Literature on geologic conditions indicates that the Ludlowville formation is 65 to 130 feet thick (Lasala, 1968).

Groundwater within the shale generally occurs along the thin vertical and horizontal openings, (joints and bedding planes) rather than through the rock mass. Water yields from wells within the bedrock have been reported to range from nearly zero to about 40 gallons per minute (gpm) where limestone is present (LaSala, 1968). In general, bedrock well water yields range from about 10 to 15 gpm.

3.0 SITE REMEDIAL ACTION

3.1 DESCRIPTION OF REMEDIAL ACTION

The ROD remedy for groundwater containment consists of three elements:

1. Installation of a groundwater collection trench to intercept and remove contaminated groundwater flowing from the site;
2. Construction of groundwater treatment system and discharge to either Smokes Creek or Erie County Sewer District; and
3. Long-term groundwater monitoring.

The ROD remedy for soil contamination consisted of three elements:

1. Excavation of hot spot soils;
2. Installation of SVE system to treat impacted soils; and
3. Prevent migration of contaminants in the on-site soils into the groundwater by installation of an impermeable cap.

3.2 GOALS OF REMEDIAL ACTION

The remedial goals for the Chem-Trol Site, as specified in the March 1996 ROD are as follows:

1. Reduce and, when feasible, remove chemical contamination in the soils, sediments and groundwater at the site,
2. Eliminate the potential for direct human or animal contact with the contaminated soils, sediments and groundwaters at the site,
3. Prevent migration of contaminants in the on-site soils into the groundwater,
4. Prevent off-site migration of contaminated groundwater, and mitigate the impacts of contaminated groundwater to the environment, and
5. Provide for attainment of standards, criteria, and guidances for groundwater quality to the extent practical.

The remedial goals are to be achieved by operating and maintaining the groundwater containment, treatment and discharge system, and the soil vapor extraction system until the treatment systems no longer significantly reduce contaminant levels in the groundwater and soils at the Site.

4.0 SYSTEM COMPONENTS

4.1 GROUNDWATER CONTAINMENT, TREATMENT AND DISCHARGE SYSTEM

4.1.1 Groundwater Containment

The groundwater containment system consists of three extraction wells (EW-1, EW-2 and EW-3) which pump contaminated groundwater through a bag filter for removal of suspended solids down to ±10 microns, the untreated water then passes through an air stripper for removal of VOCs. Treated effluent is gravity drained to an Iron Removal Filter (IRF) from which water flows by gravity to the sanitary sewer. Discharge to the sanitary sewer is currently conducted under a temporary industrial wastewater discharge permit (Permit # 5515) with the Erie County Sewer Authority.

4.1.2 Groundwater Treatment

The groundwater process flow diagram is depicted on Sheet X of Y. Treatment of the recovered groundwater is achieved using a Carbtrol® Counterflow Plate Stripper (Model CPS-100-600), located inside the treatment building. The Carbtrol® unit consists of four trays (arranged in series-parallel). The exhaust gases flow via an 10" PVC pipe manifold and exhausts to atmosphere. The air stripper exhaust manifold is fitted with a mist eliminator to prevent water from being discharged into the exhaust system.

The treated water collects in the sump of the air stripper and gravity drains to the Iron Removal Filter (IRF), located on the floor of the treatment building.

4.1.3 Groundwater Surface Discharge

The treated water then gravity drains to the sanitary sewer system through a 3" discharge pipe. The system is also designed to allow for surface water discharge at the outfall constructed at Smokes Creek.

5.0 MONITORING AND TESTING

5.1 MONITORING PLAN

The environmental monitoring program associated with the operation and maintenance of the treatment system was designed based on review of the sampling data generated during the Remedial Investigation and Pre-Design phases of the project. Environmental monitoring will consist of:

- Air Stripper sampling,
- groundwater treatment system sampling, and
- groundwater sampling.

Table 1 presents a summary of the O&M sampling and analyses requirements.

Routine groundwater treatment sampling is intended to produce data to verify the performance of the treatment systems and to ensure that the project specific water and air discharge limitations are met. Annual groundwater sampling of on-site monitoring wells will be conducted to track the overall progress of groundwater control system.

All groundwater treatment system and groundwater samples will be analyzed for site specific VOCs (Table 2) by EPA Method 8260. In addition to the VOCS, effluent samples from the groundwater treatment system will also be analyzed for selected metals and wet chemistry parameters, as required by the site wastewater discharge permit, either to the sanitary sewer or to Smokes Creek under the site SPDES permit. Table 3 presents the effluent analyte list and the associated discharge limits.

Treatment system operational monitoring (i.e., flow rates, pump pressures, well levels, etc.) will also be conducted to aid in routine maintenance and system engineering up-dates. The data from these monitoring events will be used to calculate critical quantities such as discharge rates and volumes.

5.2 TREATMENT SYSTEM PERFORMANCE MONITORING

5.2.1 Groundwater Treatment System Sampling

Grab samples will be collected from the groundwater treatment system on a monthly basis for VOC (EPA Method 8260), site specific inorganics (EPA Methods 200.7, 245.1 and 335.2), total suspended solids, total dissolved solids and oil & grease analyses (Tables 1 and 2). Table 3 presents the analyte list for treated water samples as required by the site specific SPDES permit.

During each monthly sampling event, treatment water samples will be collected from system sampling ports located immediately prior to the air stripper unit (influent) and immediately following the IRF.

Treatment water samples will be collected directly from sampling ports into appropriate sampling containers provided by the laboratory and stored on ice (4° C) until the time of shipping. All water samples will be shipped on the day of sampling by overnight courier to a NYSDOH ELAP approved laboratory under appropriate chain of custody.

Additionally, during each monthly sampling event, a grab sample will be collected from the air stripper vapor exhaust immediately following the air stripper in a Tedlar Bag. Groundwater treatment system vapor samples will be analyzed for site specific VOCs by EPA Method TO-18M (see Table 2). These samples will be shipped on the day of sampling by overnight courier to a NYSDOH ELAP approved laboratory under appropriate chain of custody.

5.2.2 System Operating Parameter Monitoring

5.2.2.1 Remote Notification

The groundwater treatment systems operating parameters will be monitored via the DAQ Station PLC the Chatterbox® remote control (telephone link) technology will notify the operator of certain alarm conditions. This computer program allows the user to call the Chatterbox® and listen to the alarm conditions. This will allow the user to determine what corrective measures need to be implemented. The DAQ station stores the operational data on a Zip Disk. The Zip disk can be taken back to the office and all data retrieved into the DAQ software. The following treatment system parameters are currently monitored in the DAQ system:

- extraction well water levels;
- extraction well pump status (on/off);
- extraction well pump control limits (based on water levels);
- water line flow volumes;
- air stripper blower status (on/off);
- booster blower status (on/off);
- system alarm settings and status.

The Chatterbox® system is programmed to call the operator's phone number(s) until a response is obtained. The system indicates the current alarm status using preprogrammed voice alarms. There are currently four (4) alarm conditions:

- Common Variable Frequency Drive (VFD) failure.
- Common High Level condition in the air stripper.
- Common Low Level condition in the air stripper.
- Air Stripper failure.

The system can be modified to include additional alarm systems, however the conditions must fit into a factory set preprogrammed vocabulary.

Discrete data and analog data collected by the monitoring system are downloaded (approximately once a month) and are archived by electronic data files for future reference. Individual "events" data

(i.e. system processes) are logged, but are not typically downloaded on a regular basis. Downloading events data is recommended for trouble shooting when an alarm condition occurs and shuts down a treatment system component.

5.2.2.2 Monthly Monitoring

Treatment system operational parameters will be monitored monthly and recorded on the Operation, Maintenance & Monitoring Checklist presented in Appendix A. Review of the monthly treatment system operating parameters will be conducted to detect operational problems and to conduct system trouble shooting.

5.2.3 Water Level Monitoring

Water level measurements will be conducted under a separate site wide monitoring program.

5.3 GROUNDWATER MONITORING

Groundwater sampling and monitoring will be conducted under a separate site wide monitoring program.

5.4 INSPECTION AND MAINTENANCE

5.4.1 Monthly Check List

The following tasks and inspection activities are to be performed on a monthly basis. A checklist-type inspection record form is provided in Appendix A to record the following maintenance activities and Site data:

- inspect the condition of the treatment building;
- inspect the condition and operation of all elements of the groundwater treatment system
- inspect the condition and operation of all pumps including the three extraction well submersible pumps, metering equipment and water level transducers;
- inspect the condition of the three extraction wells;
- inspect the condition of the effluent discharge system and the outfall;
- inspect the condition of the air stripper system including the blower, piping, blockage and gauges;

- record various extraction volumes, pumping rates and pressures on all groundwater extraction and treatment system elements.

5.4.2 Preventative Maintenance

Available operating data will be reviewed monthly to identify problem areas in the system operation.

Preventative maintenance procedures are described in the following Standard Operating Procedures (SOPs) which are provided in Appendix B.

- Groundwater Treatment System - Routine Maintenance / Measurement Procedures
- Groundwater Treatment System Iron Removal Filter Procedures

6.0 SAMPLING AND ANALYSIS QUALITY CONTROL

6.1 SAMPLE HANDLING PROTOCOL

The specific protocols described below must be followed to assure that samples are correctly identified and not damaged in shipping.

6.1.1 Sample Identification/Labeling

All samples collected should be assigned a unique sample identification number consisting of the sample location and date of sample collection. The lab should affix to each sample container a non-removable label. All sample containers will be labeled immediately prior to collection of the sample with an indelible marker/pen, with the following information:

Project name/location
Sample identification code
Date/time of collection
Sampler's name
Type of sample
Requested analyses

6.1.2 Chain-of-Custody Protocol and Shipping Requirements

A chain-of-custody form must be filled out for each sampling episode to document collection of the sample in the field and shipment to the laboratory. Prior to sampling, bottles will need to be requested from the laboratory. Insulated sample shipping containers (typically coolers) will be provided by the laboratory for shipping samples. All sample bottles within each shipping container will be individually identified with an adhesive identification label provided by the laboratory. Shipping coolers will be numbered, or otherwise identified, and this identification will be entered into the chain-of-custody form.

Once the sample containers are filled, they should be immediately placed in the cooler with bags of ice or chemical ice to maintain the samples at approximately 4°C. The field sampler will indicate the sample designation/location number in the spaces provided. The chain-of-custody forms will be signed and placed in a sealed plastic water-tight bag in the cooler. The completed shipping container should be closed and sealed with strapping tape. The seals must be broken to open the cooler and will indicate tampering if the seals are broken before receipt at the laboratory. A label will be affixed identifying the cooler as containing "Environmental Samples," and the cooler will be hand delivered or shipped overnight via a delivery service to the laboratory. The identification numbers of each cooler shipped will be written on the chain-of-custody form and the respective shipping manifest. When the laboratory receives the cooler they will check the seals and will sign the chain-of-custody form.

6.2 QUALITY ASSURANCE OBJECTIVES

Data quality objectives (DQO) for measurement data in terms of precision, accuracy, representativeness, comparability and completeness (PARCC) are established to ensure that the data collected are of adequate quality and sufficient for their intended uses. Data collected and analyzed in conformance with the DQO process described in this section will be used in assessing the uncertainty associated with any decisions related to this site.

6.2.1 Precision

Precision measures the reproducibility of measurements under a given set of conditions. The laboratory objective for precision is to equal or exceed the precision demonstrated for the applied analytical methods on similar samples. Precision is evaluated by the analyses of laboratory duplicates samples that will be performed once for every 20 samples that data will be included with all reporting.

Sampling precision will be determined by collecting one field duplicate for each set of groundwater samples. It is anticipated that all of the current sampling locations can be sampled within a single sample set, therefore, a single field duplicate sample will be collected during each sampling event. Analytical results from laboratory duplicate sample will provide data on overall measurement precision. Subtracting the analytical precision from the measurement precision will define the sampling precision.

Precision will be determined from duplicate samples and will be expressed as the relative percent difference (%RPD):

$$\%RPD = 100 \times 2(X1 - X2)/(X1 + X2)$$

where X1 and X2 are reported concentrations for each duplicate sample and subtracted differences represent absolute values. The equation is taken from Data Quality Objectives for Remedial Response Activities (EPA/540/G-87/003; March 1987).

6.2.2 Accuracy

Accuracy measures the bias in a measurement system and will be determined by laboratory internal QC samples and surrogate recovery.

Routine organic analytical protocol requires surrogate spikes in each sample. Percent recovery will be defined as:

$$\% \text{ Recovery} = (R/S) \times 100$$

where:

S = spike surrogate concentration,
R = reported surrogate concentration,

and:

% Bias= % Recovery - 100

This equation is taken from Data Quality Objectives for Remedial Response Activities (EPA/540/G-87/003; March 1987).

6.2.3 Representativeness

In the field, the representativeness of the data from the sampling sites depends on the sampling procedures. The sampling procedure has been designed with the goal of obtaining representative samples. All sample taps will be purged of stagnant water prior to sample acquisition.

In the laboratory, the representativeness of the analytical data is a function of the procedures used in processing the samples. The objective for representativeness is to provide data of the same high quality as other analyses of similar samples using the same methods during the same time period within the laboratory. Representativeness can be determined for this objective by a comparison of the quality control data for these samples with other data for similar samples analyzed at the same time.

6.2.4 Comparability

Analytical results can be comparable to results of other laboratories with the use of the following procedures/programs: instrument standards traceable to National Institute of Testing and Standards (NITS), EPA or NYSDEC sources; the use of standard methodology; reporting results from similar matrices in consistent units; applying appropriate levels of quality control within the context of the laboratory quality assurance program; and participation in inter-laboratory studies to document laboratory performance. By using traceable standards and standard methods, the analytical results can be compared to other laboratories operating similarly.

6.2.5 Completeness

The goal of completeness will be to generate the maximum amount possible of useable data. If the analytical results from intermediate samples are not useable, the data may be incomplete, and re-sampling of the intermediate tap should be considered.

6.2.6 Sensitivity

Practical Quantitation Limits (PQLs) and/or reporting limits for each analytical method are also included in Table 1.

6.3 FIELD QUALITY ASSURANCE SAMPLES

As described in section 6.2.1, one field duplicate sample will be collected during each annual groundwater sampling event.

Field duplicate samples will be used to assess the variability of a matrix at a specific sampling point and to assess the reproducibility of the sampling method. Field duplicate samples will be defined

as a second sample collected from the same location, at the same time, in the exact same manner as the first and placed into a separate container (with no prior mixing). Field duplicate samples should be collected at random locations. Each duplicate sample should be analyzed for the same parameters as the samples collected that day. Field duplicate RPD control limits will be 50% for aqueous matrixes, as calculated by the equation presented in Section 6.2.1.

A blank will be collected during each sampling episode and will be shipped in the same cooler as the environmental quality samples. The purpose of a trip blank is to place a mechanism of control on sample bottle preparation and blank water quality as well as sample handling. The trip blank travels to the site with the empty sample bottles and back from the site with the collected samples in an effort to simulate sample handling conditions. Trip blanks will be utilized for aqueous samples only at a frequency of one (1) for each sampling episode.

6.4 DATA QUALITY REVIEW

All data packages will be reviewed for compliance with applicable quality control limits and requirements by the laboratory's QC personnel prior to the release of the final reports.

7.0 LABORATORY REPORTING AND DELIVERABLES

All samples will be submitted for analysis with a 3 week turn-around time requirement. Additionally, preliminary monthly sampling event results will be provided by fax as soon as they are available. All final, hard-copy laboratory data packages will include NYSDOH ASP Category A Deliverables.

8.0 EVALUATION OF MONITORING RESULTS

Monthly treatment system monitoring laboratory reports will be reviewed by the operator upon receipt. The treatment water data will be compared to the groundwater and surface water discharge limits listed on the site specific discharge permit. In the event that one or more analytical parameters is found to have exceeded the discharge limitations, the SC Holdings project manager will be notified immediately.

Additionally, monthly air discharge sample data will be reviewed upon receipt to determine the effectiveness of the groundwater treatment system. These data will be used to make corrections to the air stripper operation parameters and to determine if Air Guide 1 parameters are being maintained.

Annual groundwater sampling data will be compared to historical site data and applicable NYSDEC groundwater standards to evaluate the effectiveness of the treatment system.

Refer to Section 11.0, Reports, for reporting requirements.

9.0 DISPOSAL OF USED MATERIALS AND WASTES

Bag filters and IRF materials generated from on-site maintenance procedures will be collected and disposed of as determined by chemical waste analysis. It is anticipated that these materials will be non-regulated waste streams.

10.0 REPORTS

Monthly status and annual summary reports will be completed by the operator to document compliance with discharge limits, track the progress of Site remediation, and to monitor trends in system data that may indicate system maintenance needs.

The system operator is required to provide the following:

- preparation of monthly status reports to SC Holdings that summarize analytical, operating and maintenance data,
- preparation of annual summary reports that summarize the past year's system data, groundwater analyses, and monthly water level data. The annual report will plot trends in influent and monitoring well water quality (beginning after 2 years of system operation).

11.0 PROJECT ORGANIZATION

Personnel from the Earth Tech, Inc., will be responsible for performing the operation, maintenance and monitoring activities required for the groundwater treatment system and associated equipment. During each inspection event, an Operation, Maintenance and Monitoring Checklist will be completed. This form is included in Appendix A of this plan.

Analytical laboratories approved by the New York State Department of Environmental Conservation (NYSDEC) and approved through ELAP will be used for all sample analyses.

12.0 RECORDS AND DRAWINGS

A copy of the current O&M plan and record drawings (Sheets x through y [bound separately]) shall be stored at the treatment building. The operator should maintain organized records and files including the following:

- Any alarm phone calls;
- completed monthly Operation, Maintenance and Monitoring Checklists;
- all maintenance logs;
- chain of custody forms for all sampling events;
- laboratory analytical results and copies of laboratory invoices;
- computer spreadsheets or a database to facilitate evaluation of laboratory analytical data; system operational data, and groundwater data;
- all relevant project correspondence;
- copies of manifests, disposal receipts, etc.;
- equipment vendor and subcontractor invoices; and
- monthly status and annual summary reports.

FIGURES

TABLES

TABLE 1

SAMPLING AND ANALYSIS REQUIREMENTS
CHEM-TROL SITE
TOWN OF HAMBURGH, NEW YORK

Sample Type	Location	Matrix	Parameter(s)	Method	Frequency	Duration
Air Stripper Influent/effluent	Treatment Building	Water	EPA Method 8260 (Site Specific VOA list) EPA Method 200.7 for Al, B, Fe, Pb, Mn, Zn and TDS, TSS and pH		Monthly	Through completion of project or until re-evaluated
Air Stripper exhaust	Treatment Building	Air	EPA Method TO-18M (Site specific VOAs List)		Monthly	Through completion of project or until re-evaluated

TABLE 2

SITE SPECIFIC ORGANIC/INORGANIC ANALYSIS
CHEM-TROL SITE
TOWN OF HAMBURGH, NEW YORK

Parameter(s)	Water Analysis Method PQL	Air Analysis Reporting Limit
	10 ug/l	
Chloroethane	10	
1,1-Dichloroethene	10	
1,1-Dichloroethane	10	
1,1,1-Trichloroethane	10	
Trichloroethene	5	
Benzene	5	
Toluene	10	
o-Chlorotoluene	10	
Chlorobenzene	10	
Cis-1,2 Dichloroethene		
	0.075 mg/l	
Aluminum	0.048	
Boron	0.04	
Iron	0.0010	
Lead	0.005	
Manganese	0.02	
Zinc		
	10 mg/l	
Total Dissolved Solids (TDS)	7	
Total Suspended Solids (TSS)		
pH		

TABLE 3

SUMMARY OF DISCHARGE LIMITS
CHEM-TROL SITE
TOWN OF HAMBURGH, NEW YORK

Effluent Parameter(s)	Surface Water Discharge Limits			Minimum Monitoring Requirements	
	Daily Ave	Daily Max	(units)	Frequency	Sample Type
Flow	72000	144000	GPD	Continuous	Meter
pH	6.5-8.5	6.5 – 8.5	SU	Weekly	Grab
Total Dissolved Solids (TDS)	Monitor	500,000	ug/l	Weekly	Grab
Total Suspended Solids (TSS)	Monitor	20,000	ug/l	Weekly	Grab
Chloroethane	Monitor	10	ug/l	Weekly	Grab
1,1-Dichloroethene	Monitor	10	ug/l	Weekly	Grab
1,1-Dichloroethane	Monitor	10	ug/l	Weekly	Grab
1,1,1-Trichloroethane	Monitor	10	ug/l	Weekly	Grab
Trichloroethene	Monitor	10	ug/l	Weekly	Grab
Benzene	Monitor	5	ug/l	Weekly	Grab
Toluene	Monitor	5	ug/l	Weekly	Grab
o-Chlorotoluene	Monitor	10	ug/l	Weekly	Grab
Chlorobenzene	Monitor	10	ug/l	Weekly	Grab
Cis-1,2 Dichloroethene	Monitor	10	ug/l	Weekly	Grab
Aluminum	Monitor	4000	ug/l	Weekly	Grab
Boron	Monitor	1800	ug/l	Weekly	Grab
Iron	Monitor	300	ug/l	Weekly	Grab
Lead	Monitor	5.6	ug/l	Weekly	Grab
Manganese	Monitor	2000	ug/l	Weekly	Grab
Zinc	Monitor	110	ug/l	Weekly	Grab

APPENDIX A

Operation, Maintenance & Monitoring Checklist

Operation, Maintenance & Monitoring Checklist

Groundwater Treatment System
CHEM-TROL Site
Town of Hamburg, New York

This summary inspection checklist is to be completed during each site inspection. Note all items which require repair or maintenance. Use the last page to note any additional comments or unusual events.

General

Service by:_____ Weather/Temperature: _____

Date: _____ Arrival Time:_____ Departure Time: _____

Reason for Service: _____

Inspection Items:	**OK:**	**Comments:**
Site Appearance/Condition	_____	_____
Building Exterior	_____	_____
Overhead Door	_____	_____
Siding	_____	_____
Roof and Discharge Pipe	_____	_____
	_____	_____
Building Interior	_____	_____
Indication of Spills or Leaks	_____	_____
Building Heater	_____	_____
Phone System	_____	_____
Exhaust Fan	_____	_____
Fire Extinguisher	_____	_____
	_____	_____
Groundwater Treatment System		
Air Stripper	_____	_____
Iron Removal Filter	_____	_____
Bag Filter	_____	_____

Groundwater Treatment System (continued)

Flow Meters	_____	_____
Gauges	_____	_____
Stripper Blower	_____	_____
Indication of Alarm	_____	_____

Groundwater Treatment Wells

EW-1 Pump	_____	_____
EW-1 Transducer	_____	_____
EW-1 Flow Meter	_____	_____
EW-2 Pump	_____	_____
EW-2 Transducer	_____	_____
EW- 2 Flow Meter	_____	_____
EW-3 Pump	_____	_____
EW-3 Transducer	_____	_____
TW-3 Flow Meter	_____	_____

Effluent Discharge

Outfall	_____	_____
Meter Pit (if sanitary)	_____	_____
Cleanout	_____	_____

<u>Instrumentation/Readings:</u>

EW-1

Pumping Rate	_____GPM
Water Level Above Transducer	_____feet
Flow Meter Reading	_____gallons

EW-2

Pumping Rate	_____GPM
Water Level Above Transducer	_____feet

Flow Meter Reading _____gallons

EW-3

Pumping Rate _____GPM

Water Level Above Transducer _____feet

Flow Meter Reading _____gallons

Air Stripper

Stripper Blower Pressure _____inches H_2O

Air Flow Rate _____ft/sec

Air Temperature in Stripper _____°F

Pressure Gauge- Left Leg _____inches H_2O

Pressure Gauge- Right Leg _____inches H_2O

Pressure/Vacuum on the Stripper _____inches H_2O

Effluent Flow

Total System Meter Reading _____gallons

Influent/Effluent Sampling

On a monthly basis, samples of the system influent and effluent must be collected and submitted for the following analyses:

- VOAs by EPA 8260
- Metals (Al, B, Fe, Mn, Zn)
- TDS
- TSS
- O&G

pH measurements must be made in the field:

Influent pH _____
Effluent pH _____

Notes/Explanations
(Please include any additional information on those items which require attention as indicated above.)

Monthly Operation and Maintenance

A copy of this checklist will be filled out on a monthly basis. This will be provide a basis for the reaction of the seasonal changes in water levels at the site and how the pumping of the treatment system is affecting this.

APPENDIX B

Standard Operating Procedures

- Groundwater Treatment System: Start Up and Shut Down Procedures
- Groundwater Treatment System: Routine Maintenance/Measurement Procedures
- Iron Removal Filter: Routine Maintenance/Measurement Procedures

GROUNDWATER TREATMENT SYSTEM
ROUTINE MAINTENANCE / MEASURMENT PROCEDURES

Summary

The following procedures should be followed, as needed, on a routine basis. All maintenance procedures conducted should be recorded on the Treatment System Maintenance Checklist log sheets.

Maintenance

1. Ensure that the air stripper intake is free of debris and obstructions. When the air intake requires cleaning, the treatment system must be shut down following the proper standard operating procedure before starting the cleaning procedure.

2. The Counterflow Plate Stripper (CPS) is provided with four (4) cleanout ports for each tray, located in the side of the CPS. Clear the plate holes of any blockage. Hose down the tanks to remove any sediment buildup.

3. The system should be scrubbed down on the inside to remove any iron fouling or iron slime from building up inside the plate systems.

4. Grease the electric motor on the air stripper blower as needed (1 or 2 pumps on grease gun. approximately every two months).

5. Change Iron Removal Filter media every month (refer to standard operating procedure).

6. Occasionally remove the manhole from the concrete catch basin and inspect piping and cleanouts.

7. Replace bag filter as needed. The changing of bag filter should become less frequent as the wells stabilize.

Measurements and Sampling

1. Water treatment system samples are collected monthly. Collect the system effluent sample at the discharge of the IRF system. The influent sample is collected from the drain on the bag filter housing located just before air stripper. Samples are collected for the following analyses: Site Specific VOAs by EPA Method 8260, Metals Al, B, Fe, Pb, Mn, Zn by EPA Methods 200.7 and 239.2, and for TDS, TSS, and pH.

2. A vapor sample is collected monthly from the air stripper exhaust. Collected the air sample via hand pump into two Tedlar® bags from the labeled sampling port located inside the treatment building. Purge the hand pump with fresh air before and after sampling. Only fill the air sample bags partly the air sample bags partly full (like a potato chip bag) since the sample may be transported to the laboratory by airfreight.

Analyze for site specific volatile organics by EPA Method TO-18M.

3. Water level meter measurements should be taken Quarterly. Measure the water level from the top of the PVC riser.

4. On a monthly basis, record the gauge readings and control panel system display. Record on an O&M checklist log stored in a binder located in the treatment building (a copy of the checklist is presented in Appendix A).

IRON REMOVAL FILTER SYSTEM
ROUTINE MAINTENANCE

Summary

The following procedures should be followed, as needed, on a routine basis. All maintenance procedures conducted should be recorded on Treatment System Maintenance Checklist log sheets.

Maintenance

When the water in the Iron Removal Filter overflows the last filter screen, or the water in the last chamber is visibly dirty, the filter media should be changed using the following procedures:

1. Shut down the owner's well or feed pump.

2. Use the drain valve to drain the water form the Iron Removal Filter back to the head end of the system, or dispose of it in an environmentally safe manner.

3. Remove the filter screens.

4. Hose down the interior of the Iron Removal Filter. Drain the water to the head end of the system, or dispose of it in an environmentally safe manner. Close the drain valve.

5. Remove the clevis pins from the filter screens. Open each screen and remove the filter media. Dispose of the used filter media in an environmentally safe manner.

6. Replace two layers of filter media, cut to 17" x 31", into each filter frame. Replace the removable screen and clevis pins.

7. Replace the screens in the runners.

8. Start up the system.

GROUNDWATER TREATMENT SYSTEM BAG FILTER CLEANING PROCEDURES

Summary

The groundwater treatment system bag filter should be inspected and replaced monthly, or as needed, based on a visual inspection of the filter. When the filter is operating properly the filter should remove all suspended material down to the 10 micron range, or lower depending on the filter rating.

Maintenance

1. Shut the system down following the standard operation procedure provided above.
2. Slowly open valve to release pressure.
3. Once pressure has been released, unscrew four (4) hand screws on top of bag filter.
4. Remove filter and housing. Inspect housing for scaling, clean as necessary. Remove used filter bag and replace with new bag. Dispose of filter bag in an environmentally safe manner.
5. Reinstall filter and housing, then place cover and hand tighten.

GROUNDWATER TREATMENT SYSTEM
START UP AND SHUT DOWN PROCEDURES

Summary

The following procedures are to be followed any time the treatment system is to be shutdown.

System Start Up Procedures

1. Turn on breaker in main control panel for air stripper.
2. Open PLC and turn on CB-1 switch (switch to the left).
3. Turn on Uninterrupted Power Supply (UPS) unit.
4. Make sure red emergency (E-Stop) is pulled out on main PLC.
5. Allow system to boot up on main PLC control panel.
6. Turn the control switches for the air stripper blower on the local control panel to the AUTO position.
7. Turn the switches on the main breaker panel for all three pumps (EW-1, EW-2 and EW-3) to the on position. It takes the pumps a few seconds to start up.
8. After the system is running, disconnect the poly tubing to the magnehelic qauge and drain water from line. Re-install poly tubing. After system has been running for approximately 10 minutes, adjust the flow on the air stripper by closing and/or opening dampers on the air stripper blower until the blower discharge pressure/vacuum gauge reads approximately 7.5 (inches H_20).

System Shut Down Procedures

1. Turn the breaker off in panel for pumps EW- 1, EW-2 and EW-3 on the control panel to the OFF position. Wait five minutes for water to stop flowing into the air stripper.
2. Turn the control switches for air stripper blower on the control panel to the OFF position.
3. Turn off breakers in main panel for control switches for the air stripper.

EPG Companies Inc.

Operations & Maintenance Manual

FOR

Lee Supply Company
Earth Tech/Chemtrol

EPG Job #00-5072

EPG Companies Inc.

Submittal Index

Lee Supply Company – Earth Tech/Chemtrol

EPG Job #00-5072

Bulletin	1055	Equipment List
Drawing	0665	TSP5 SurePump™ Submersible Pump
Bulletin	0480d	Materials of Construction
Bulletin	0130b	Important Notice: EPG SurePump™ Sump Drainer Vent Tube/Check Valve Installation Instructions
Bulletin	0680	SurePump™ Maintenance Details
Bulletin	0790	Test Equipment
Bulletin	0780a	Troubleshooting Guide
Bulletin	6090	Wire Cable Clamp Installation
Bulletin	0370a	Storage Information
Bulletin	0380d	SurePump™ Installation Record
Bulletin	0387	SurePump™ Preventive Maintenance
Bulletin	0060	Engineer's Specification EPG's L925PT PumpMaster™
Form	117	Attachment to Bulletin 0060
Drawing	05341	L925PT Control Panel Schematics
Drawing	05342	Stand Alone Flow Meter Schematics
Bulletin	3360	Caution
Bulletin	0121a	EPG LevelMaster™ Submersible Level Sensor System
Bulletin	0690b	User's Guide Submersible Level Sensor for Liquid Level Measurement
Bulletin	0510b	EPG LevelMaster™ Setup and Troubleshooting
Bulletin	6160	S3070-PT Transducer Simulator Operation
Bulletin	6165	S3070-PT Transducer Simulator Test Procedure
Drawing	1125	Pump Discharge Disconnect
Drawing	1492	PVC Flow Spool Flanged Ends
Page		01-5072A Certified Pump Test
Page		01-5072B Certified Pump Test
Page		01-5072C Certified Pump Test
Photo	A	Front Panel Layout for 00-5072 ABC
Photo	B	Inner Door Layout for 00-5072 ABC
Photo	C	Back of Inner Door Layout for 00-5072 ABC.
Photo	D	Back Panel Layout for 00-5072 ABC
Photo	A	Front Panel Layout for 00-5072 D
Photo	B	Inner Door Layout for 00-5072 D
Photo	C	Back of Inner Door Layout for 00-5072 D
Photo	D	Back Panel Layout for 00-5072 D
Bulletin	0200c	Limited Warranty

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List of Equipment

Lee Supply – Earth Tech/Chemtrol

EPG Job # 00-5072

3 ea.	EPG TSP 5-4 SurePump pump end with 1HP 460VAC 3Ø motor. Includes 40' jacketed motor lead and 40' of 1/8" stainless steel cable with clamps.
3 ea.	EPG L925PT PumpMaster to operate 1 ea. 1HP 460VAC 3Ø motor. Includes LevelMaster meter with simulator, variable frequency drive, local/remote selector/switch, remote inhibit circuit, outputs for PLC, H-series panel lights, indicating fuse blocks, and fused convenience outlet (in control panel). Enclosure rated NEMA 4x-stainless steel with keyed handle.
3 ea.	EPG PT20x40 submersible level sensor with 40' lead.
3 ea.	EPG 1 ¼" PVC flow sensor adapter with flanged ends. Includes paddlewheel flow sensor with 25' lead.
3 ea.	Certified Pump Test.
1 ea.	Spare fuse set (3 each type).
3 ea.	EPG N20C 2" non-guided disconnect.
1 ea.	EPG Stand-alone flow monitoring system. Includes 3 ea. flow meters, intrinsically safe sensor circuit and 3 ea. pulse to analog converter (for 4-20mA signal to PLC). Enclosure rated NEMA 4.

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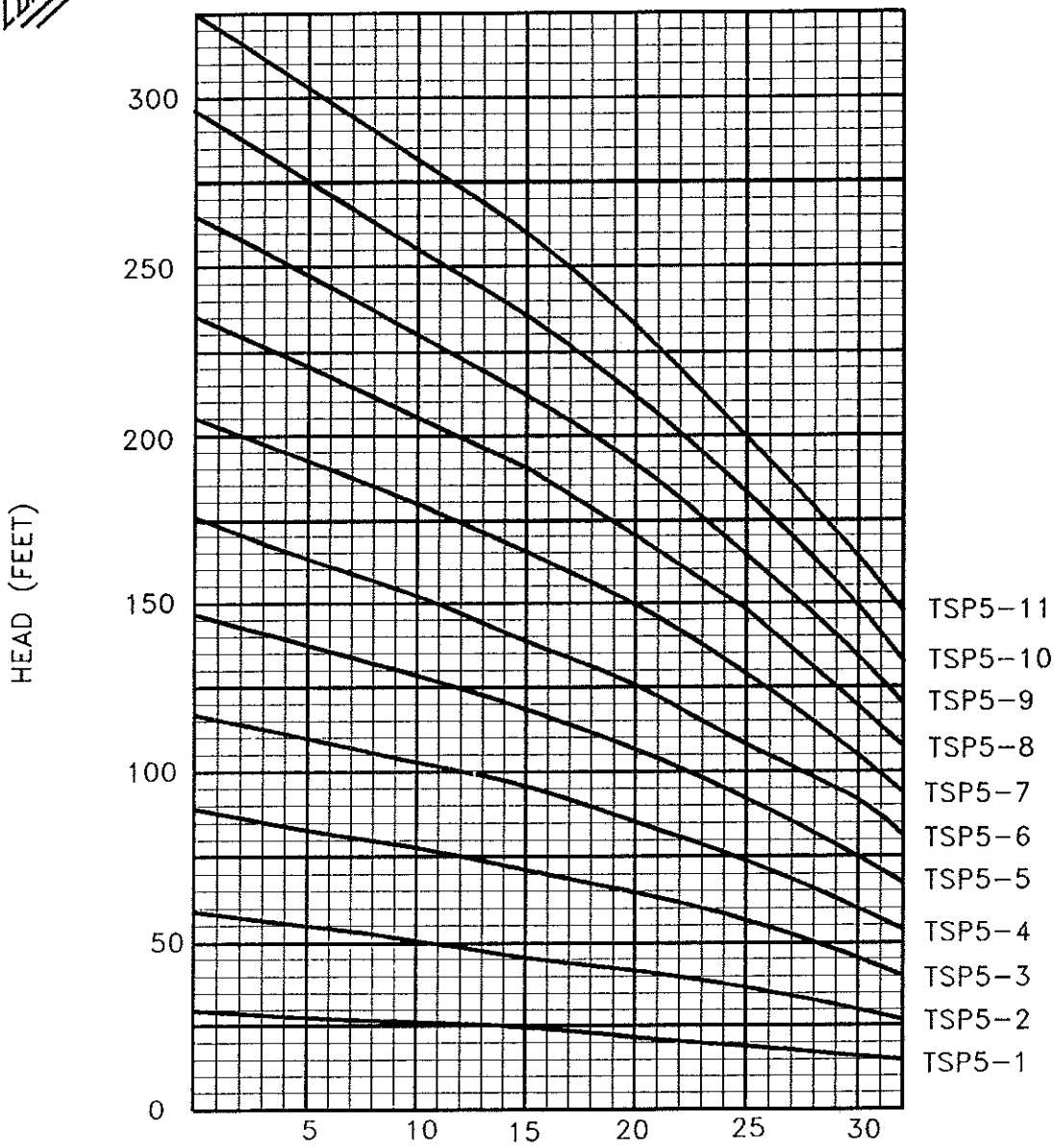
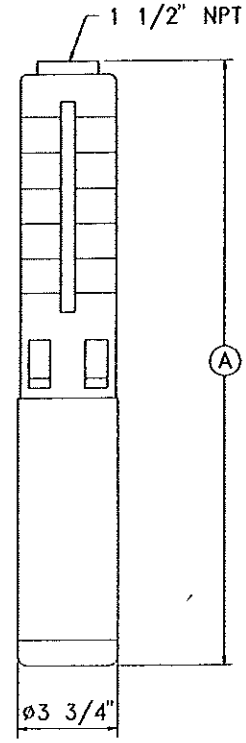
EPG COMPANIES

TSP5 SurePump™ SUBMERSIBLE PUMP





PUMP MODEL	SINGLE PHASE		THREE PHASE		SHIPPING WEIGHT (LBS)	
	MOTOR HP	A (in)	MOTOR HP	A (in)	1ø	3ø
TSP5–1	0.33	15.75	0.50	16.25	24.0	26.1
TSP5–2	0.50	17.25	0.50	17.25	27.3	27.3
TSP5–3	0.50	18.00	0.50	18.00	28.1	28.1
TSP5–4	0.75	20.00	0.75	20.00	32.1	32.1
TSP5–5	0.75	21.00	0.75	21.00	33.4	33.4
TSP5–6	1.00	22.75	1.00	22.75	37.0	37.0
TSP5–7	1.00	23.75	1.00	23.75	38.2	38.2
TSP5–8	1.50	26.25	1.50	25.25	46.0	41.7
TSP5–9	2.00	28.75	2.00	27.25	50.7	46.2
TSP5–10	2.00	29.75	2.00	28.25	52.0	47.5
TSP5–11	2.00	30.75	2.00	29.25	53.3	48.8

Materials of Construction

EPG SurePump™

	STANDARD
Check Valve Housing	304 Stainless Steel
Check Valve	304 Stainless Steel
Check Valve Seat	E-Glide™
Diffuser Chamber	304 Stainless Steel
Impeller Seal Ring	E-Glide™
Impeller	304 Stainless Steel
Motor Adapter	304 Stainless Steel
Inlet Screen	304 Stainless Steel
Pump Shaft	304 Stainless Steel
Coupling	329/420/431 Stainless Steel
Fasteners	304 Stainless Steel
Bearings	E-Glide™

FRANKLIN ELECTRIC MOTORS

	1/3 to 2 HORSEPOWER POLLUTION RECOVERY	3 to 10 HORSEPOWER NI-RESIST
End Bell Castings	304 Stainless Steel over Iron	Ni-Resist Type 1B
Stator Shell	301 Stainless Steel	316 Stainless Steel
Shaft Extension	303 Stainless Steel	17-4 Stainless Steel
Fasteners	316 Stainless Steel	316 Stainless Steel
Seal Cover	Tefzel	316 Stainless Steel
Shaft Seal	Viton	Viton, Carbon, Ceramic Face Seal
Diaphragm	Viton	Type 200 Hydrin
Diaphragm Plate	304 Stainless Steel	304 Stainless Steel
Diaphragm Spring	302 Stainless Steel	302 Stainless Steel
Diaphragm Cover	316 Stainless Steel	316 Stainless Steel
Slinger	Viton	Nitrile Rubber
Lead Sleeve	316 Stainless Steel	316 Stainless Steel
Lead Jam Nut	316 Stainless Steel	316 Stainless Steel
Lead Bushing	Viton	Viton

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Inc.

IMPORTANT NOTICE:

EPG SUREPUMP™ SUMP DRAINER VENT TUBE/CHECK VALVE INSTALLATION INSTRUCTIONS

EPG's patented sump drainer* enables the use of a stainless steel and Teflon submersible pump in applications that would normally require a sump type pump.

Critical to the operation of the sump drainer is the installation of the vent tube and air check valve. The vent tube/ check valve assembly has 2 functions. As the sump drainer fills with fluid the vent tube assembly allows air, trapped in side of the sump drainer to escape - allowing the sump drainer to completely fill with fluid. When the sump drainer pump starts, the vent assembly closes, allowing the pump to draw water through the screen at the opposite end of the sump drainer. The closed check valve enables the pump to continue pumping even though the fluid level in the sump is below the normal intake of the pump.

The vent check valve must be set at no less than a 15° angle above the horizon for it to operate correctly. The vent tube may be tied off to the pump discharge line. The vent check valve will operate correctly even if submerged.

Installation

Refer to Figure 1 for help in completing this procedure.

1. Slip the free end of the plastic vent tube onto the adapter on the top of the sump drainer.
2. Verify the open end of the check valve is labeled "VAC".
3. As you lower the sump drainer into the sump, uncoil the vent tube and fasten it to the discharge pipe. We recommend you keep the check valve above the fluid level. The check valve will work if it is submerged, but can foul with particles in the fluid.

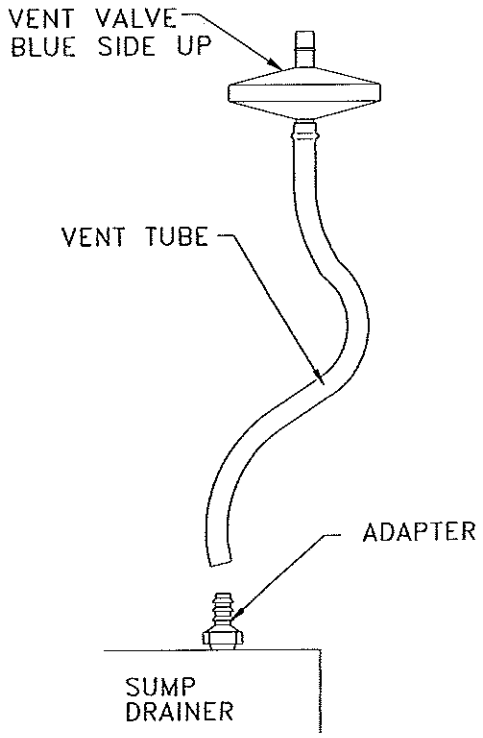

Figure 1. Vent Tube/Check Valve Assembly

* U.S. Patent #4,966,534 and 4,992,030

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SurePump™
Maintenance Details

DISASSEMBLY

Note: Please refer to Table B for list of tools needed for disassembly, testing and assembly.

1. Place the pump on a suitable work surface with blocks to prevent the pump from rolling. Remove the vent tube by pulling straight out from the top.

> In cold weather it is better to unscrew the vent hose barb adaptor with tube attached rather than try to pull the tube off the hose barb.

2. Unscrew the cord restraint nuts and pull inserts out about two(2) feet along the motor lead and level sensor lead. Loosen the insert from the wires so they are free to move through the cord restraint.

3. Mark the alignment of the tube and top (check for factory alignment marks). Center punch new marks in top and tube if factory marks can not be found. The alignment marks will make reassembly easier.

4. Remove capscrews (3) that secure the tube to the top and carefully pull the top, with pump and motor attached, out of the tube. DO NOT HAMMER, PRY, OR POUND ON TUBE OR TOP. Allow the sensor leadwire to slide through the cord restraint.

5. Remove the socket head setscrews (3) from the level sensor housing on the bottom of the tube. Carefully pull the level sensor up and out from the bottom of the tube. Carefully remove the sensor leadwire by pulling the controller end back through the top. Cover the end of the sensor leadwire with tape to prevent moisture and dirt from entering. If sensor is unused or put into storage, remove the dryer from the controller and install on end of vent tube during storage period.

6. Remove the nuts (4) that secure the motor to the pump and pull the motor from the pump.

NOTE

DO NOT REMOVE THE MOTOR LEAD FROM THE MOTOR UNLESS IT WILL BE REPLACED WITH A NEW LEAD. It is recommended that a new motor lead be used whenever the old lead is removed from the motor because of possible damage to the lead or distortion of the rubber seal that may prevent resealing.

7. Unscrew the motor lead nut from the motor. Work the lead back and forth to loosen seal and unplug the lead from the motor connector. Remove the lead by pulling the controller end back through the top.

8. Unscrew the pump assembly from the top using cloth strap wrenches to prevent damage to the metal surfaces.

NOTE

DO NOT ATTEMPT TO DISASSEMBLE LEVEL SENSOR OR PUMP MOTOR. ANY DISASSEMBLY WILL VOID YOUR WARRANTY.

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ASSEMBLY

1. Apply pipe sealing compound to the top threads and screw pump to the top. To prevent damage to the top sealing surface or the pump bowls, tighten pump to cover using cloth strap wrenches.

2. Slide motor and pump together and align motor shaft splines to pump splines by turning motor shaft. Align motor lead connector with the cutaway in the pump flange. Secure motor to pump with nuts (4).

3. Slide the long end of the motor lead through the cord restraint cap and nut in the top. Insert plug into the motor connector. Tighten motor lead connector nut to secure lead to motor.

4. Inspect upper and inside surface of tube and remove any sharp edges or burrs. Wipe surface of tube and top to remove any dirt, sand, metal filings or metal slivers. Remove the O-ring and clean sealing groove in the top.

NOTE

If original O-ring installation used a spacer/shim between the top and O-ring, clean the shim and reinstall into the sealing groove in the top.

5. Carefully slide level sensor leadwire through the top cord restraint and nut.

CAUTION

USE CARE WHILE HANDLING LEVEL SENSOR LEADWIRE TO PREVENT DAMAGE TO THE CONDUCTORS AND CENTER VENT TUBE.

6. Slide the level sensor and center it within the sensor housing at the bottom of the tube. Secure it with socket head setscrews (3). To prevent damage to the sensor case, do not overtighten the setscrews.

7. Position the tube vertically and carefully slide the pump and motor assembly into the tube. GUIDE THE ASSEMBLY PAST THE SENSOR LEADWIRE TO PREVENT CRUSHING OR CUTTING THE LEADWIRE. Remove slack from the sensor leadwire by pulling the leadwire out through the top.

8. Install a new top O-ring and liberally apply white petroleum jelly (Vaseline or equivalent) to the O-ring and cover sealing surfaces. Align the screw holes in the top with the holes in the tube and carefully slide the top into the tube making sure that the O-ring isn't damaged.

9. Remove slack from the motor lead and sensor leadwire. Secure top to the tube with capscrews (3). Tighten capscrews until sealing grease starts to bead out from the top-to-tube joint. Do not overtighten.

10. Secure motor lead and sensor leadwire with the cord restraint nuts. Tighten nut until the edge of the insert can be seen on the inside edge. Install vent hose.

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SEAL TEST PROCEDURE

NOTE: Refer to Figure 2.

1. Install mechanical plug into discharge pipe connection located in pump top. Tighten to recommended specifications. Refer to Table A.
2. Connect gauge tubing to vent fitting.
3. Connect magnehelic gauge to gauge tubing.
4. Fill five gallon pail with water to the brim.
5. Place pump assembly, as depicted on Figure 2, in the filled five gallon pail.
6. Observe the magnehelic gauge. The pressure should read about 5" wc and hold steady.
   a. If the pressure holds steady, the pump is ready to be installed. Remove the gauge tubing and the mechanical plug.
   b. If the gauge pressure does not hold steady state, there is an air leak in the top assembly.
      b.1. Remove the pump assembly from the five gallon pail and refill the pail with water.
      b.2. Mix a solution of soap and water in a hand pump spray application bottle and spray the top assembly.
      b.3. Place the pump assembly in the five gallon pail and observe the top assembly for bubbles to determine the seal leak.
      b.4. Make necessary adjustments to the pump assembly and repeat items b.1. through b.3. until the leak has been corrected and the gauge pressure holds steady .

INSTALLATION

1. Remove the gauge tubing and the mechanical plug and install the vent tube and vent valve.
2. Run the level sensor leadwire to the control panel and connect the sensor BLUE wire to the (-) terminal and WHITE wire to the (+) terminal. Connect the level sensor vent tube to the dryer and check for kinks and crushed areas in the tube connection area. The vent tube must be open to allow atmospheric pressure change compensation in the sensor.
3. Repeat bucket test to verify level sensor operation.
4. Install pump into place.
5. Check the level sensor readings before running pump. The LevelMaster system should indicate the proper depth of the sensor when immersed in liquid. If the meter shows -34.7 the leadwires connections are reversed, not connected or damaged. Be certain to check correct voltages at the controller and measure the resistance of the motor lead and motor to assure proper wiring.

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Table A

MECHANICAL PLUG SPECIFICATION

Nominal Pipe Size	Maximum Allowable Back Pressure PSIG		Tightening Torque
	Air	Water	
1"	5	110	20 in. lbs.
1.25"	5	100	30 in. lbs.
1.5"	5	70	5 ft. lbs.
2"	5	40	10 ft. lbs.
3"	5	30	12 ft. lbs.

Table B

TOOLS AND ITEMS REQUIRED FOR MAINTENANCE OF EPG SUREPUMP™

0-32 Screw with 5/16" hex head
5/16" Nut driver
10-32 x 5/16" long Stainless steel set screw
3/32" Allen wrench
.0005" Shim stock (blue)
O-ring set 4,5,6
White petroleum jelly (Vaseline)
Anti-seize compound
Small channel lock pliers
Magnehelic gauge (2010)
Scissors to cut shim stock
Flat blade screw driver
1/2" Open end wrench
24" of 1/4" OD nylon tubing
Mechanical plug set – 1", 1.25", 1.5", 2", 3"
Torque wrench

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Figure 1

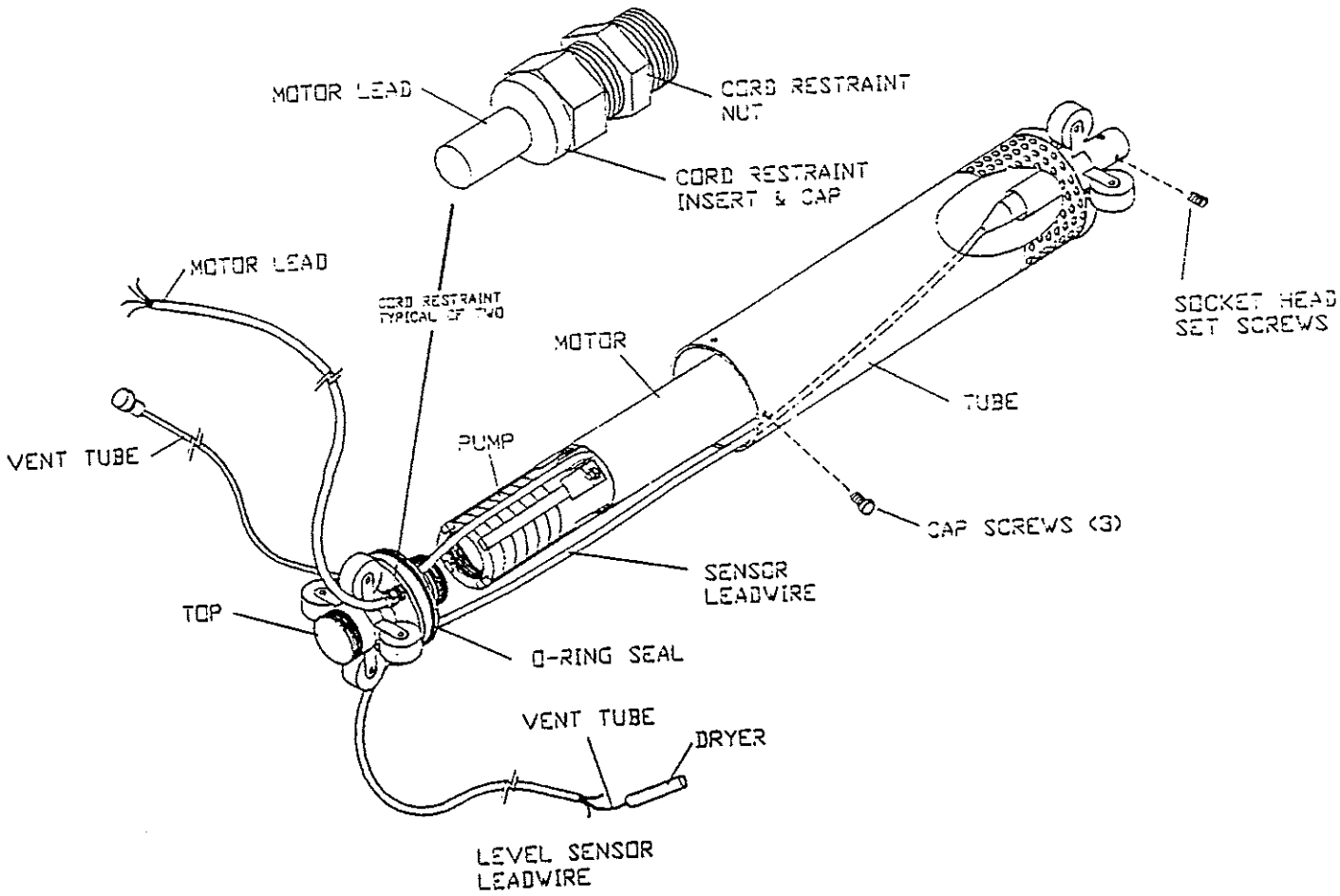

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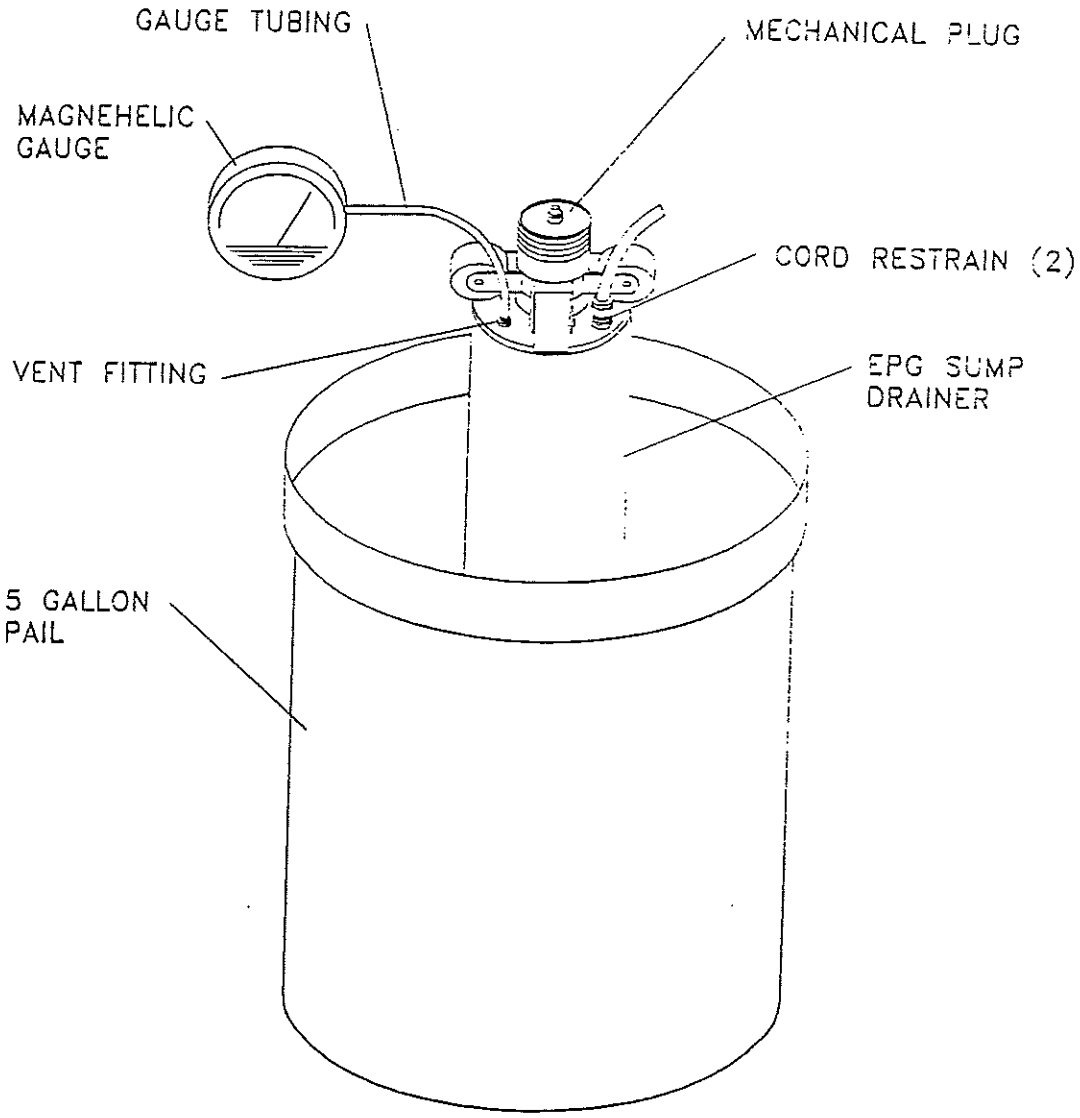
Figure 2



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TEST EQUIPMENT

To insure proper installation, EPG recommends the following instruments. When working with electrical circuits, use caution to avoid electrical shock.

Megohmmeter: To measure insulation value of motor and motor leads to ground. The higher the reading, the better.

Ohmmeter: (Must be able to read less than 1 ohm) To measure resistance winding to winding in motor, check quality of any connections made in motor circuit to test coils of relays and continuity of circuits.

Volt Meter: To verify correct supply voltage and measure system requirements when running.

Clamp on Amp Meter: To measure current draw in system.

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TROUBLESHOOTING GUIDE

FAULT	POSSIBLE CAUSE	HOW TO CHECK	HOW TO CORRECT
Pump or blower does not run.	No electricity at controller.	Check for voltage at controller.	If no voltage at controller, check for cause. Contact power company if voltage is incorrect.
	Fuses are blown or circuit breakers are tripped.	Check fuses for correct size and check for loose, dirty, or corroded connections in fuse receptacle, terminal strip and at splice points.	Replace with proper fuse or reset circuit breaker. If new fuses blow or circuit breaker trips, the electrical installation, motor and leads must be checked.
	Motor starter overloads have tripped out.	Check for voltage on line and load side of starter. Check megohm value of motor and lead.	Reset heaters or replace. Inspect starter for other damage. If heater trips again, check the supply voltage. Replace motor or lead as needed.
	Motor and/or cable are defective.	Turn off voltage, disconnect drop leads from controller to the motor. Measure the lead-to-lead resistances with ohmeter (RX-1). Measure lead-to-ground values with megohm meter. Record measured values.	If open winding or ground is found, remove pump and recheck values at the surface. Repair or replace motor or cable.

FAULT	POSSIBLE CAUSE	HOW TO CHECK	HOW TO CORRECT
	Starter does not energize.	Energize control circuit and check for voltage at the holding coil.	If no voltage, check control circuit. If voltage, check holding coil for shorts. Replace bad coil.
	Defective controls.	Check all sensors and safety switches for operation. Inspect contact in control devices.	Replace worn or defective parts.
	Defective capacitor. (Single phase only.)	Turn off voltage, discharge capacitor. Check with megohm meter. Record measured values.	Replace if defective.
Pump runs but does not deliver liquid.	Liquid level in sump is too low or sump infiltration rate is reduced or intranded gas.	Check sump draw down.	See pump data sheet for minimum submergence values.
	Vent valve not installed or improperly installed.	Make sure valve is attached to the to of the sump drainer and that it is not installed backward.	Replace valve if missing. Reverse valve if installed upside down.
	Inlet strainer is clogged.	Install pressure gauge, start pump, gradually close the discharge valve and read pressure at shutoff.	Remove pump and inspect for blockage. Clean screen as needed. Inspect check valve for blockage. Rinse out pump and reinstall.

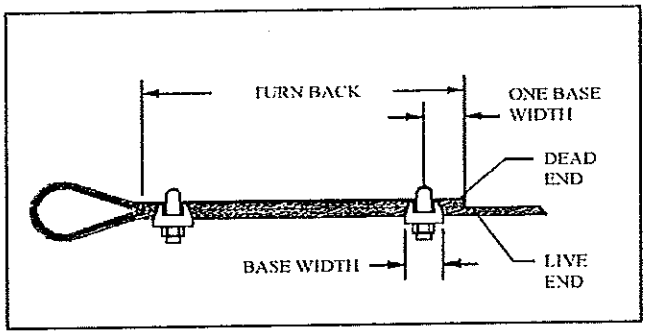
FAULT	POSSIBLE CAUSE	HOW TO CHECK	HOW TO CORRECT
	Pump is defective or worn.	Same as description above.	Convert PSI to feet (PSI x 2.31 ft/PSI = ___ ft.), add elevation from pressure gauge to liquid level to the converted pressure reading. Refer to specific pump curve for shutoff head for that pump model. If calculated value is close to curve, pump is probably OK. If not, remove pump & inspect.
Pump runs continuously.	Leak in system.	Check system for leaks.	Replace damaged pipes or repair leaks.
	Worn pump.	Install pressure gauge, start pump, gradually close the discharge valve and read pressure at shut-off.	Pull pump and inspect. Replace worn impellers, bearings or other close fitting parts.
	Loose or broken motor shaft.	Little or no liquid will be delivered if the pump/motor coupling is loose or if the motor shaft has sheared off.	Check for damaged shafts if coupling is loose and replace worn or defective units.
	Pump intake or impellers blocked.	Restricted flow may indicate a clogged intake screen or partially blocked impellers. Pump may be installed in mud or sand.	Clean screen and reset pump. It may be necessary to clean impellers.

FAULT	POSSIBLE CAUSE	HOW TO CHECK	HOW TO CORRECT
Pump runs but at reduced capacity.	Wrong rotation.	Check for proper electrical connection in control box.	Correct wiring and change leads as required.
	Leak in system.	Check system for leaks.	Replace damaged pipes or repair leaks.
	Pump strainer or check valve is clogged.	Remove pump and inspect.	Clean, repair, rinse out and re-install pump. It may be necessary to take pump apart and clean impellers. Check discharge line for any obstructions.

WIRE CABLE CLAMP INSTALLATION

Recommended Method of Applying
Clamps to get Maximum Holding Power

1. *Turn back* the specified amount of rope from the loop. Apply the first clamp one base width from the dead end of the wire rope (U-bolt over dead end - live end rests in clamp saddle). Tighten nuts evenly to recommended torque.
2. *Apply the next clamp* as near the loop as possible. Turn on nuts firm, take up rope slack, tighten nuts evenly to recommended torque.
4. Do not use clamps on plastic coated wire rope.
5. Never use clamps to connect two straight lengths of wire rope.



Attaching Clamps

A termination made in accordance with instruction and using the number of clamps shown has an approximate 80% efficiency rating. This rating is based upon the catalog breaking strength of wire rope.

Number of Clamps Recommended

Clamp Size Inches	Minimum No. of Clamps	Amount of Cable to Turn Back in Inches	Breaking Strength FT/LBS	Clamp Torque FT/LBS
1/8	2	3 1/4	1,760	4.5
3/16	2	3 3/4	3,700	7.5
1/4	2	4 3/4	6,400	15

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STORAGE INFORMATION

SUREPUMP™

1. The ideal storage condition for SurePump is in a warm dry location. Although SurePump will tolerate a light freeze, temperatures should not fall below -3°C (27°F). Repeated freezing and thawing should be avoided to prevent possible loss of motor fluid.

2. Limit storage time to less than two years if storage area temperatures exceed 100°F. Limit storage time to one year or less if storage area temperatures exceed 130°F.

3. To prevent motor seal damage and/or fluid loss, always store SurePumps vertically.

LEVELMASTER™

1. IMPORTANT: During any short or long term storage, to prevent moisture damage to internal components, the desiccant dryer must be installed on the vent tube of the submersible level sensor signal cable. Store in a warm dry location to prevent internal condensation in the meter enclosure.

2. If the level sensor is installed in a SurePump, pump must be stored in a vertical position. Coil the sensor signal cable and place in a box or protected area to prevent damage to the signal cable. Do not stack heavy items on top of level sensor signal cable.

3. Make certain that the desiccant dryer is attached to the end of the level sensor vent tube. Inspect dryer periodically and replace if crystals are pink or white.

PUMPMASTER™ CONTROLS

1. To prevent condensation/moisture damage within the control cabinet, store the PumpMaster in a warm dry location.

2. Check that the corrosion inhibitor cartridge is installed in the interior of the cabinet. If the PumpMaster control will be stored for over six months, contact EPG Companies Inc. for additional corrosion inhibitor cartridges

NOTE

The non-volatile memory of level and flow meters may deteriorate if left without power for periods greater than one year. If storage times are expected to exceed one year contact EPG Companies Inc. for special precautions.

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EPG Companies Inc.

SurePump™ Installation Record

Form Completed by: _____ Installation Date: _____

Company: _____ EPG Serial #: _____

PUMPS, CONTROLS AND POWER SUPPLY

Installer:	Address:	Installation Location:
Motor Model HP	Volts: Max Amps Rating:	Pump Model:
Power Supply Transformers: Number Used: KVA Each:	Hertz: Comments:	
Pump Control Panel: Mfg. & Model #:	Motor Starter Size:	Overload Heater Part or setting range: IEC Starters:
Lightning Arrestors: Mfg. & Model:	Surge Capacitors: Yes _____ No _____	Disconnect Fuse or Circuit Breaker Amp Rating:
Primary Flow Control Devices: (Low Level Control, Flow Control, Valve, System Back Pressure, etc.)		

OPERATING DATA (Measurements at Control Panel)

PUMP CONDITIONS: GPM	VOLTS	AMPS
Pump Not Running 0	R-Y _____ R-B _____ B-Y _____	
Open Discharge	R-Y _____ R-B _____ B-Y _____	R _____ Y _____ B _____
Normal Operation Run Time _____ Off Time _____	R-Y _____ R-B _____ B-Y _____	R _____ Y _____ B _____

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INSTALLATION DATA

Discharge Line Size:	Discharge Pressure:	Pump Submergence:	Fluid Temp: _____°F _____°C
External Check Valve Used?	Location:	Cable Length & Size:	Ground Resistance
Insulation Megohm Readings:	Before Installation:	After Installation:	After 30 min. Run:

SENSORS

Type of Level Sensor: Pressure Transmitter _____ Load Monitor _____ Floats _____ Other _____	Transmitter Serial Number:
Length of Sensor Lead:	Ohm Readings Across I.S. Barrier:
mA Readings on Transmitter Lead:	Voltage Reading Entering Level Meter: ____VAC Voltage Leaving Level Meter: _____VAC
Are Flow Sensors Used: Yes _____ No _____	Flow Spool Made of: PVC _____ Stainless Steel _____

Comments: _____

_____

_____

_____

_____

Place one copy of this record in the control panel, return one copy to EPG, and retain original for your records.

In case of problems or questions, contact EPG Companies Inc., 19900 County Road 81, Maple Grove, MN 55311. Phone: 800-762-8418 FAX: 763-493-4812

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EPG Companies Inc.

SurePump™ Preventive Maintenance

Form Completed by: _____ Inspection Date: _____

Company: _____ EPG Serial #: _____

OPERATING DATA (Measurements at Control Panel)

PUMP CONDITIONS: GPM	VOLTS	AMPS
Pump Not Running: 0	R-Y _____ R-B _____ B-Y _____	--
Open Discharge:	R-Y _____ R-B _____ B-Y _____	R _____ Y _____ B _____
Normal Operation: Run Time _____ Off Time _____	R-Y _____ R-B _____ B-Y _____	R _____ Y _____ B _____

PUMP DATA

Discharge Line Size:	Discharge Pressure:	Pump Submergence:	Fluid Temp: _____°F or _____°C
External Check Valve Used: Yes _____ No _____	Location:	Cable Length & Size:	Ground Resistance:
Motor Resistance: Ohms (Turn off power to pump)	Three Phase: Line to Line _____	Single Phase: B-Y _____ R-Y_____	

SENSORS

Type of Level Sensor: Pressure Transmitter _____ Load Monitor _____ Floats _____ Other (Specify) _____	
Length of Sensor Lead:	Ohm Readings Across I.S. Barrier:
mA Readings on Transmitter Lead:	Voltage Reading Entering Level Meter: ____ VAC Voltage Leaving Level Meter: ____ VAC

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Are Flow Sensor(s) Used: Yes _____ No _____	Flow Sensor(s) Cleaned: Yes _____ No _____

CONTROL PANEL

Control Panel Door Closed & Latched: Yes _____ No _____	Wire Splices Taped: Yes _____ No _____ Does Not Apply _____
Wire Connections at Terminal Strip: Tight _____ Loose _____	Overall Appearance of Control Panel Components: Good ___ Worn ___ Burned ___ Dusty ___
Wire Color: Bright _____ Faded _____	Odor Inside Control Panel: Methane _____ H_2S _____ Burnt _____ None _____
Wire Flexibility: Flexible _____ Brittle _____	Condition of Conduit Seal Offs: Sealed ____ Not Sealed ____ Don't Exist ____
Corrosion of Wire Terminals: Yes _____ No _____	Cover on Sump: Yes _____ No _____ Does Not Apply _____

Comments: _____

_____

_____

_____

_____

_____

Place one copy of this record in the control panel, return one copy to EPG, and retain original for your records.

Complete this form quarterly or as often as necessary.

In case of problems or questions, contact EPG Companies Inc., 19900 County Road 81, Maple Grove, MN 55311. Phone: 800-762-8418 FAX: 763-493-4812

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ENGINEER'S SPECIFICATION

EPG'S L925 PT PumpMaster™

3Ø CONTROL PANEL

Furnish three EPG Companies Inc., U.L. listed, L925 PT control panel to operate pump motor and auxiliary equipment in manual or automatic mode. The panel enclosure will be NEMA type 4x-stainless steel with keyed handle.

Enclosures shall come equipped with an inner door, stainless steel drip shield and tamper resistant latch. The NEMA 4 enclosures are finished with polyester urethane paint. The NEMA 4X enclosures can be either stainless steel or non-metallic.

The control system will operate from a 460 Volt, 60 Hertz, 3 phase power supply. Pump control components will be sized to operate pump motor of specified horsepower.

The control panel shall include the following as standard features:

* Main 40 Amp Disconnect Switch with Door Interlock: Shall prevent opening of panel while power is on and includes 600 Volt, 3A Amp dual element type fuses.
* "Hand-Off-Auto" Selector Switch: Allows manual or automatic operation. The selector switch shall be a heavy duty, oil tight, NEMA 4 rated switch mounted on the inner door.
* Motor Starter: The motor starter will be sized to the pump motor horsepower, and shall be equipped with built in single phasing protection and ambient compensated, quick trip adjustable thermal overloads.
* Running Light: Indicates energization of motor circuit. It shall be heavy duty, oil tight, NEMA 4 rated with voltage surge suppressor built in to prolong lamp life.
* Motor Overload Light: Indicates motor not running due to overload condition. Light shall be heavy duty, oil tight, NEMA 4 rated with voltage surge suppressor to prolong life.
* Control Transformer: Transformer with fused primary to isolate control circuit from power circuit and for easier and safer field wiring of accessories. It shall lower incoming voltage to 120Volts.
* LevelMaster™ Level Control: The LevelMaster shall be mounted on the inner door. Meter shall have a digital readout and the capability to monitor and maintain pumping operations as well as at least two other level signals. Level control shall be accurate to within 0.1 inch.
* Heater with Adjustable Thermostat: To promote even distribution of heat and elimination of hot spots and condensation. Heater element shall be mounted in space between the sub-panel and the back of the enclosure and provide a minimum of 200 inches square of heating area.
* Lightning Arrestor: Shall be grounded, metal to metal, to water strata.
* Terminal Strip: Provides easy connection of external components.
* Corrosion Inhibitor Emitter: Inclusion of an industrial corrosion inhibitor emitter that shall protect internal components of control panel from corrosion for up to one year.
* For options see specification sheets.

The EPG submersible pressure transmitter level sensor shall have a range of 0 to 11.5 feet with a 4 to 20 MA output signal. Transmitter construction shall be stainless steel body, stainless steel diaphragm and Viton seals with chemical resistant signal cable. The transmitter circuit shall be protected by intrinsically safe barriers.

SIMPLEX SYSTEM

This system is designed to start a pump on a change in liquid level as sensed by the pressure transmitter. The pump will continue to run until the selected level is reached. If the liquid level changes beyond set points, a high and/or low level will be annunciated.

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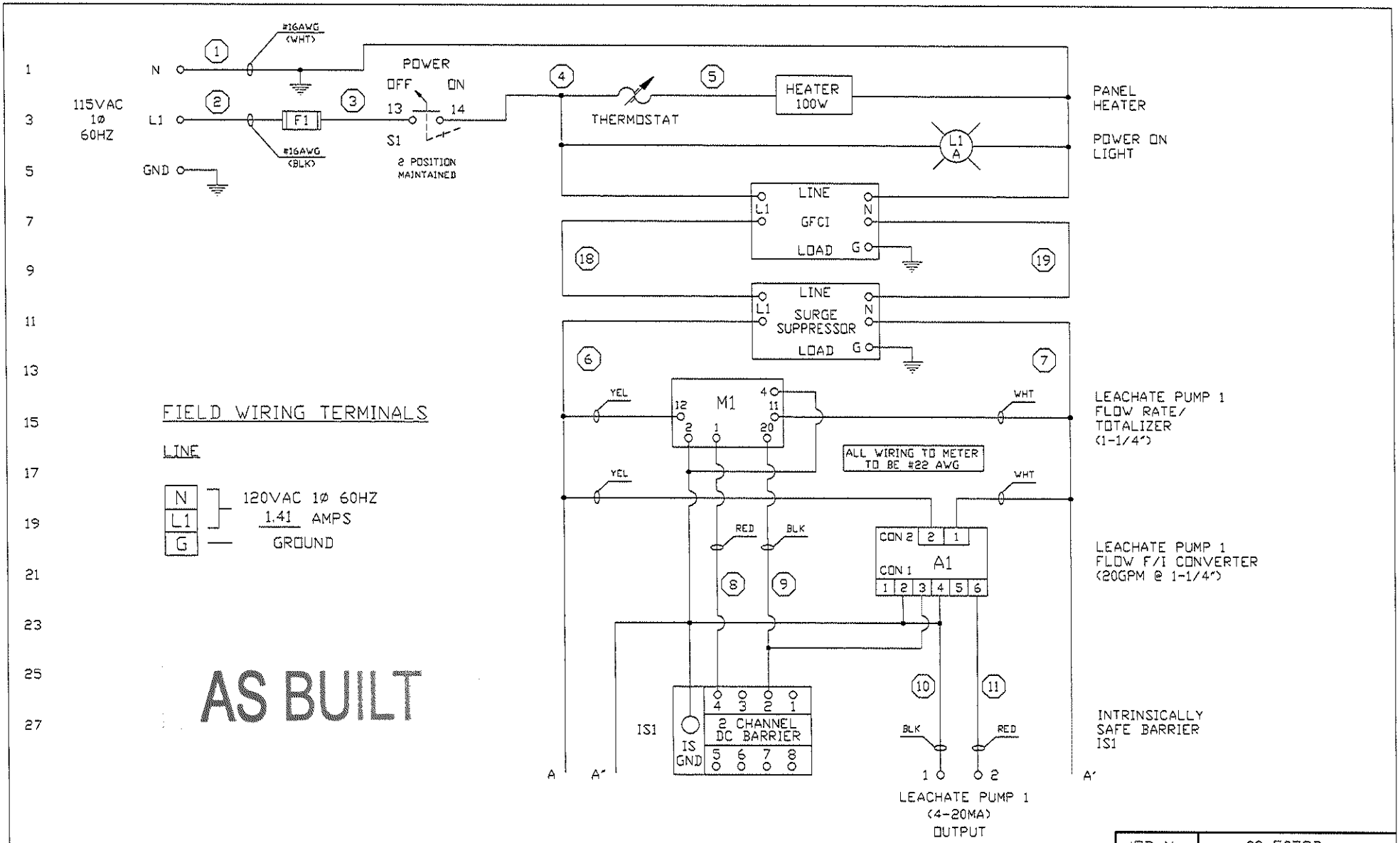
ATTACHMENT TO BULLETIN 0060

ENGINEER'S SPECIFICATION
EPG L925PT Controller
3Ø Control Panel

EPG Job #00-5072

These controllers include the following optional features:

* Variable frequency drive.
* Local/remote selector switch.
* Remote inhibit circuit.
* Outputs for PLC.
* H series panel lights.
* Indicating fuse blocks.
* Fused convenience outlet (in control panel).



FIELD WIRING TERMINALS

LINE

N	120VAC 1Ø 60HZ	
L1	1.41	AMPS
G	—	GROUND

AS BUILT

NOTES

1. REFERENCE INSTALLATION OF INTRINSICALLY SAFE INSTRUMENT SYSTEMS IN CLASS I HAZARDOUS LOCATIONS, ANSI/ISA-RP 12.6-1987, SECTION 4.5.4

FUSE	TYPE	RATING
F1	MDL	3

JOB No. 00-5072D

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TOLERANCES (UNLESS AS NOTED) DECIMAL / FRACTIONAL / ANGULAR /

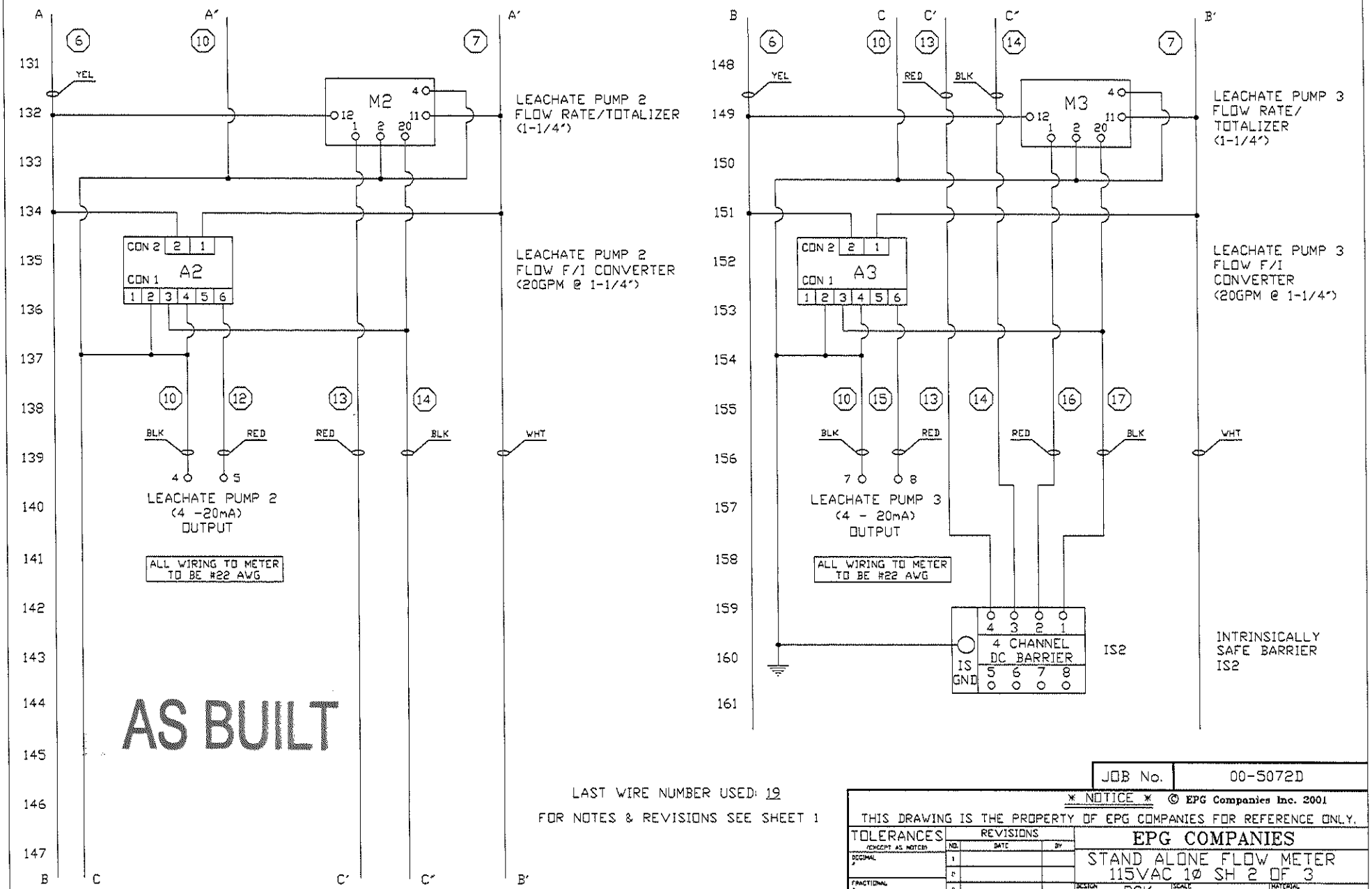
REVISIONS

NO.	DATE	BY
1		
2		
3		
4		
5		

EPG COMPANIES

STAND ALONE FLOW METER
115VAC 1Ø SH 1 OF 3

DESIGN	RCK	SCALE	MATERIAL
DRAWN	RCK	DATE 06-01-01	DRAWING NO. 05342-0100
CHK'D		APP'D	



LAST WIRE NUMBER USED: 19

FOR NOTES & REVISIONS SEE SHEET 1

JOB No.	00-5072D

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TOLERANCES (EXCEPT AS NOTED)
DECIMAL
FRACTIONAL
ANGULAR

REVISIONS			
NO.	DATE	BY	
1			
2			
3			
4			
5			

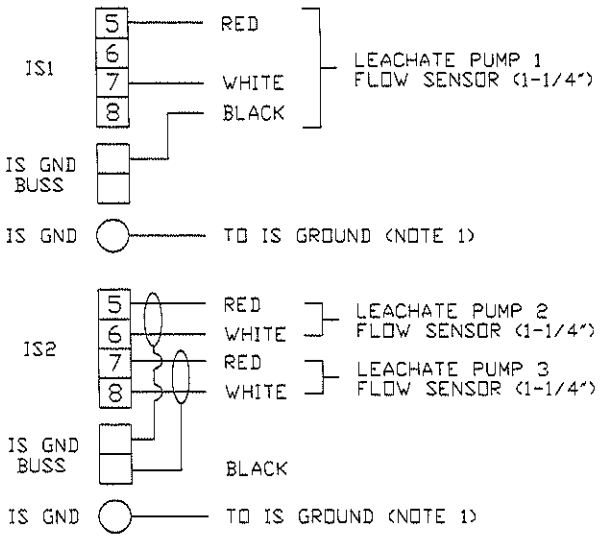
EPG COMPANIES

STAND ALONE FLOW METER
115VAC 1Ø SH 2 OF 3

DESIGN	RCK	SCALE	MATERIAL
DRAWN	RCK	DATE 06-01-01	DRAWING NO. 05342-0101
CHK'D		APP'D	

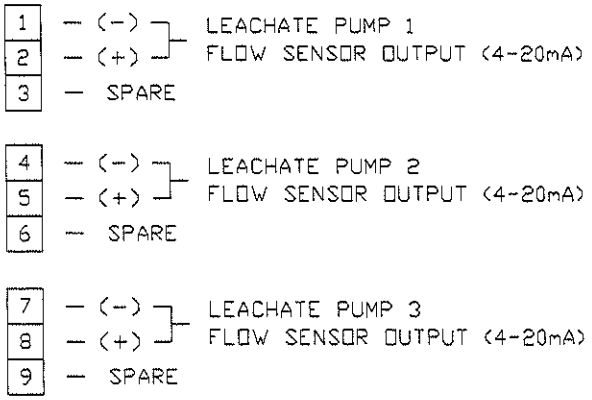
FIELD WIRING TERMINALS

SENSOR (INTRINSICALLY SAFE BARRIER)



FIELD WIRING TERMINALS

FLOW SENSOR OUTPUT SIGNAL (4-20 mA)



FOR NOTES AND REVISIONS SEE SHEET 1

AS BUILT

JOB No.	00-5072D

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TOLERANCES (UNLESS AS NOTED)	REVISIONS			EPG COMPANIES	
DECIMAL	NO.	DATE	BY	STAND ALONE FLOW METER 115VAC 1Ø SH 3 OF 3	
FRACTIONAL				DESIGN RCK	SCALE / MATERIAL
ANGULAR				DRAWN RCK	DATE 06-01-01 / DRAWING NO. 05342-0102
				CHK'D	APP'D

EPG LevelMaster Pump controller

Panel S/N: 00-5072ABC
Meter S/N: _____

Primary Leachate Meter
Default setting - Operating Parameters - Setup Code 35

Meter Designation(s): M1

Parameter	Value	Operation
Pr Hi	30	Turns Pump on when level on meter reads 30 ".
Pr Lo	16	Turns Pump off when level on meter reads 16 ".
AL H1	36	Turns High Level Light on when meter reads 36 ".
Hy Hi	1	Keeps High Level Light on until level drops 1 " below AL Hi.
AL H2	150	Turns Pumps off it meter reads 150" or greater. Indicates a possible sensor failure.
Hy H2	0	Not used.

Default Settings - Sensor Parameters - Setup Code 25

Parameter	Value	Operation
dp	8888.8	Sets Meter to read in 0.1"
OFFSET	-34.6	Provides a "0" reading when sensor inputs 4.0ma
SCALE	0.8656	Converts current input into inches - 1.0ma = 8.656 inches.

AS BUILT

CAUTION

EPG submersible level sensors are designed for rugged use. However, care should be taken to protect these devices from over pressure and sudden impact. When lowering the level sensor into a liquid, penetrate the surface slowly and only to the depth that the unit is designed for. Do not drop or wash with high pressure since this may damage the unit.

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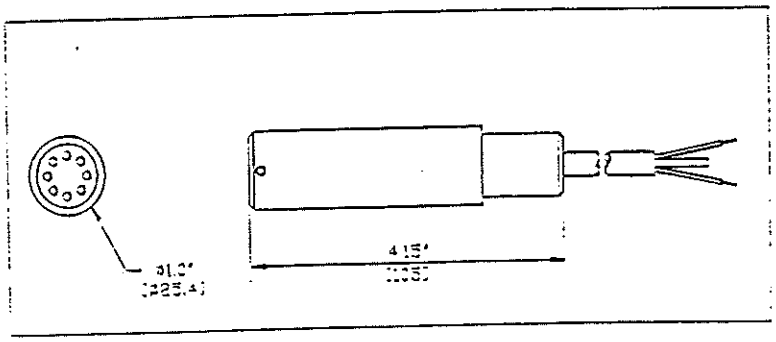
EPG LEVELMASTER™ SUBMERSIBLE LEVEL SENSOR SYSTEM



GENERAL FEATURES

* **Ease of Installation**
  LevelMaster is designed specifically to work with the EPG SurePump™, but it's durability, accuracy and weight make it the logical choice for stand alone applications. The chemical resistant lead wire contains a vent tube for atmospheric pressure compensation.

* **Ranges Available**
  0 to 5 through 0-50 PSIG models are available.
  Please call for special needs.

TRANSMITTER FEATURES:

* **Accuracy**
  LevelMaster has built-in temperature compensation as well as precise calibration giving an accuracy of ±1.0%. at ambient temperature and a combined repeatability and hysteresis error of ±.125%.

* **Fully Submersible**
  LevelMaster transmitter is fully submersible in any liquid compatible with 316 stainless steel and the chemical resistant polyurethane cable jacket. LevelMaster sensor is designed for submergence at depths greater than operating level without sustaining damage. For more severe service consult the factory.

* **Superior Noise Immunity**
  Designed for heavy duty use in hostile environments, LevelMaster gives outstanding noise immunity. Unlike transducers, whose signals may be distorted by outside interference, the LevelMaster utilizes a conditioned compensated 4-20mA output to maximize signal strength and accuracy. The sensor also features a shielded lead to help prevent signal disruption from outside sources.

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Warranty

EPG Companies warrants its products against defects in material and workmanship for 12 months from date of shipment. Products not subjected to misuse will be repaired or replaced. THE FOREGOING IS IN LIEU OF ANY OTHER EXPRESSED OR IMPLIED WARRANTIES. EPG Companies reserves the right to make changes to any product herein and assumes no liability arising out of the applications or use of any product or circuit described.

DD100-4 Vent Filter & Water Vapor Trap

The DD100-4 is a replaceable vent tube dehumidifier intended for use with our submersible pressure transmitters. This device is specifically designed to protect sensitive electronic components from mildew, corrosion, rust, and other forms of deterioration while at the same time preventing the formation of a liquid column.

Vent filters should be changed when they are 85% spent. Do not remove the old filter until a new one is available. The number one failure mode is moisture and corrosion damage due to lack of maintenance of the vent filter.

The DD100-4 connects to the existing vent tube as it exits the cable at the junction box via a tube. The unbreakable acrylic drying tube is 4 inches in length and 3/4 inches in diameter. Inserted in each pull-off molded polypropylene drying tube end cap is a 20 micron polypropylene filter.

The drying tube is filled with an indicating desiccant (drying agent). The maximum flow rate through the drying tube is 300 cubic centimeters per minute, more than sufficient to allow the transmitter to respond to barometric changes. As air passes through the drying tube, moisture is absorbed by the desiccant. The desiccant changes from blue to a rose red as its drying capacity becomes diminished.

The desiccant can be rejuvenated after normal use by spreading it in a layer one granule deep and heating for one hour at 205°C (400°F). The heating temperature is very important for if it is lower than 205°C (400°F) the desiccant will not rejuvenate. Alternatively, if the desiccant is overheated, the crystal structure may be altered and render the desiccant permanently inactive. Alternatively, spare vent filters can be ordered by calling 800-443-7426. The DD100-4 vent filter and water vapor trap can be exposed to air, industrial gases, refrigerants, organic liquids, and solvents. It should not, however, be used when ammonia is present.

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USER'S GUIDE

Submersible Level Sensor for Liquid Level Measurement

Congratulations on your purchase of an EPG Companies pressure transmitter. Our precision measurement devices are built to exacting standards. Before shipping, all units pass rigorous inspection by our Quality Assurance program.

Please take a few moments to read this brief user's manual to fully acquaint yourself with the characteristics, features, and benefits of your EPG transmitter.

Future orders may be placed by calling our Applications Support and Order Hotline at 800-443-7426. Call (800) 762-8418 for warranty repair service.

Characteristics of EPG Companies Transducers/Transmitters

All EPG transducers incorporate our isolated diaphragm sensors, which are specifically designed for use with hostile fluids and gases. These sensors utilize a silicon pressure cell that has been fitted into a stainless steel package with a stainless steel barrier diaphragm. This sensor assembly is housed in a rugged 316 SS case, which provides for a variety of pressure inputs

Our devices feature high performance internal signal conditioning. Standard output is 4 to 20 mA. All units have surge and reverse polarity protection.

For your convenience and ease of use in the field, all EPG transmitters are permanently etched with our logo & name, wiring information, part number (P/N), serial number (S/N), date of manufacture (DOM), range, excitation, and output.

All EPG transmitters are designed for rugged use. However, care should be taken to protect these devices from overpressure and sharp impact. When lowering submersible pressure transmitters into a liquid, penetrate the surface slowly and only to the depth necessary. Avoid dropping the unit from above the surface. All transmitters can be cleaned by rinsing them in mild detergent. Do not pressure wash.

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SPECIFICATIONS

PERFORMANCE

Pressure Range . . . . . 0-5 through 0-50 PSIG
Static Accuracy* . . . . =1.0% BFSL FSL maximum
Thermal Error** . . . . 0.05% FSO/°C worst case
Proof Pressure . . . . . 1.5 X rated pressure
Burst Pressure . . . . . 2.0 X rated pressure
Resolution. . . . . Infinitesimal

* Static accuracy includes the combined errors due to nonlinearity, hysteresis and non-repeatability on a Best Fit Straight Line basis, at 25°C per ISA S51.1.

** Thermal error is the maximum allowable deviation from the Best Fit Straight Line due to a change in temperature, per ISA S51.1.

ENVIRONMENTAL

Compensated temp range . . . . . 0° to 50°C
Operating temp range . . . . . -20° to 70°C

ELECTRICAL TERMINATION	
2-24 AWG CONDUCTORS IN A SHIELDED CABLE WITH SENSOR BREATHER AND POLYURETHANE JACKET.	
4-20 mA: RED	+ EXCITATION
BLACK	- EXCITATION

ELECTRICAL

Excitation . . . . . 10 to 40 VDC
Input Current . . . . . 20 mA maximum
Output . . . . . 4-20 mA (2 wire)

Zero offset, max . . . . . 4-20 mA: =.12mA

Output impedance . . . . . <10 ohms
Insulation resistance . . . . . 100 megohms at 50VDC
Circuit protection . . . . . Polarity, surge & shorted output
Power supply rejection . . . <=.05% FSO/VDC (mA output)

PHYSICAL

Weight . . . . . 7 oz. (not incl. cable)
Cable . . . . . Polyurethane jacketed shielded cable with polyethylene vent tube and Kevlar tension members

Wetted materials . . . . . 316 SS, Viton
Mounting provision . . . . . Suspended by cable

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Polyurethane & Tefzel Jacketed Cable

Most installations of our submersible pressure transmitters connect our cable to a junction box.

From this junction box, end-users run their own cable to the required instrumentation. Specifications for our polyurethane or tefzel jacketed cable are as follows:

Weight	0.04 lbs/ft
Min. OD.	0.28"
Max. OD	0.31"
Conductors	3
Insulation	PVC
Shield	36 gauge spiral tinned copper
Wire	22 AWG (19/34) tinned copper stranding

Chemical Resistance of Polyurethane

Potable Water, Waste Water, Borax, Butane, Animal Fat, Carbonic Acid, Citric Acid, Cod Liver Oil, Corn Oil, Glycerin, Glycol, Mineral Oils, Potassium Nitrate, Potassium Sulfate, Silicone Oils, Stoddard Solvent, Tannic Acid (10), Tartaric Acid, Turbine Oil

Chemical Resistance of Tefzel

Acetic Acid (Glacial), Acetic Anhydride, Acetone, Aluminum Chloride, Anti-Freeze, Bromine, Calcium Chloride, Calcium Hydroxide, Chlorine, Copper Chloride, Ferrous Chloride, Hydrochloric Acid, Ketones, Lacquer Thinners, Sulfuric Acid.

Cable Lengths

The maximum length of cable to be used with our submersible pressure transmitter is up to 10,000 feet.

ORDERING INFORMATION

PHONE: (800)443-7426 Sales Representatives are available from Monday through Friday from 8:00 A.M until 5:00 P.M. Central time.

MAIL: Mail your order to: EPG Companies, Inc.
P.O. Box 427
Rogers, MN 55374

FAX: (763) 493-4812 We accept fax orders 24 hours a day, 7 days a week.

SERVICE INFORMATION

PHONE: (800) 762-8418 Customer Services Personnel are available Monday through Friday 8:00 A.M. to 5:00 P.M. Central time.

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EPG LevelMaster™

Setup and Troubleshooting

The EPG LevelMaster system uses a submersible pressure transmitter to detect changes in fluid levels and a programmable meter featuring a digital LED display and front panel keypad to monitor and control fluid levels. The user can program the desired control parameters for a single pump and two other level control functions or a dual pump system with one other level function. The LevelMaster readout is in inches unless otherwise programmed. During a pumping and/or an alarm condition, the display alternates between the message and the current liquid level reading. The message indicates which function is active (see below).

FUNCTION	MESSAGE
Hi	High alarm exceeded. Display flashes current level.
H1	High alarm (1st) exceeded. Display flashes current level.
H2	High alarm (2nd) exceeded. Display flashes current level.
Lo	Low alarm exceeded. Display flashes current level.
L1	Low alarm (1st) exceeded. Display flashes current level.
L2	Low alarm (2nd) exceeded. Display flashes current level.
P	Pump relay activated. Display flashes current level. (Lead pump in two pump system)
P2	Pump relay activated. Display flashes current level. (Lag Pump in two pump system.)
Hi P	High alarm & pump relay activated. Display flashes current level.
P Lo	Pump relay & low alarm relay activated. Display flashes current level.

GENERAL SETUP OPERATIONS

IMPORTANT - During setup, if two (2) minutes elapse without a keypad entry the meter automatically returns to the run mode without the entered changes being stored. DO NOT USE FINGERNAIL OR OTHER SHARP OBJECT TO PROGRAM METER. DAMAGE TO KEYPAD MAY RESULT.

DISPLAY	INSTRUCTION
SETUP	This prompt tells you to enter the lockout code (35) in order to enter the set-point setup mode.
Pr-Hi	This prompt, followed by the default setting, tells you to select the Pump Relay High set-point. This is the pump ON set-point.
Pr-Lo	This prompt, followed by the default setting, tells you to select the Pump Relay Low set-point. This is the pump OFF set-point.
Al-Hi	This prompt, followed by the default setting, tells you to select the Alarm High Relay set-point. This is the high level alarm set-point.
Hy-Hi	This prompt, followed by the default setting, tells you to select the hysteresis for the Alarm High Relay set-point. This value, when subtracted from the high-level-alarm set-point, sets the disengage point for the high-alarm condition.
Al-Lo	This prompt, followed by the default setting, tells you to select the Alarm Low Relay set-point. This is the low level alarm set-point.

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Hy-Lo	This prompt, followed by the default setting, tells you to select the hysteresis for the Alarm Low Relay set-point. This value, when added to the low-level-alarm set-point. sets the disengage point for the low level.
Pr-H1	This prompt, followed by the current setting, tells you to select the Lead Pump on set-point. This is the Lead Pump ON set-point.
Pr-H2	This prompt, followed by the default setting, tells you to select the Lag Pump on set-point. This is the Lag Pump ON set-point.

LevelMaster Set Up Procedures for Simplex Operations (SDHL meters only)

STEP NO.	ACTION
1	Push SETUP/ENTER button. Wait for the meter to display 0.
2	Push arrow buttons to set a value of 35 on meter display. Push SETUP/ENTER.
3	Meter shows **Pr-Hi** (pump ON set point) followed by current value.
4	Push arrow buttons to set the desired level for pump ON. Push SETUP/ENTER button.
5	Meter shows **Pr-Lo** (pump OFF set point) followed by current value.
6	Push arrow buttons to set the desired pump OFF level. Push SETUP/ENTER button.
7	Meter shows **Hi-Al** (High Level Alarm) followed by current value.
8	Press arrow buttons to set desired high level alarm point. Push SETUP/ENTER button.
9	Meter shows **HY-Hi**. Press arrow buttons to select value. Push SETUP/ENTER button.
10	Meter shows **Al-Lo** (low level alarm set point) followed by current value.
11	Press arrow buttons to set desired low level alarm point. Push SETUP/ENTER button.
12	Meter shows **HY-Lo**. Press arrow buttons to select value.
13	Push SETUP/ENTER button. Meter shows **RUN**.

EXAMPLE:

If the desired levels for the pump were:

Pump ON	18.0"
Pump OFF	12.0"
High Level Alarm	30.0"
High Level Alarm Hys.	1.0"
Low Level Alarm	6.0"
Low Level Alarm Hys.	1.0"

Complete steps 1 - 3 above.

Select **18.0** with arrow buttons for the **Pr-Hi** value. Push SETUP/ENTER.

Pr-Lo is displayed, select **12.0** with the arrow buttons for the Pump OFF value. Push SETUP/ENTER.

Hi-Al is displayed, select **30.0** with the arrow buttons for the High Alarm value. Push SETUP/ENTER.

HY-Hi is displayed, select **1.0** with the arrow buttons for the High Level Alarm OFF value (value determined by subtracting from high-level-alarm set-point). Push SETUP/ENTER.

Al-Lo is displayed, select 6.0 with the arrow buttons for the Low Alarm value. Push SETUP/ENTER.

HY-Lo is displayed, select 1.0 with the arrow buttons for the Low Level Alarm OFF value (value, when added to Alarm point , will reset alarm). Push SETUP/ENTER. Meter shows **RUN**.

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LevelMaster Set Up Procedures for Simplex Operations (SDHH meters only)

STEP NO.	ACTION
1	Push SETUP/ENTER button. Wait for the meter to display 0.
2	Push arrow buttons to set a value of 35 on meter display. Push SETUP/ENTER.
3	Meter shows **Pr-Hi** (pump ON set point) followed by current value.
4	Push arrow buttons to set the desired level for pump ON. Push SETUP/ENTER button.
5	Meter shows **Pr-Lo** (pump OFF set point) followed by current value.
6	Push arrow buttons to set the desired pump OFF level. Push SETUP/ENTER button.
7	Meter shows **AL-H1** (High Level Alarm) followed by current value.
8	Press arrow buttons to set desired high level alarm point. Push SETUP/ENTER button.
9	Meter shows **HY-Hi**. Press arrow buttons to select value. Push SETUP/ENTER button.
10	Meter shows **AL-H2** (High-High level alarm set point) followed by current value. Factory default setting is 150.0. **NOTE: Pumps will not run in auto mode if high-high level is exceeded.**
11	Press arrow buttons to set desired high-high level alarm point. Press SETUP/ENTER button.
12	Meter shows **HY-H2**. Press arrow buttons to select value.
13	Push SETUP/ENTER button. Meter shows **RUN**.

EXAMPLE:

If the desired levels for the pump were:

Pump ON	18.0"
Pump OFF	12.0"
High Level Alarm	30.0"
High Level Alarm Hys.	1.0"
High-High Alarm	150.0"
High-High Alarm Hys.	0.0"

Complete steps 1 - 3 above.
Select **18.0** with arrow buttons for the **Pr-Hi** value. Push SETUP/ENTER.
Pr-Lo is displayed, select **12.0** with the arrow buttons for the Pump OFF value. Push SETUP/ENTER.
Hi-Al is displayed, select **30.0** with the arrow buttons for the High Alarm value. Push SETUP/ENTER.
HY-Hi is displayed, select **1.0** with the arrow buttons for the High Level Alarm OFF value (value determined by subtracting from high-level-alarm set-point). Push SETUP/ENTER.
Al-H2 is displayed. Value should be 150.0", if you wish to change value, use arrow buttons to change. Push SETUP/ENTER.
HY-Lo is displayed Set at 0.0".
Push SETUP/ENTER. Meter shows **RUN**.

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Level Master Set Up Procedures for Duplex Operations (DDHX meters only)

STEP NO.	ACTION
1	Push SETUP/ENTER button. Wait for the meter to display 0.
2	Push arrow buttons to set a value of 35 on meter display. Push SETUP/ENTER.
3	Meter shows PR-H1 (Lead Pump ON set point) followed by current value.
4	Push arrow buttons to set the desired level for pump ON. Push SETUP/ENTER button.
5	Meter shows PR-H2 (Lag Pump ON set point) followed by current value.
6	Push arrow buttons to set the desired pump ON level. Push SETUP/ENTER button.
7	Meter shows PR-LO (Common Low Pump OFF set point) followed by current value.
8	Press arrow buttons to set desired level alarm for pumps OFF. Push SETUP/ENTER button.
9	Meter shows Al-Hi (High Level Alarm set point) followed by current value.
10	Push arrow buttons to set desired alarm level. Push SETUP/ENTER button.
11	Meter shows HY-Hi. Set at 1.0". Press arrow buttons to select value.
12	Push SETUP/ENTER button. Meter shows RUN.

EXAMPLE:

If the desired levels for the pump were:	Lead Pump ON	18.0"
	Lag Pump ON	24.0"
	Pumps OFF	12.0"
	High Level Alarm	30.0"
	High Level Alarm Hysteresis	1.0"

Complete steps 1 - 3 above.
Select **18.0** with arrow buttons for the **PR-H1** value. Push SETUP/ENTER.
PR-H2 is displayed, select **24.0** with the arrow buttons. Push SETUP/ENTER.
PR-LO is displayed, select **12.0** with the arrow buttons. Push SETUP/ENTER.
Al-Hi is displayed, select **30.0** with the arrow buttons. Push SETUP/ENTER.
HY-Hi is displayed, select **1.0** with arrow buttons.
Push SETUP/ENTER. Meter shows **RUN**.

INSTALLATION NOTES AND TROUBLESHOOTING

BACKGROUND: Numerous installations of the EPG LevelMaster system have proven its long-term reliability. The majority of malfunctions of the LevelMaster system are the result of improper installation and handling of the pressure transmitter sensor. During new installations, be certain to check for any shipping damage, loose controller connections or parts that may have come loose during shipment.

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A. IMPROPERLY INSTALLED SENSOR VENT DRYER. The sensor vent tube, a small hollow tube in the center of the leadwire, must be connected to the dryer cylinder in the controller to prevent moisture from entering and damaging the sensor. The vent tube must be open to the dryer to allow atmospheric pressure equalization.

B. DAMAGED/CUT/CRUSHED SENSOR LEADWIRES. Most failures at startup or shortly thereafter are the result of damaged sensor leadwires. If the leadwire outer shield is damaged, moisture can enter the conductors causing intermittent or complete failure.

USE CARE WHEN INSTALLING THE LEADWIRE during pump installation. Protect the leadwire with sleeving or plastic tubing to prevent cutting or gouging the insulation when feeding the leadwire through or over any sharp or jagged edges.

C. IMPROPER SENSOR LEADWIRE CONNECTION. Check the schematic drawing shipped with the pump controller to assure the sensor BLUE (BLACK on some models) wire is connected to the minus (-) controller terminal and the sensor WHITE (RED on some models) wire is connected to the plus (+) controller terminal.

D. PHYSICAL ABUSE/DAMAGE OF THE SENSOR. Do not attempt to disassemble the sensor. Do not strike or hammer against a hard surface. - *THE WARRANTY IS VOID IF THE PROBE HAS BEEN DISASSEMBLED, DENTED OR CRUSHED.*

SYMPTOM/DISPLAY	PROBABLE CAUSE	REPAIR
Continuous above full scale reading (above 139).	Loose connections in circuit. Short circuit in sensor leadwire or connector or circuit. Faulty sensor.	Repair connections in controller. Replace sensor. Replace sensor.
-34.6 reading.	Leadwire damaged or reversed connections. Open circuit in sensor leadwire or controller connections. Faulty power supply in meter.	Check schematic, repair connections. Replace sensor and leadwire. Check IS barrier. Replace meter.
Erratic readings.	Damaged sensor leadwire. Improper connections. Faulty meter.	Check schematic, repair connections. Replace sensor and leadwire. Replace meter.

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S3070-PT TRANSDUCER SIMULATOR
Operation

The model 3070-PT Transducer Simulator is a device designed for the express purpose of testing an EPG LevelMaster™ level controller circuit while temporarily bypassing the existing level sensor. In the "Run" (normal operation) mode liquid level in the sump applies pressure on the level sensor. The sensor converts that force into an electrical signal. The electrical signal is transmitted by the sensor cable to the level meter where it is converted into a liquid level display.

The "Test" mode simulates a level sensor signal. Rotating the potentiometer changes the electrical signal forcing the system to function as if a level sensor were in the circuit. Varying the electrical signal changes the level meter display in the same manner in which the level sensor signal would effect the system. By turning the simulator knob slowly clockwise from top to bottom the meter will display each set point such as start, stop and alarms. With the toggle switch turned back to the "Run" position the potentiometer is removed from the circuit and the level sensor controls according to the set points. Meter values register actual liquid level.

"**CAUTION**", care must be taken when using this device in "Test" mode to avoid damaging the motor by running it dry. In normal test mode the pump switches should be off.

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S3070-PT TRANSDUCER SIMULATOR TEST PROCEDURE

1. When the toggle switch is in the "Run" position the controls should function normally.
2. When the toggle switch is in the "Test" position (pressure transducer temporarily removed from he control circuit) the level meter should display the liquid level. By turning the simulator knob slowly clockwise from top to bottom the meter will display each set point such as start, stop, and alarms. Care must be taken when using this device in the "Test" mode to avoid damaging the motor by running it dry. In normal test mode the pump switches should be off.
3. Make sure that the potentiometer has full travel (270 degrees maximum) in both clockwise and counter-clockwise directions.
4. Make sure that all of the wires on the rear of the simulator (wires 200, 201, 202, 203) are connected in the proper position.
5. Replace the transducer simulator if it does not function as described above.

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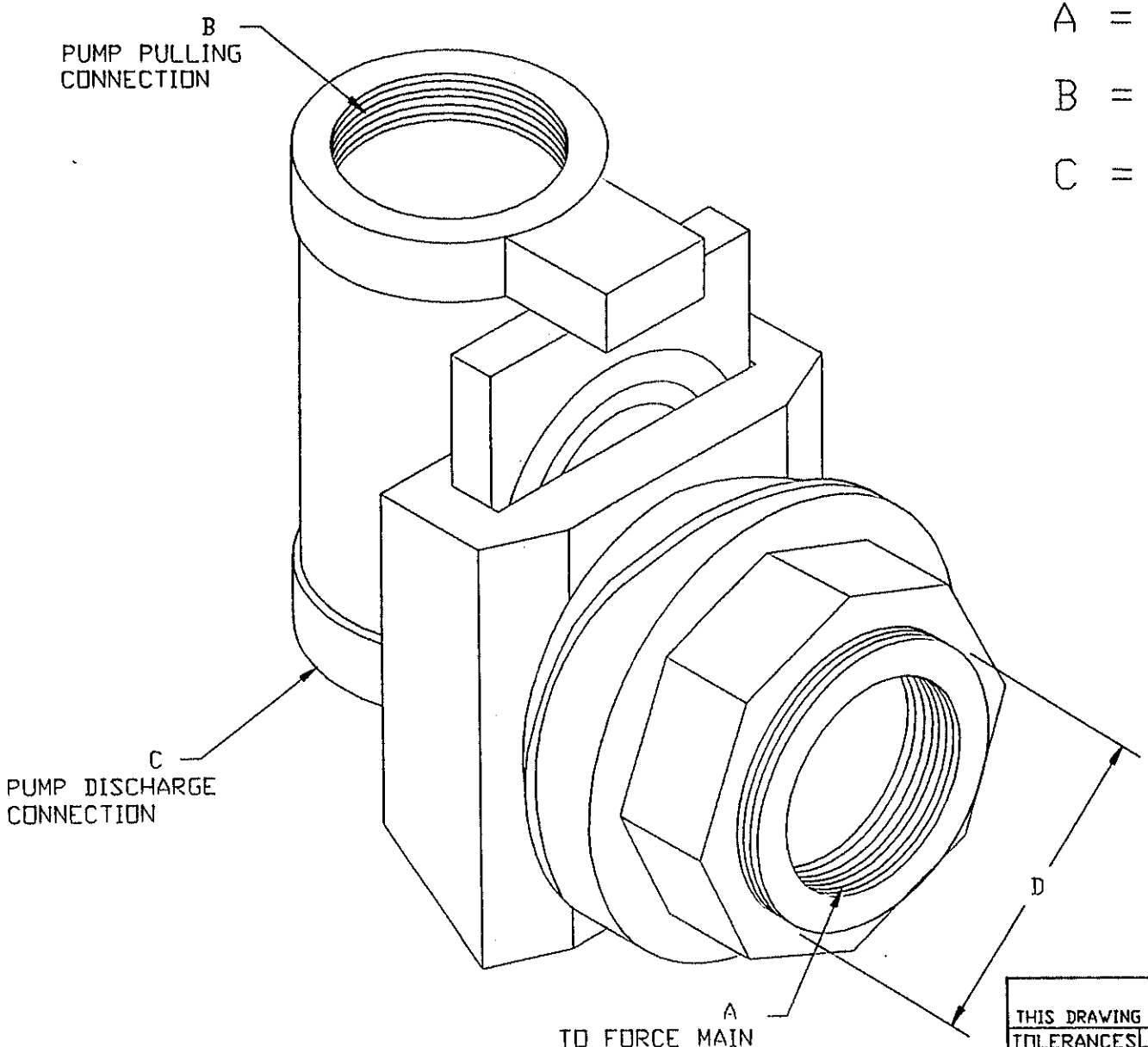


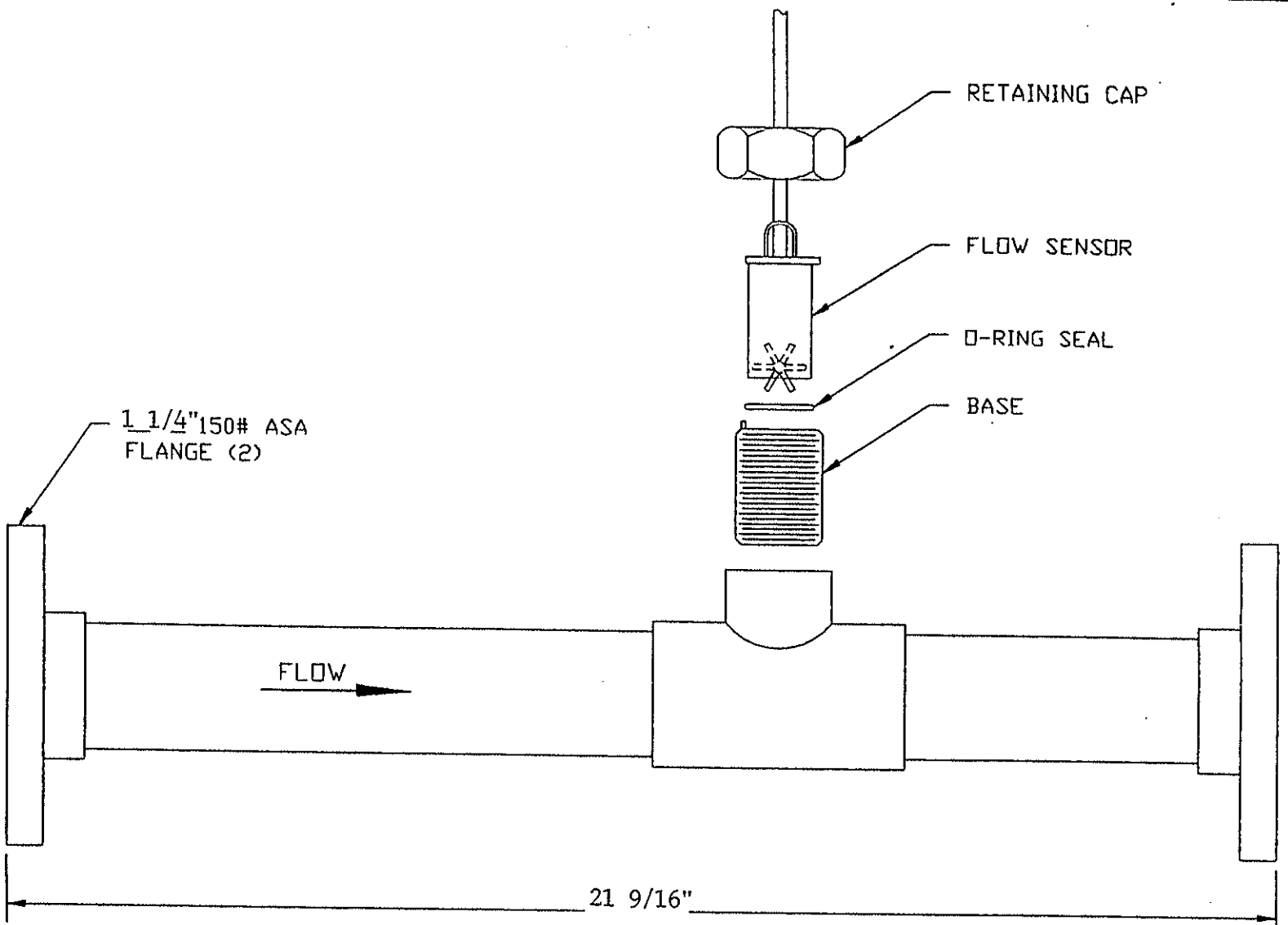
A = 2" FNPT

B = 2" FNPT

C = 2" FNPT

* NOTICE *
THIS DRAWING IS A PROPERTY OF EPG COMPANIES FOR REFERENCE ONLY.

TOLERANCES	REVISIONS			EPG COMPANIES
(EXCEPT AS NOTED)	NO.	DATE	BY	PUMP DISCHARGE DISCONNECT
DECIMAL	1			
	2			
FRACTIONAL	3			DRAWN BY D.S. SCALE MATERIAL
	4			CHK'D DATE 6-01-92 DRAWING NO
ANGULAR	5			TRACED APP'D 1125



* NOTICE *

THIS DRAWING IS A PROPERTY OF EPG COMPANIES FOR REFERENCE ONLY.

TOLERANCES (EXCEPT AS NOTED)	REVISIONS			EPG COMPANIES		
DECIMAL	NO.	DATE	BY	PVC FLOW SPOOL		
	1	02-17-95	HT.	FLANGED ENDS		
FRACTIONAL				DRAWN BY D.S.	SCALE	MATERIAL PVC
ANGULAR				CHK'D J.S.H.	DATE 12-22-92	DRAWING NO 1492
				TRACED	APP'D J.S.H.	

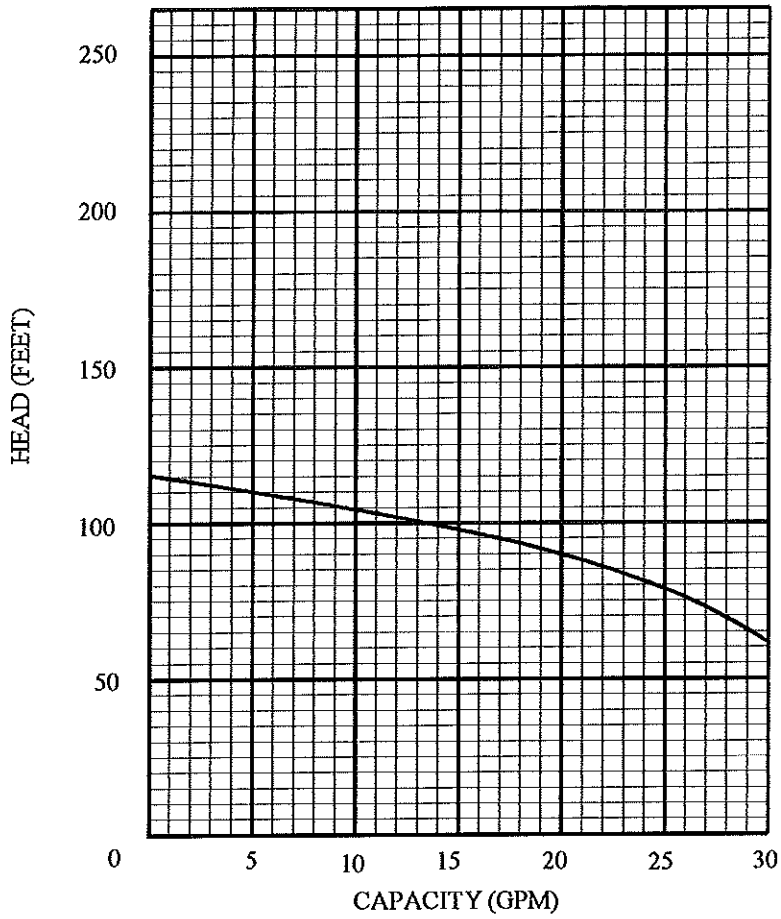
EPG Companies Inc.

CERTIFIED PUMP TEST

Customer EARTHTECH

Date 07/12/01 Job # 01-5072A

Pump Model TSP5-4 Motor HP 1.0



GPM	PSIG	TDH
SHUTOFF	50.3	116.2
15	42.3	97.7
20	38.7	89.4
25	34.0	78.5
30	26.6	61.5

SIGNATURE

CERTPMPTST5

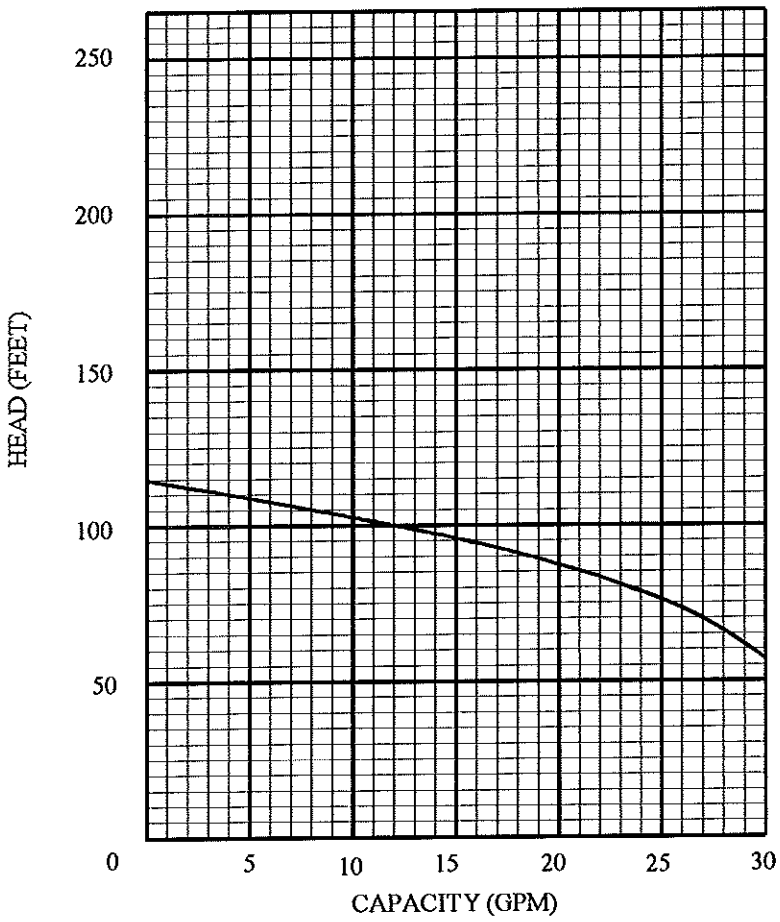
EPG Companies Inc.

CERTIFIED PUMP TEST

Customer EARTHTECH

Date 07/12/01 Job # 01-5072B

Pump Model TSP5-4 Motor HP 1.0



GPM	PSIG	TDH
SHUTOFF	49.8	115.0
15	41.4	95.6
20	37.7	87.1
25	32.8	75.8
30	24.6	56.8

SIGNATURE John T. Church III

CERTPMPTST5

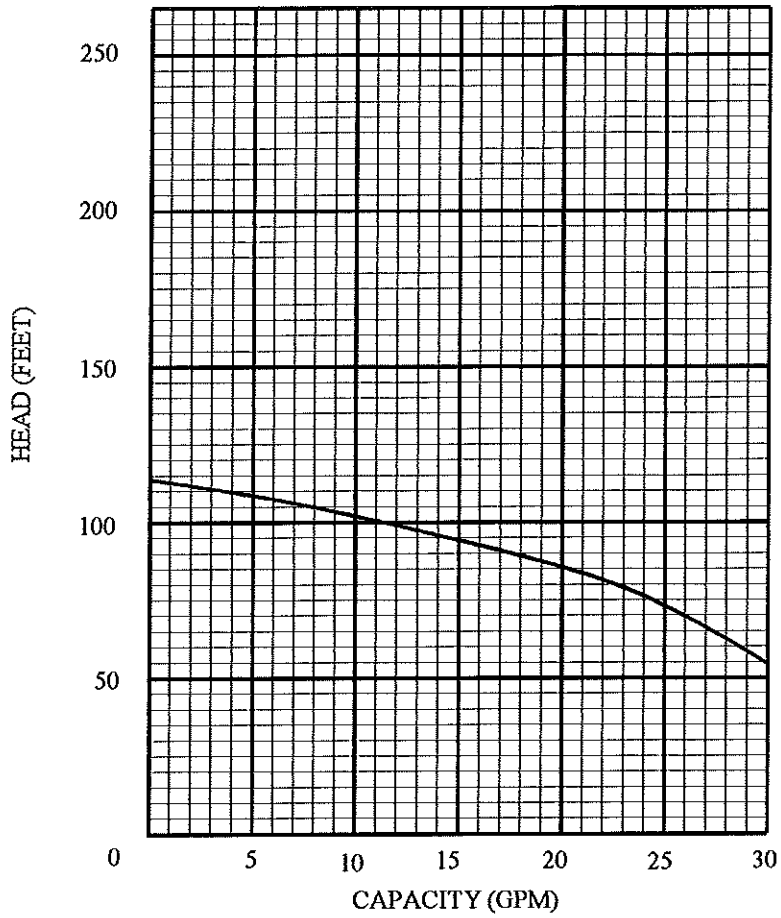
EPG Companies Inc.

CERTIFIED PUMP TEST

Customer EARTHTECH

Date 07/12/01 Job # 01-5072C

Pump Model TSP5-4 Motor HP 1.0

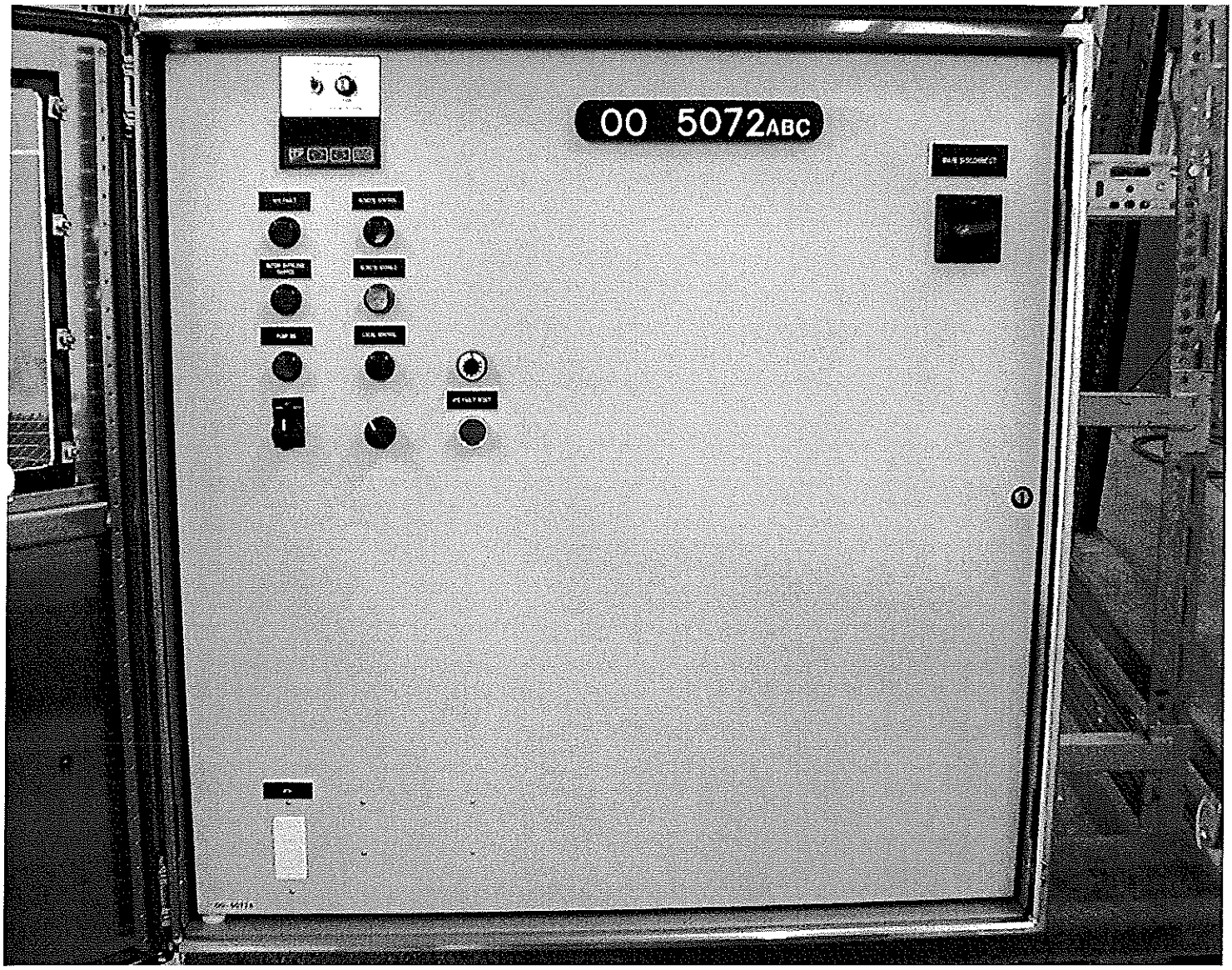


GPM	PSIG	TDH
SHUTOFF	49.3	113.9
15	40.5	93.6
20	36.7	84.8
25	31.6	73.0
30	23.5	54.3

SIGNATURE

CERTPMPTST5

A



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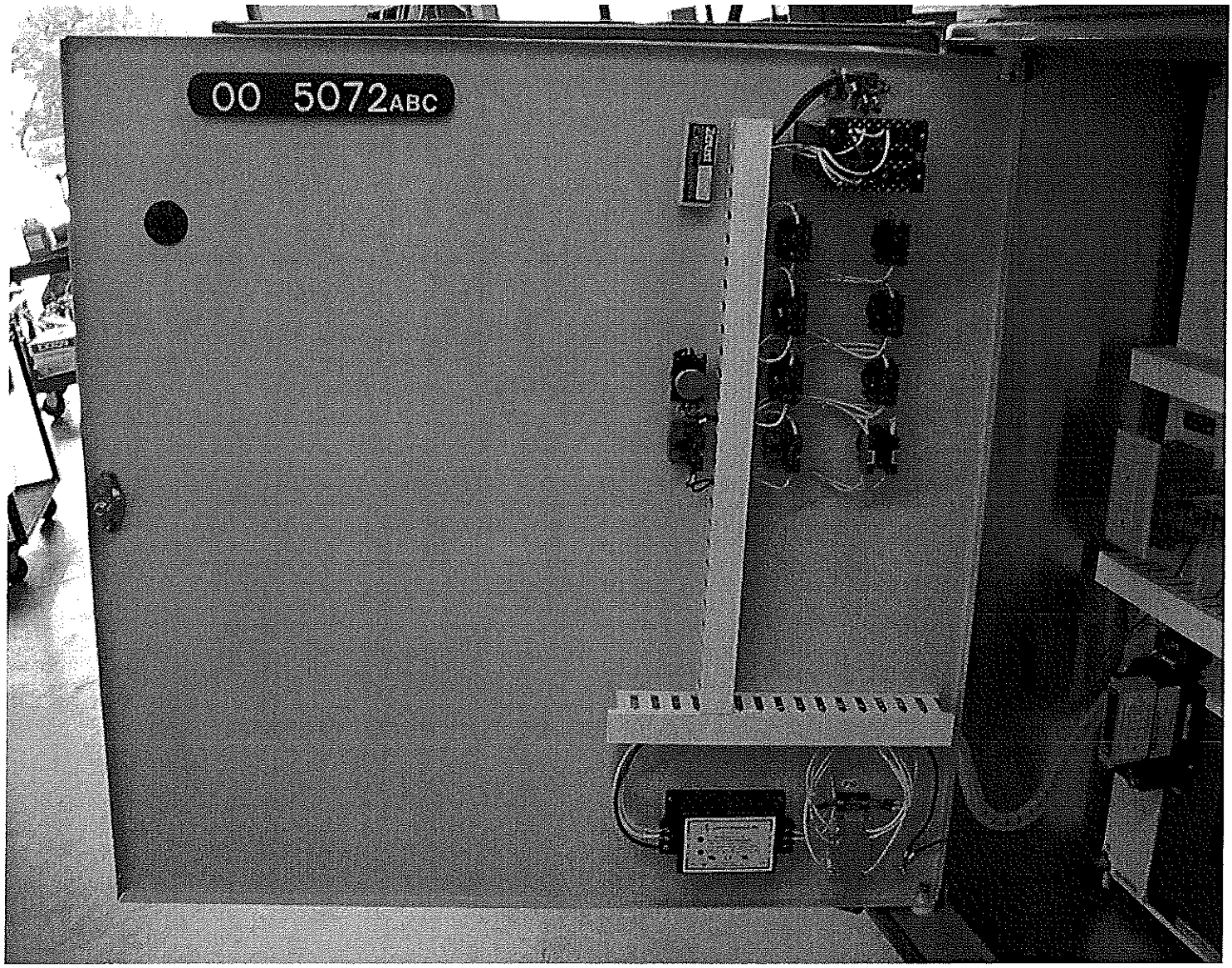

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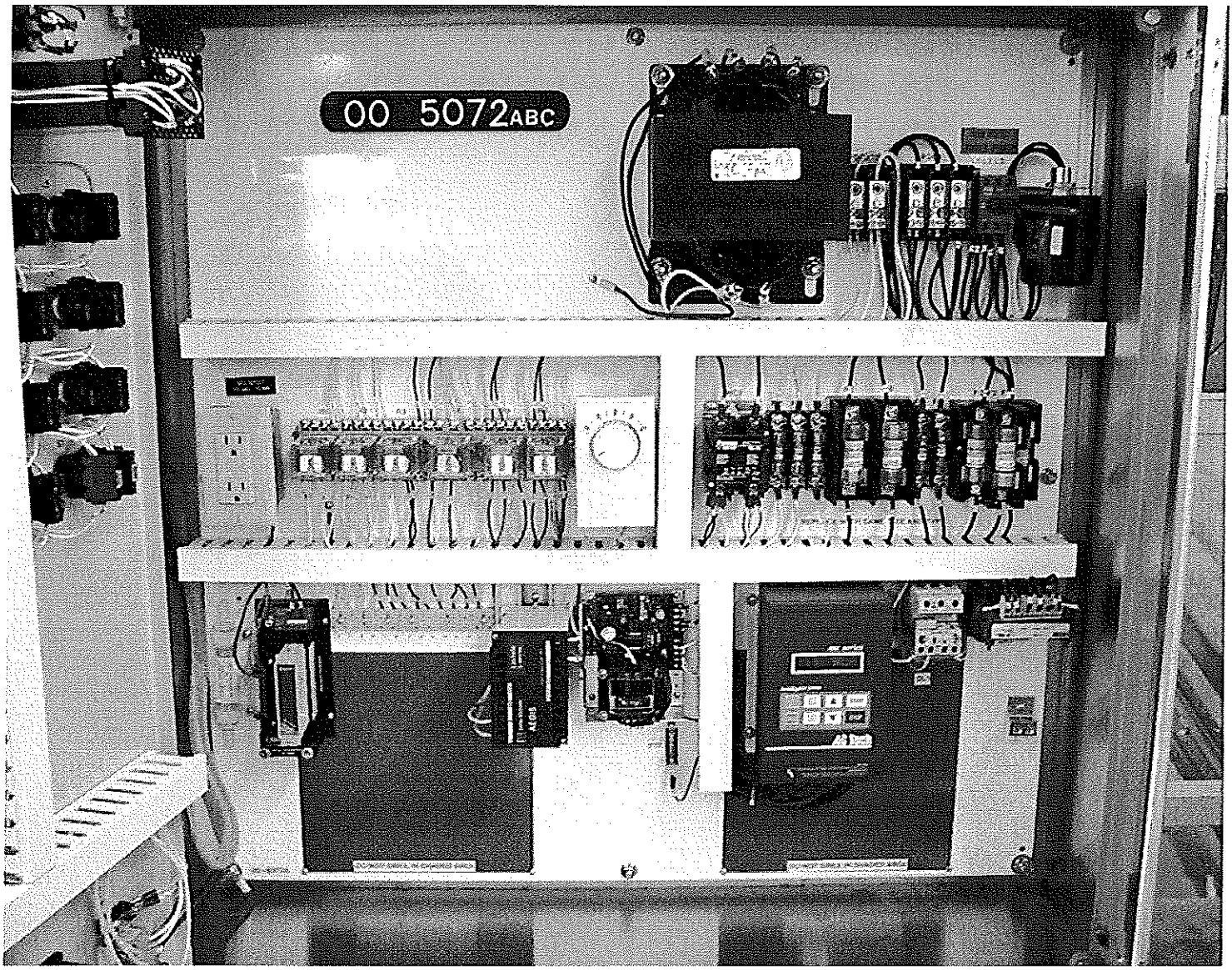
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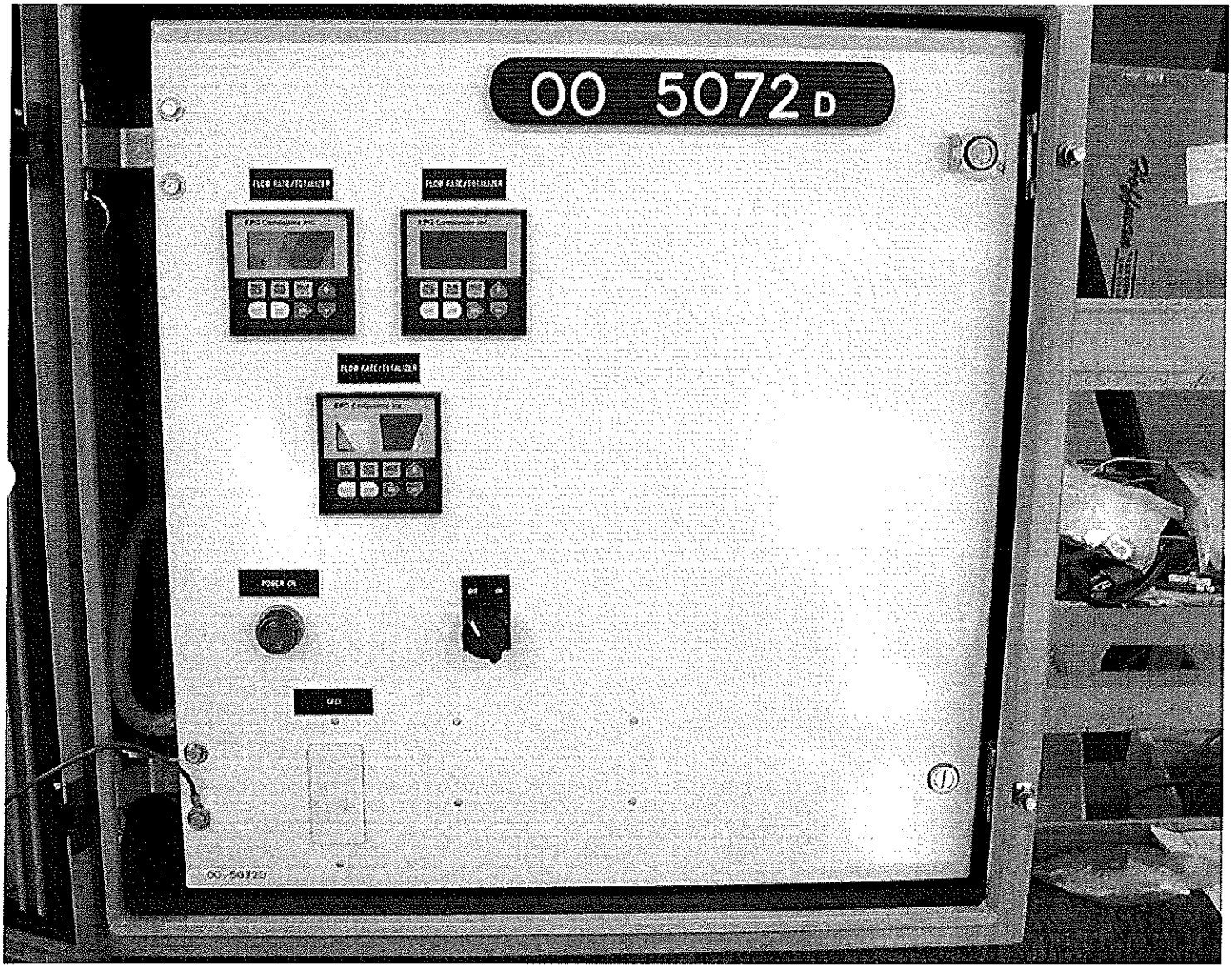
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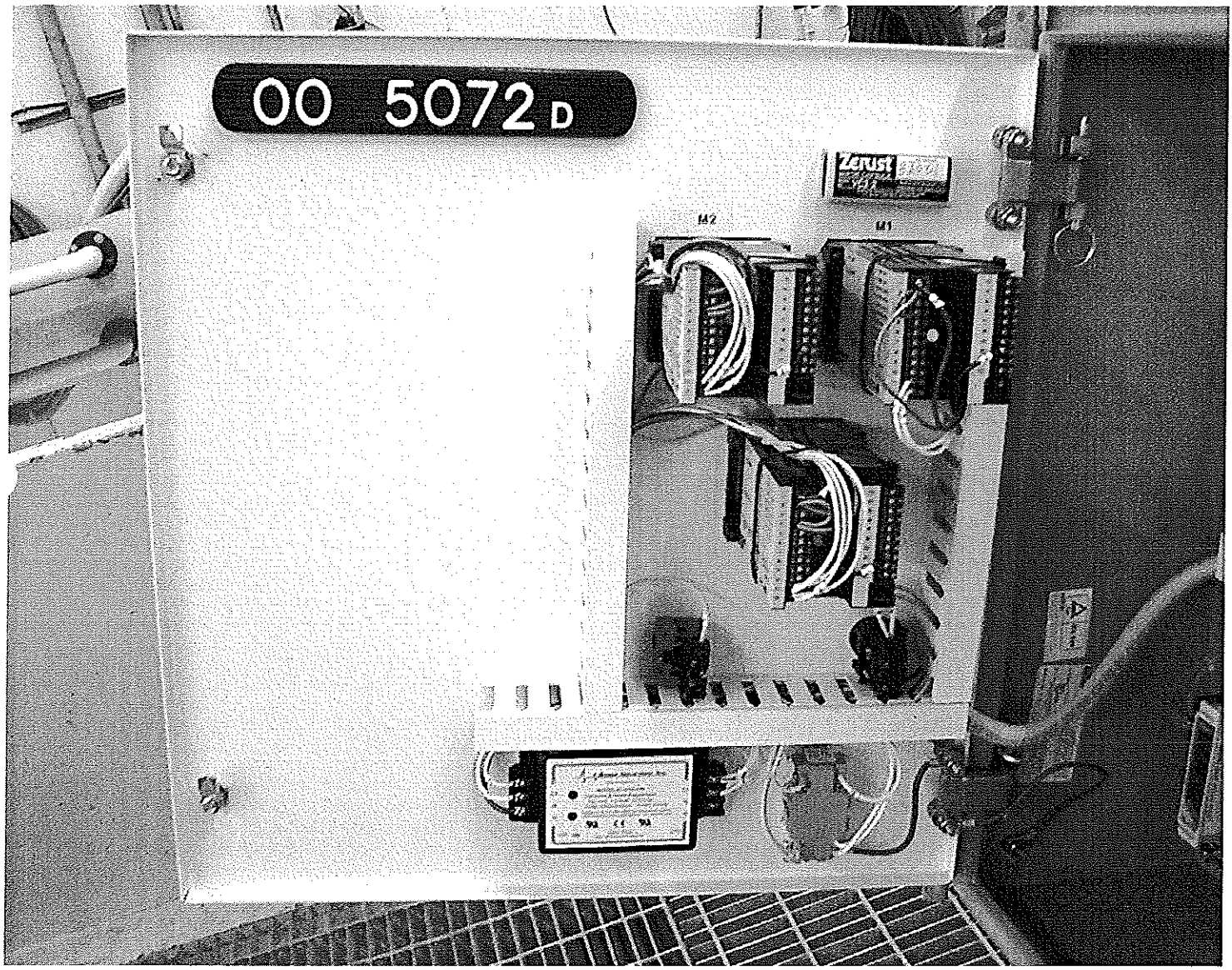
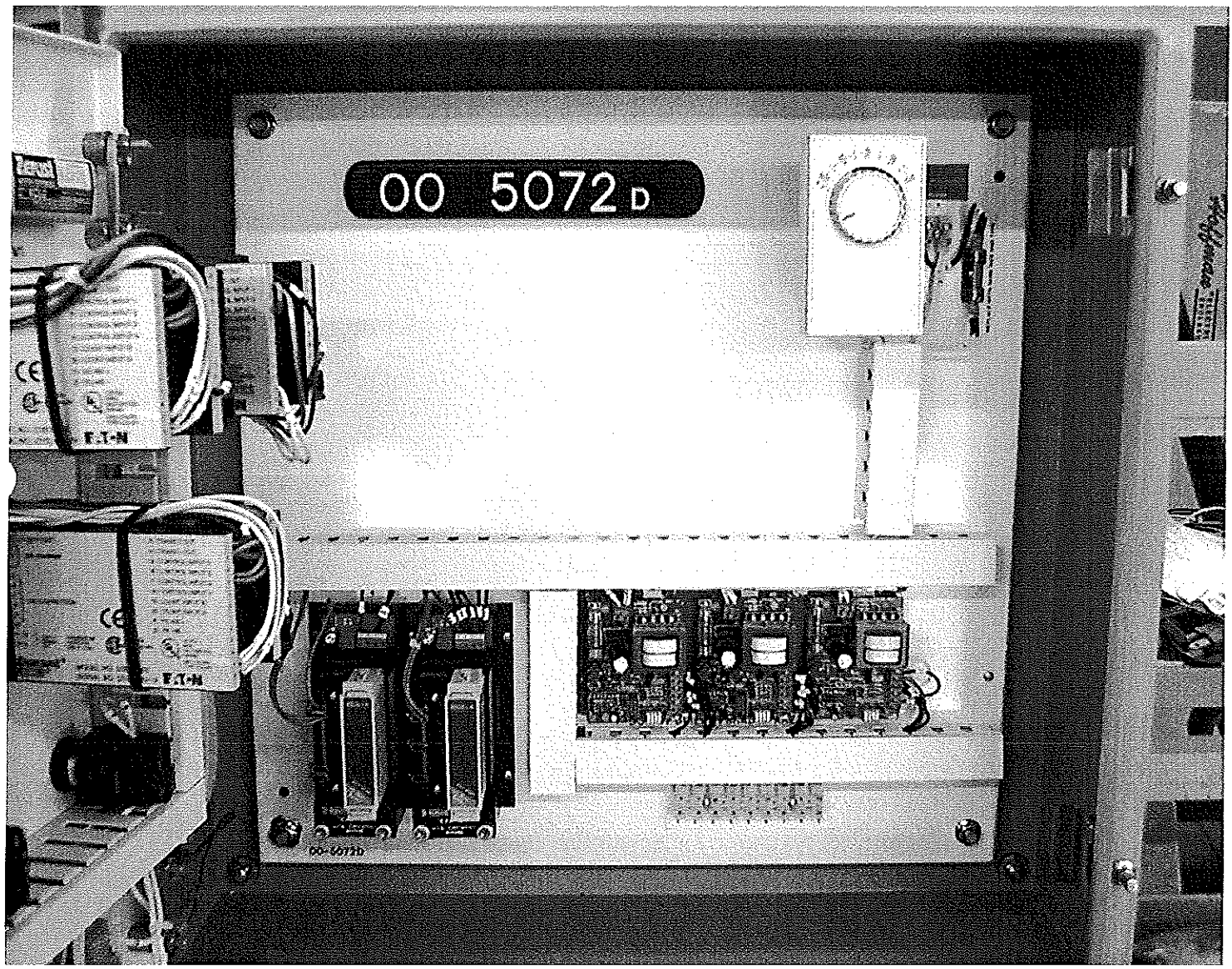
FLOW RATE/TOTALIZER
FLOW RATE/TOTALIZER
FLOW RATE/TOTALIZER
POWER ON
OFF ON
00-50720

B


00 5072 D
ZANUSSI
M2
M1



D

LIMITED WARRANTY

This agreement shall be deemed to have been entered into in the State of Minnesota, and shall be construed in accordance with the laws of the State of Minnesota, including Minnesota's enactment of the Uniform Commercial Code. Buyer hereby stipulates and agrees that Hennepin County, Minnesota shall be the proper jurisdiction for adjudicating all claims and controversies arising from this agreement.

Products manufactured by EPG Companies Inc. are warranted for a period of 12 months from date of installation or eighteen(18) months from date of manufacture* to be free from defects of materials and workmanship. It is expressly agreed that the exclusive remedy under this warranty is limited solely to the repair or replacement, at the sole discretion of EPG, of the part that failed. The cost of labor for any field repairs is not covered by this warranty. EPG Companies will not be liable for any damage or wear due to abnormal conditions or improper installation.

Products not manufactured by EPG Companies Inc. are covered by the original manufacturer's warranty, which EPG Companies passes through to the purchaser. The actual manufacturer will make warranty determination.

To have a defective part repaired or replaced, you must return the defective product to EPG Companies. Please call (800) 443-7426 or (763) 424-2613 to obtain a Return Goods Authorization (RGA) number. Send defective product (freight prepaid) with RGA #, description of installation, installation data and failure date to EPG Companies Inc., 19900 County Rd. 81, Maple Grove, MN 55311.

EPG Companies will not be held liable for any incidental or consequential damages, losses or expenses incurred from installation, use or any other reason. THERE ARE NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING IMPLIED WARRANTIES OF EITHER FITNESS FOR A PARTICULAR PURPOSE OR OF MERCHANTABILITY, WHICH EXTEND BEYOND THOSE SPECIFICALLY LISTED HERE.

If equipment is to be stored for a period greater than six months, proper storage precautions must be taken if the warranty is to be maintained. Please call EPG Companies for specific requirements regarding product storage.

The following is a partial list of items which will void the warranty:

- Opening the motor for any reason.
- Using undersized electrical wire.
- Making unauthorized circuit changes. Please call EPG Companies before making any changes.
- Operating a three phase submersible motor from single phase power through a phase converter unless 3-leg ambient-compensated quick trip overload protectors are used and complete details are sent in writing to EPG Companies.

* To qualify for the delayed installation warranty you must contact EPG Companies Inc., at (800) 443-7426 or (763) 424-2613 within 60 days of purchase.

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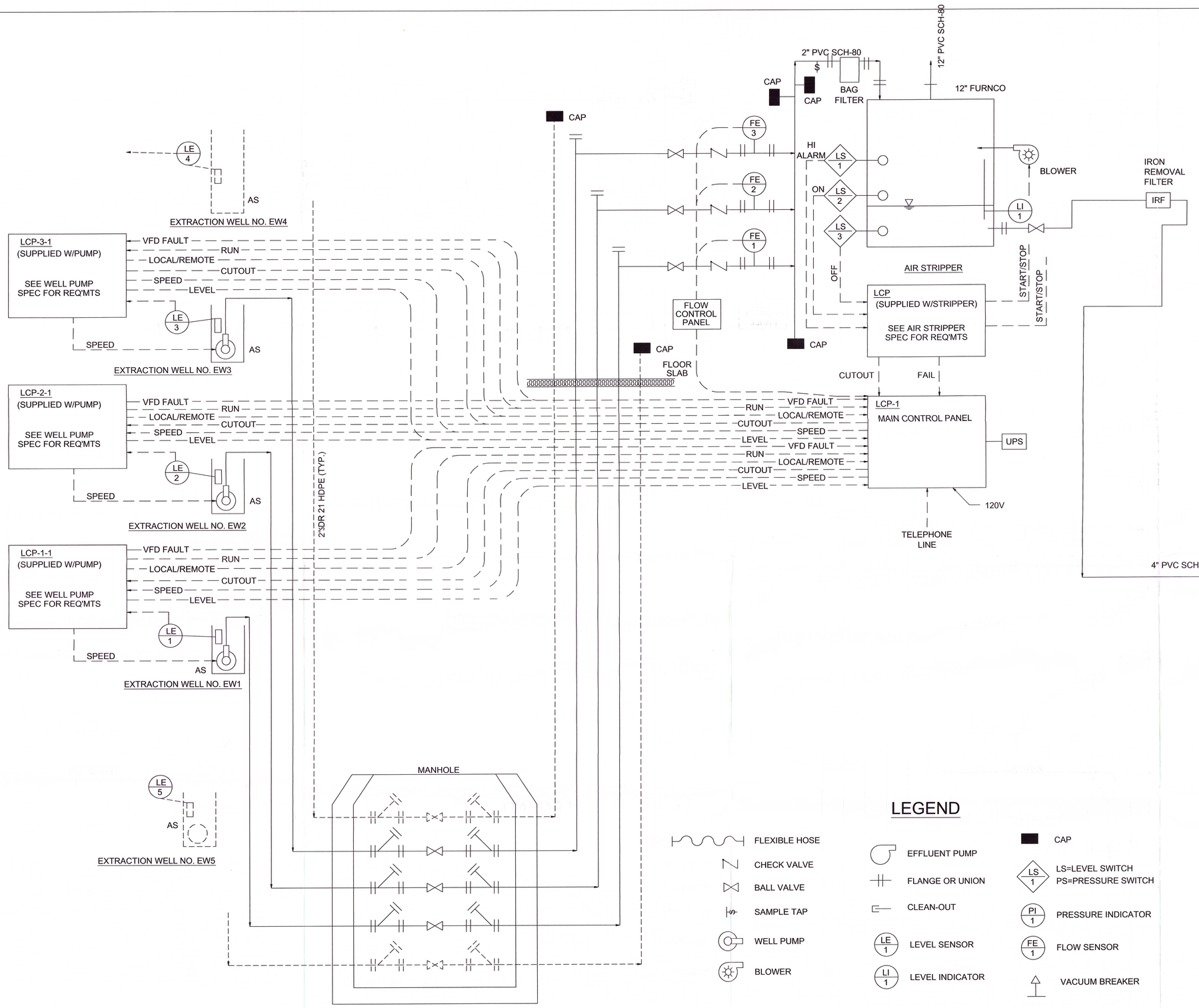
PROCESS AND INSTRUMENTATION DIAGRAM NOTES AND LEGEND

NOTE:

Extraction Wells 4 and 5 are proposed for future installation if required.

LEGEND:

AS	Adjustable Speed Electric Line to Pump
CAP	HDPE Pipe End Cap
CUTOUT	Electrical control line
EW1	Extraction Well Number 1
FE1	Flow Transducer Well Number 1
FURNCO	Flexible Pipe Coupler
HDPE	High Density Polyethylene Pipe
IRF	Iron Removal Filter
LCP	Local Control Panel
LCP-1-1	Local Control Panel At Well Number 1
LE1	Water Level Transducer At Well Number 1
LEVEL	Electrical Signal Line from Water Level Transducer
LOCAL/REMOTE	Switch Enabling Local Panel or Remote Panel Control
LS1	Water Level Switch for Well Number 1
PVC	Polyvinyl Chloride Pipe
RUN	Electrical Power Line for Well Pump
SDR	Standard Dimension Ratio for HDPE Pipe
SPEED	Electrical Control Line for Pump Speed Control
UPS	Uninterruptible Power Supply
VFD	Variable Frequency Drive - Pump Speed Control
VFD FAULT	Variable Frequency Drive Circuit Breaker



LEGEND

- FLEXIBLE HOSE
- CHECK VALVE
- BALL VALVE
- SAMPLE TAP
- WELL PUMP
- BLOWER
- EFFLUENT PUMP
- FLANGE OR UNION
- CLEAN-OUT
- LE 1 — LEVEL SENSOR
- LI 1 — LEVEL INDICATOR
- CAP
- LS 1 — LS=LEVEL SWITCH, PS=PRESSURE SWITCH
- PI 1 — PRESSURE INDICATOR
- FE 1 — FLOW SENSOR
- VACUUM BREAKER

GENERAL INSTALLATION NOTES

1 Provide building floor plan with any revisions to proposed lay-out.

2 All equipment and piping hangers shall be securely mounted to the floor using steel hardware and vibration isolation as needed.

3 Bolt exhaust stack to building wall and extend to 5-ft above roofline. Stack to be open at top with 12-in drip leg and clean-out plug at base of straight portion of stack.

PROCESS AND INSTRUMENTATION DIAGRAM

NO	REVISIONS	DRN	CHK	DATE

ALBANY, NY

DRN	SRS	08-09-99
DES	SRS	08-09-99
CHK		
APP		

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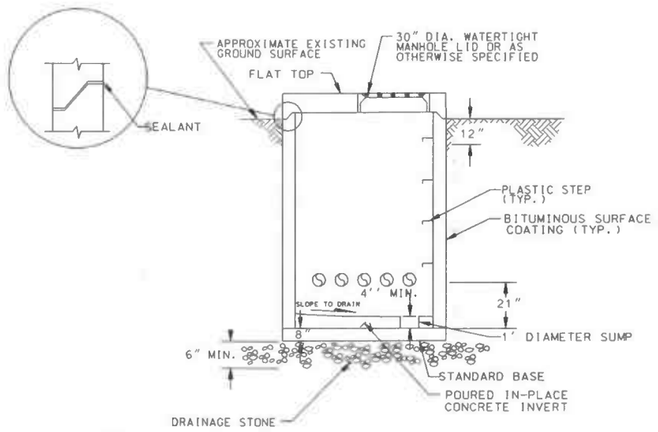
GROUNDWATER CONTROL ELEMENT
SCA - CHEM-TROL
HAMBURG, NY

PROCESS AND INSTRUMENTATION DIAGRAM

DATE	08-09-99
PROJECT NO	32067
FILENAME	PID1.DWG
SHEET NO	00
DRAWING NO	00

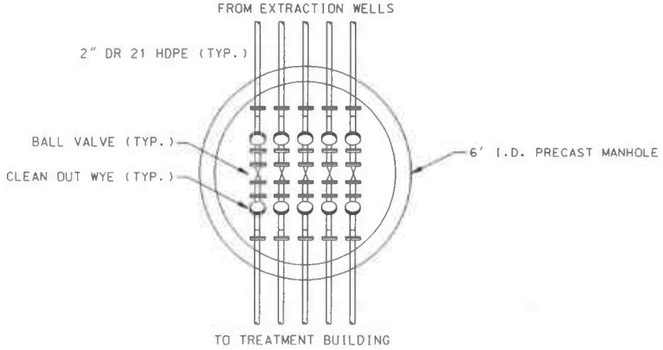


1 PRECAST CONCRETE MANHOLE SECTION

NTS

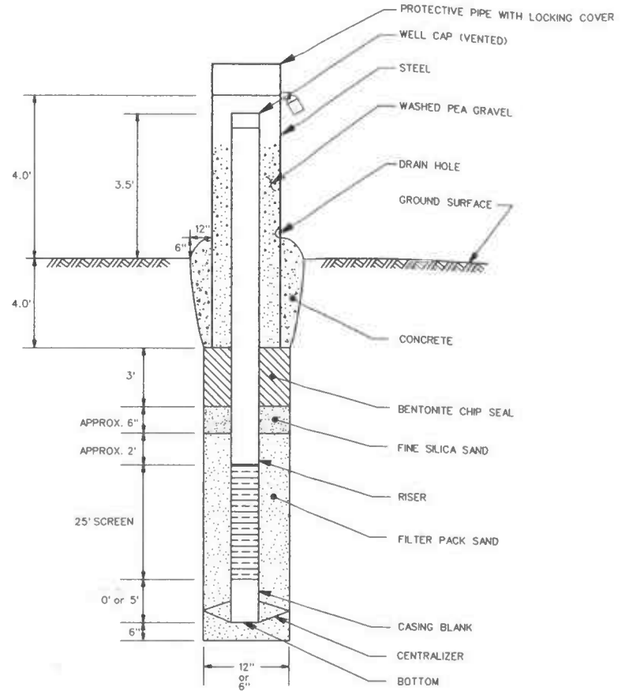
NOTES:

1. NON-SHRINK GROUT SHALL BE USED TO SEAL AROUND PIPING ANNULUS AND MANHOLE LIFTING HOLES.
2. ALL PIPING CLEANOUT WYES SHALL BE FLANGED AND SEALED WITH A BOLTED BLIND FLANGE CONNECTION.
3. USE RUBBER GASKETED PIPE OPENINGS



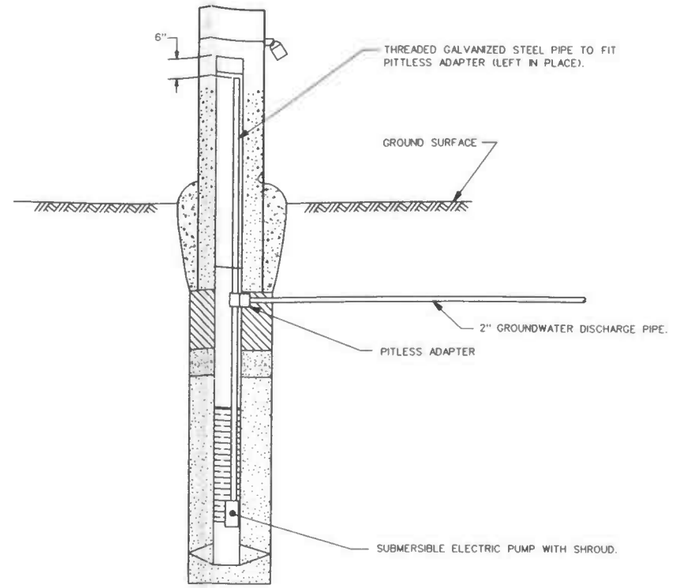
2 PRECAST CONCRETE MANHOLE PLAN

NTS



3 EXTRACTION AND PIEZOMETER WELLS

NTS



4 EXTRACTION WELL COMPLETION DETAIL

NTS

NO.	REVISIONS	MADE	CHK	DATE

NAMES		DATE
DRAWN:	JV	8-13-99
DESIGN:	ARB	8-13-99
CHECKED:	MJM	8-13-99
PE:		
APP'D:		
APP'D:		
APP'D:		

CIVIL DETAILS

CHEM-TROL SITE
GROUNDWATER CONTROL ELEMENTS
HAMBURG, NEW YORK

EARTH TECH

PROJECT NUMBER 32067 DATE MAY 2000

EARTHTECH DWG NUMBER C4 FILE NUMBER

CLIENT DWG NUMBER SHEET NUMBER 4 of 11

The drawings, specifications and other documents prepared by the Engineer for this project are instruments of the Engineer's service for use solely with respect to this project and, unless otherwise provided, the Engineer shall be deemed the author of these documents and shall retain all common law, statutory and other reserved rights, including the copyright.

PRF - \\abbs02\data\work\32067\cadd\bush\mh.prf
DATE - Tue May 30 14:08:48 2000
DGN - \\abbs02\data\work\32067\cadd\bush\mh.dgn

EARTH TECH, INC.

CHEM-TROL SITE / HAMBURG NY
MAIN CONTROL PANEL LCP-1

DRAWING INDEX

PROJECT	DWG NO.	DESCRIPTION	REV.
PS5181	0	COVER PAGE AND DRAWING INDEX	A
	1	GENERAL NOTES AND SYMBOL DESCRIPTION	A
	2	PHYSICAL LAYOUT DRAWING	A
	3	POWER WIRING DIAGRAM	A
	4	PLC INPUT WIRING DIAGRAM	A
	5	PLC OUTPUT WIRING DIAGRAM	A
	6	PLC ANOLOG INPUT WIRING DIAGRAM	A
	7	PLC ANOLOG INPUT WIRING DIAGRAM	A
	8	PLC ANOLOG OUTPUT WIRING DIAGRAM	A
	9	CONTROL WIRING DIAGRAM	A
	10	TERMINAL BLOCK LAYOUT	A
	11	BILL OF MATERIAL	A

CHEM-TROL SITE / MAIN CONTROL PANEL LCP-1
COVER PAGE AND DRAWING INDEX

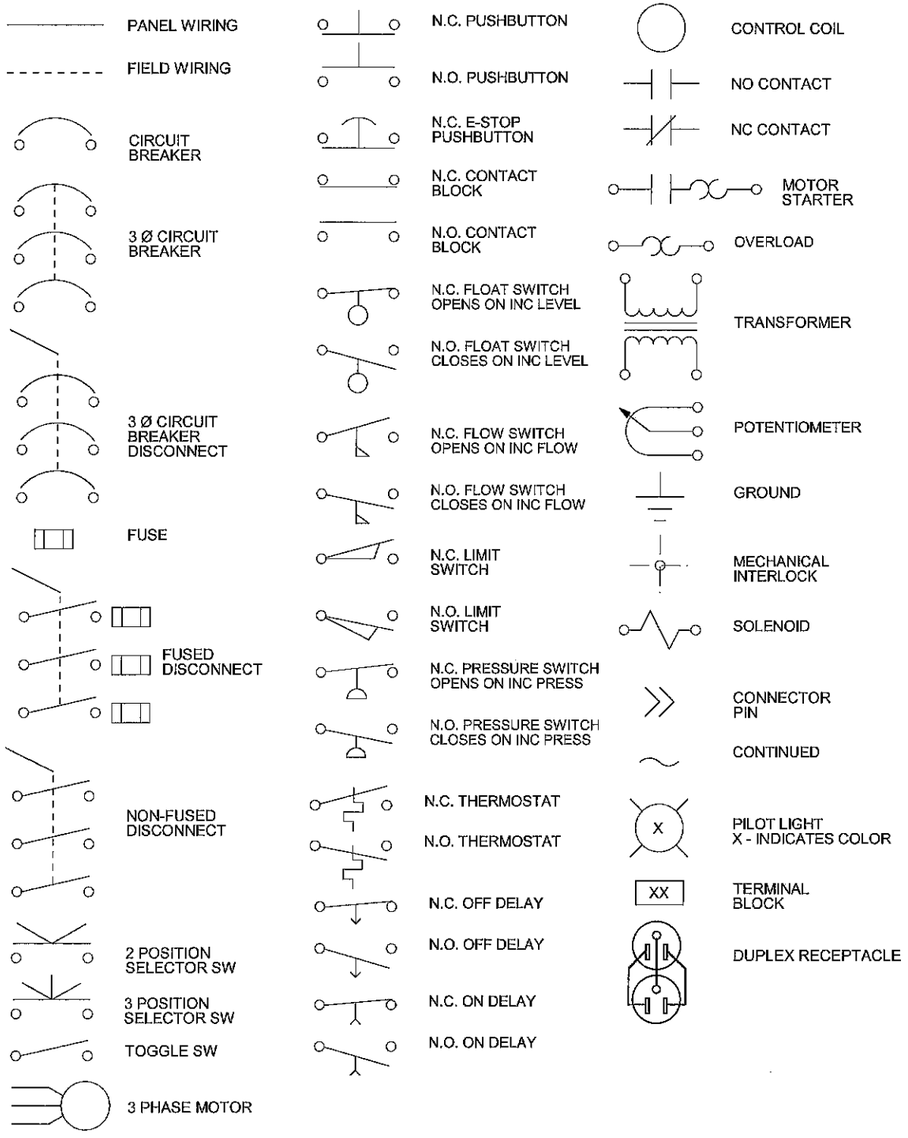
EARTH TECH, INC.
ALBANY, NY

DWG BY: D.SEERY
APPD BY:
DATE: 12/04/00
DWG NO.: PS5181-0

REV.	DESCRIPTION	BY	DATE
A	ECN No.0536	JR	01/08/02
–	INITIAL RELEASE	–	–

BENFIELD CONTROL SYSTEMS Inc
WHITE PLAINS NY 914-948-3231

SYMBOLS



GENERAL NOTES

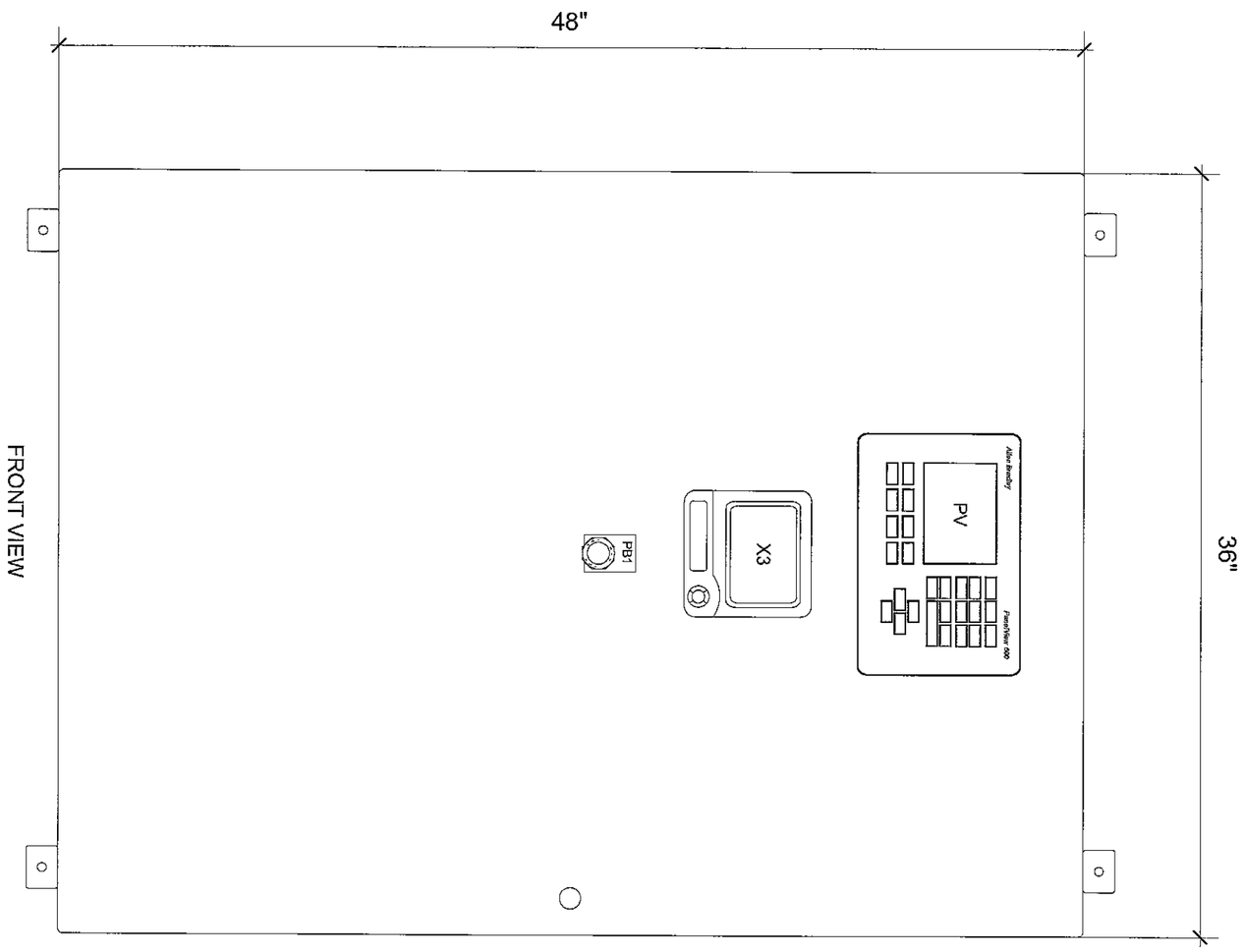
CHEM-TROL SITE / MAIN CONTROL PANEL LCP-1
SYMBOLS PAGE AND GENERAL NOTES

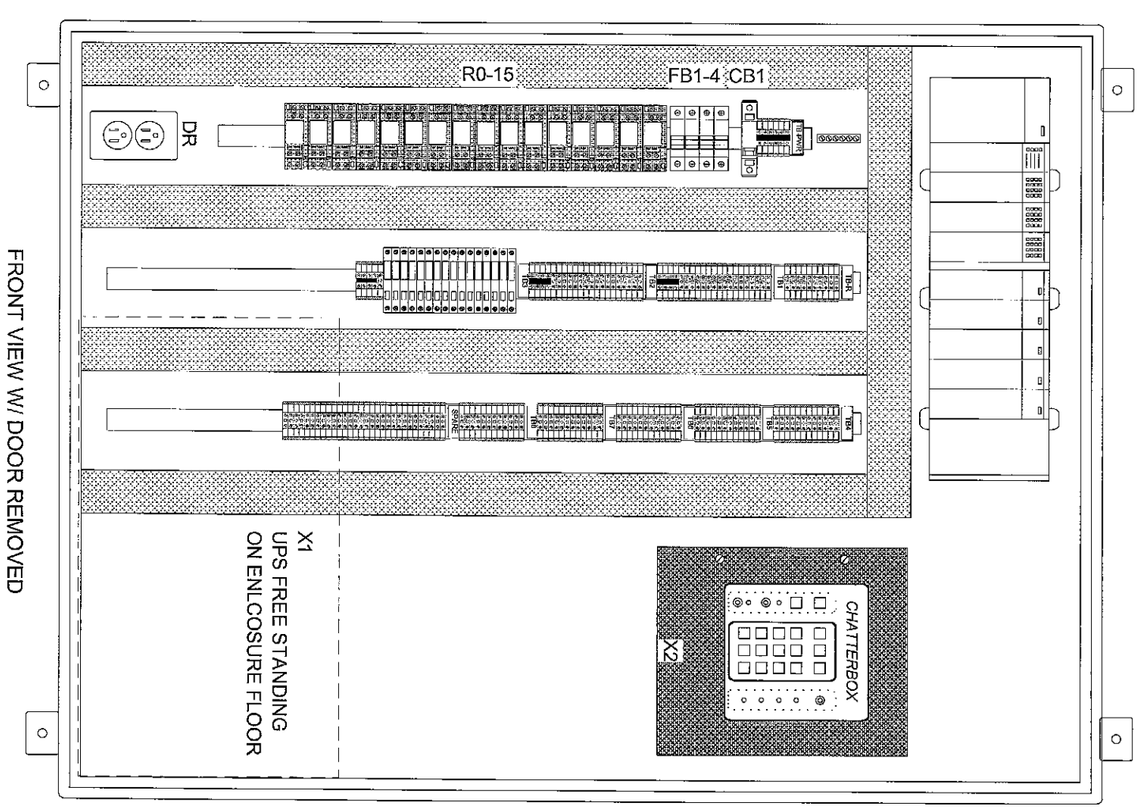
EARTH TECH, INC.
ALBANY, NY

DWG BY	APP'D BY	DATE	DWG NO.
D.SEERY		12/04/00	PS5181-1

REV.	DESCRIPTION	DATE	BY
A	ECN No.0536	01/09/02	JR
–	INITIAL RELEASE	–	DMS

BENFIELD CONTROL SYSTEMS Inc.
WHITE PLAINS NY 914-948-3231



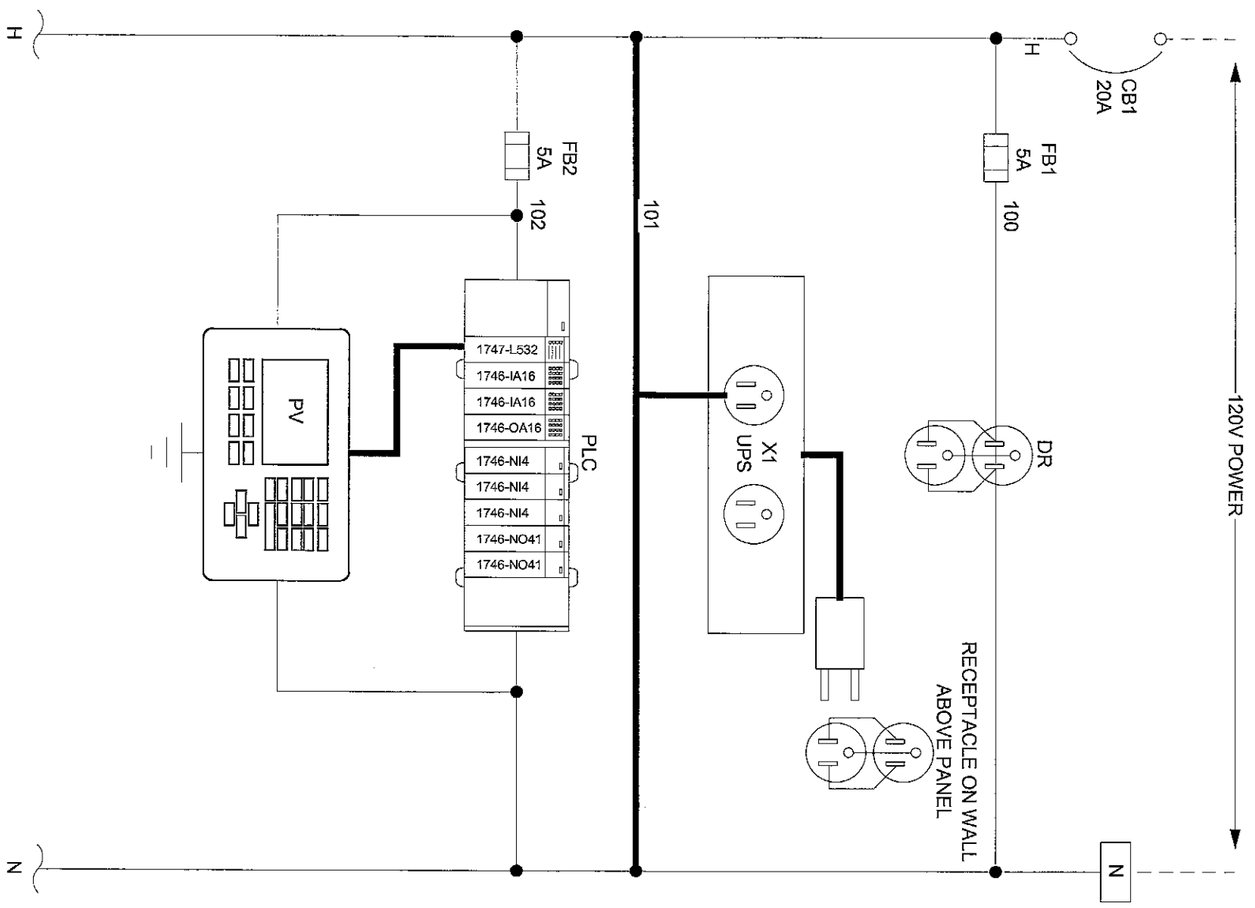


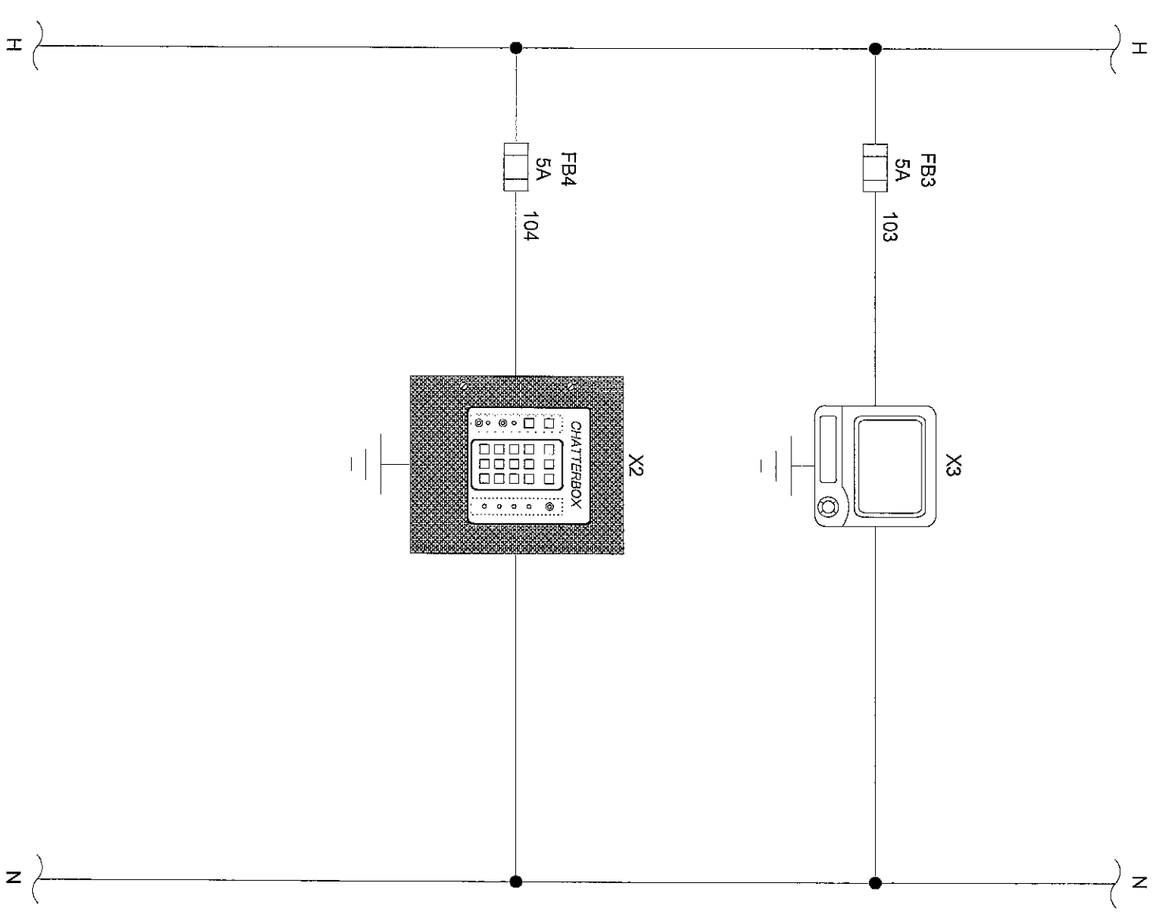
BENFIELD CONTROL SYSTEMS Inc.
WHITE PLAINS NY 914-948-3231

REV.	DESCRIPTION	BY	DATE
A	ECN No.0536	JR	01/09/02
–	INITIAL RELEASE	DMS	–

CHEM-TECH SITE / MAIN CONTROL PANEL LCP-1
PHYSICAL LAYOUT DRAWING
EARTH TECH, INC.
ALBANY, NY

DWG BY	APP'D BY	DATE	DWG NO.
D.SEERY		12/04/00	PS5181-2



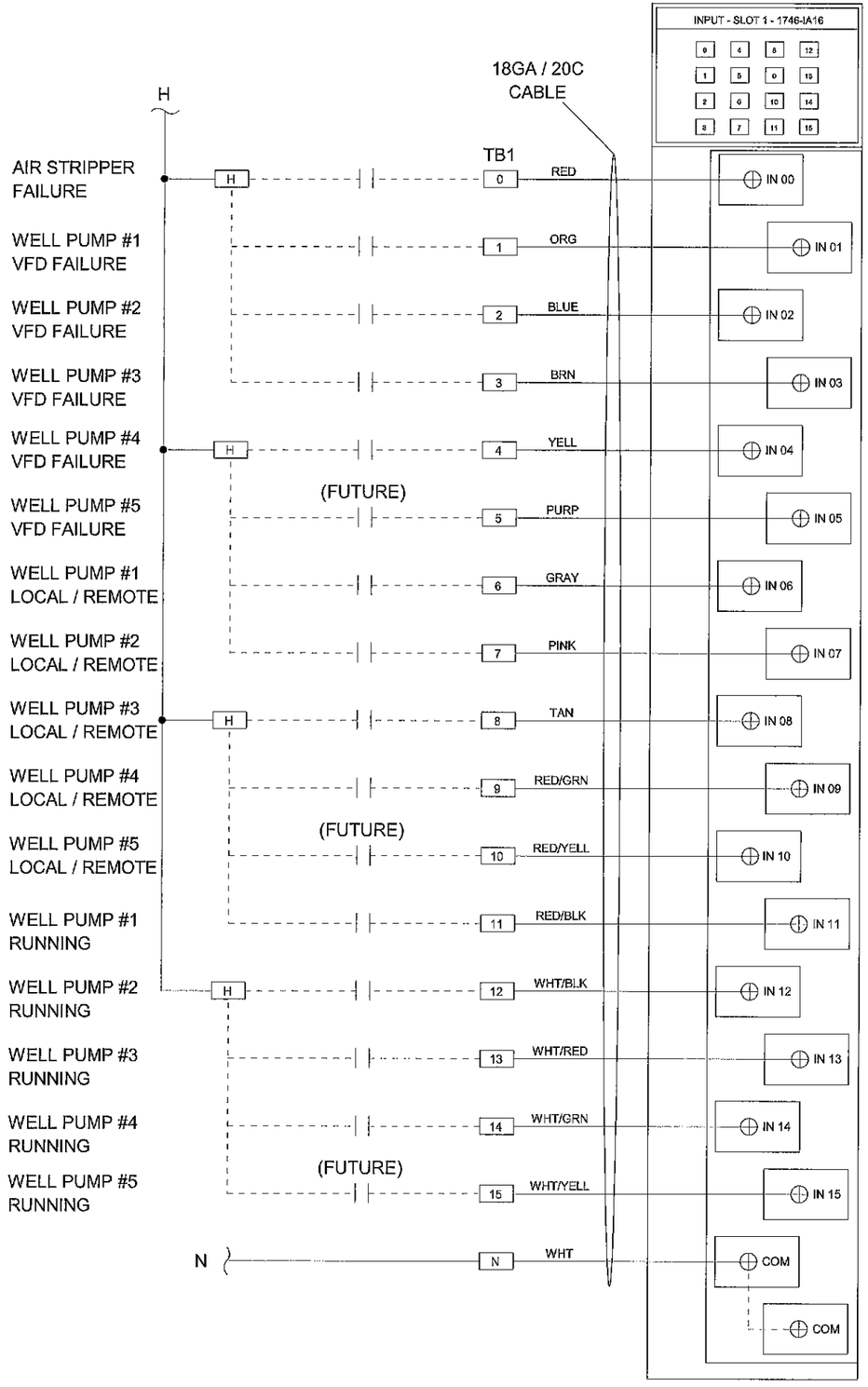


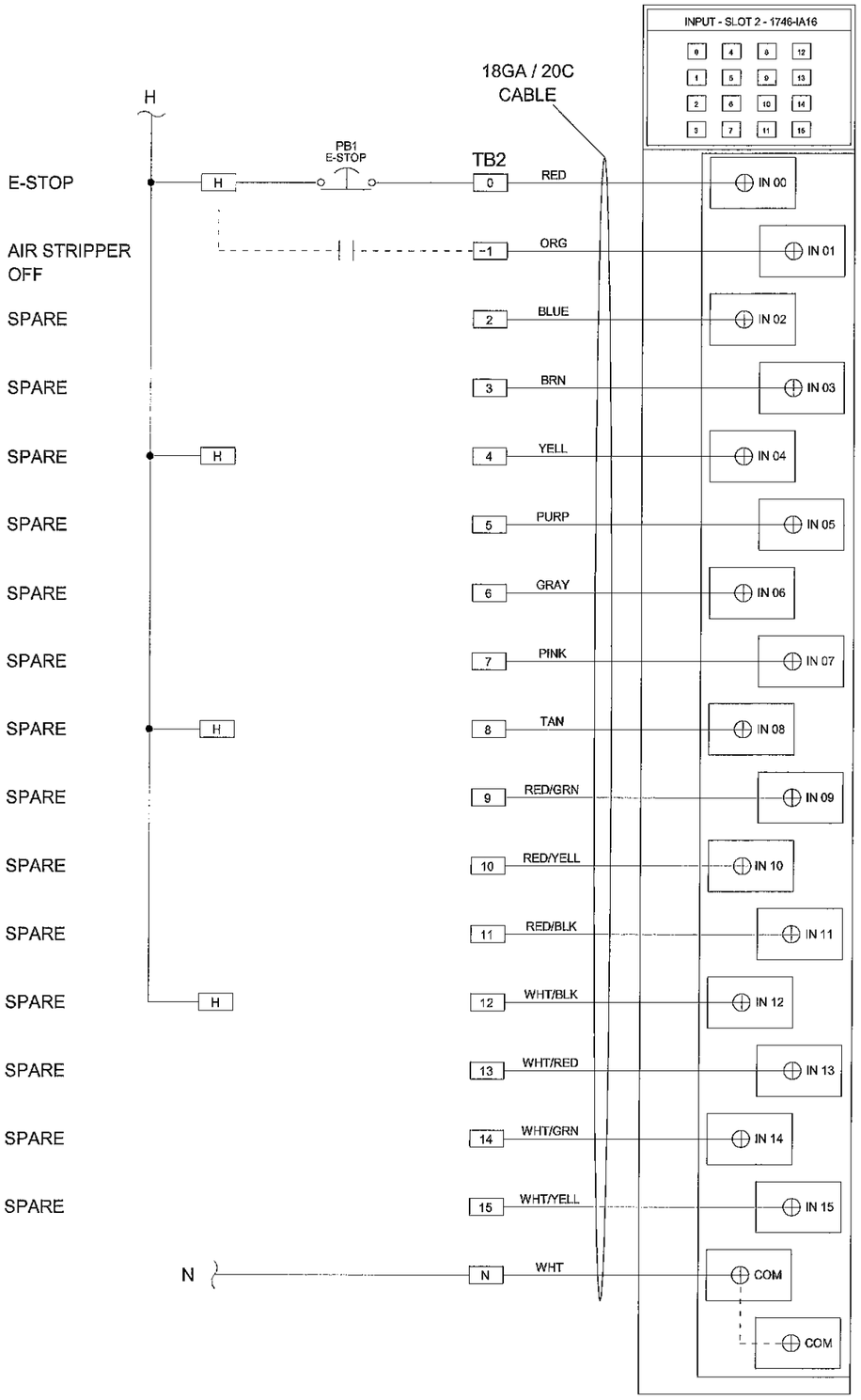
BENFIELD CONTROL SYSTEMS Inc.
WHITE PLAINS NY 914-948-3231

REV.	DESCRIPTION	BY	DATE
A	ECN No.0536	JR	01/09/02
–	INITIAL RELEASE	DMS	–

CHEM-TROL SITE / MAIN CONTROL PANEL LCP-1
POWER WIRING DIAGRAM
EARTH TECH, INC.
ALBANY, NY

DWG BY	APP'D BY	DATE	DWG NO.
D.SEERY		12/04/00	PS5181-3





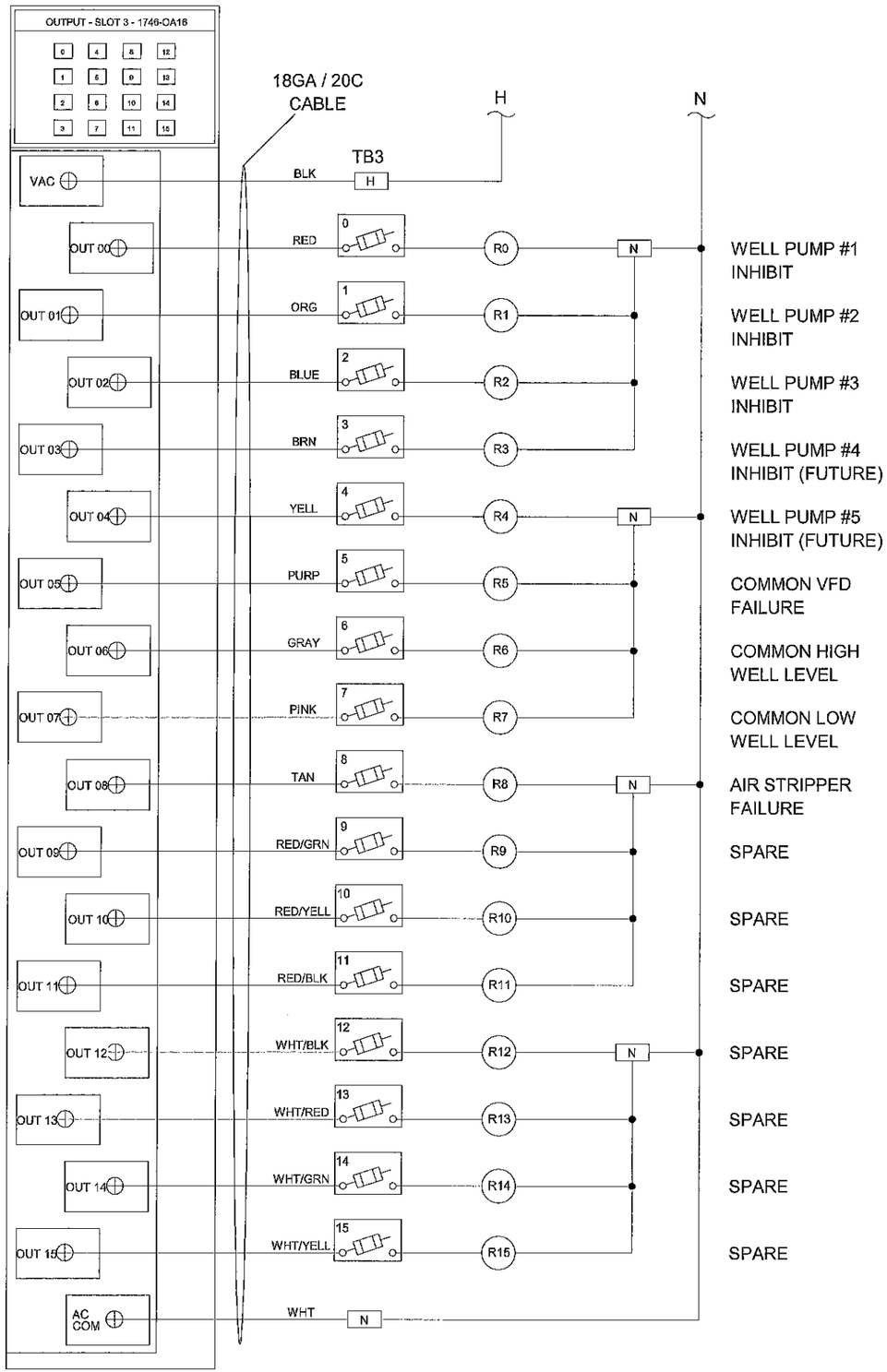
CHEM-TROL SITE / MAIN CONTROL PANEL LCP-1
DIGITAL I/O WIRING DIAGRAM

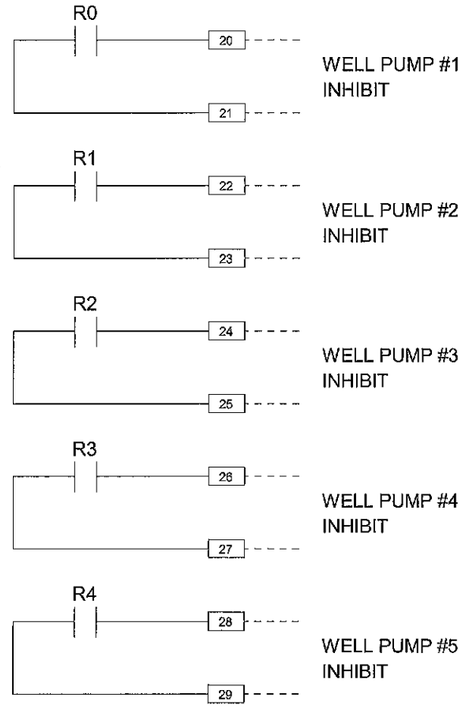
EARTH TECH, NY.
ALBANY, NY

DWG BY: D.SEERY
APP'D BY:
DATE: 12/04/00
DWG NO.: PS5181-4

REV.	DESCRIPTION	BY	DATE
A	ECN No.0536	JR	01/09/02
–	INITIAL RELEASE	—	—

BENFIELD CONTROL SYSTEMS Inc.
WHITE PLAINS NY
914-948-3231





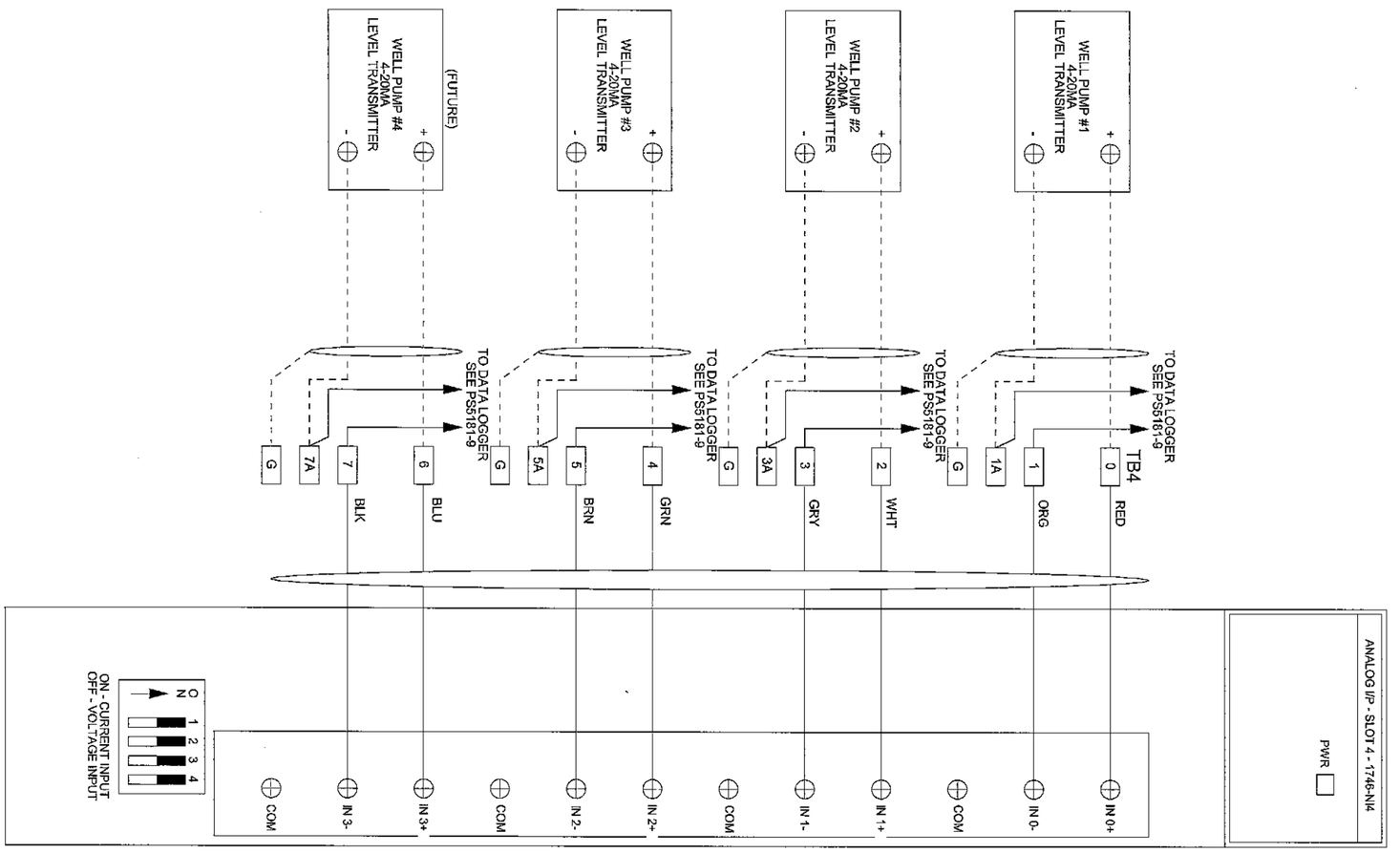
CHEM-TROL SITE / MAIN CONTROL PANEL LCP-1
DIGITAL I/O WIRING DIAGRAM

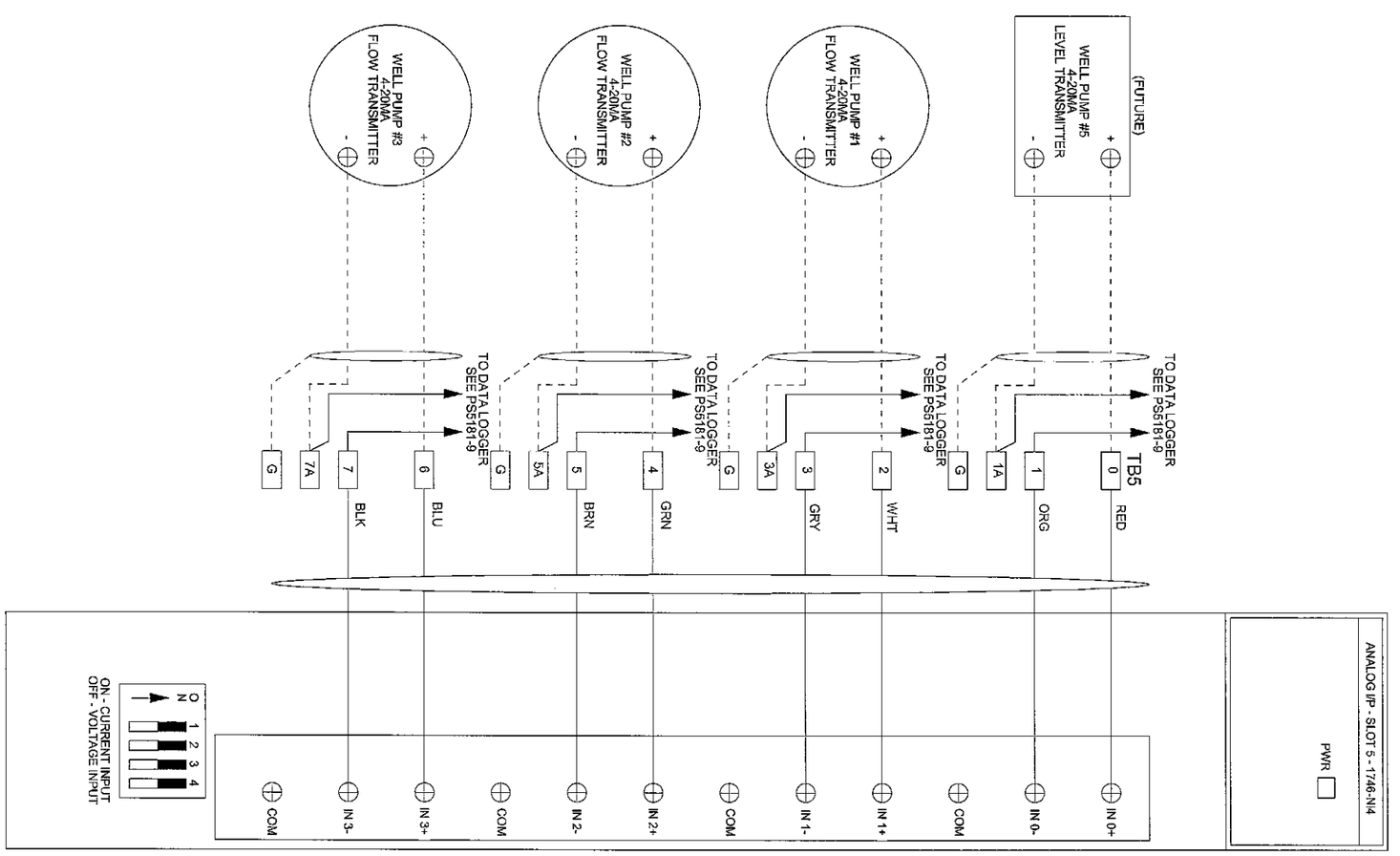
EARTH TECH, INC.
ALBANY, NY

DWG BY D.SEERY
APP'D BY
DATE 12/04/00
DWG NO. PS5181-5

REV	DESCRIPTION	BY	DATE
A	ECN No.0536	JR	01/09/02
-	INITIAL RELEASE	—	—

BENFIELD CONTROL SYSTEMS Inc.
WHITE PLAINS NY
914-948-3231



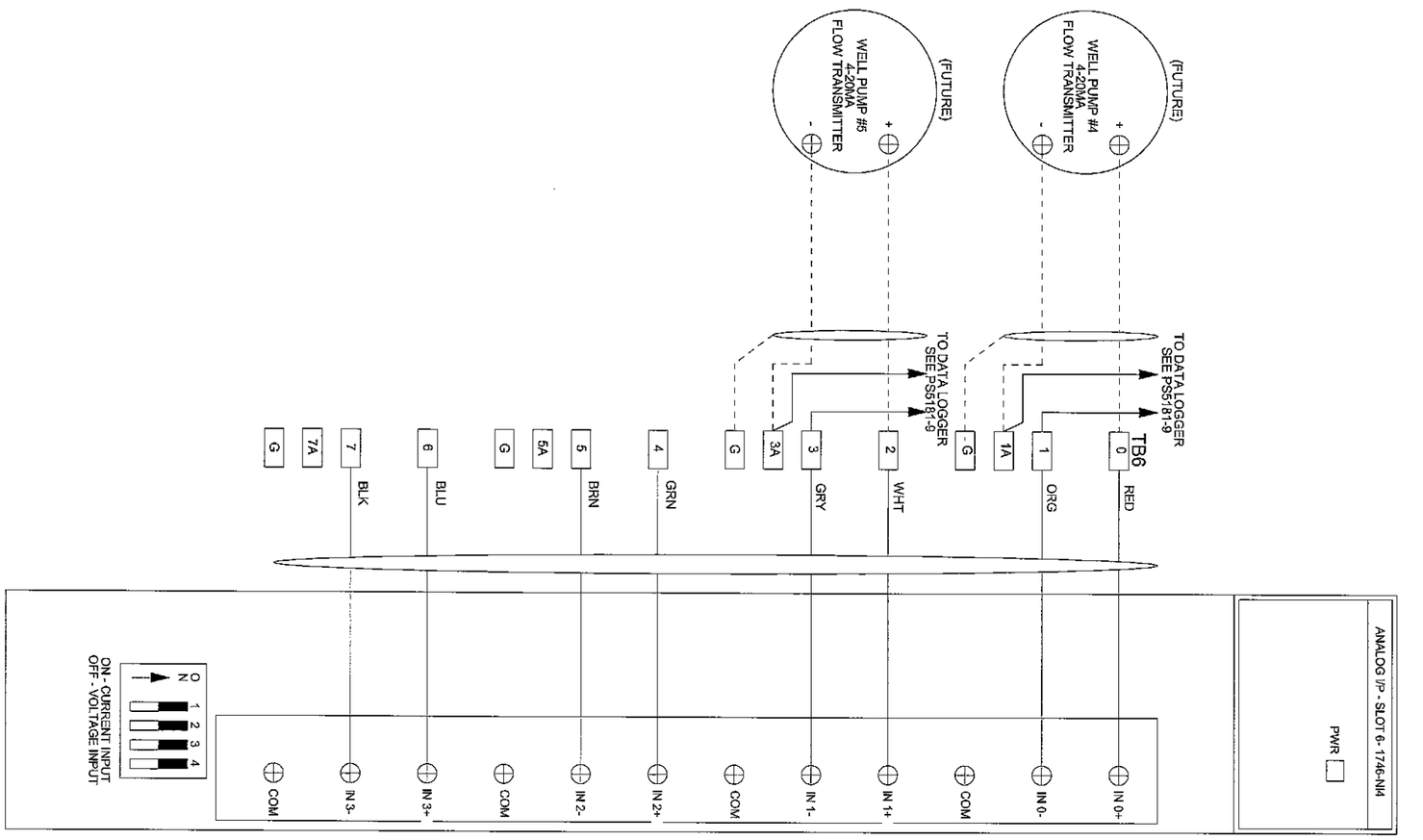


BENFIELD CONTROL SYSTEMS Inc.
WHITE PLAINS NY 914-948-3231

REV	DESCRIPTION	BY	DATE
A	ECN No.0536	JR	01/09/02
–	INITIAL RELEASE	–	——

CHEM-TROL SITE / MAIN CONTROL PANEL LCP-1
ANALOG I/O WIRING DIAGRAM
EARTH TECH, NY.
ALABNY, NY

DWG BY	APP'D BY	DATE	DWG NO.
D.SEERY		12/04/0000	PS5181-6

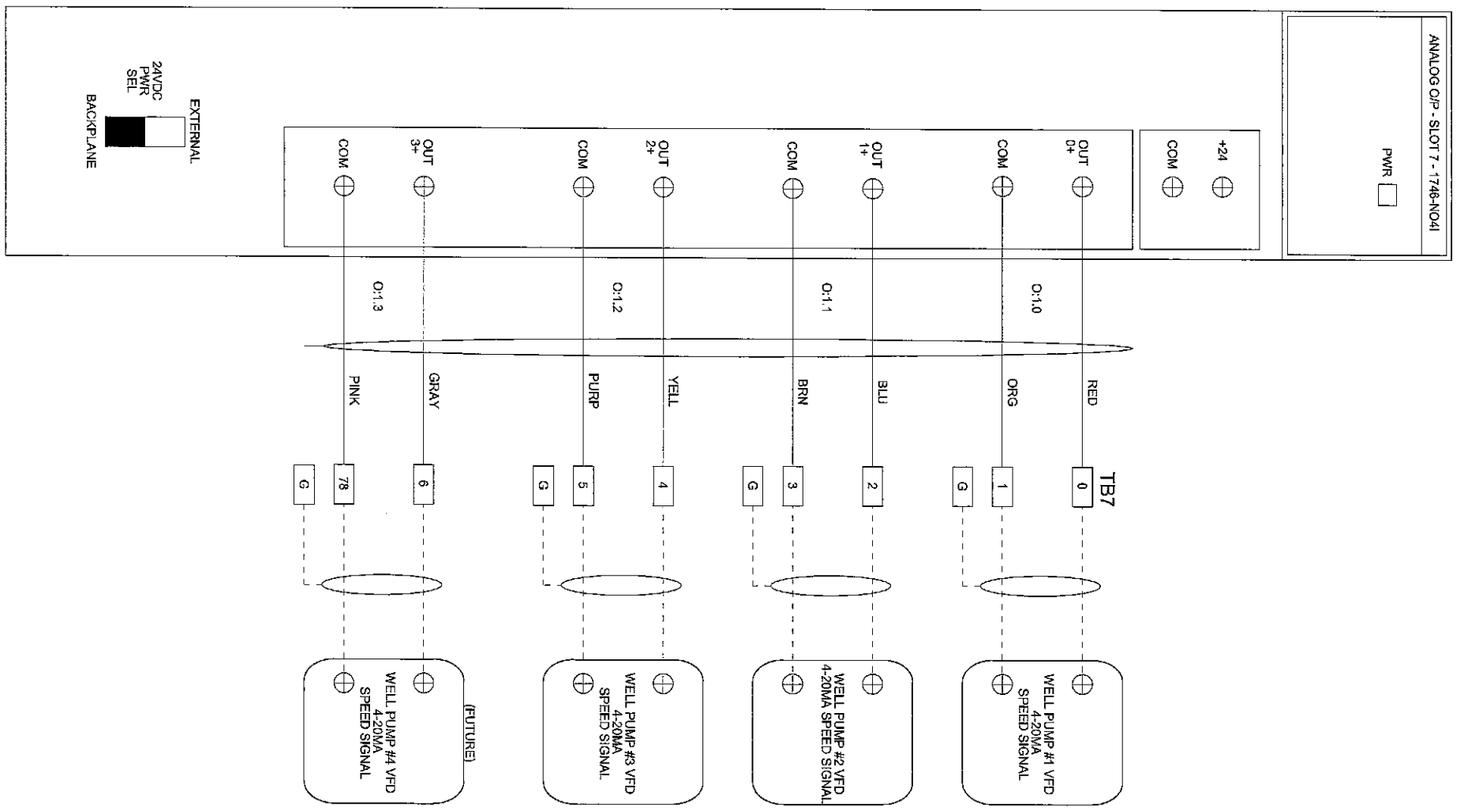


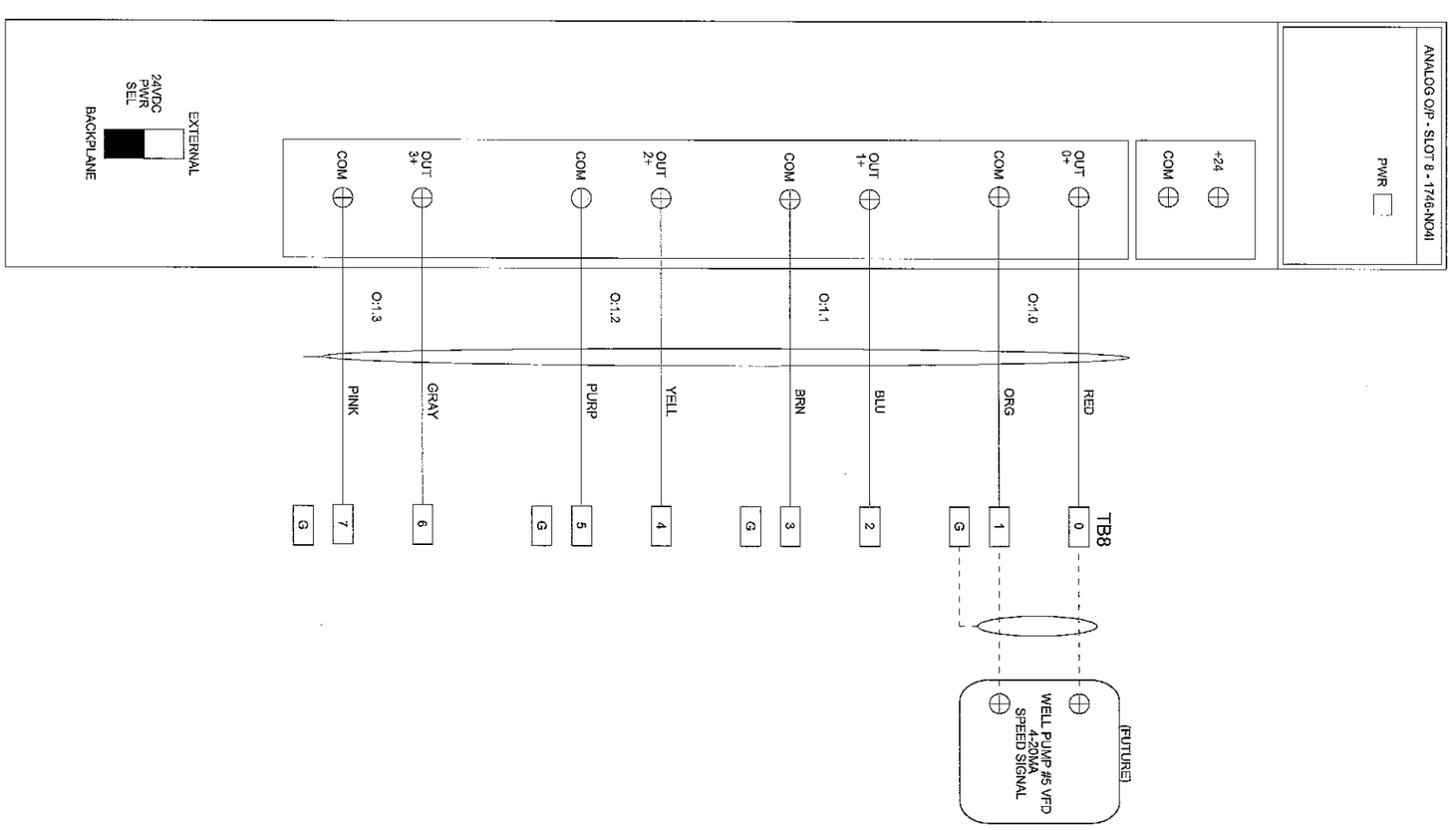
BENFIELD CONTROL SYSTEMS Inc.
WHITE PLAINS NY 914-948-3231

REV.	DESCRIPTION	BY	DATE
A	ECN No.0536	JR	01/09/02
–	INITIAL RELEASE	—	-----

CHEM-TROL SITE / MAIN CONTROL PANEL LCP-1
ANALOG I/O WIRING DIAGRAM
EARTH TECH, NY.
ALABNY, NY

DWG BY	APP'D BY	DATE	DWG NO.
D.SEERY		12/04/0000	PS5181-7





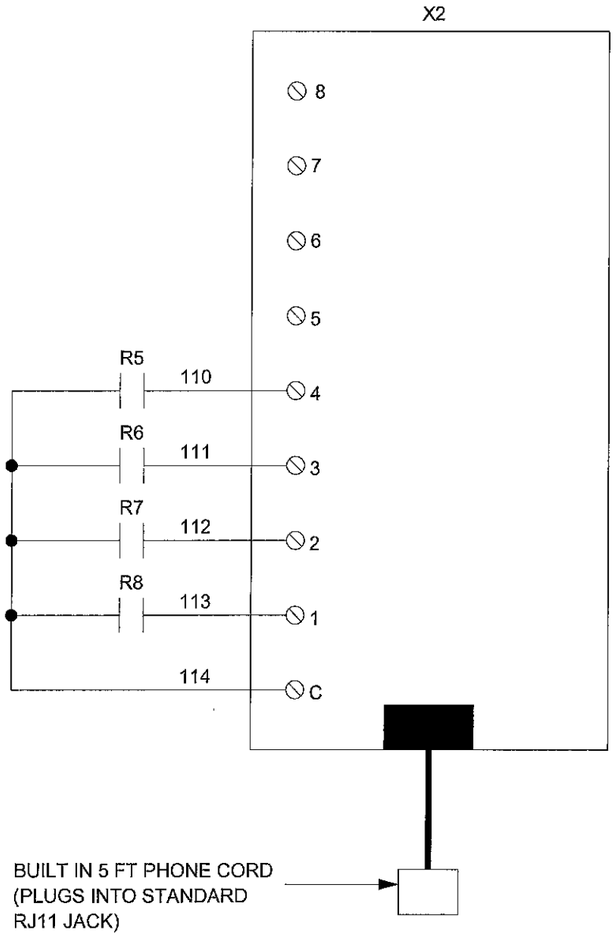
BENFIELD CONTROL SYSTEMS Inc.
WHITE PLAINS NY 914-948-3231

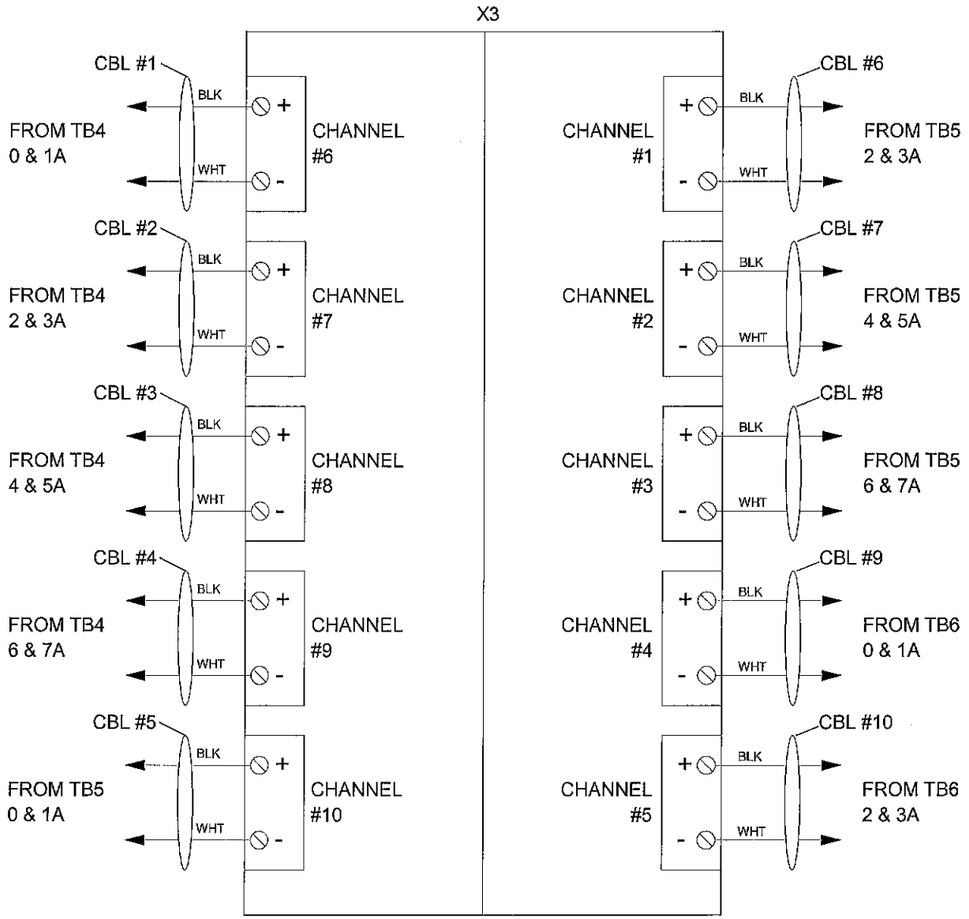
REV.	DESCRIPTION	BY	DATE
A	ECN No.0536	JR	01/09/02
–	INITIAL RELEASE	—	——

CHEM-TROL SITE / MAIN CONTROL PANEL LCP-1
ANALOG WIRING DIAGRAM

EARTH TECH, INC.
ALBANY, NY

DWG BY	APP'D BY	DATE	DWG NO.
J.RAUM		12/04/00	PS5181-8





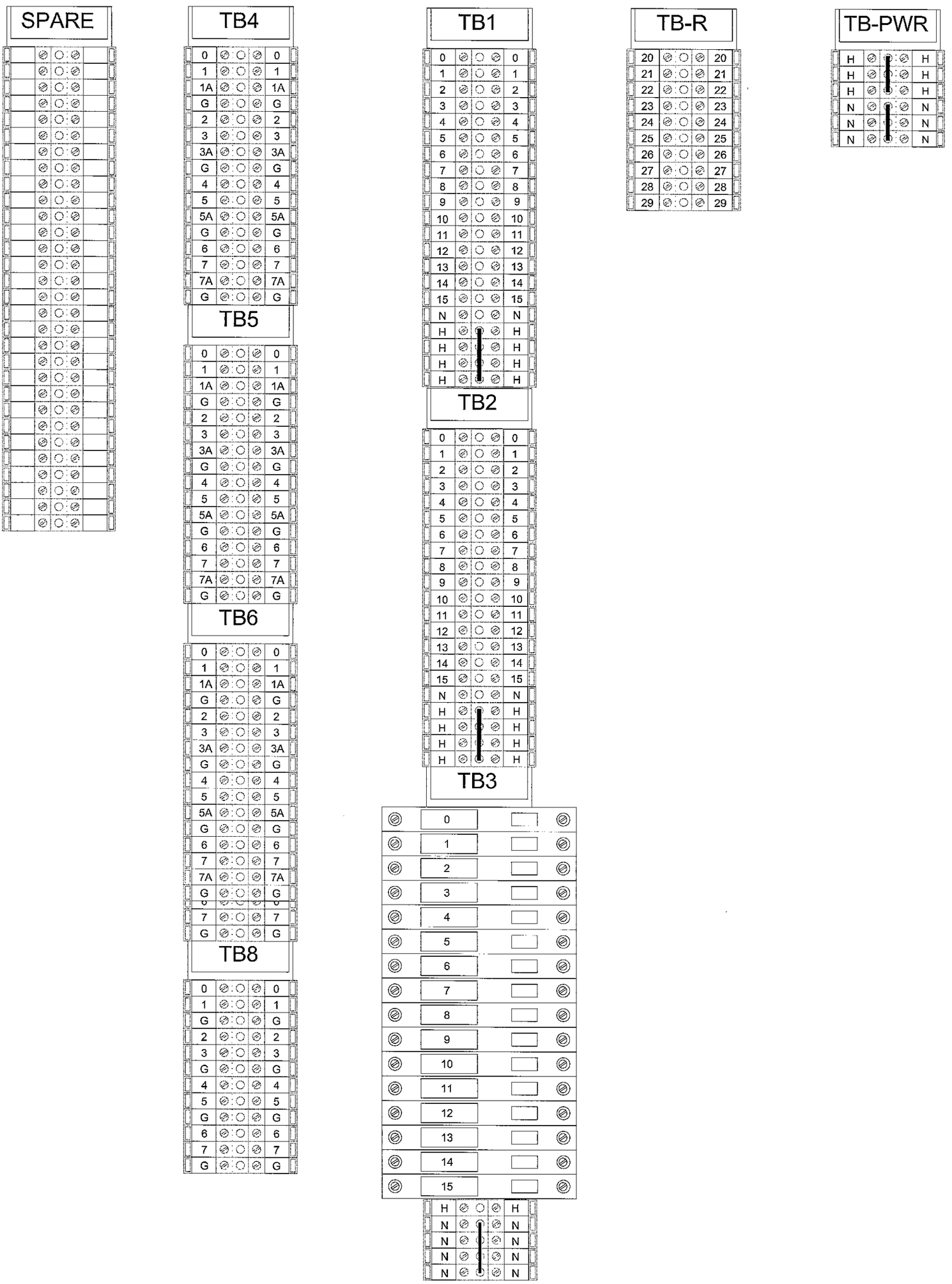
CHEM-TROL SITE / MAIN CONTROL PANEL LCP
CONTROL WIRING DIAGRAM

EARTH TECH, INC.
ALBANY, NY

DWG BY: J.RAUM
APP'D BY:
DATE: 12/04/00
DWG NO.: PS5181-9

REV.	DESCRIPTION	BY	DATE
–	INITIAL RELEASE	JR	01/09/02
A	ECN No.0536	–	–

BENFIELD CONTROL SYSTEMS Inc.
WHITE PLAINS NY 914-948-3231



BENFIELD CONTROL SYSTEMS Inc.
WHITE PLAINS NY 914-948-3231

REV.	DESCRIPTION	BY	DATE
A	ECN No.0536	JR	01/09/02
–	INITIAL RELEASE	---	-----

CHEM-TROL SITE / MAIN CONTROL PANEL LCP-1
TERMINAL BLOCK LAYOUT
EARTH TECH, INC.
ALBANY, NY

DWG BY	APP'D BY	DATE	DWG NO.
D.SEERY		12/04/00	PS5181-10

BILL OF MATERIAL - PLC PANEL				
TAG	**DESCRIPTION**	**MANUFACTURER**	**QTY**	**PART NO.**
ENC1	NEMA 12 CONCEPT STYLE ENCLOSURE	HOFFMAN	1	C-SD483612
---	ENCLOSURE INNER PANEL	HOFFMAN	1	C-P4836
---	MOUNTING FEET	HOFFMAN	1	C-MFK
CB1	CIRCUIT BREAKER, 1P, 20A	SIEMENS	1	5SX2120-7
FB1-4	FUSEBLOCK, 1P, 10A	FERRAZ	4	USCC1I
--	W/ 5A FUSE	FERRAZ	4	ATDR5
GB	5 POINT GROUND BAR	SIEMENS	1	GB5
DR	DUPLEX RECEPTACLE	BCS	1	PS4622
R0-15	2 POLE RELAY W/ 120V COIL	FINDER	16	56.32.8.120.0030
--	W/ BASE	FINDER	16	96.72
PLC	SLC500 10 SLOT CHASSIS	ALLEN BRADLEY	1	1746-A10
---	SLC500 CHASSIS POWER SUPPLY	ALLEN BRADLEY	1	1746-P2
---	SLC 5/03 PROCESSOR	ALLEN BRADLEY	1	1747-L532
---	SLC500 16PT 120VAC INPUT CARD	ALLEN BRADLEY	2	1746-IA16
---	SLC500 16PT 120VAC OUTPUT CARD	ALLEN BRADLEY	1	1746-OA16
---	SLC500 4PT ANALOG INPUT CARD	ALLEN BRADLEY	3	1746-NI4
---	SLC500 4PT ANALOG OUTPUT CARD	ALLEN BRADLEY	2	1746-NO4I
X1	500VA UPS W/ BATTERY	BEST POWER	1	FE500DDAABBA
X2	CHATTERBOX MODEL CB-8	RACO	1	CB-8
PV	PANELVIEW 550	ALLEN BRADLEY	1	2711-B5A3
--	W/ COMMUNICATION CABLE	ALLEN BRADLEY	1	1747-C10
X3	DAQSTATION DATA LOGGER	YOKOGAWA	1	DX112-2-2/M1
PB1	N.C. E-STOP PUCHBUTTON	CONTROL CONCEPTS	1	PBO-PPMCRD-NC
---	W/ 0-160 PSI GUAGE	WATTS	1	275Y160WS
TB(ALL)	TERMINAL BLOCKS	ENTRELEC	135	115 116.07
--	W/ JUMPER	ENTRELEC	2	168 973.07
---	GROUNDING TERMINAL BLOCKS	ENTRELEC	20	165 113.16
---	W/ END BARRIER	ENTRELEC	11	118 368.16
---	FUSED TERMINAL BLOCKS	ENTRELEC	16	199 168.00
---	W/ FUSES	FERRAZ	25	GGC2
---	W/ END BARRIER	ENTRELEC	1	199 635.24
---	W/ END ANCHORS	ENTRELEC	6	118 368.16
---	W/ GROUP MARKER	ENTRELEC	11	1492-NM36
---	W/ GROUP MARKER LABEL	ENTRELEC	11	178 430.05

LEGEND LIST			
TAG	**CHARACTERS**	**QTY**	**TYPE**
PB1	E-STOP	1	A-B JUMBO RED W/ WHITE LETTERS

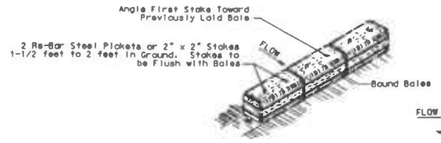
CHEM-TROL SITE / MAIN CONTROL PANEL LCP-1
BILL OF MATERIAL

EARTH TECH, NY
ALBANY, NY

DWG BY: D.SEERY
APP'D BY:
DATE: 12/04/00
DWG NO.: PS5181-11

REV.	DESCRIPTION	BY	DATE
A	ECN No.0536	JR	01/09/02
–	INITIAL RELEASE	–	–

BENFIELD CONTROL SYSTEMS Inc.
WHITE PLAINS NY
914-948-3231



ANCHOR DETAIL

BEDDING DETAIL

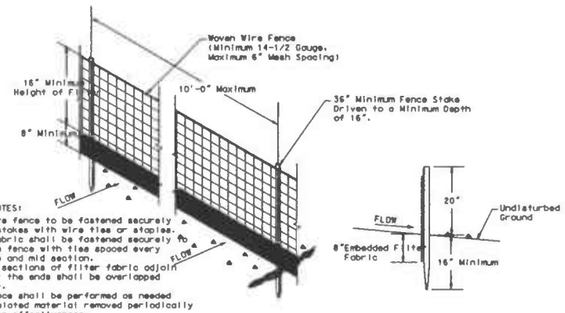
STRAW BALE BERM NOTES:

1.) Bales shall be placed in a row with ends tightly abutting the adjacent bale.
2.) Each bale shall be embedded in the soil a minimum of 4" and placed so the bindings are horizontal.
3.) Bales shall be securely anchored in place by stakes driven through the bales. The first stake in each bale shall be angled toward previously laid bale to force bales together.
4.) Inspection shall be frequent and repair or replacement shall be made promptly as needed.
5.) Bales shall be removed and replaced when they became filled with sediment and block or impede storm flow or drainage.

Set hay bales as shown on the Drawing and as otherwise required by job conditions to control erosion.

NOTE: BALE DIKES SHALL BE PLACED EVERY 200 ft. IN THE PERIMETER DITCHES.

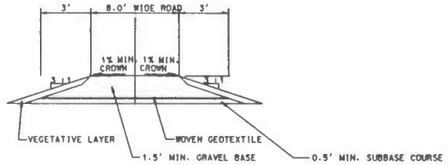
1 STRAW BALE DIKE DETAIL
NTS



SILT FENCE NOTES:

1.) Woven wire fence to be fastened securely to fence stakes with wire ties or staples.
2.) Filter fabric shall be fastened securely to woven wire fence with ties spaced every 24" at top and mid section.
3.) When two sections of filter fabric adjoin each other the ends shall be overlapped three feet.
4.) Maintenance shall be performed as needed and accumulated material removed periodically to maintain effectiveness.

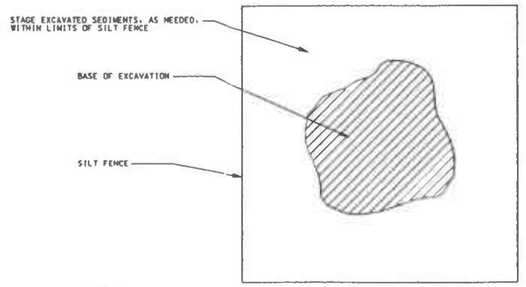
2 SILT FENCE DETAIL
NTS



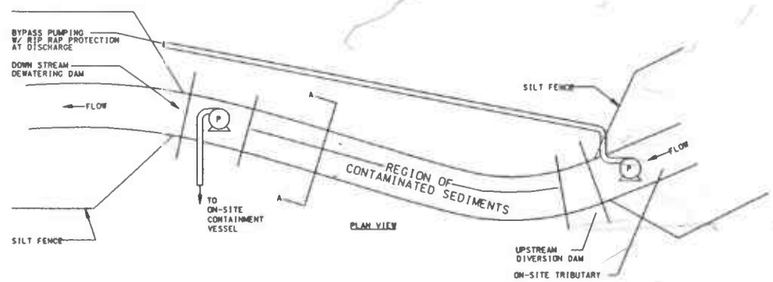
3 ACCESS ROAD DETAIL
NTS

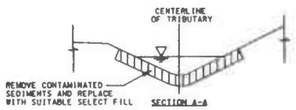
ACCESS ROAD NOTES:

1. TRANSITIONS TO EXISTING GRADE VARY BY LOCATION
2. GRADE LEVEL OR PLACE ADDITIONAL SUBBASE, AS NEEDED TO PROVIDE LEVEL SURFACE FOR GEOTEXTILE
3. PROVIDE GRADING LEVEL, MAINTAIN EROSION CONTROL FOR CUT BANK UNTIL VEGETATION ESTABLISHED.

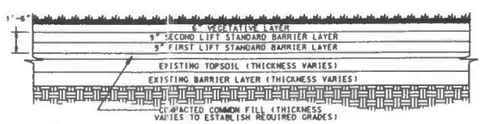


4 FLOODPLAIN SEDIMENT EXCAVATION DETAIL
NTS





5 TRIBUTARY SEDIMENT REMOVAL DETAIL
NTS



6 STANDARD SOIL BARRIER
NTS

NO.	REVISIONS	MADE	CHK	DATE

NAMES		DATE
DRAWN:	JV	8-13-99
DESIGN:	ARB	8-13-99
CHECKED:	MJM	8-13-99
PE:		
APP'D:		
APP'D:		
APP'D:		

CIVIL DETAILS

CHEM-TROL SITE
GROUNDWATER CONTROL ELEMENTS
HAMBURG, NEW YORK

EARTH TECH

PROJECT NUMBER 32067 DATE SEP. 1999

EARTHTECH DWG NUMBER C3 FILE NUMBER

CLIENT DWG NUMBER SHEET NUMBER 3 of 11

...Earth Tech for this project are instruments of the Engineer's service for use solely with respect to this project and,

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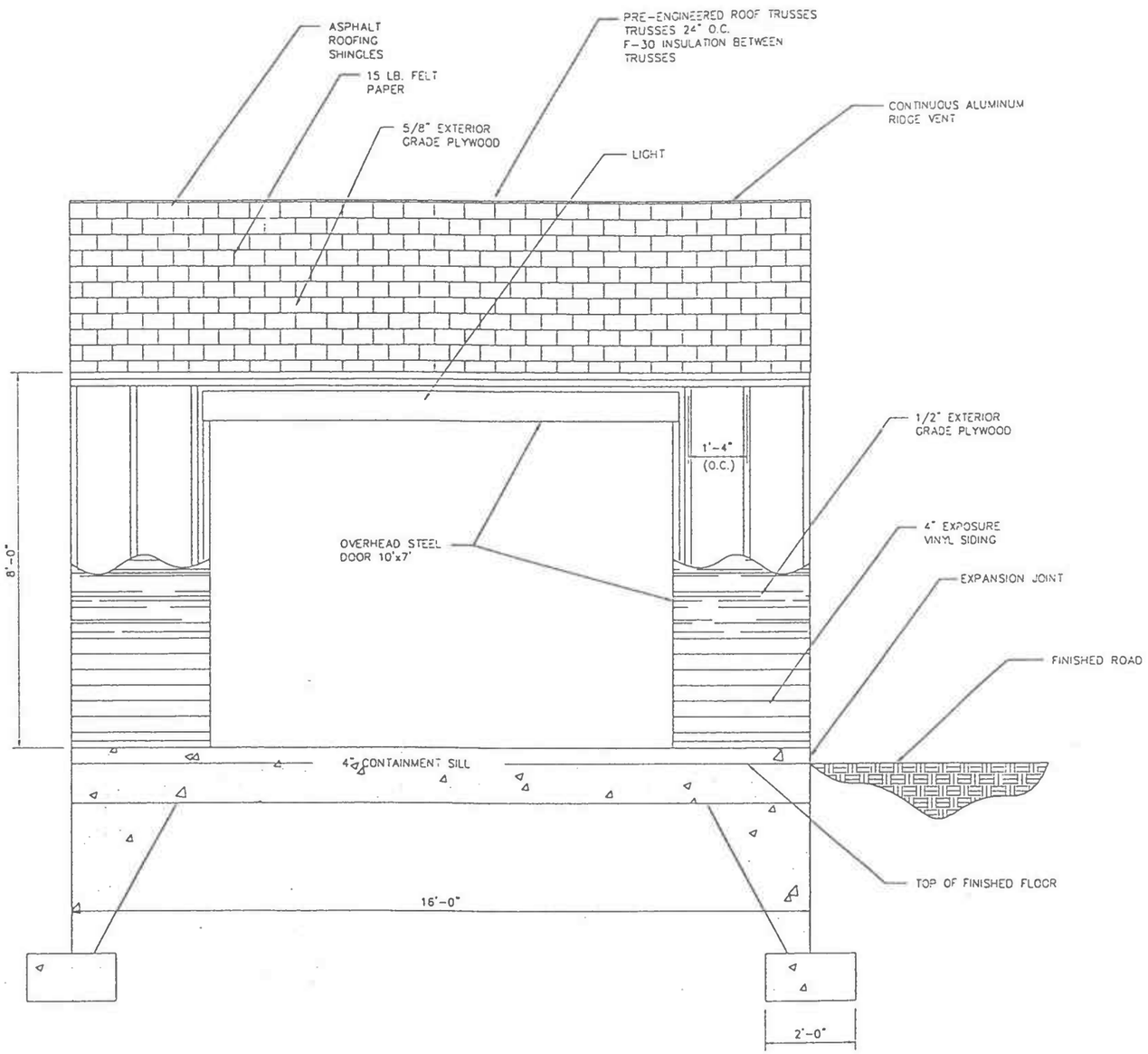
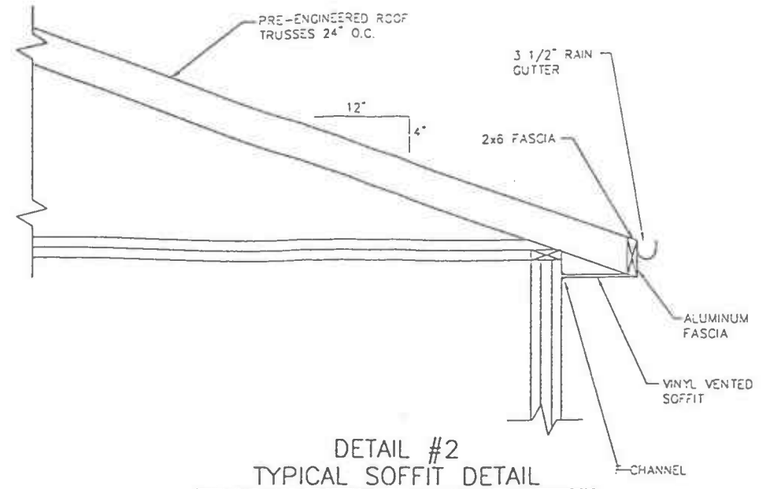
Record Drawings

Drawing Number	Description
C-01	System Building Structural Drawing
G-01	General Arrangement Diagram
M-01	Blower Skid Mechanical Assembly Drawing
E-01	Control Panel Layout Diagram
E-02	Signal Wiring Diagram
E-03	120 VAC Power Wiring Diagram
E-04	Motor Starter Panel Layout Diagram
E-05	480 VAC Single Line Diagram
E-06	120 VAC Control Wiring Diagram



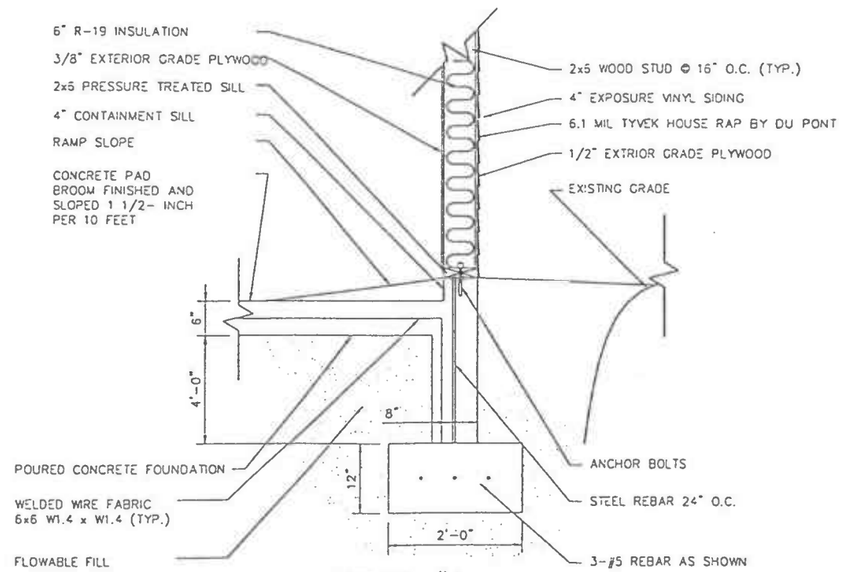
FRONT VIEW

SEE DWG.
SCALE: 3/4" = 1'-0"



DETAIL #2
TYPICAL SOFFIT DETAIL

SEE DWG.
SCALE: 1" = 1'-0"



DETAIL #1
TYPICAL WALL SECTION

SEE DWG.
SCALE: 1" = 1'-0"

NOTES:

1. CONCRETE SHALL BE 2-4% ENTRAINED AIR, 4-6 SLUMP, 4000 PSI PLACED IN ACCORDANCE WITH ACI 304. CONTRACTOR SHALL TEST CONCRETE DURING POUR AND SUBMIT RESULTS TO THE ENGINEER
2. CONTRACTOR SHALL CUT DRAINAGE GROOVE TO SUMP AS NEEDED TO ENSURE FREE DRAINAG OF THE BUILDING FLOOR.
3. CONTRACTOR MAY PROPOSE "ALASKAN" SLAB INSTEAD OF BLOC
4. ALL DOORWAYS USE SOLID BLOCK FOR TOP COURSE

REVISION NUMBER	01	REVISION NUMBER	REVISION NUMBER	REVISION NUMBER	REVISION NUMBER	REVISION NUMBER	REVISION NUMBER	REVISION NUMBER	REVISION NUMBER
DESIGN	WLC 11/23/98	DESIGN	DESIGN	DESIGN	DESIGN	DESIGN	DESIGN	DESIGN	DESIGN
ENGINEERING	TA	ENGINEERING	ENGINEERING	ENGINEERING	ENGINEERING	ENGINEERING	ENGINEERING	ENGINEERING	ENGINEERING
DESCRIPTION	EDIT WIRE FABRIC SIZE	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION

PLOT DATE: 11/23/98

JOB NUMBER: 107197
CONTRACT NUMBER:
INTERNAL VERSION ISSUE DATES

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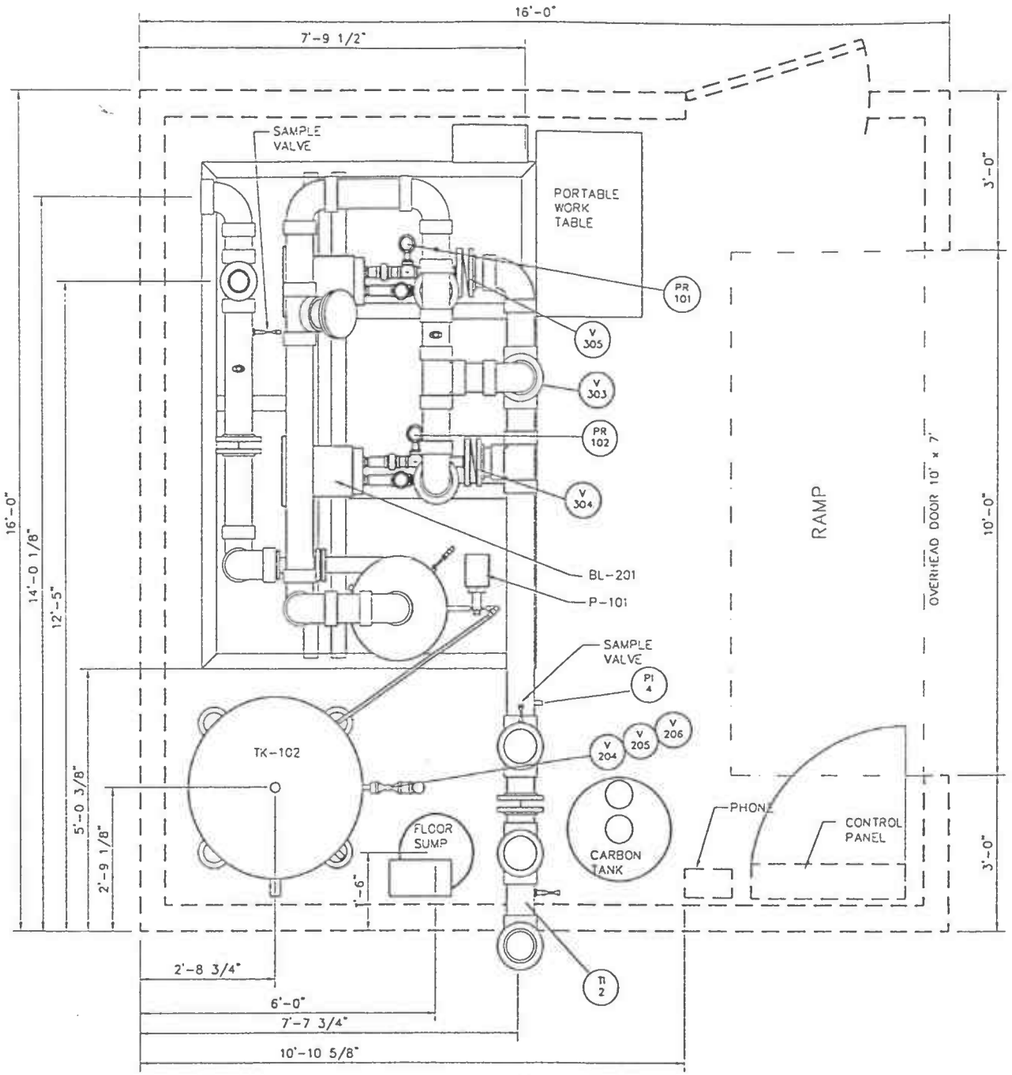
DESIGNER	MJH	10/30/98
CHECKED BY:	TA	
PROJECT ENGINEER APPROVED	TA	
PROJECT MANAGER APPROVED	JW	

CSK TECHNICAL, INC
752 MILES AVE, P.O. BOX 74
SCHWENKSVILLE, PA 19473-0074
PHONE: (215) 584-2000

TITLE: OHM
OHM
HAMBURG, NEW YORK
SOIL VAPOR EXTRACTION SYSTEM
BUILDING STRUCTURE

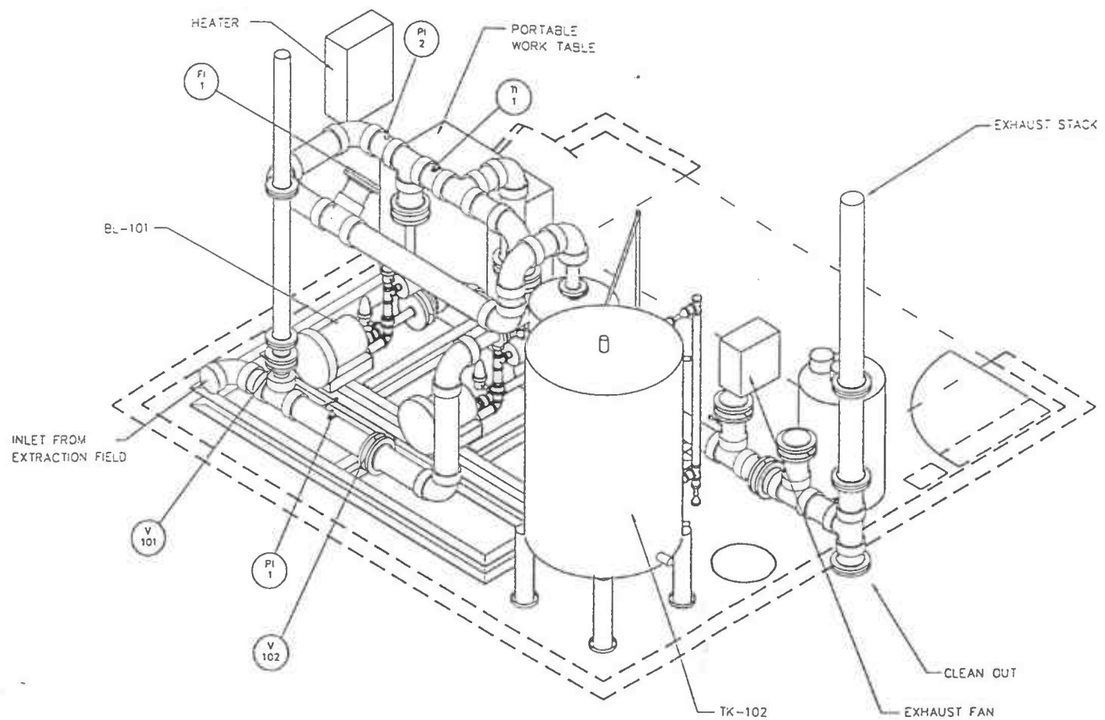
SIZE: D | DWG NO.: C-01 | REV: 0

SCALE: AS NOTED | CSK CAD FILE: C-019



PLAN VIEW

SEE DWG.
SCALE: 3/4" = 1'-0"



ISOMETRIC VIEW

SEE DWG.
SCALE: N.T.S.

REVISION NUMBER	01		REVISION NUMBER	02		REVISION NUMBER	03		REVISION NUMBER	04		REVISION NUMBER	05		REVISION NUMBER	06		REVISION NUMBER			REVISION NUMBER			REVISION NUMBER		
DESIGN	MLC	11/6/98	DESIGN	MLC	11/23/98	DESIGN	MLC	11/25/98	DESIGN	MLC	12/14/98	DESIGN	MLC	2/5/99	DESIGN	MLC	4/30/99	DESIGN			DESIGN			DESIGN		
ENGINEERING	TA		ENGINEERING	TA		ENGINEERING	TA		ENGINEERING	TA		ENGINEERING	TA		ENGINEERING	MB		ENGINEERING			ENGINEERING			ENGINEERING		
DESCRIPTION: CHANGES PER CLIENT			DESCRIPTION: ADD CLEAN OUT TO STACK			DESCRIPTION: ADD VACUUM RELIEFS & PRESSURE RELIEFS PER CLIENT WTC.			DESCRIPTION: REVISE FLOOR SUMP			DESCRIPTION: REVISE PIPING TO FIT FLOW INDICATOR AND SILENCER IN A BETTER WAY.			DESCRIPTION: AS BUILTS			DESCRIPTION:			DESCRIPTION:			DESCRIPTION:		

DT DATE: 11/2/98

JOB NUMBER:
CONTRACT NUMBER:
INTERNAL VERSION ISSUE DATES
11/23/98 | 11/30/98 | 2/5/99
11/25/98 | 11/30/98 | 4/30/99

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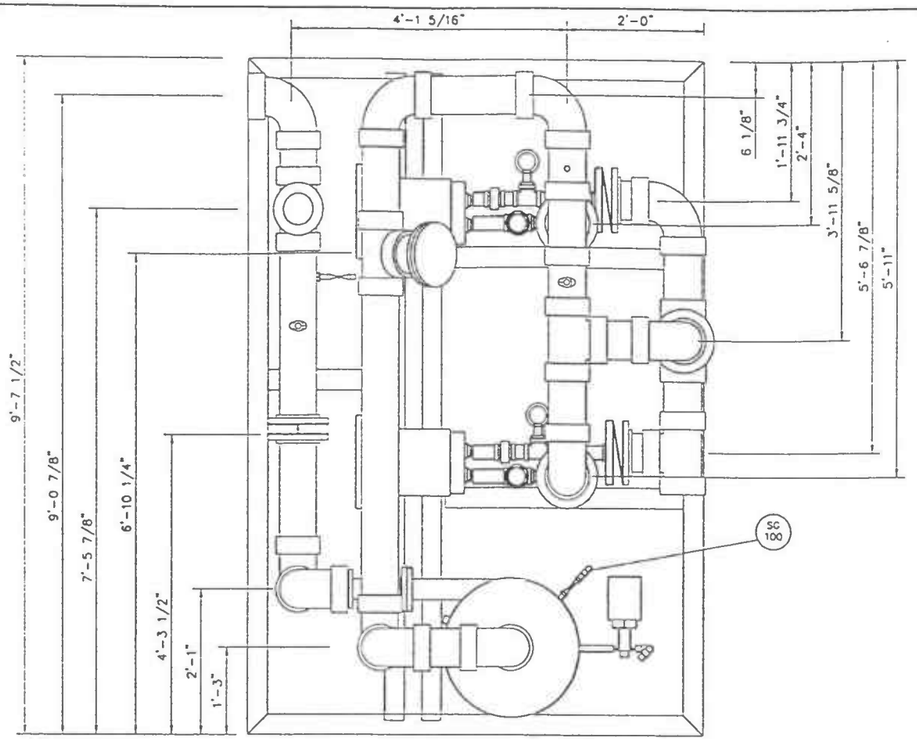
DESIGNER	MLC	11/2/98
CHECKED BY:	TA	
PROJECT ENGINEER APPROVED	TA	
PROJECT MANAGER APPROVED	JW	

CSK TECHNICAL, INC
[illegible]
PHONE: (716) 205-2000

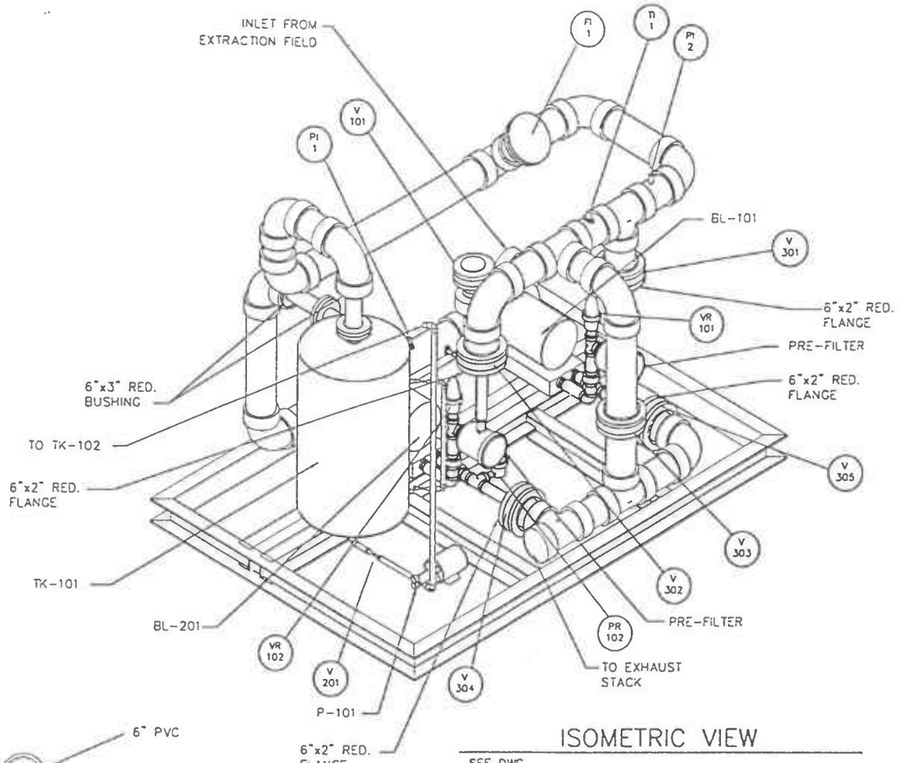
TITLE: OHM
CHEM TROL
HAMBURG, NEW YORK
SOIL VAPOR EXTRACTION SYSTEM
GENERAL ARRANGEMENT

SIZE: D | DWG NO.: G-01 | REV: 0
SCALE: AS NOTED | CSK CAD FILE: G-01



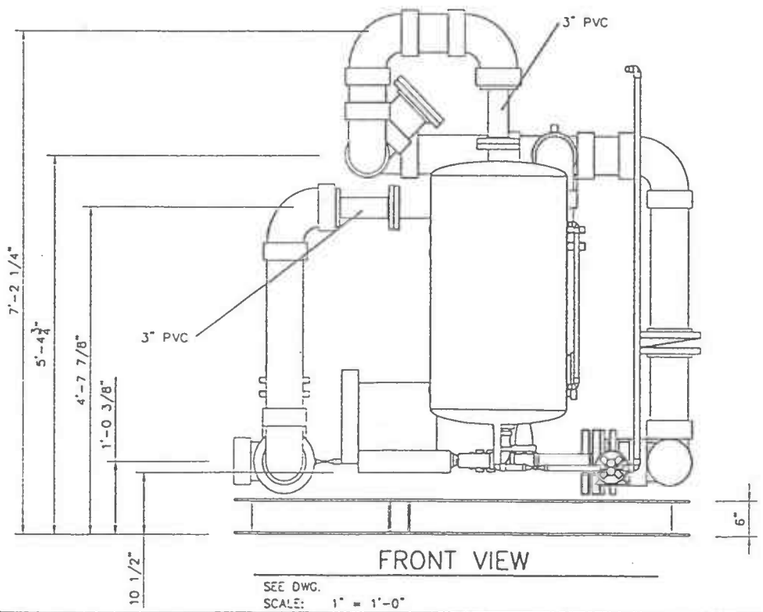
PLAN VIEW

SEE DWG.
SCALE: 1" = 1'-0"



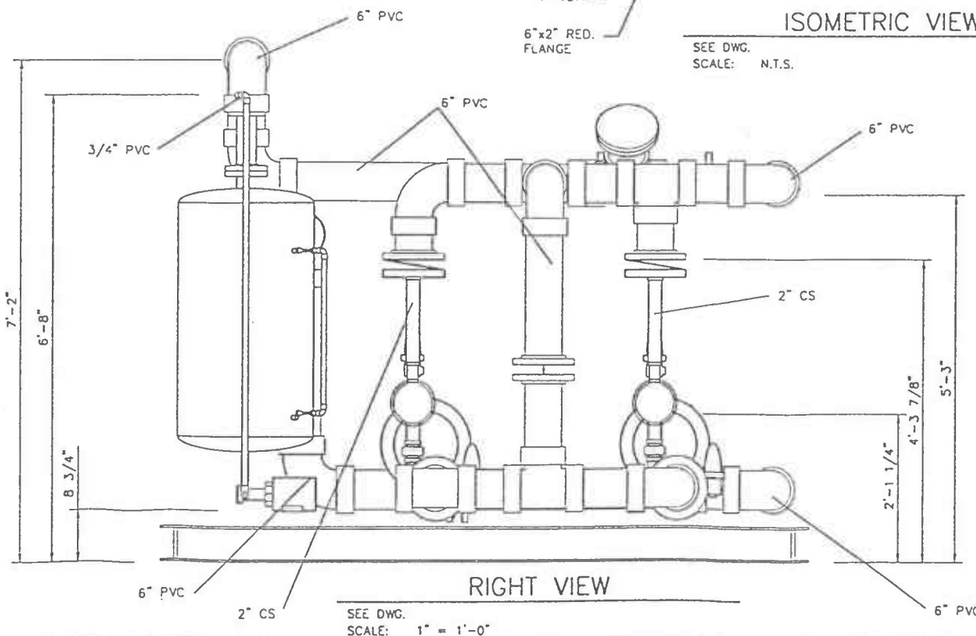
ISOMETRIC VIEW

SEE DWG.
SCALE: N.T.S.



FRONT VIEW

SEE DWG.
SCALE: 1" = 1'-0"



RIGHT VIEW

SEE DWG.
SCALE: 1" = 1'-0"

REVISION NUMBER	01		REVISION NUMBER	02		REVISION NUMBER	03		REVISION NUMBER	04		REVISION NUMBER	05		REVISION NUMBER	06		REVISION NUMBER	07		REVISION NUMBER			REVISION NUMBER		
DESIGN	RWR	11/6/98	DESIGN	MLG	11/23/98	DESIGN	MLG	11/25/98	DESIGN	TJD	12/17/98	DESIGN	MLG	1/20/99	DESIGN	MLG	2/10/99	DESIGN	MLG	4/30/99	DESIGN			DESIGN		
ENGINEERING	TA		ENGINEERING	TA		ENGINEERING	TA		ENGINEERING	TA		ENGINEERING	TA		ENGINEERING	TA		ENGINEERING	WB		ENGINEERING			ENGINEERING		
DESCRIPTION: CHANGE PIPE SIZES			DESCRIPTION: ADD SITE GLASS			DESCRIPTION: ADD RELIEF VALVES PER CLIENT MTG.			DESCRIPTION: FIX TAGGING & DIM.			DESCRIPTION: REWORK PIPE DUE TO ADDITION OF BLOWER FILTER			DESCRIPTION: AS-BUILTS			DESCRIPTION: AS-BUILTS			DESCRIPTION:			DESCRIPTION:		

JOB NUMBER: 107197
CONTRACT NUMBER:
INTERNAL VERSION ISSUE DATES
2/5/99
4/30/99

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DESIGNER	MLG	11/2/98
CHECKED BY:	TA	
PROJECT ENGINEER APPROVED	TA	
PROJECT MANAGER APPROVED	JW	

CSK TECHNICAL, INC
761 Route 6 & 6, P.O. Box 761
Tallmadge, New York 11148
Phone: (716) 656-3000

TITLE: CHEM TROL
OHM
HAMBURG, NEW YORK
SOIL VAPOR EXTRACTION SYSTEM
SKID MECHANICALS

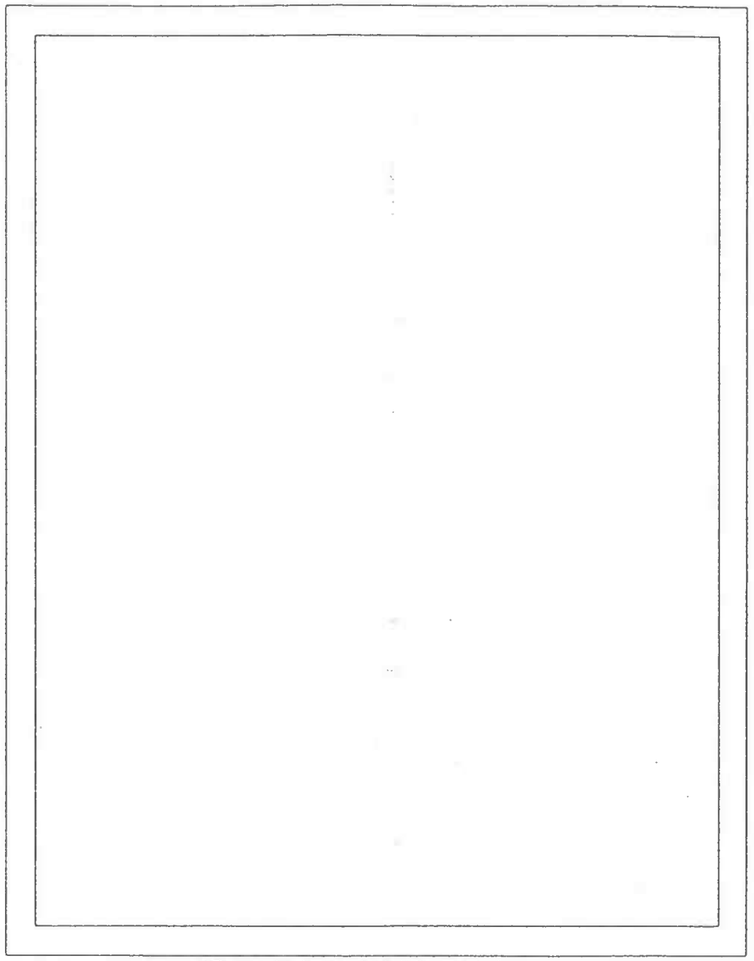
SIZE: D | DWG NO.: M-01 | REV:

SCALE: AS NOTED | CSK CAD FILE: 197m0100

PLOT DATE: 11/23/98

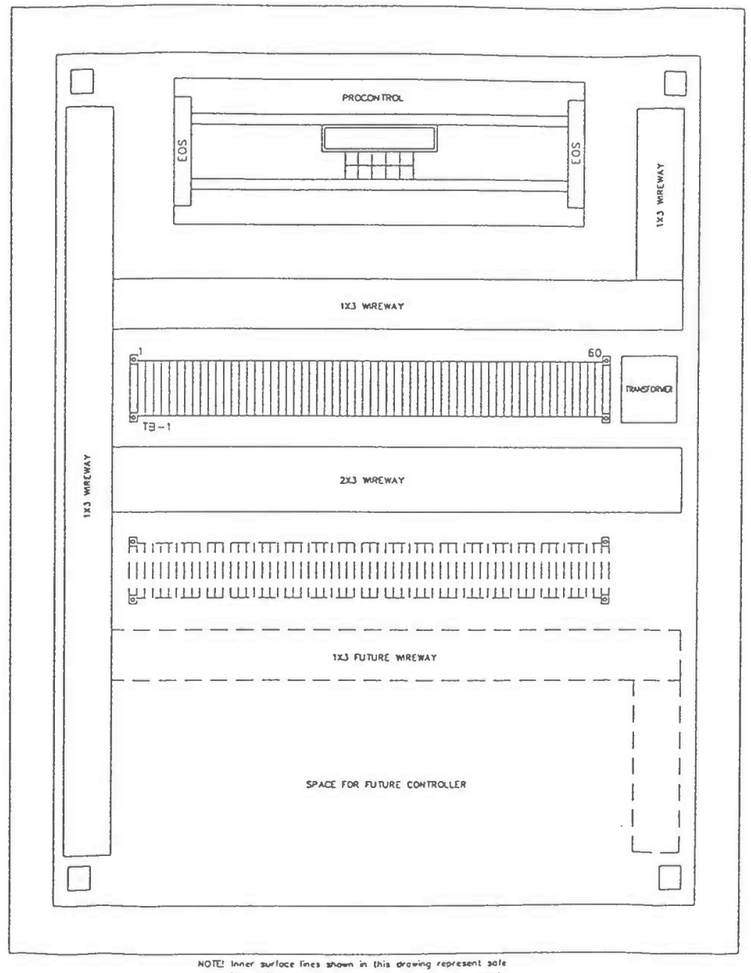
BILL OF MATERIAL

KEY ID	QTY	CATALOG NUMBER	DEV ID	DESCRIPTION MANUFACTURER
1	1	1418N4K10		ENCL, SINGLE DOOR WALL MTD HAMMOND
2	1	199-DR1 DIN RAIL		DINRAIL: 1 3/8in wide X 12in long
3	1	EOS-B2	PC	Process Controller EOS Research
4	1	HBL1T65	SURGE	Surge Protection 120VAC Hubbel
5	1	WIRE-CHANNEL		1in wide X 20 45/64in long X 3in deep
6	1	WIRE-CHANNEL		1in wide X 8 5/8in long X 3in deep
7	1	WIRE-CHANNEL		1in wide X 8 5/8in long X 3in deep



NOTE! Inner surface lines shown in this drawing represent safe mounting surface, not physical mounting plate or door edge!

COVER



NOTE! Inner surface lines shown in this drawing represent safe mounting surface, not physical mounting plate or door edge!

Plate

REVISION NUMBER	01		REVISION NUMBER	02		REVISION NUMBER	03		REVISION NUMBER			REVISION NUMBER			REVISION NUMBER			REVISION NUMBER			REVISION NUMBER		
DESIGN	TJD	2/11/99	DESIGN	TJD	2/16/99	DESIGN	TJD	2/18/99	DESIGN			DESIGN			DESIGN			DESIGN			DESIGN		
ENGINEERING	TA		ENGINEERING	TA		ENGINEERING	TA		ENGINEERING			ENGINEERING			ENGINEERING			ENGINEERING			ENGINEERING		
DESCRIPTION: AS-BUILTS			DESCRIPTION: AS-BUILTS			DESCRIPTION: AS-BUILTS			DESCRIPTION:			DESCRIPTION:			DESCRIPTION:			DESCRIPTION:			DESCRIPTION:		

PLOT DATE: 1/22/99

JOB NUMBER: 107197

CONTRACT NUMBER:

INTERNAL VERSION ISSUE DATES

2/11/99 | 2/18/99

2/16/99

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AS-BUILT

DESIGNER	WLG	1/22/99	
CHECKED BY:	TA		
PROJECT ENGINEER APPROVED	TA		
PROJECT MANAGER APPROVED	JW		

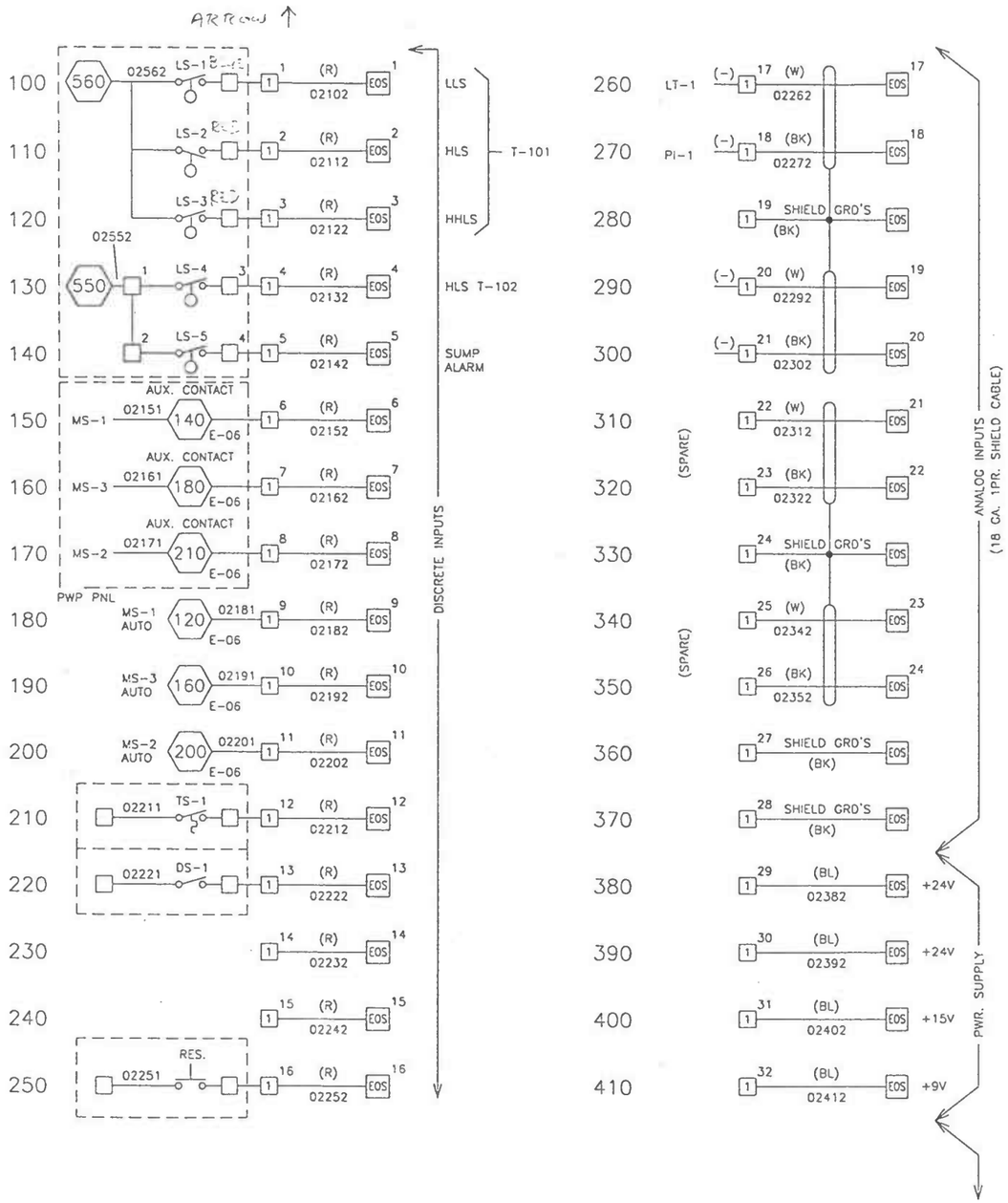
CSK TECHNICAL, INC.
762 MAIN AVE, P.O. BOX 780
NORWALK, CT 06856-0780
PHONE: (203) 853-3344

TITLE: CHEM TROL
OHM
HAMBURG, NEW YORK
SOIL VAPOR EXTRACTION SYSTEM
MCP LAYOUT

SIZE: D | DWG NO.: E-01 | REV: C

SCALE: NTS | CSK CAD FILE: E-01

MCP / PROCONTROL



NOTE:

1. ALL WIRE TO BE 16 GA. UNLESS OTHERWISE NOTED.
2. [1] – MCP TERMINAL
   [EOS] – PROCONTROL TERMINAL

REVISION NUMBER	01		REVISION NUMBER	02		REVISION NUMBER	03		REVISION NUMBER	05		REVISION NUMBER			REVISION NUMBER			REVISION NUMBER			REVISION NUMBER			REVISION NUMBER		
DESIGN	TJD	2/16/99	DESIGN	TJD	2/18/99	DESIGN	TJD	3/17/99	DESIGN	MLG	8/2/99	DESIGN			DESIGN			DESIGN			DESIGN			DESIGN		
ENGINEERING	TA		ENGINEERING	TA		ENGINEERING	TA		ENGINEERING	TA		ENGINEERING			ENGINEERING			ENGINEERING			ENGINEERING			ENGINEERING		
DESCRIPTION: AS-BUILTS			DESCRIPTION: AS-BUILTS			DESCRIPTION: AS-BUILTS			DESCRIPTION: AS-BUILTS EDIT LINES 150-170 & 260-300			DESCRIPTION:			DESCRIPTION:			DESCRIPTION:			DESCRIPTION:			DESCRIPTION:		

PLOT DATE:

JOB NUMBER: 107197

CONTRACT NUMBER:

INTERNAL VERSION ISSUE DATES: 2/10/99, 2/18/99, 2/16/99

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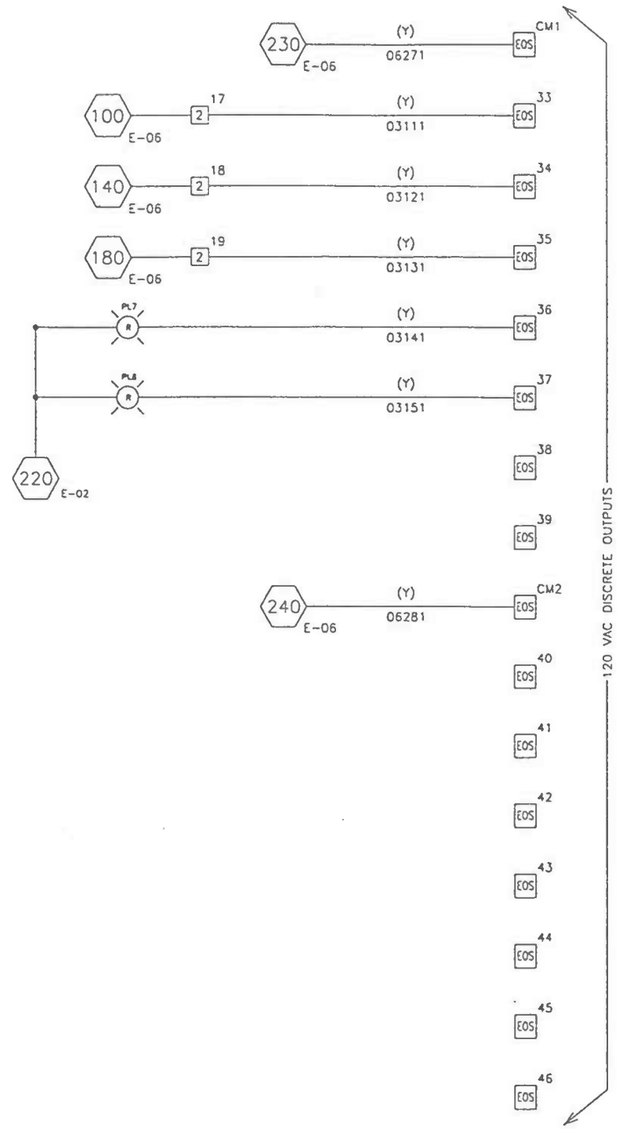
DESIGNER	TJD	2/10/99
CHECKED BY:		
PROJECT ENGINEER APPROVED	TA	
PROJECT MANAGER APPROVED	JW	

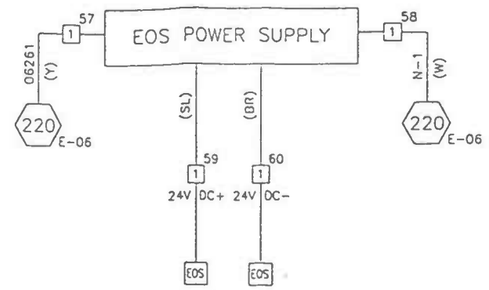
CSK TECHNICAL, INC.
143 MAIN ST. P.O. BOX 340
HAMBURG, NEW YORK 14075
PHONE: (716) 649-3480

TITLE: CHEM TROL
CHW
HAMBURG, NEW YORK
SOIL VAPOR EXTRACTION SYSTEM
PROCONTROL UNIT

SIZE: D | DWG NO.: E-02 | REV: 05

SCALE: NTS | CSK CAD FILE: E-02





REVISION NUMBER	01		REVISION NUMBER	02		REVISION NUMBER			REVISION NUMBER			REVISION NUMBER			REVISION NUMBER			REVISION NUMBER			REVISION NUMBER			JOB NUMBER: 107197
DESIGN	TJD	2/16/99	DESIGN	TJD	2/18/99	DESIGN			DESIGN			DESIGN			DESIGN			DESIGN			DESIGN			CONTRACT NUMBER:
ENGINEERING	TA		ENGINEERING	TA		ENGINEERING			ENGINEERING			ENGINEERING			ENGINEERING			ENGINEERING			ENGINEERING			INTERNAL VERSION ISSUE DATES
DESCRIPTION: AS-BUILTS			DESCRIPTION: AS-BUILTS			DESCRIPTION			DESCRIPTION			DESCRIPTION			DESCRIPTION			DESCRIPTION			DESCRIPTION			2/10/99 2/18/99 2/16/99

PLOT DATE:

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DESIGNER	TJD	2/10/99
CHECKED BY:		
PROJECT ENGINEER APPROVED	TA	
PROJECT MANAGER APPROVED	JW	

CSK TECHNICAL, INC.

TITLE: CHEM TROL
DHW
HAMBURG, NEW YORK
SOIL VAPOR EXTRACTION SYSTEM
MCP WIRING

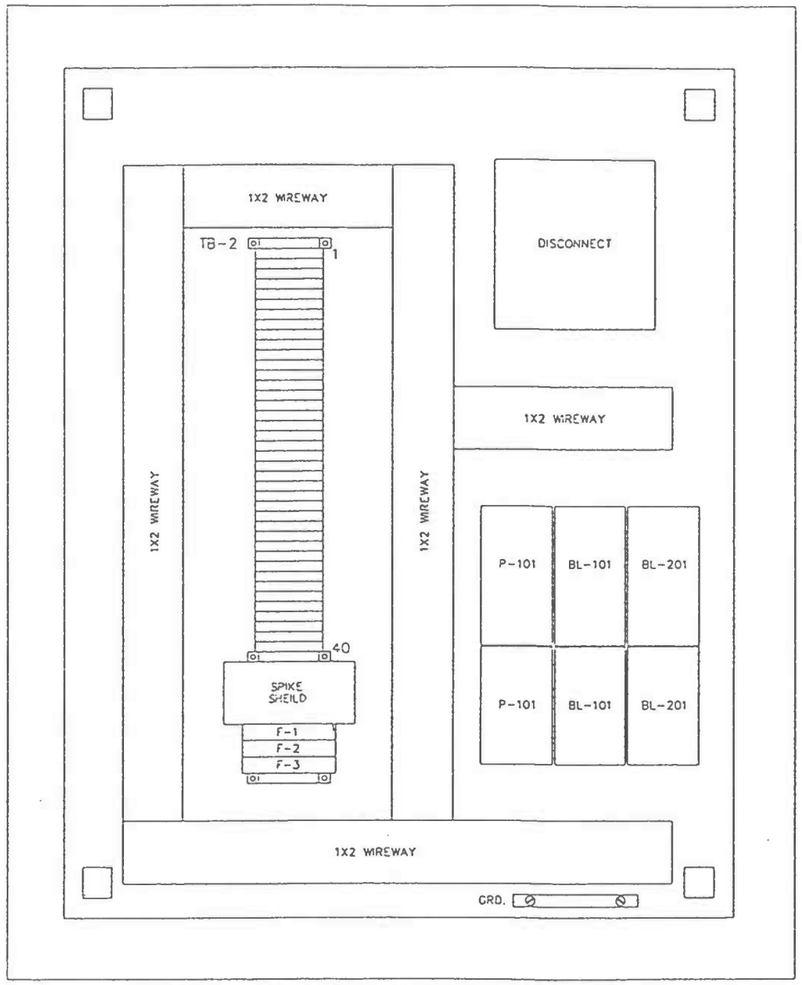
SIZE: D | DWG NO.: E-03 | REV: C

SCALE: NTS | CSK CAD FILE: E-03

POWER PANEL

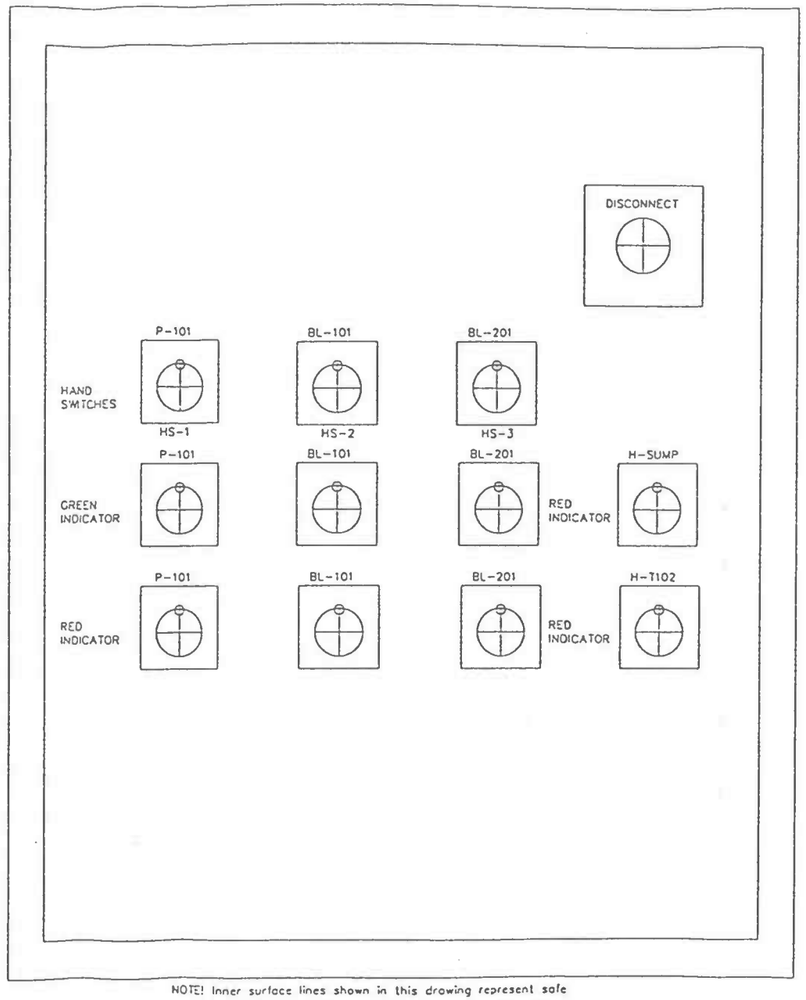
BILL OF MATERIAL

KEY ID	QTY	CATALOG NUMBER	DEV ID	DESCRIPTION MANUFACTURER
1	1	1418N4E10		ENCL SINGLE DOOR WALL MTD HAMMOND
2	1	194R-R1		STD LUG SKIN (.3.2-10.3IN (140-260mm) WORKING 50/6 ALLEN-BRADLEY
3	1	100-A09ND3	P-101	CONTACTOR,E.C.9A,110/120V,50/60HZ ALLEN-BRADLEY
4	1	100-A12ND3	BL-101	CONTACTOR,E.C.12A,110/120V,50/60HZ ALLEN-BRADLEY
5	1	100-A12ND3	BL-102	CONTACTOR,E.C.12A,110/120V,50/60HZ ALLEN-BRADLEY
6	1	140-MN-0100	P-101	MAN MOTOR STARTER @ PROT,6.30-10.00A ALLEN-BRADLEY
7	1	140-MN-1000	BL-101	MAN MOTOR STARTER @ PROT,6.00-10.00A ALLEN-BRADLEY
8	1	140-MN-1000	BL-102	MAN MOTOR STARTER @ PROT,6.00-10.00A ALLEN-BRADLEY
9	1	194R-HS4	DIC	BLACK OPERATING HANDLE ALLEN-BRADLEY
10	1	194R-NJ030P3	DIS	FUSED DISCONNECT 3W 30A,30A BOSW,CLASS J ALLEN-BRADLEY
11	1	800T-J2A	BL-101	PL,30.5MM,3POS,3 PB,MM T,1NO-1NC ALLEN-BRADLEY
12	1	800T-J2A	BL-102	PL,30.5MM,3POS,3 PB,MM T,1NO-1NC ALLEN-BRADLEY
13	1	800T-J2A	P-101	PL,30.5MM,3POS,3 PB,MM T,1NO-1NC ALLEN-BRADLEY
14	1	800T-D10G	BL-101	PL,30.5MM,PY,120V,GRN ALLEN-BRADLEY
15	1	800T-D10G	BL-102	PL,30.5MM,PY,120V,GRN ALLEN-BRADLEY
16	1	800T-D10G	P-101	PL,30.5MM,PY,120V GRN ALLEN-BRADLEY
17	1	800T-D10R	BL-101	PL,30.5MM,PY,120V,RED ALLEN-BRADLEY
18	1	800T-D10R	BL-102	PL,30.5MM,PY,120V,RED ALLEN-BRADLEY
19	1	800T-D10R	H-SUMP	PL,30.5MM,PY,120V,RED ALLEN-BRADLEY
20	1	800T-D10R	H-T102	PL,30.5MM,PY,120V,RED ALLEN-BRADLEY
21	1	800T-D10R	P-101	PL,30.5MM,PY,120V,RED ALLEN-BRADLEY



NOTE! Inner surface lines shown in this drawing represent safe mounting surface, not physical mounting plate or door edge!

Panel



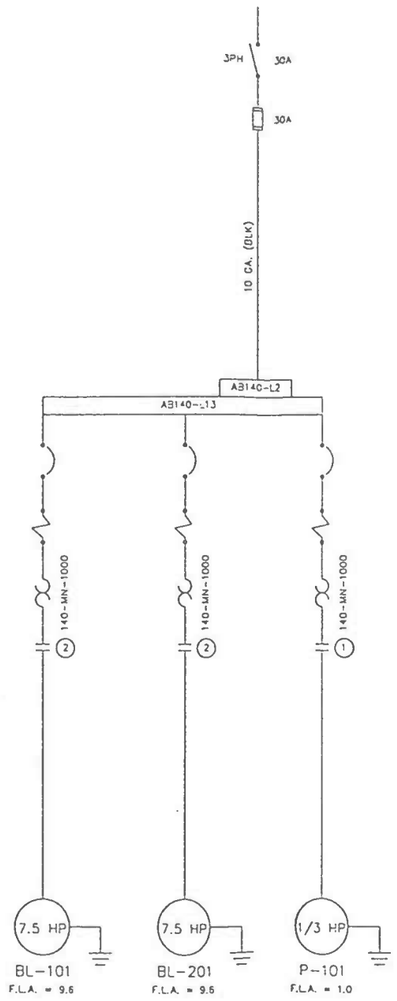
NOTE! Inner surface lines shown in this drawing represent safe mounting surface, not physical mounting plate or door edge!

Cover

REVISION NUMBER	01	REVISION NUMBER	02	REVISION NUMBER	03	REVISION NUMBER	04	REVISION NUMBER		REVISION NUMBER		REVISION NUMBER		REVISION NUMBER		JOB NUMBER: 107197	AS-BUILT	DESIGNER	M.G.,TJD	1/22/99	CSK TECHNICAL.
DESIGN	TJD 2/11/99	DESIGN	TJD 2/15/99	DESIGN	TJD 2/18/99	DESIGN	TJD 3/17/99	DESIGN		DESIGN		DESIGN		DESIGN		CONTRACT NUMBER:		CHECKED BY:	TA		TITLE: CHEM TROL OHM HAUPPAUGE, NEW YORK SOIL VAPOR EXTRACTION SYSTEM 480V CONTROL PANEL
ENGINEERING	TA	ENGINEERING	TA	ENGINEERING	TA	ENGINEERING	TA	ENGINEERING		ENGINEERING		ENGINEERING		ENGINEERING		INTERNAL VERSION ISSUE DATES		PROJECT ENGINEER APPROVED	TA		
DESCRIPTION: AS-BUILTS		DESCRIPTION: AS-BUILTS		DESCRIPTION: AS-BUILTS		DESCRIPTION: AS-BUILTS		DESCRIPTION:		DESCRIPTION:		DESCRIPTION:		DESCRIPTION:		2/11/99 | 2/18/99 | 2/16/99		PROJECT MANAGER APPROVED	JW		SIZE D | DWG NO. E-04
																DRAWING CONFIDENTIAL: THIS DRAWING AND ALL INFORMATION CONTAINED THEREON IS AND SHALL REMAIN THE PROPERTY OF CSK TECHNICAL, INC., AS AN INSTRUMENT OF PROFESSIONAL SERVICE. THIS INFORMATION SHALL NOT BE USED IN WHOLE OR IN PART, WITHOUT THE FULL KNOWLEDGE AND PRIOR WRITTEN CONSENT OF CSK TECHNICAL, INC. © 1997 CSK					SCALE: NTS | CSK CAD FILE: E-04

PLOT DATE: 1/22/99

SVE MOTOR STARTER PANEL



NOTES:

ALLEN BRADLEY CONTACTORS

1. 100-C09D10
2. 100-C12D10

REVISION NUMBER	01		REVISION NUMBER	02		REVISION NUMBER	03		REVISION NUMBER			REVISION NUMBER			REVISION NUMBER			REVISION NUMBER			REVISION NUMBER		
DESIGN	TJD	2/10/99	DESIGN	TJD	2/18/99	DESIGN	TJD	3/17/99	DESIGN			DESIGN			DESIGN			DESIGN			DESIGN		
ENGINEERING	TA		ENGINEERING	TA		ENGINEERING	TA		ENGINEERING			ENGINEERING			ENGINEERING			ENGINEERING			ENGINEERING		
DESCRIPTION: AS-BUILTS			DESCRIPTION: AS-BUILTS			DESCRIPTION: AS-BUILTS			DESCRIPTION:			DESCRIPTION:			DESCRIPTION:			DESCRIPTION:			DESCRIPTION:		

PLOT DATE:

JOB NUMBER: 107197

CONTRACT NUMBER:

INTERNAL VERSION ISSUE DATES

11/04/98 | 2/18/99

2/10/99

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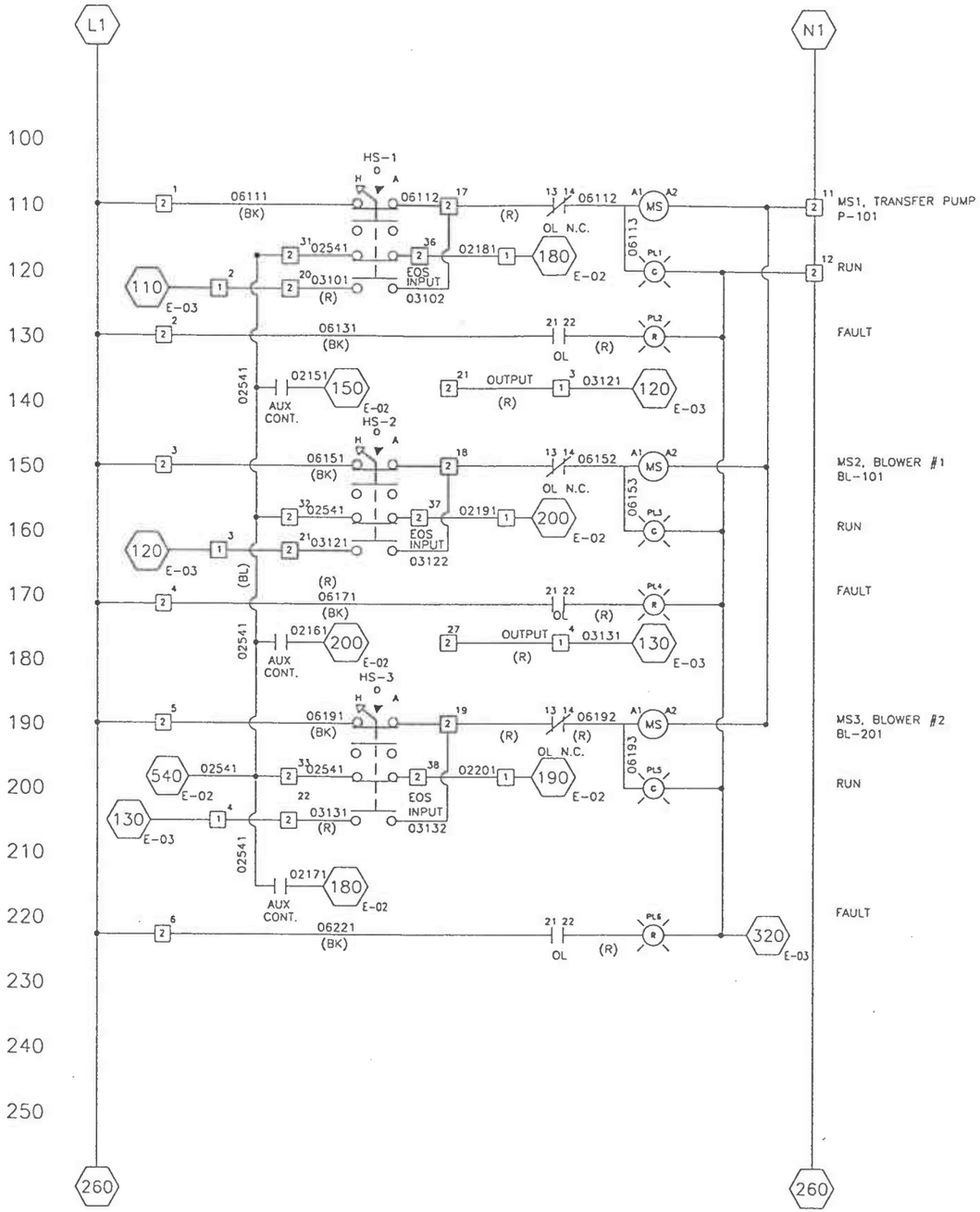
CHECKED BY:		
PROJECT ENGINEER APPROVED	TA	
PROJECT MANAGER APPROVED	JW	

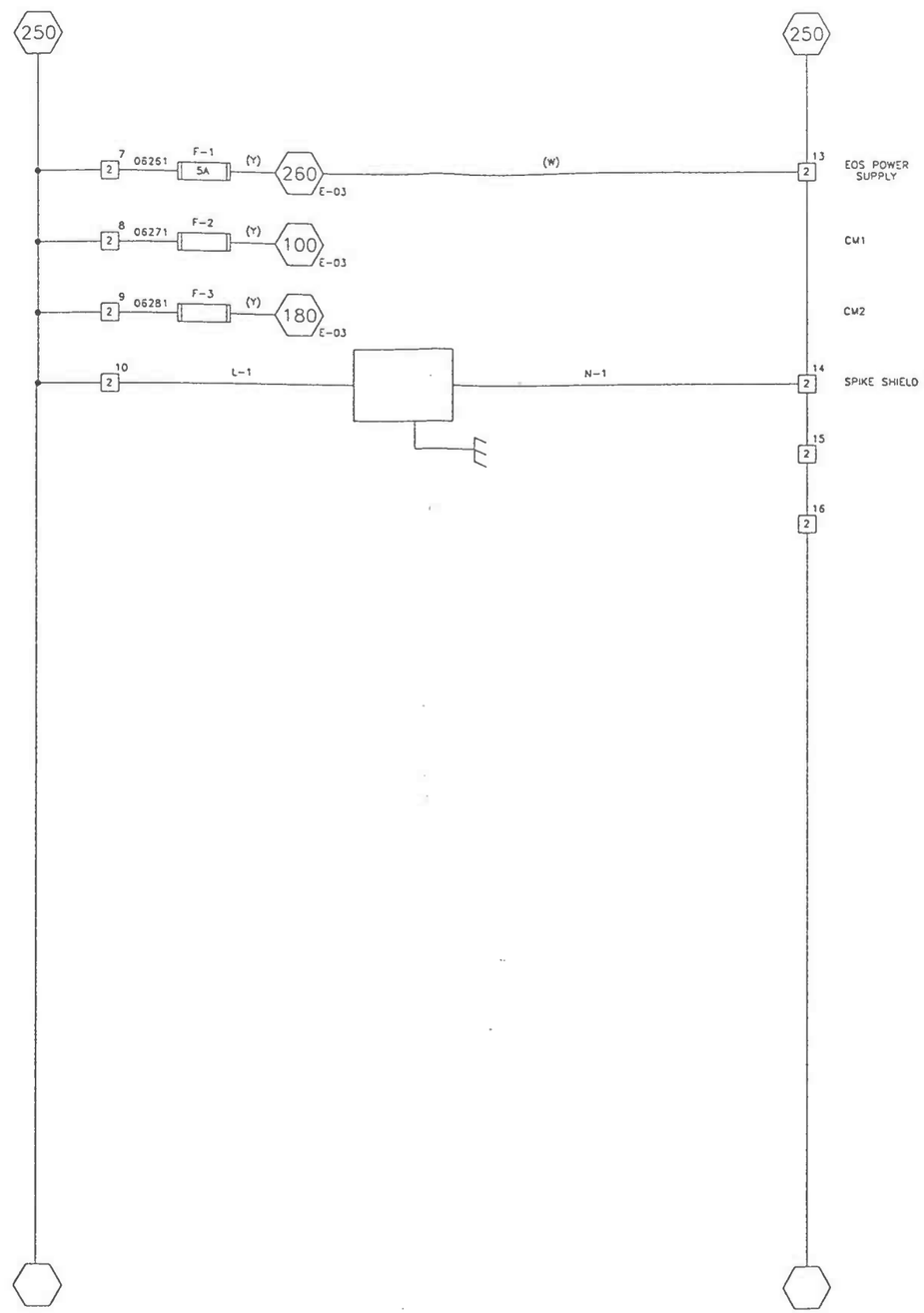
CSK TECHNICAL, INC.
153 WILLIS AVE, P.O. BOX 751
WILLISTON, NEW YORK 11596
PHONE: (516) 877-3700

TITLE: CHEMTROL
OHM
HAMBURG, NEW YORK
SOIL VAPOR EXTRACTION SYSTEM
480VAC SINGLE LINE DIAGRAM

SIZE: D | DWG NO.: E-05 | REV: 03

SCALE: NTS | CSK CAD FILE: E-05





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ENGINEERING	TA		ENGINEERING	TA		ENGINEERING	TA		ENGINEERING	TA		ENGINEERING	MB		ENGINEERING	MB		ENGINEERING		ENGINEERING		ENGINEERING	
DESCRIPTION: AS-BUILTS			DESCRIPTION: AS-BUILTS			DESCRIPTION: AS-BUILTS			DESCRIPTION: AS-BUILTS			DESCRIPTION: AS-BUILTS			DESCRIPTION: AS-BUILTS EDIT LINES 160 180,200, & 210 REFERENCE POINTS			DESCRIPTION:		DESCRIPTION:		DESCRIPTION:	

JOB NUMBER: 107197

CONTRACT NUMBER:

INTERNAL VERSION ISSUE DATES

11/10/98 | 1/22/99 | 2/16/99

11/17/98 | 2/10/99 | 2/18/99

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AS-BUILT

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CSK TECHNICAL, INC.
153 MILES AVE, P.O. BOX 786
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TITLE: CHEM TROL
OHM
HAMBURG, NEW YORK
SOIL VAPOR EXTRACTION SYSTEM
120VAC CONTROL DIAGRAM

SIZE: D | DWG NO.: E-06 | REV: 06

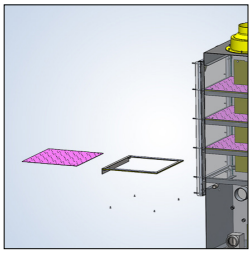
SCALE: NTS | CSK CAD FILE: E-06

PLOT DATE:

EZR TRAY® Air Stripper

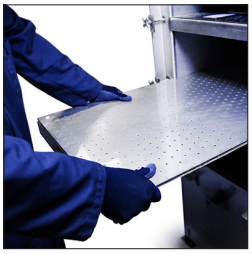
The easier solution for air stripping and VOC removal

QED makes VOC removal even easier with the EZR Tray Air Stripper. The EZR Tray is a sliding tray, stainless steel air stripper ideal for removing volatile organic compounds (VOCs) and dissolved gases from contaminated groundwater and waste streams. The simplified, snap-together tray design is lighter and more cost effective than other designs. Featuring a patented water flow path design, (U.S. Patent No. 10,272,356), the EZR Tray allows flow rates of up to 120 gallons per minute; making it easier for smaller models to remove low concentration or easy to strip contaminants. The EZR Tray design provides easier access for process monitoring, inspection and cleaning, saving time and reducing O&M costs. Offering numerous advantages over other air stripping methods, the EZR Tray Air Stripper is the easiest choice for VOC removal.



Snap-Together tray is up to 50% lighter than previous designs.

Patented water flow channel design allows for increased flow rates – up to 120GPM



Easier Maintenance. The EZR Tray can be cleaned and maintained by a single person.

QED™

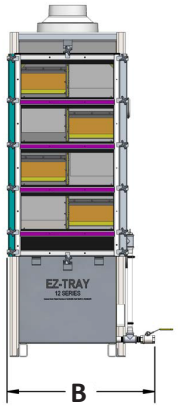
QED Environmental Systems Inc.
2355 Bishop Circle West Dexter, MI 48130,USA

INFO@QEDENV.COM
WWW.LANDTECNA.COM

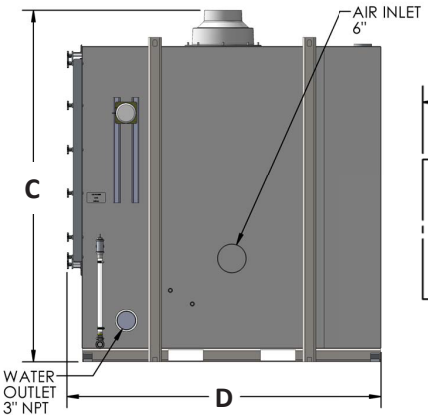
800.624.2026
734.995.2547

EZR Tray Dimensions

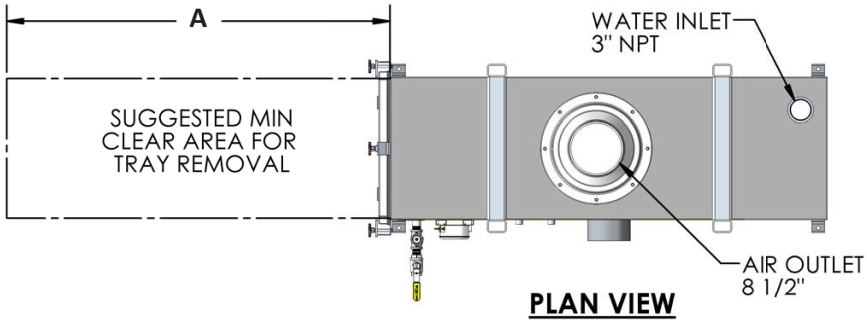
Model number	A (inch/cm)	B (inch/cm)	C (inch/cm)	D (inch/cm)	Air inlet (inch/cm)	Air Outlet ID (inch/cm)	Water inlet (inch)	Water Outlet (inch)
EZ-4.4HF	24/61	34/86	83/211	34/86	4/10	8.5/21.6	3 NPT	3 NPT
EZ-4.6HF	24/61	34/86	103/262	34/86	4/10	8.5/21.6	3 NPT	3 NPT
EZ-6.4HF	36/91	34/86	83/211	46/117	4/10	8.5/21.6	3 NPT	3 NPT
EZ-6.6HF	36/91	34/86	103/262	46/117	4/10	8.5/21.6	3 NPT	3 NPT
EZ-8.4HF	48/122	34/86	80/203	58/147	4/10	8.5/21.6	3 NPT	3 NPT
EZ-8.6HF	48/122	34/86	100/254	58/147	4/10	8.5/21.6	3 NPT	3 NPT
EZ-12.4HF	60/152	34/86	80/203	72/183	6/15	8.5/21.6	3 NPT	3 NPT
EZ-12.6HF	60/152	34/86	100/254	72/183	6/15	8.5/21.6	3 NPT	3 NPT



FRONT VIEW



SIDE VIEW



PLAN VIEW

EZR Tray Specifications

Model number	Max. Flow: gpm (Lpm)	Dry Weight: lbs (Kg)	Oper. Weight: lbs. (Kg)	Shell Dimension (WxDxH): in (cm)	Number of Trays	Tray Weight Lb. (kg)	Max Sump Working Volume: Gal. (Liter)	Active Area: ft2(m2)	Nominal Air Flow: cfm (m3/min)
EZ-4.4HF	1-120 (4-454)	600 (272)	1,250 (567)	34 x 34 x 83 (86 x 86 x 203)	4	15 (6.8)	55 (208)	2.8 (0.26)	210 (5.95)
EZ-4.6HF	1-120 (4-454)	800 (362)	1,545 (700)	34 x 34 x 103 (86 x 86 x 254)	6	15 (6.8)	55 (208)	2.8 (0.26)	210 (5.95)
EZ-6.4HF	1-120 (4-454)	750 (340)	1,710 (775)	34 x 46 x 83 (86 x 117 x 203)	4	22 (10)	77 (291)	4.63 (0.43)	320 (9.06)
EZ-6.6HF	1-120 (4-454)	960 (435)	2,004 (909)	34 x 46 x 103 (86 x 117 x 254)	6	22 (10)	77 (291)	4.63 (0.43)	320 (9.06)
EZ-8.4HF	1-120 (4-454)	910 (412)	2,080 (944)	34 x 58 x 80 (86 x 148 x 203)	4	30 (13.6)	99 (374)	6.45 (0.60)	420 (11.9)
EZ-8.6HF	1-120 (4-454)	1,170 (530)	2,512 (1140)	34 x 58 x 100 (86 x 148 x 259)	6	30 (13.6)	99 (374)	6.45 (0.60)	420 (11.9)
EZ-12.4HF	1-120 (4-454)	1,240 (562)	2,587 (1174)	34 x 72 x 80 (86 x 183 x 203)	4	38 (17.2)	109 (412)	8.55 (0.79)	600 (17.0)
EZ-12.6HF	1-120 (4-454)	1,580 (716)	3,144 (1426)	34 x 72 x 100 (86 x 183 x 259)	6	38 (17.2)	109 (412)	8.55 (0.79)	600 (17.0)

EZR Tray Design

After blower energy costs, maintenance and tray cleaning remains the biggest ongoing expense. Users with high fouling applications often purchase spare trays, soak tanks or coated trays just to maintain their equipment. The EZR Tray design significantly shortens the time to access and clean trays and the design is optimized to save space and cost for the active tray element. Spare tray sets are much more affordable, as are soak tanks for hard to remove scale. The thin aspect of the new tray design drastically lowers the volume required for soaking trays (also using less acid). The EZR Tray design is the answer for easier, faster more cost-effective air stripper maintenance.

© Product designs and specifications are subject to change without notice. User is responsible for determining suitability of product.

QED Environmental Systems Inc.
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QED | EZR-TRAY™ AIR STRIPPER

EZ-4.4HF – EZ-12.6HF

Manual No 95345

EN

Process Unit for stripping dissolved volatile organic chemicals (VOCs) and gases from water using ambient air. For professional use only.

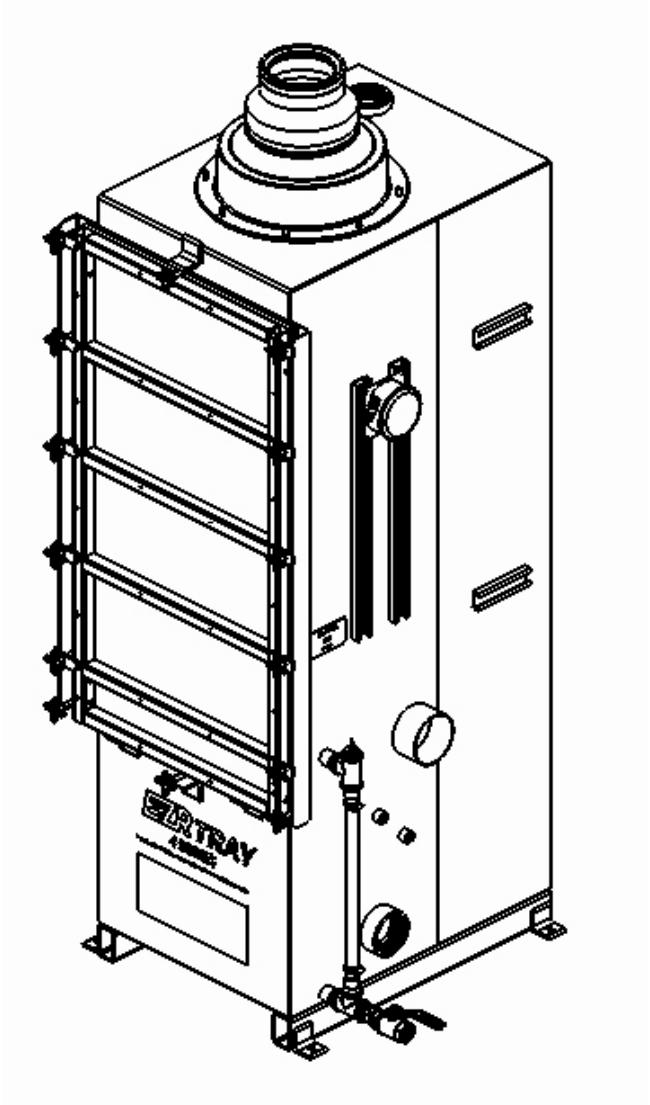
Not approved for use in European explosive atmosphere locations.

Not approved for use in explosive atmospheres or hazardous locations..

Models: EZ-4.4HF, EZ-4.6HF, EZ-6.4HF, EZ-6.6HF, EZ-8.4HF, EZ-8.6HF, EZ-12.4HF and EZ-12.6HF

50 inch-H2O Maximum Working Pressure

See page __ for model information, including maximum working pressure and approvals.



Important Safety Instructions

Read all warnings and instructions in this manual and in the E-Z Tray Systems Manual before using the equipment. Save all instructions.

Contents

Product Models

Related Manuals

Installation Setup Startup

Operation Maintenance

Troubleshooting

Repair

Parts

Specifications

Warranty

Product Models

Part No.	Maximum Working Pressure Inch-H20 (cmH20)	Description	Air Flow cfm (m3/m)	Max Flow gpm (lpm)
EZ-4.4HF	50(127)	VOC Treatment process unit	210 (5.9)	120 (454)
EZ-4.6HF	50(127)	VOC Treatment process unit	210 (5.9)	120 (454)
EZ-6.4HF	50(127)	VOC Treatment process unit	320 (9.1)	120 (454)
EZ-6.6HF	50(127)	VOC Treatment process unit	320 (9.1)	120 (454)
EZ-8.4HF	50(127)	VOC Treatment process unit	420 (11.9)	120 (454)
EZ-8.6HF	50(127)	VOC Treatment process unit	420 (11.9)	120 (454)
EZ-12.4HF	50(127)	VOC Treatment process unit	600 (17)	120 (454)
EZ-12.6HF	50(127)	VOC Treatment process unit	600 (17)	120 (454)

Related Manuals

95168 EZ-Tray Manual -Full
95167 EZ Tray Manual - Box Only
95293 EZ Tray Manual Large Strippers
95165 EZ-2.XP
95166 EZ-4.XP
95164 EZ-Stacker (Box Only)
95167 EZ-Tray (Spanish)

Installation Setup

WARNING

E-Z Tray units are heavy, care should be used when moving and positioning. Use provided fork slots for side lifting with larger units. Trays and other elements may contain sharp edges.

All electrical writing must be done by a qualified electrician and company with all local codes and regulations.

For QED supplied turn-key systems with components by other manufacturers, refer to the project specific **Approval Package** and supporting information. A typical example QED turn-key skid package is shown in Figure 1.

Referring to Figure 2. – install system on a level pad and secure with anchor points located on lower edge of the unit base.

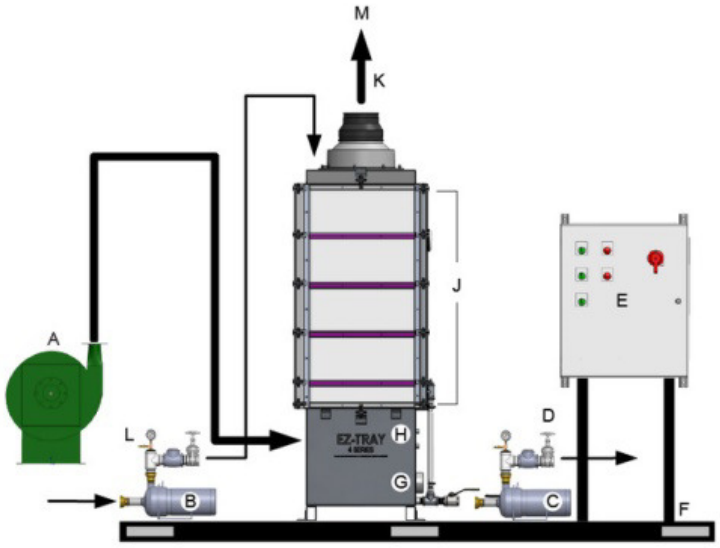
Pipe influent water into the 3-inch NPT inlet port located at the top rear of the E-Z Tray process unit. Pipe effluent water to transfer pump or gravity drain into the 4-inch NPT outlet port located on the front lower right of the E-Z Tray process unit. The E-Z Tray unit has internal water flow stilling baffles, a low exit location and integral vortex eliminator to ensure steady water flow to the transfer pump.

Gravity drains must include a water seal to prevent air exiting from the pressurized clear water sump. The water seal normally requires the addition of 2-3 ft horizontal u-section in the drain. Best height of the u-section depends on water flow rate and number of tray levels (4-tray stage units or 6-tray stage units). Gravity drain piping packages are available from QED.

For pressure air inlet systems (Figure 3.), pipe blower discharge air to 4-inch air inlet port located at the side of the unit. Blower piping should include an inverted U to ensure water never drains into the blower. Blower piping should be sized to minimize losses due to pipe ID and fittings.

For induced draft air systems (Figure 3.), pipe blower air intake to 6-inch or 8-inch air exit port located on top of the stripper process unit. An open pipe inlet with a high opening should be also piped to the 4-inch or 6-inch air inlet port located at side of the unit.

Figure 1.. *Typical example.*



A	Aeration Blower
B	Transfer Pump
C	Discharge Pump
D	Discharge control valve
E	Control Panel
F	Skid
G	Air Stripper Discharge Port
H	Level Switch Couplings
J	Air Stripper Tray Area
K	Air Discharge Connection
L	Pressure Gauge
M	Air Discharge

Figure 2. *typical example.*

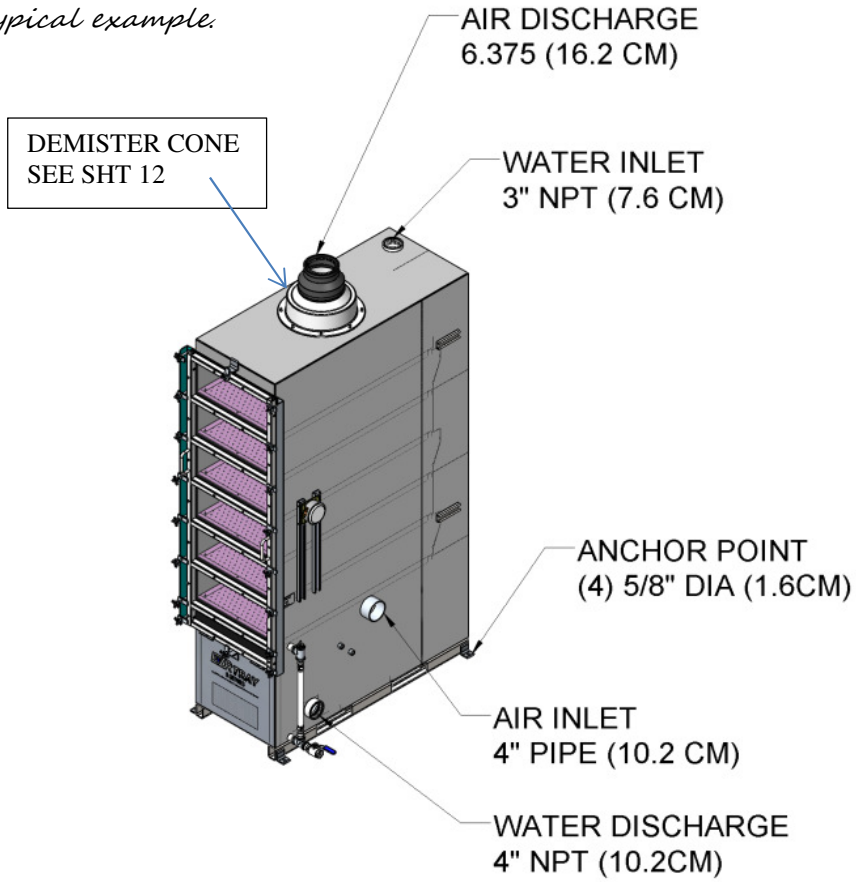
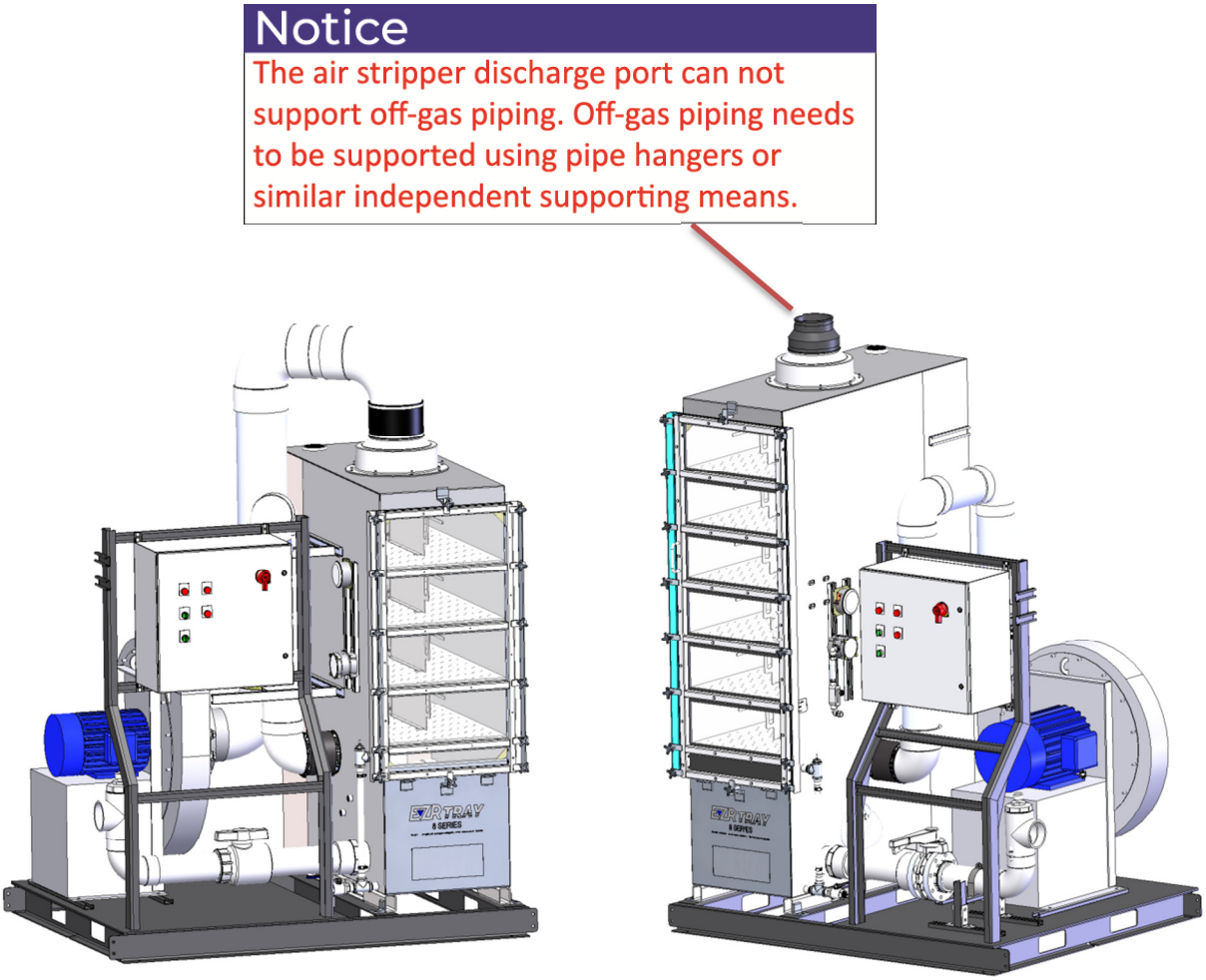


Figure 3. *Piping examples for pressure and induced draft modes.*



Startup Operation

The blower is started before water inflow to the E-Z Tray process unit. Ensure that the blower flow throttle or air flow control valving (by QED or other) is set to deliver the appropriate air flow rate to the stripper. QED supplied blowers include an integral flow throttle in the blower discharge throat. Sump pressure is also a good indicator of proper air flow rate. In general sump pressure should range between 4-6 inch H2O per tray stage (16-24 inch H2O for 4-tray units and 24-36 inch H2O for 6-tray units). The lower end of the range is typical when a unit is clean and the high end is typical for a fouled stripper.

Most applications will require periodic air flow adjustments as the stripper fouls. Fouling increases the back pressure on the blower (delta-P across the trays), so the air throttle can be opened to offset this and maintain the required air flow rate. At some point the stripper will need to be cleaned to return to the clean delta-P across the trays. Once cleaned the blower is again throttled back as described at the start.

When shutting the stripper down it is necessary to maintain blower air flow for about 5-10 minutes to ensure that the partially treated water on the upper trays has extra contact time to strip target VOCs and/or dissolved gases. QED supplied control panels with the intermittent operation option have a shutdown timer that automatically maintains blower operation after a shutdown (including alarm driven shutdowns).

Notice

When taking the stripper off-line for extended periods of time it is recommended that the sump, pumps and other water piping elements be completely drained. This is especially important if the stripper is located in a space where freezing is possible. During normal operation the thermal mass of the water dominates, so very cold air is not a concern.

Maintenance

The most common maintenance issue with an air stripper is tray fouling due to scales and inorganic metal oxides. Bio-slimes, algae and collected solids can also cause issues. The air stripper process relies on maintaining the design air to water ratio (A/W). As stripper trays foul, built up material increases the air flow head loss across the trays. The resulting increased back pressure on the blower lowers the air flow if the blower flow throttle is not adjusted (as described, above). When the blower "turn-up" range is exhausted the stripper trays need to be cleaned to return the system to the clean stage. Periodic cleanings can be expected at a similar interval if fouling factors remain consistent.

A main design feature of the E-Z Tray is the ease of tray access using the removable front door. Cleaning approaches will vary depending on the material that is fouling the trays. Some trays can be cleaned in place by lightly power washing the tray active areas (areas of the trays with air holes). Some fouling is harder to remove and benefits from soaking in dilute recommended acids and/or cleaning solutions.

Additional steps to make cleaning easier of less frequent can include:

- Chemical anti-fouling feeds, such as sequestering agents
- Spare tray sets to allow for cleaning or longer time soaking of fouled trays
- pH adjustment to prevent the formation of metal oxides

A web based fouling prediction tool and supporting documentation regarding fouling and prevention options can be found here –

https://www.qedenv.com/TOOLS/foulingtool/

Cleaning the E-Z Tray

The most common method used for tray cleaning is to use a pressure washer with washer wand. 2 GPM is the recommended minimum water flow at a 900 PSI maximum pressure. Equipment rental companies can usually supply this type of washer on a daily rental basis.

Washer should use a clean water supply with a capacity of at least 2 GPM at 20 PSI, connected to the pressure washer by means of an ordinary garden hose.

The QED air stripper is designed for easy cleaning. Trays can either be removed for cleaning or left in the unit and cleaned. Another option is the purchase of a spare set of trays. Spare trays can quickly be used to replace the fouled trays, reducing air stripper down-time and allowing maintenance personnel to clean the trays at their convenience.

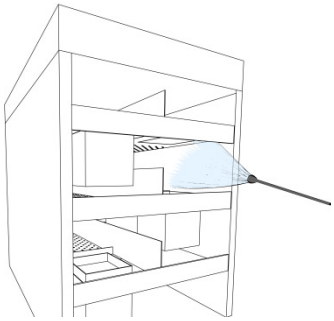
Cleaning Steps

Step 1. Turn Off Equipment, Perform Electrical Lockout Procedure
Turn off the feed water supply and all associated electrical equipment.

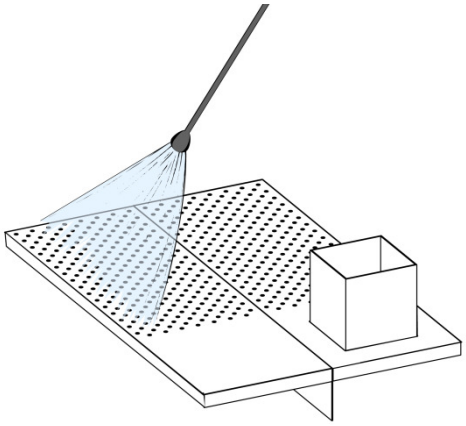
Step 2. Provide for Waste Disposal
Make provisions for disposing of the sludge and waste generated during cleaning.

Step 3. Remove Stripper Door
Either remove the trays from the air stripper unit or leave them in for cleaning.

Step 4. Turn On Water and Pressure Washer
Turn on the water supply to the pressure washer. Then, turn on the pressure washer itself. Wear recommended protective goggles while spraying.

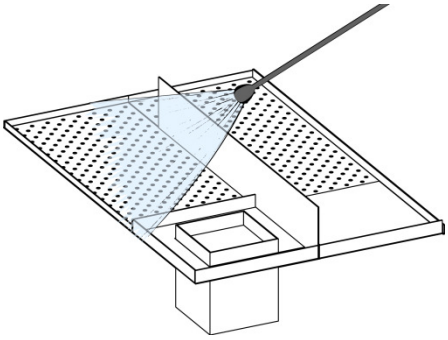


Step 5. Insert Wand into Air Stripper
(This step is for cleaning trays while they remain in the air stripper unit. If trays have been removed for cleaning, skip step 5 and proceed to step 6.) Insert the wand all the way into the door opening. Point the spray nozzle up towards the bottom of the lowest tray.

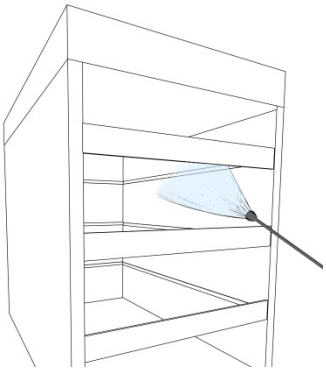


Step 6. Clean Bottom Side of Tray
Holding the wand tightly, pull the trigger to start the pressurized water flow. Expect the wand to kick back as flow starts. Move the wand side to side at a rate of about 1" per second. Be sure to cover the entire tray bottom area. The tray holes must be cleaned of all deposits. Periodically stop the cleaning operation and inspect the cleaned area. The area is clean when there are no deposits around the aeration holes. Be sure to not remove or loosen the felt when doing this.

Step 7. Clean Top Side of Tray
Move the wand to the top side of the tray. Continue spraying with the nozzle pointed down onto the top surface of the tray. For older model E-Z Tray units, also clean the downcomer and sealpot areas. Remove all visible deposits from the tray baffles and the walls of the unit. Inspect the cleaned area for deposits.



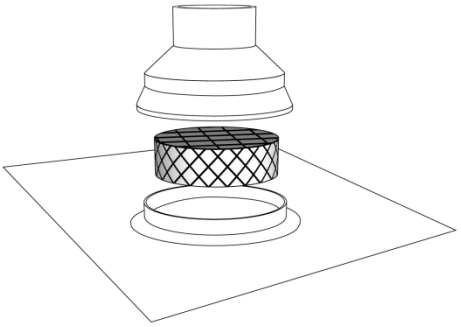
Step 8. Repeat for all Trays
Repeat the procedure for all trays, working up to the top-most tray.



Step 9. Spray the Ceiling and Walls of the Air Stripper (optional).
Cleaning the walls and ceiling are not necessarily required for proper air stripper operation.

Step 10. Rinse
After the cleaning operation is finished, rinse the ceiling, trays, baffles and walls with the pressure washer. Work down from the top down to the sump tank. Make sure the surfaces are clean and the holes are not blocked by loosened debris.

Step 11. Check the Demister Pad and Replace as Necessary
Inspect the demister pad and clean as needed. Use the pressure sprayer to remove debris, deposits and gummy residues sometimes found on the demister pad. Demister pads that are excessively plugged should be replaced.



Step 12. Inspect the Air Stripper
Visually inspect the air stripper box for the following:
1. Door gasket integrity
2. Inspect the air stripper for any damage and repair as necessary.
3. Aeration tray integrity. Inspect trays for structural damage.
4. Inspect any internal piping (on some units, typically PVC piping) and replace as necessary.

Note: Door gaskets will need to be replaced after 5-10 door openings and closings. The gasket loses some amount of sealing compression on each cycle. Tray sealing felt (located on the underside of each tray along the edges) is serviced at a lower frequency than the door gasket. Tray felt wear is based on tray removal frequency and how carefully the trays are removed and re-installed. See spare parts section for QED part numbers.

QED Air Stripper Cleaning Solution Recommendations

While pressure washing is often effective at removing scales and other solids from around stripper tray sieve holes, sometimes the scale is tightly adhered and requires a chemical solution to soften and/or re-dissolve the solids. Care needs to be exercised in selecting cleaning chemicals to avoid damage to the stripper metal enclosure.

General Precautions – Use adequate personal protection and recommended procedures when handling cleaning chemicals (eye shields, gloves of appropriate resistance, vented area, etc.). Consult with your company's health and safety coordinator for recommendations prior to attempting cleaning activities. An example PPE for citric acid is shown, below.

Citric Acid – QED's general recommendation is the use of a dilute citric acid solution for scale cleaning. Dilute citric acid can be used with the standard 304 stainless steel used in the E-Z Tray systems and additionally with both 316 stainless steel and marine grade aluminum versions. Citric is also safe to use with the HDPE E-Z Stacker.

Citric acid can be purchased in powder or granular form and is added to water to create a cleaning solution. A solution of 20-30% can be made by using the following weight to volume guide –

Citric Solution	Ratio (gm/ml)	Ratio (lbs/gal)
20%	250 gm / 1000ml	2lbs / 1gal
30%	430 gm / 1000ml	3.6 lbs / 1gal

Other Acids – For more aggressive scales stronger acid solutions may be tested. The following is a general guide for dilute solutions in the 10-20% range. It is suggested that a small area be tested with the acid solution to evaluate effectiveness and observe any impacts on the stripper materials. **Do not use hydrochloric (muriatic) acid on stainless steel (E-Z Tray version of strippers).**

304 stainless steel (standard E-Z Tray) – Solutions of nitric or phosphoric acid can be used.
316 stainless steel – Solutions of nitric, phosphoric or sulfuric acid can be used.
Marine grade aluminum – Solutions of phosphoric acid can be used.
HDPE (Plastic E-Z Stacker) – Solutions of hydrochloric, nitric, phosphoric or sulfuric acid can be used.

Example MSDS PPE for a 20% citric acid solution
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Troubleshooting

Problem	Cause	Solution
Leaks around door	Worn door gasket Door knobs not tight	Replace door gasket Tighten knobs
Air blowing up tray edges	Worn or damaged tray felt Tray not installed correctly	Replace tray felt Reseat tray
Water raining through air holes in trays (weeping)	Air flow rate is too low	Open blower air throttle Clean trays
Water blowing from stripper air discharge	Air flow rate is too high Demister is fouled Water flow rate too high	Close blower air throttle Clean or replace demister Lower water flow rate
Erratic or unstable operation	Air flow rate is too high Water flow rate exceeds unit maximum	Close blower air throttle Lower water flow rate
Unit not meeting expected removal targets	Numerous	Confirm air flow rate Investigate – surfactants, free-phase organics, organic solids, other polar organics **Contact QED Technical Support**

Repair

For structural damages, spare trays and other major air stripper component issue, **contact QED Technical support.**

Spare Parts

Models: EZ-4.4HF,EZ-4.6HF,EZ-6.4HF,EZ-6.6HF,EZ-8.4HF,EZ-8.6HF,EZ-12.4HF and EZ-12.6HF

Item	Part Number	Quantity
Door Gasket	808084 4 high	1
Door Gasket	808085 6 high	1
Tray Felt	FELTKIT70	1
Demister pad	808093 9”	1
Demister pad	808094 12”	1
Sight tube	807580	1
Door knob	805042	as needed
Channel Flap	808074	as needed
Door Latch	807100	as needed

Specifications

Model number	Max. Flow: gpm (Lpm)	Dry Weight: lbs (Kg)	Oper. Weight: lbs. (Kg)	Shell Dimension (WxDxH): in (mm)	Number of Trays	Tray Weight Lb. (kg)	Max Sump Working Volume: Gal. (Liter)	Active Area: ft2(m2)	Nominal Air Flow: cfm (m3/min)
EZ-4.4HF	1-120 (4-454)	600 (272)	1,250 (567)	34 x 34 x 83 (860 x 860 x 2030)	4	15 (6.8)	55 (208)	2.8 (0.26)	210 (5.95)
EZ-4.6HF	1-120 (4-454)	800 (362)	1,545 (700)	34 x 34 x 103 (860 x 860 x 2540)	6	15 (6.8)	55 (208)	2.8 (0.26)	210 (5.95)
EZ-6.4HF	1-120 (4-454)	750 (340)	1,710 (775)	34 x 46 x 103 (860 x 1170 x 2540)	4	22 (10)	77 (291)	4.63 (0.43)	320 (9.06)
EZ-6.6HF	1-120 (4-454)	960 (435)	2,004 (909)	34 x 58 x 103 (860 x 1170 x 2540)	6	22 (10)	77 (291)	4.63 (0.43)	320 (9.06)
EZ-8.4HF	1-120 (4-454)	910 (412)	2,080 (944)	34 x 58 x 80 (860 x 1480 x 2030)	4	30 (13.6)	99 (374)	6.45 (0.60)	420 (11.9)
EZ-8.6HF	1-120 (4-454)	1,170 (530)	2,512 (1140)	34 x 58 x 100 (860 x 1480 x 2540)	6	30 (13.6)	99 (374)	6.45 (0.60)	420 (11.9)
EZ-12.4HF	1-120 (4-454)	1,240 (562)	2,587 (1174)	34 x 72 x 80 (860 x 1830 x 2030)	4	38 (17.2)	109 (412)	8.55 (0.79)	600 (17.0)
EZ-12.6HF	1-120 (4-454)	1,580 (716)	3,144 (1426)	34 x 72 x 100 (860 x 1830 x 2540)	6	38 (17.2)	109 (412)	8.55 (0.79)	600 (17.0)

Removal performance is predicted with the QED Air Stripper performance model. The model can be found here –

https://www.qedenv.com/TOOLS/modeler/

Model use:

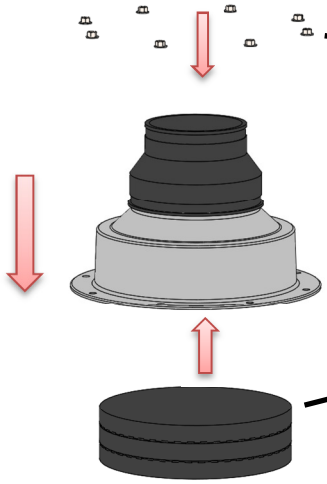
1. Select the way you want the contaminants to be sorted (alphabetic or by Henry's constant) on this page and then hit the Run Model button.
2. Select the units (metric or English) that you wish to use for data input and reporting and check all the contaminants you wish to model. Hit the Next button.
3. Enter the required data and the contaminant levels required. Hit the Next button.
4. View the output report. Use your browser's back button to change conditions and re-model.

Model results assume -

- Contaminants are in the dissolved-phase, within a water matrix
- Stripper Influent air is contaminant-free
- Influent liquid does not have surfactants, oil, grease, other immiscible phase(s) or other Henry's constant altering additions present, such as dissolved phase polar organic contaminants
- The air stripper is operated within the given parameters listed above and as instructed in the E-Z Tray O&M manual

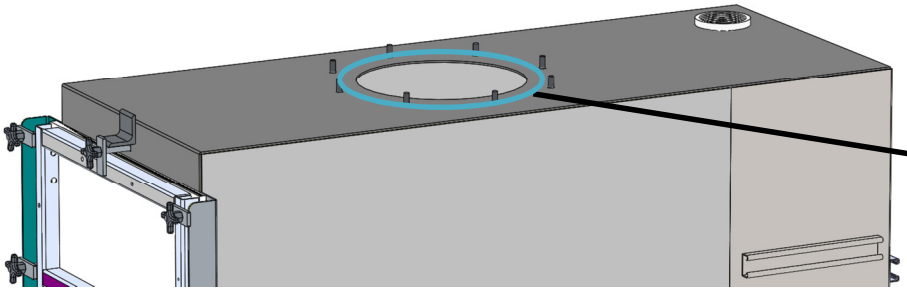
The model report includes a URL that can be saved to quickly reconstruct your data form for future remodeling with changes.

Demsiter Cone Installation

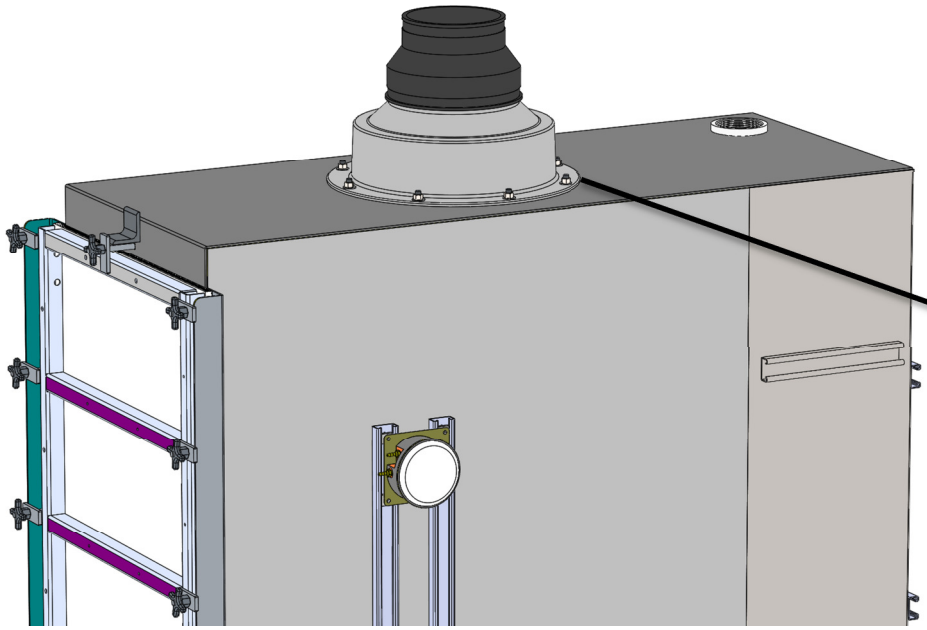


3/8 nuts and washers

Insert the demister into the bottom of the cone, before attaching the cone to the air stripper

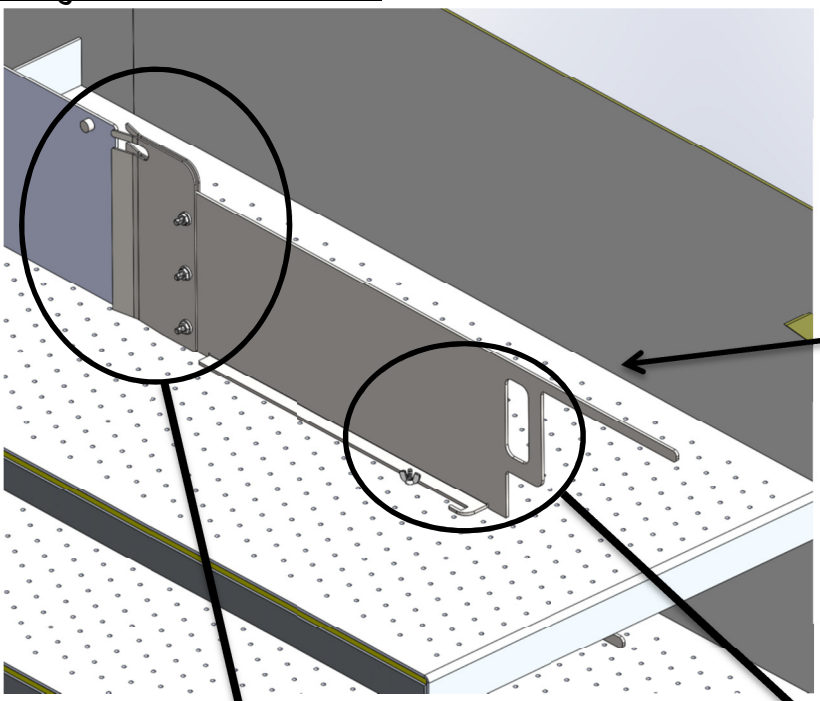


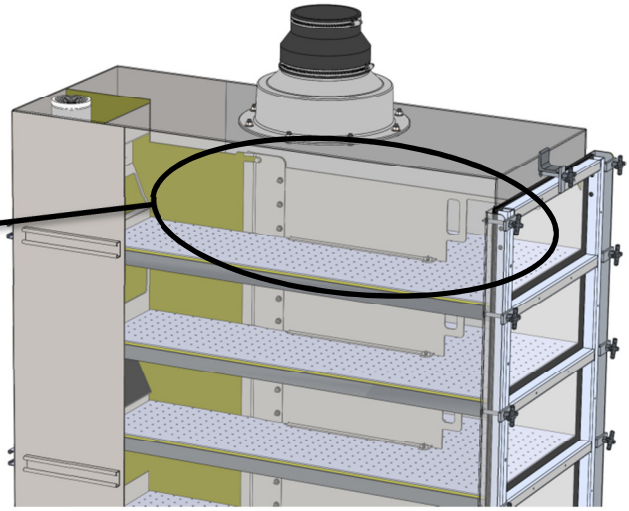
Apply a good bead of caulk around the bolt circle

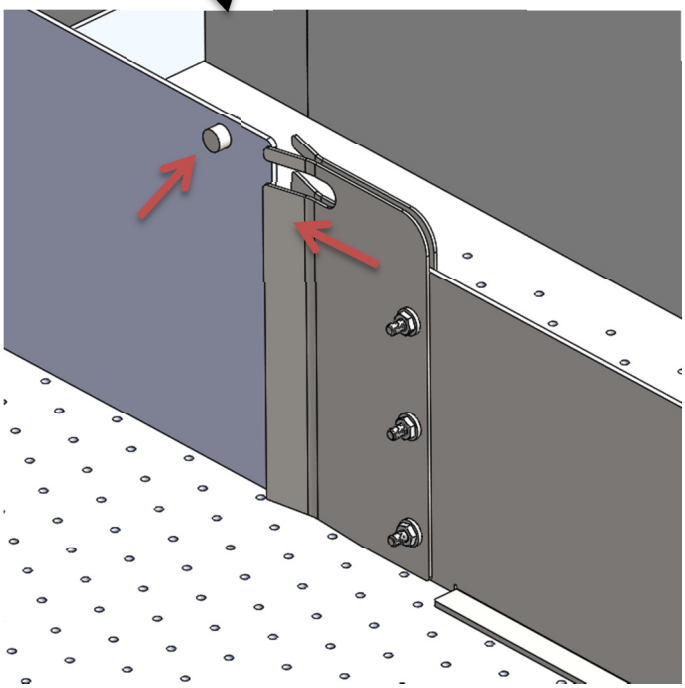


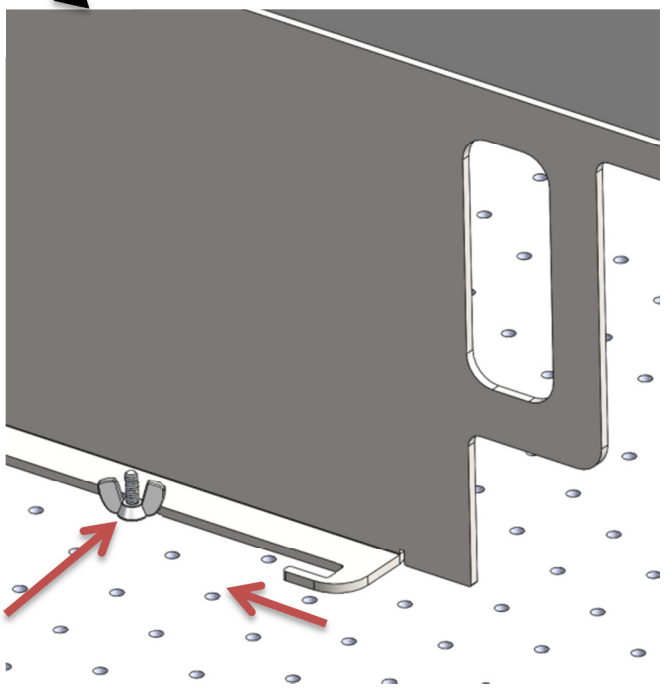
Tighten nuts and washers to 10 ft/lbs toque minimum, but do not over tighten.

Tray Weir Installation





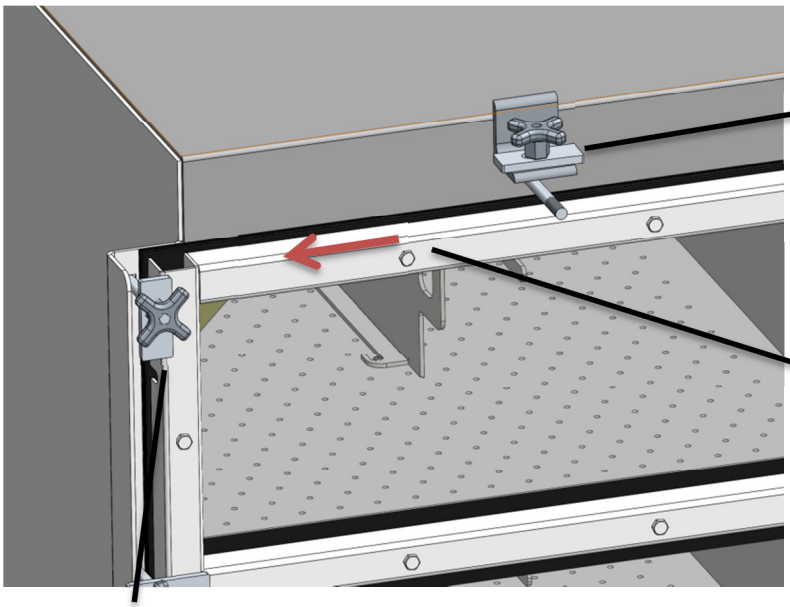




Slide the weir in so that the fixed weir slides in between the two plates and onto the weir pin. Used only on the 6, 8 and 12 series units.

Continue to slide the weir in so that the slot engages the wing nut. Used only on 8 and 12 series units.

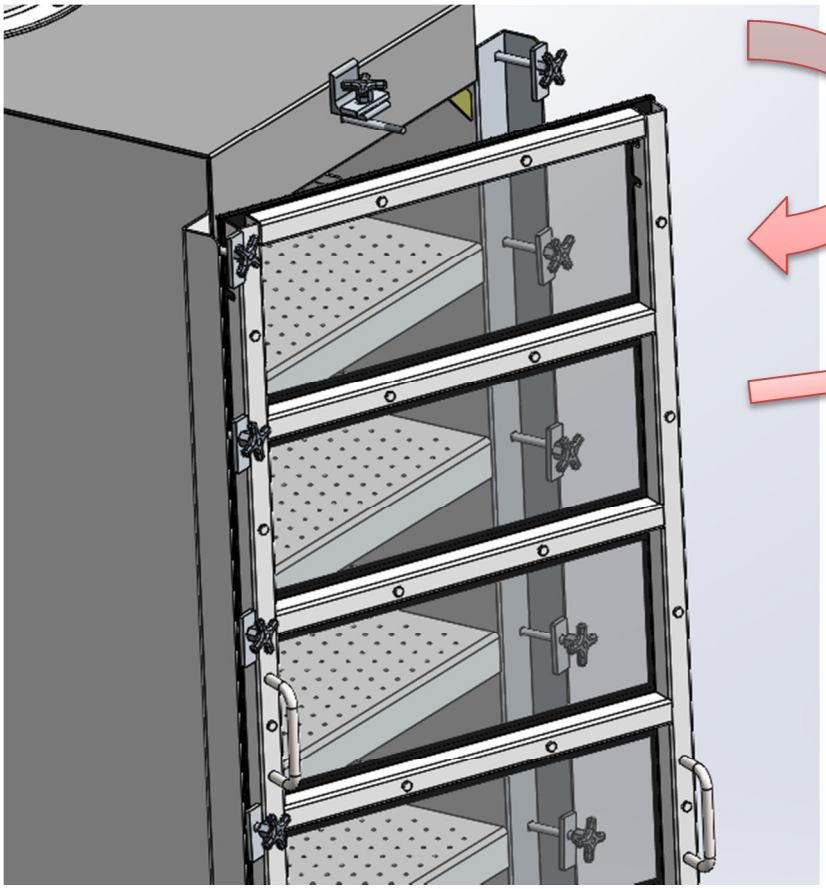
DOOR REMOVAL



2. Remove top and bottom knob and latch.

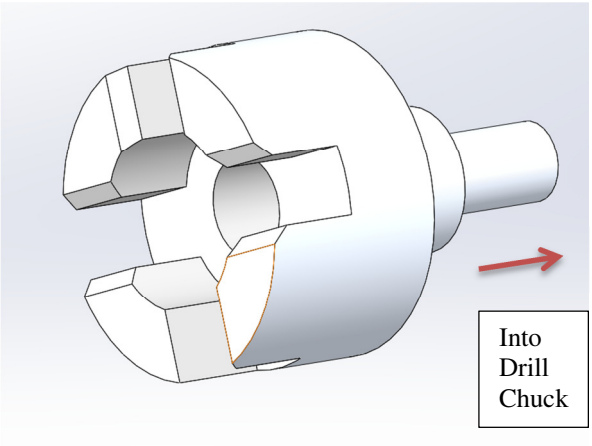
3. Slide the door to the left under the latches

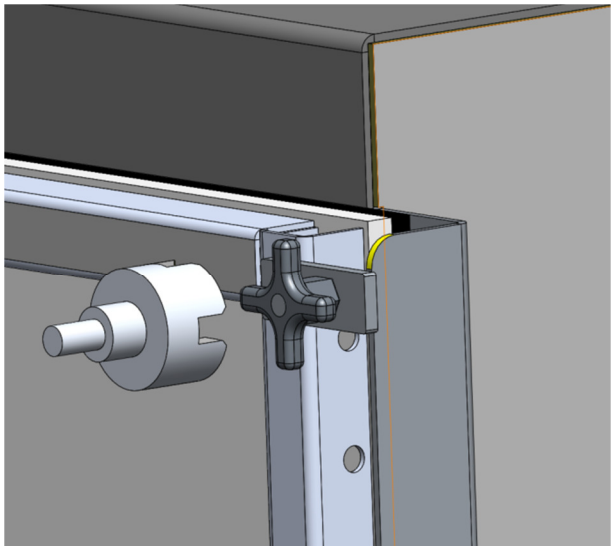
1. Loosed all knobs to allow latches to hang vertical



Rotate door and pull out to remove the door

Knob Removal Tool (807200)





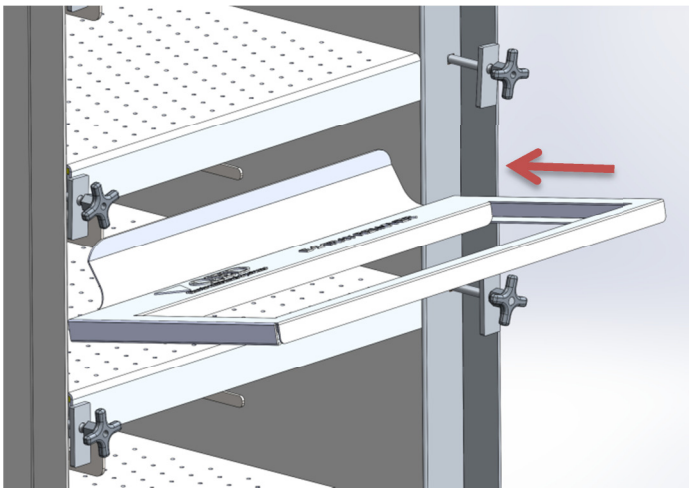
KNOB REMOVAL:

1. Use a power drill with reverse settings and preferably use one that has a variable seeds and adjustable torque settings.
2. Keep in mind that drive tools such as these have a lot of power and torque. Refer to, understand, and foloow all safety precautions and operation instructions of such power tools prior to use.
3. Install Knob Removal Tool in appropriate drill chuck and tighten securely.
4. Set torque setting on highest setting (if equipped).
5. Set rotation of drill to counterclockwise rotation.
6. Place tool over each knob, begin certain that the tool is squarely on the knob.
7. Begin by operating the drill as you normally would and spin off each knob. Work from the bottom of the each access door up, and leave one knob at the top of each access door on so that the door will not fall off suddenly.
8. If stuck ofr stubborn knobs cannot be loosened using this methon, use a wrench first and loosen slightly. If rust or corrosion is present or suspected, spray each knob/stud with a light penetration oil first and let it set for some time prior to removal.

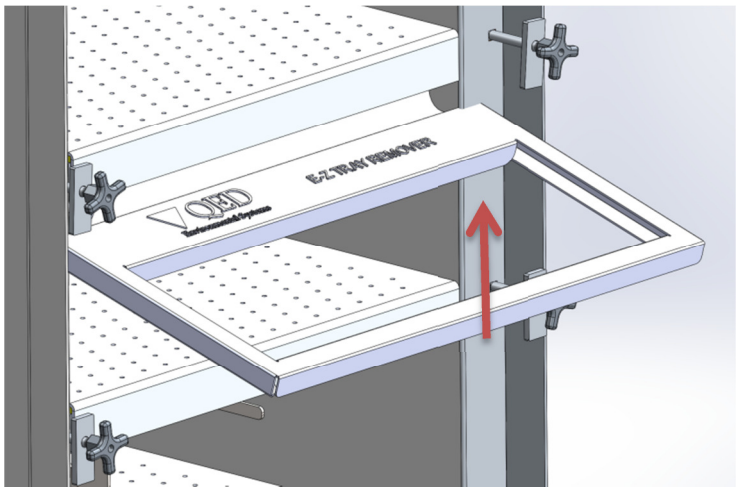
KNOB INSTALLATION:

1. Be sure all knobs are started on each stud by hand prior to using the tool.
2. Set drill to clockwise rotation.
3. Set torque setting (if equipped) to approxiately 50% of maximum torque.
4. Using the same tool, alternate from side to side, top to bottom, and diagonally to provide even sealing pressure across entire door surface. Be carful not to over tightedn any knob, which could cause damage to the access door and /or damage (strip) the interanal threads of the knob.
5. If knobs are not tight encough to provide adequate sealing pressure, incareace the torque seeing of the drill slightly to add tightenign torque and repeat as necessarey. If knobs are still not tight encough at miximum drill torque, use a wrench to tighten.

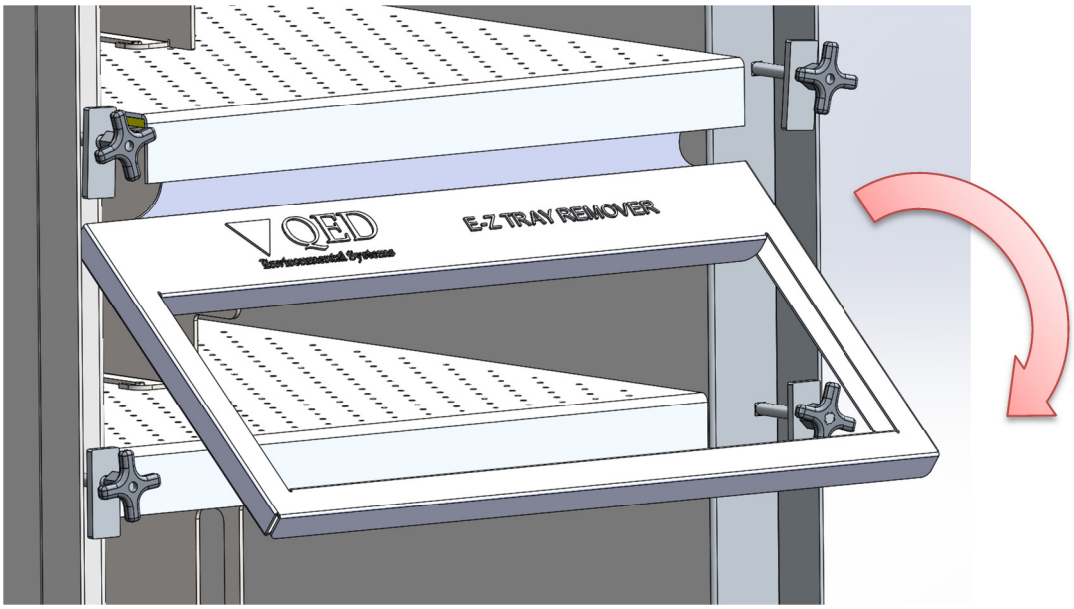
TRAY REMOVER (807201)



Using the tray remover (807201) insert behind Tray front lip

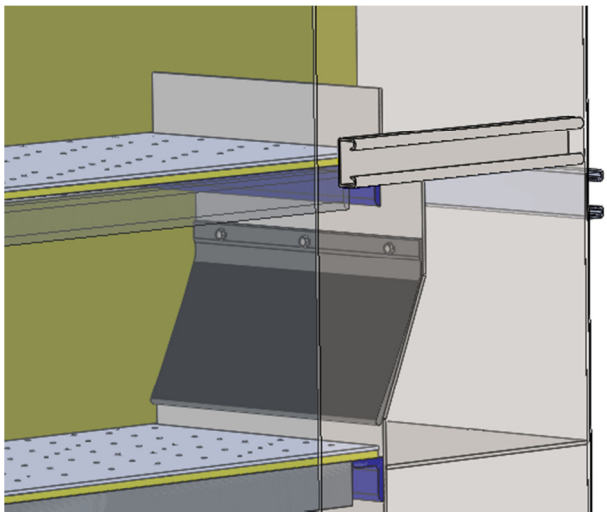


Slide up under the tray

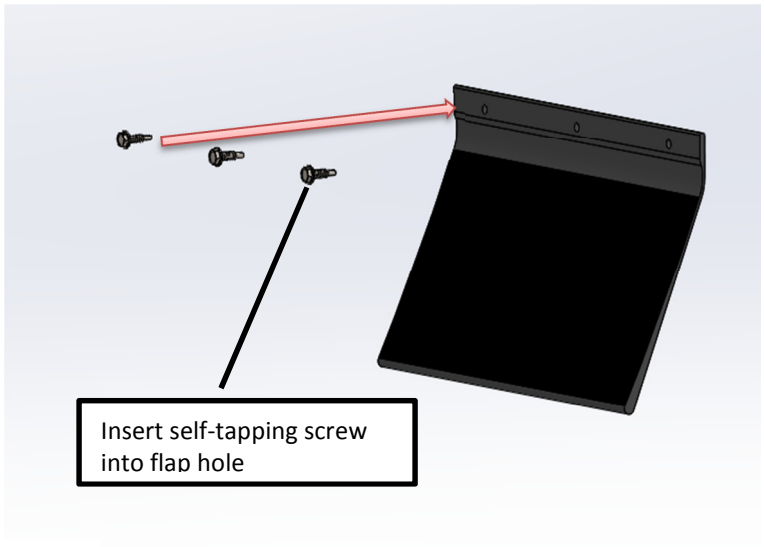


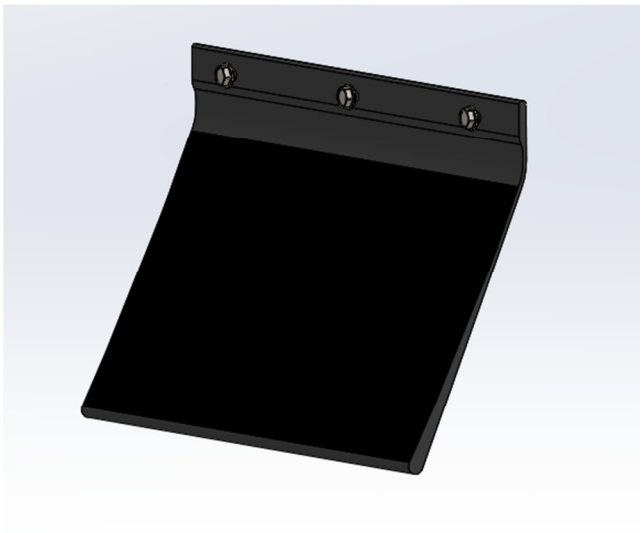
Rotate the tray remover down to loosen the tray. Once the tray is loose the remover is no longer needed

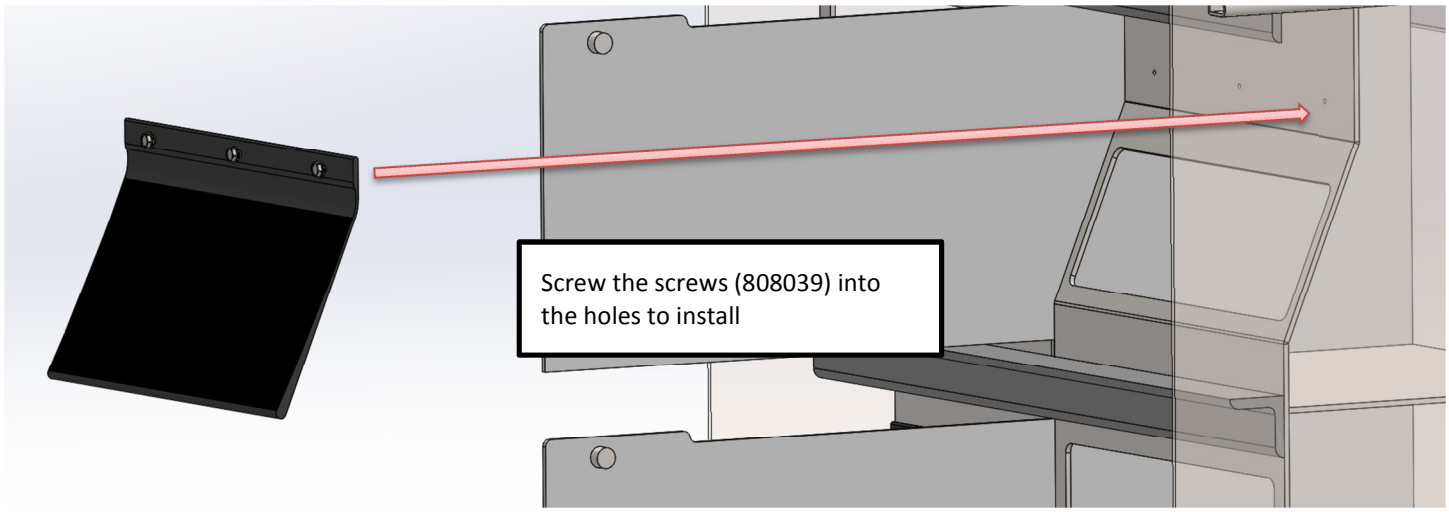
Downcomer Flap Installation (808074)



Installed flap (808074)
with screws (808039)







Equipment Warranty

QED Environmental Systems Inc. (QED) warrants to the original purchaser of its products that, subject to the limitations and conditions provided below, the products, materials and/or workmanship shall reasonably conform to descriptions of the products and shall be free of defects in materials and workmanship. Any failure of the products to conform to this warranty will be remedied by QED in the manner provided herein.

QED warrants the equipment components of its manufacture for a period of one (1) year from date of delivery. Our sole obligation during this warranty will be to repair or replace (at our option) the defective components. We are not responsible for consequential damages. Labor costs are not included.

Purchaser's exclusive remedy for breach of said warranty shall be as follows: if, and only if, QED is notified in writing within the applicable warranty period of the existence of any such defects in the said products, and QED upon examination of any such defects, shall find the same to be within the term of and covered by the warranty running from QED to Purchaser, QED will, at its option, as soon as reasonably possible, replace or repair any such product, without charge to Purchaser. If QED for any reason, cannot repair a product covered hereby within four (4) weeks after receipt of the original Purchaser's notification of a warranty claim, then QED's sole responsibility shall be, at its option, either to replace the defective product with a comparable new unit at no charge to the Purchaser, or to refund the full purchase price. In no event shall such allegedly defective products be returned to QED without its consent, and QED's obligations of repair, replacement or refund are conditioned upon the Purchaser's return of the defective product to QED.

IN NO EVENT SHALL QED ENVIRONMENTAL SYSTEMS INC. BE LIABLE FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES FOR BREACH OF SAID WARRANTY.

The foregoing warranty does not apply to major subassemblies and other equipment, accessories, and other parts manufactured by others, and such other parts, accessories, and equipment are subject only to the warranties supplied by their respective manufacturers. In the event of failure of any such product or accessory, QED will give assistance to Purchaser in obtaining from the respective manufacturer whatever adjustment is reasonable in light of the manufacturer's own warranty.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY (INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANT ABILITY AND FITNESS FOR A PARTICULAR PURPOSE), WHICH OTHER WARRANTIES ARE EXPRESSLY EXCLUDED HEREBY, and of any other obligations or liabilities on the part of QED, and QED neither assumes nor authorizes any person to assume for it any other obligation or liability in connection with said products, materials and/or workmanship.

It is understood and agreed that QED shall in no event be liable for incidental or consequential damages resulting from its breach of any of the terms of this agreement, nor for special damages, nor for improper selection of any product described or referred to for a particular application.

This warranty will be void in the event of unauthorized disassembly of component assemblies. Defects in any equipment that result from abuse, operation in any manner outside the recommended procedures, use and applications other than for intended use, or exposure to chemical or physical environment beyond the designated limits of materials and construction will also void this warranty.

The equipment is warranted to perform as specified under the conditions specified here and within the air stripper model or QED will make the necessary changes at no cost to the owner. Some restrictions apply. Requirements for warranty consideration include, (but are not limited to):

1. Current operating conditions do not differ from the previously-modeled conditions.
2. The system should be cleaned regularly to maintain system performance.
3. The equipment is installed, operated and maintained according to QED's instruction or non-QED manufactured subassembly manufacturer’s instructions.
4. Air stripper influent air is not “ dirty” (does not contain VOC’s, etc.).
5. No surfactants, oils, greases, immiscible phases or other Henry's constant altering water additions present in the water.
6. Each influent contaminant does not exceed 25% of its maximum solubility under modeled conditions.

QED shall be released from all obligations under all warranties if any product covered hereby is repaired or modified by persons other than QED's service personnel unless such repair by others is made with the consent of QED. If any product covered hereby is actually defective within the terms of this warranty, Purchaser must contact QED for determination of warranty coverage. If the return of a component is determined to be necessary, QED will authorize the return of the component, at owner's expense. If the product proves not to be defective within the terms of this warranty, then all costs and expenses in connection with the processing of the Purchaser's claim and all costs for repair, parts and labor as authorized by owner hereunder shall be borne by the Purchaser.

In the event of air stripper performance issues, QED may require customer to conduct a variety of troubleshooting steps. These include, but are not limited to, modifying operational parameters, cleaning air stripper system, modifying (temporarily or permanently) process piping, and obtaining reasonable and necessary influent/effluent samples. These steps are the responsibility of the customer and will be conducted by customer prior to consideration by QED for a site visit. These steps and the associated costs incurred are the responsibility of the customer, regardless of future action. Should customer request a site visit by QED or accept a site visit offer by a QED-trained technician, the visit and associated costs: a) will be the responsibility of the customer at $750/day, plus travel, lodging, and meals, if the visit finds improper sampling, process piping installation, or equipment operation inconsistent with QED's Operation and Maintenance Manual; or b) will be the responsibility of QED if the visit finds QED responsible for the performance issue(s) raised.

The original Purchaser's sole responsibility in the instance of a warranty claim shall be to notify QED of the defect, malfunction, or other manner in which the terms of this warranty are believed to be violated. You may secure performance of obligations hereunder by contacting the Customer Service Department of QED and:

1. Identify the product or system involved by job number or QED order number.
2. Specifying where, when, and from whom the product was purchased.
3. Describing the nature of the defect or malfunction covered by this warranty.
4. If applicable, send the malfunctioning component, after receiving a Return Authorization Code (RAC) Number from the QED Service Department, to:

QED Environmental Systems Inc.
2355 Bishop Circle West
Dexter, MI 48130
Attn: RAC Number
(RAC provided by QED Service Dept.)

All written and visual data contained in this document reflects the latest product information available at the time of publication.
QED reserves the right to make changes at any time without notice.

Original instructions. This manual contains English.
QED Headquarters: Michigan

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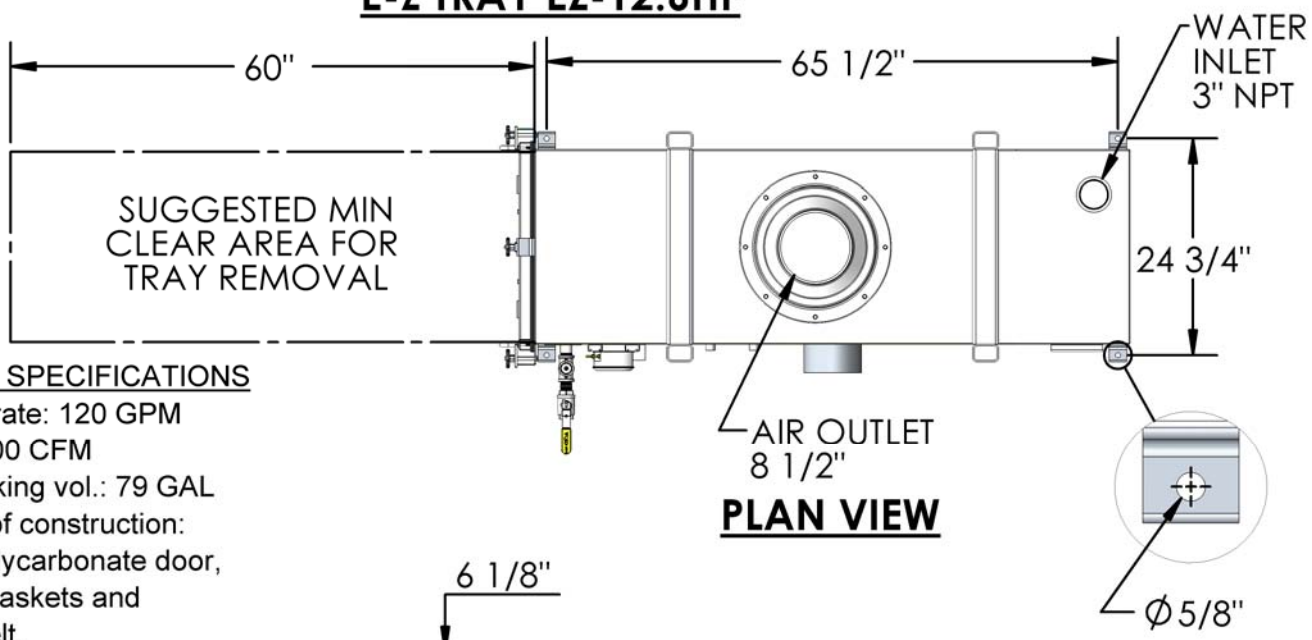
www.qedenv.com
www.graco.com
Revision A, November 2019

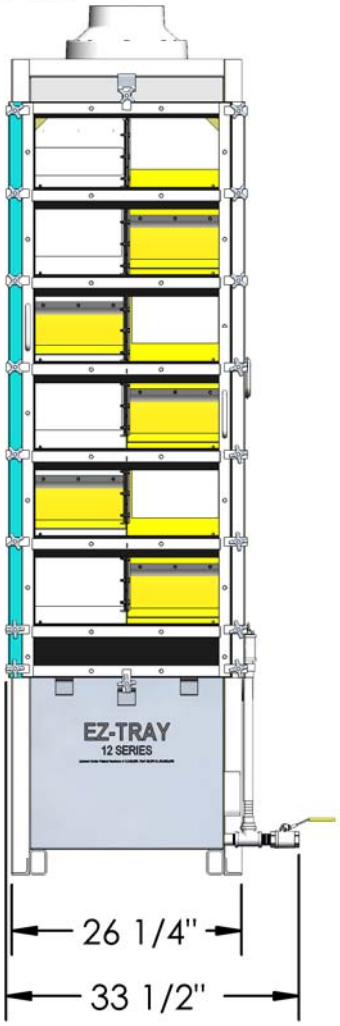
E-Z TRAY EZ-12.6HF



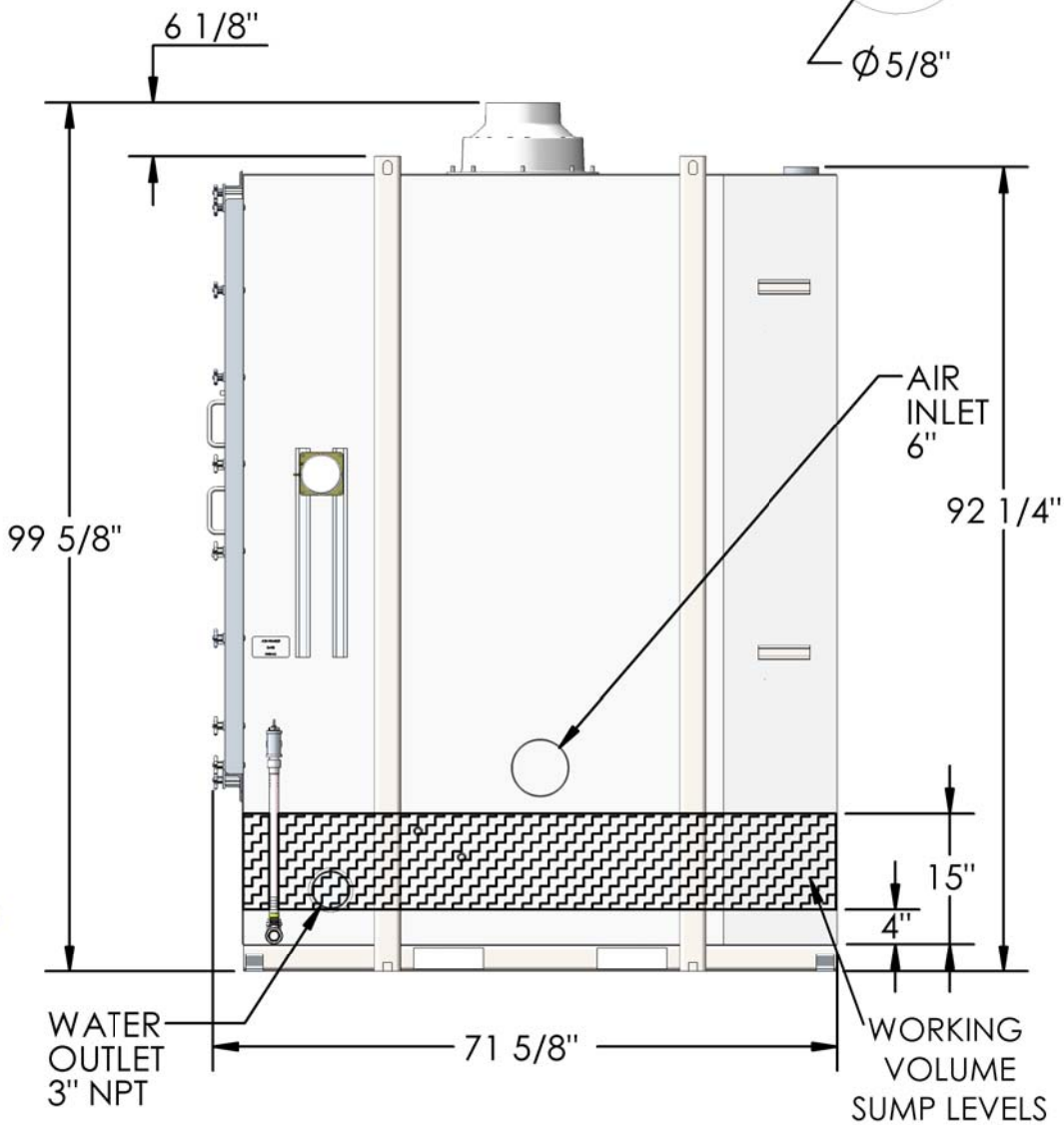
PLAN VIEW

GENERAL SPECIFICATIONS

-Max. flow rate: 120 GPM
-Air flow: 600 CFM
-Sump working vol.: 79 GAL
-Materials of construction: 304SS , polycarbonate door, neoprene gaskets and polyester felt.



FRONT VIEW



SIDE VIEW

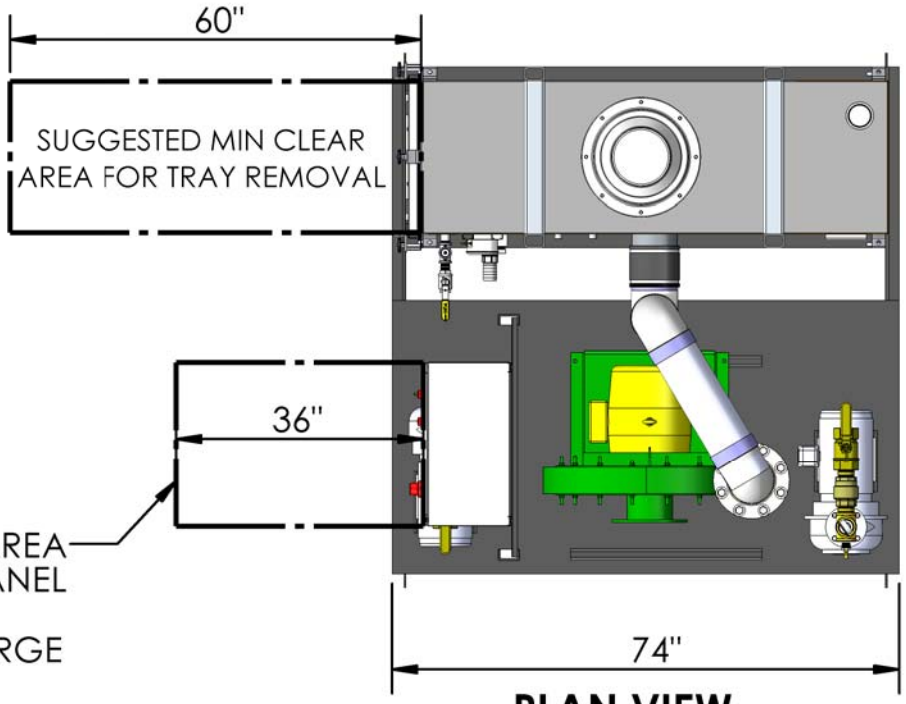
EZ-12.6HF (AIR STRIPPER ONLY)

FOR MORE SPECIFICATIONS SCAN:
http://www.qedenv.com

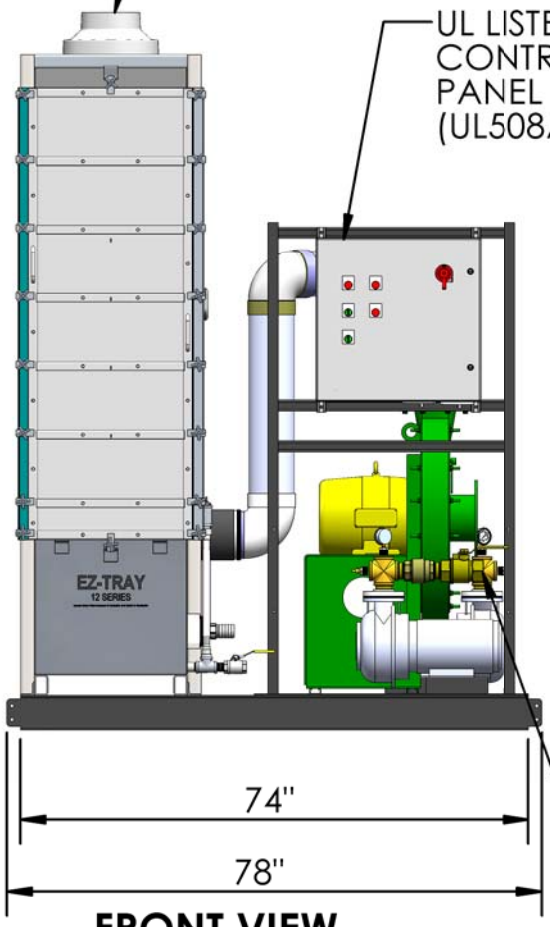
NOT TO SCALE, *NOT FOR CONSTRUCTION, FOR REFERENCE ONLY*
LICENSED UNDER PATENT # 10,272,356 B2 AND MORE U.S. AND NON U.S. PATENTS.

GENERAL SPECIFICATIONS

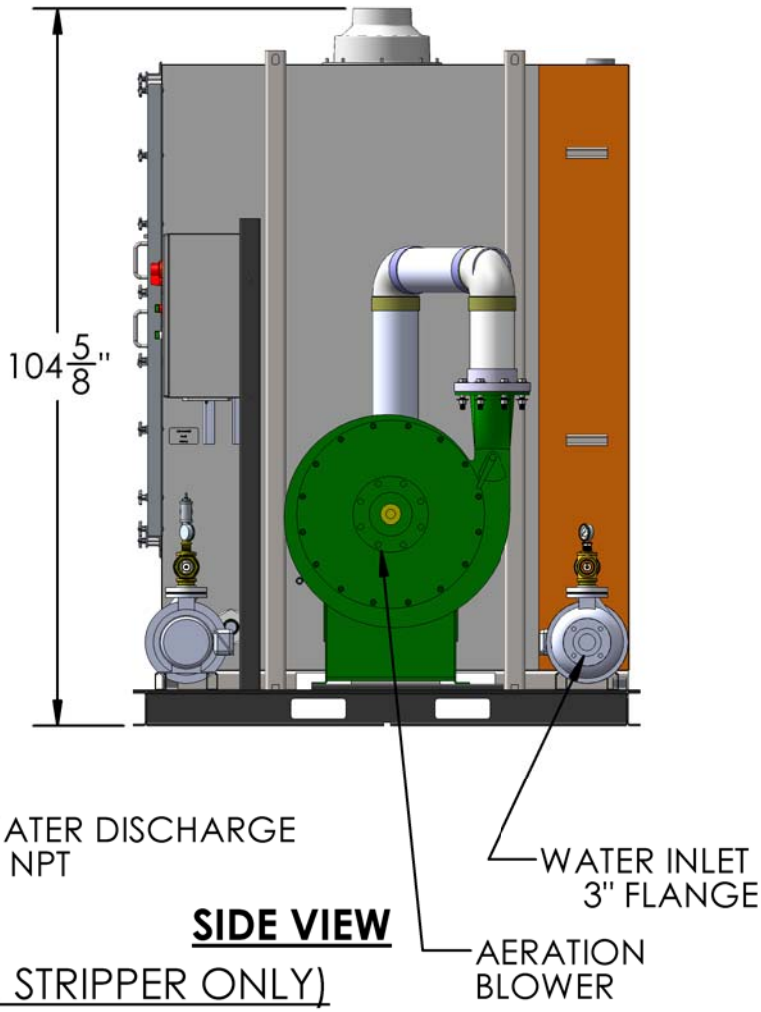
-Max. flow rate: 120 GPM
-Air flow: 600 CFM
-Sump working vol.: 79 GAL
-Materials of construction: 304SS , polycarbonate door, neoprene gaskets and polyester felt.



PLAN VIEW



FRONT VIEW



SIDE VIEW

EZ-12.6HF (AIR STRIPPER ONLY)

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NOT TO SCALE, *NOT FOR CONSTRUCTION, FOR REFERENCE ONLY*
LICENSED UNDER PATENT # 10,272,356 B2 AND MORE U.S. AND NON U.S. PATENTS.

QED Part Number - 807142

Blower, pressure / mfg. New York Blower.
Motor: 7.5 hp, 230/460 volt, 3-phase, TEFC.
Inlet: 6" OD - discharge: 6" flange 150 lb. class.
Used on 16.6 stainless steel

The New York Blower Company
Fan-to-Size
Fan Selection Detail

Fan Design

Product:	Pressure Blower
Type:	Radial
Size:	2206
Fan Class:	N/A
Wheel Type:	Radial (shrouded) - ALM
Wheel Material:	Aluminum
Wheel Weight:	13.0 lb
Wheel WR²:	5.31 lb/ft2
Percent Width:	100%
Percent Diameter:	100.0%
Oulet Area:	.196 sq. ft.
Options:	None

Thrust load on motor is 56 lbf.

Calculation Mode: Find Pressure

Drive Type:	Direct
Arrangement:	4
Outlet Velocity:	4337 ft/min
Static Efficiency:	68.33%
Total Efficiency:	70.5%
Operating Temp:	70° F
Maximum Temp:	70° F
Maximum Speed: (1)	3900 RPM
Velocity Pressure:	1.17 in wg
Fan Static Pressure:	36.2 in wg
Fan Total Pressure:	37.4 in wg
Altitude:	0 ft

Conditions

	Flow	Pressure	Power	Speed	Speed Limit (2)	Density	Altitude	Inlet Temp.
	ACFM	in wg (FSP)	bhp	rpm	rpm	lb/ft3	ft	f
Operating	850	36.2	7.1	3500	3900	0.075	0	70
Cold	850	36.2	7.1	3500	3900	0.075	0	70
Standard	850	36.2	7.1	3500	3900	0.075	0	70

(1) Speed Limit at Maximum Temperature (2) Speed Limit at indicated Inlet Temperature

My Sales Representative

Baltus Incorporated
6020 W Maple Road Suite 504 West Bloomfield, MI 48322, USA
(P) 248-851-6420, (F) 248-851-6694
sbraun@baltusinc.com

The New York Blower Company certifies that the Pressure Blower fan is licensed to bear the AMCA Air Performance Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and comply with the requirements of the AMCA Certified Ratings program. AMCA Licensed for Air Performance without Appurtenances (Accessories). Power HP (bhp) excludes drives. Performance certified is for installation type: B - free inlet, ducted outlet.

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Sound Power Level Ratings

Sound power and sound pressure levels are shown in decibels. (Power levels reference 10-12 watts and pressure levels reference 2x10-7 microbar.) Sound power ratings are calculated per AMCA Standard 301. Ratings do not include the effects of duct end correction. Sound levels do not include motors or drives. Pressure levels are estimated. A-weighing is per ANSI S.1.42-2001 (R2011).

Fan Sound

Center Freq (Hz)	63	125	250	500	1000	2000	4000	8000	Overall
Octave	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
Inlet Total Power, dB	71	83	86	93	90	85	81	80	**96**
Inlet Accessories (N/A)	0	0	0	0	0	0	0	0	
Inlet Total Pressure, dBA	37	59	70	82	82	78	74	71	**86**
Outlet Total Power, dB	71	83	86	93	90	85	81	80	**96**
Outlet Accessories (N/A)	0	0	0	0	0	0	0	0	
Outlet Total Pressure, dBA	37	59	70	82	82	78	74	71	**86**
Fan Total Power, dB	74	86	89	96	93	88	84	83	**99**
Housing Radiated Noise	-6	-10	-15	-17	-14	-14	-15	-16	
Fan Total Pressure, dBA	34	52	58	68	71	67	62	58	**74**

Directivity/Reflection is a hemispherical radiation (Q = 2); Distance is 1 m.
At 1 m, the estimated sound pressure level:

1. outside the fan due to an open inlet OR outlet is 86 dBA.
2. housing radiated noise when inlet and outlet are ducted away from listening point is 74 dBA.

The sound power and pressure levels displayed here are estimated values based on tests and ratings conducted in accordance with AMCA standards 300 and 301. AMCA does not certify any of these ratings. See the Policy on Sound for more details.

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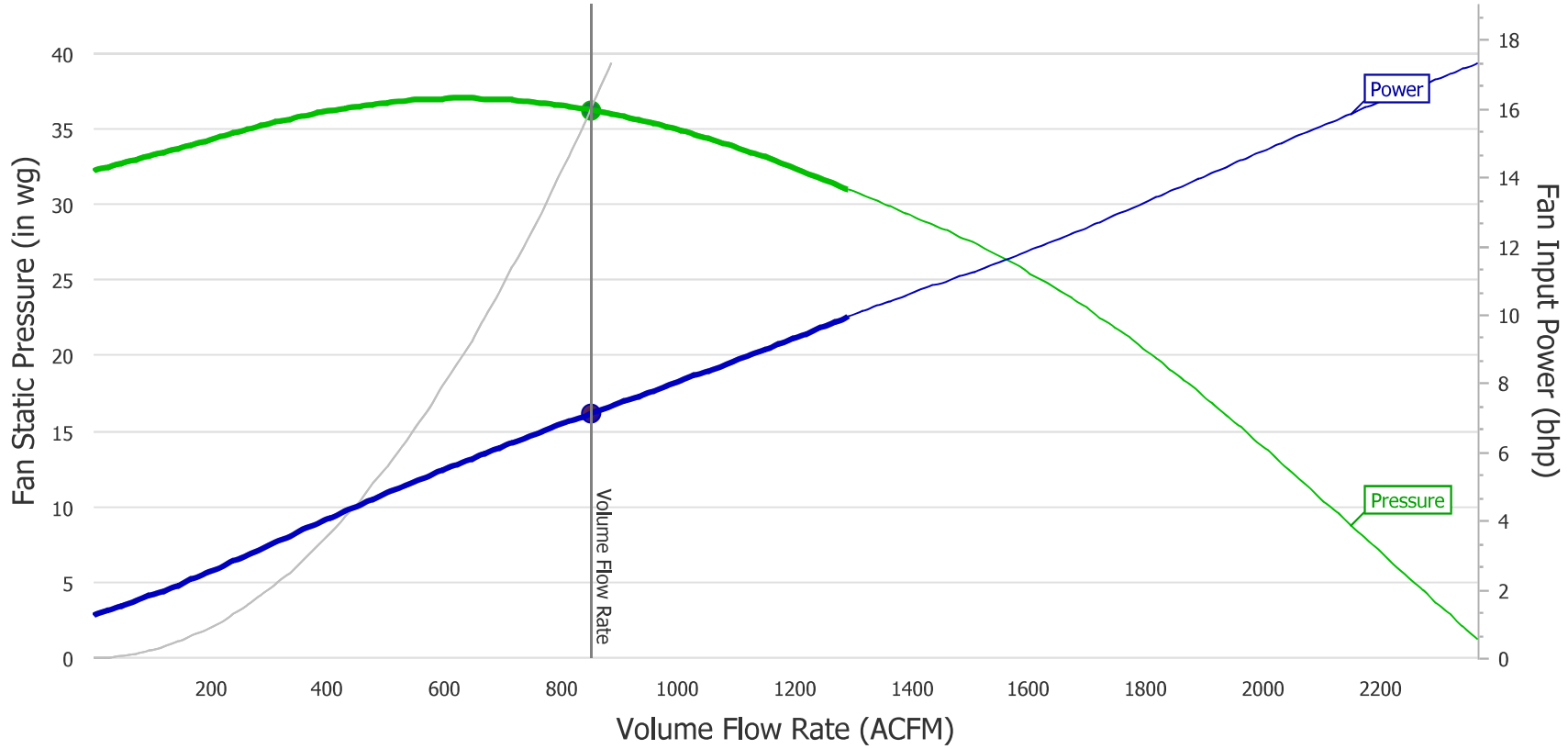
Fan-to-Size
Fan Selection Detail

Product: Pressure Blower
Material: Aluminum
Fan Size: 2206
Arrangement: 4
Wheel Type: Radial (shrouded) - ALM
Options: None

Volume Flow Rate: 850 ACFM
Fan Static Pressure: 36.2 in wg
Speed: 3500 rpm
Power: 7.1 bhp

Inlet Temperature: 70 °f
Altitude: 0 ft
Density: 0.075 lb/ft3
Outlet Velocity: 4337 ft/min



AMCA Licensed for Air Performance without Appurtenances (Accessories). Power HP (bhp) excludes drives. Performance certified is for installation type: B - free inlet, ducted outlet.

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APPENDIX G – QUALITY ASSURANCE PROJECT PLAN

AECOM

QUALITY ASSURANCE PROJECT PLAN (QAPP)

Chem-Trol Site
4818 Lake Avenue
Hamburg, New York
New York State Superfund Program
Site No. 915015
EPA ID No. NYD980531180

Prepared for:

SC Holdings, Inc.
600 New Ludlow Road
South Hadley, Massachusetts 01075

Prepared by:

AECOM USA, Inc.
50 Lakefront Boulevard, Suite 111
Buffalo, NY 14202

March 2026

QUALITY ASSURANCE PROJECT PLAN (QAPP)

Chem-Trol Site
4818 Lake Avenue
Hamburg, New York
New York State Superfund Program
Site No. 915015
EPA ID No. NYD980531180

March 2026

Contents

1.0 Introduction 1-1
1.1 PURPOSE AND OBJECTIVE 1-1
1.2 SITE DESCRIPTION AND LOCATION 1-1

2.0 Data Quality Objectives 2-1

3.0 Sample Collection 3-1
3.1 Soils 3-1
3.2 Sediment 3-1
3.3 Groundwater 3-1
3.4 Sample Collection and Preservatives 3-1
3.5 Sample Holding Times 3-1
3.6 Field Sampling Procedures 3-1
3.7 Field Equipment Decontamination 3-1
3.8 Personnel Decontamination 3-2

4.0 Sample Custody, Identification, and Tracking 4-1
4.1 Holding Times and Sample Transport 4-1
4.2 Chain-of-Custody 4-1
4.3 Sample Containers 4-1
4.4 Laboratory Sample Tracking 4-2
4.4.1 Laboratory Sample Custody 4-2
4.4.2 Sample Storage, Security, and Disposal 4-2

5.0 Calibration Procedures 5-1

6.0 Analytical Procedures 6-1
6.1 Laboratory Analyses 6-1
6.2 Laboratory Analyses 6-1

7.0 Data Reduction, Validation, and Reporting 7-1
7.1 Data Reduction 7-1
7.1.1 Field Data Collection 7-1

7.1.2 Laboratory Data Collection and Reduction 7-1
7.2 Data Review 7-1
7.3 Data Validation 7-1
7.4 Data Usability Summary Report 7-1
7.5 Reporting 7-1

8.0 Quality Control Checks 8-1
8.1 Field Quality Control 8-1
8.1.1 Field Duplicate Samples 8-1
8.1.2 Trip Blanks 8-2
8.1.3 Temperature Blanks 8-2
8.2 Laboratory Quality Assurance 8-2
8.2.1 Sensitivity 8-2
8.2.2 Precision 8-3
8.2.3 Accuracy 8-3
8.2.4 Representativeness 8-3
8.2.5 Comparability 8-4
8.2.6 Completeness 8-4

9.0 Preventative Maintenance 9-1
9.1 Field Instruments and Equipment 9-1
9.2 Laboratory Instruments and Equipment 9-1
9.2.1 Instrument Maintenance 9-1
9.2.2 Equipment Monitoring 9-1

10.0 PERFORMANCE AND SYSTEM AUDITS 10-1
10.1 RESPONSIBILITY, AUTHORITY, AND TIMING 10-1
10.2 FIELD AUDITS 10-1
10.3 LABORATORY PERFORMANCE AND SYSTEM AUDITS 10-2
10.4 AUDIT PROCEDURES 10-2
10.5 AUDIT DOCUMENTATION 10-2

11.0 CORRECTIVE ACTIONS 11-1
11.1 RATIONALE 11-1
11.2 CORRECTIVE ACTION METHODS 11-1
11.2.1 Immediate Corrective Actions 11-1

11.2.2 Long-Term Corrective Actions 11-1
11.2.3 Corrective Action Steps 11-1
11.2.4 Audit-Based Non-Conformances 11-2
11.3 CORRECTIVE ACTION REPORT REVIEW AND FILING 11-2

12.0 REFERENCES 12-1

List of Tables

Table 1 Reporting Limits, Sample Bottle, Volume, Preservation, and Holding Time Summary

Table 2 Sample Matrix for Analytical Parameters

1.0 Introduction

1.1 PURPOSE AND OBJECTIVE

The purpose of this Quality Assurance Project Plan (QAPP) is to document planned investigative activities and establish the criteria for performing these activities at a predetermined quality for the work conducted by AECOM USA, Inc. (AECOM) for the Chem-Trol Site (New York State Superfund Site No. 915015 [United States Environmental Protection Agency (USEPA) Site No. NYD980531180]) located at 4818 Lake Avenue, Town of Hamburg, Erie County, New York. The fundamental purpose of the QAPP is to ensure that quality analytical data will be generated to support the project in a manner consistent with the Data Quality Objectives as specified herein.

The QAPP is intended to be a companion document to the site-specific Site Management Plan (SMP) with regards to specific project objectives and field sampling activities. To the extent that discrepancies exist between this QAPP and the SMP, the SMP shall take precedence. The location of the project site is shown on SMP **Figure 1**.

1.2 SITE DESCRIPTION AND LOCATION

Detailed background data on the site, including the site description and location, site history, previous investigations, and current conditions, are summarized in the in the SMP.

2.0 Data Quality Objectives

Data quality objectives are statements, expressed in either qualitative or quantitative terms, which address the appropriate level of data quality for a project. The quality of data generated must be suitable to support the decisions used to achieve the overall goals as delineated in the SMP. The general project data quality objectives are summarized in this section, with detailed information given throughout this QAPP and associated sections of the SMP. The overall data quality objectives of the project are:

- To ensure that samples collected are representative of the sample population.
- To provide detection limits for the selected analytical methods, which are below the established cleanup objectives or regulatory limits.
- To measure and document precision and accuracy using procedures established by the laboratories, the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) and U.S. Environmental Protection Agency (EPA) approved analytical methods.
- To ensure that a NYSDOH ELAP and NYSDOH ELAP CLP certified laboratory will conduct all analyses.

3.0 Sample Collection

3.1 Soils

No soil samples are anticipated to be collected as part of the SMP. In the event that a soil removal action will be required where potentially impacted soils remain at the site, a soil sampling plan will be included with the soil removal work plan submitted to the NYSDEC for approval prior to any soil removal activities.

3.2 Sediment

No sediment samples are anticipated to be collected as part of the SMP. In the event that a sediment removal action will be required where potentially impacted materials remain at the site, a sampling plan will be included with a work plan submitted to the NYSDEC for approval prior to any sediment removal activities.

3.3 Groundwater

Groundwater samples collected from on-site monitoring wells and the on-site groundwater treatment system will be collected as described in the appropriate sections of the SMP/Field Activities Plan (FAP). These sections describe the collection procedures, sampling equipment, locations and frequencies for the groundwater samples.

Samples will be transferred directly into pre-cleaned sample collection containers, which are supplied by the laboratory performing the analyses. All necessary preservatives will be added to the sample containers at the laboratory prior to being shipped to the site (see Section 3.4). Samples will be stored at 4° Celsius until delivered to and analyzed by the laboratory.

3.4 Sample Collection and Preservatives

Sample containers and preservatives will be provided by the contracted laboratories and stored on-site in a clean and dry location. Sample containers and preservatives by matrix and analysis are listed in **Table 1**.

3.5 Sample Holding Times

Table 1 identifies the sample preparation and analytical method, matrix, holding time, containers, and preservatives for the typical analyses to be performed as part of this SMP QAPP.

3.6 Field Sampling Procedures

Field activities are detailed in the SMP Field Activities Plan and are not repeated in this QAPP.

3.7 Field Equipment Decontamination

To avoid cross-contamination, sampling equipment (defined as any piece of equipment which may contact a sample) will be decontaminated according to the procedures specified in the SMP Field Activities Plan.

3.8 Personnel Decontamination

Details of the personnel decontamination procedures will be provided in the HASP.

4.0 Sample Custody, Identification, and Tracking

4.1 Holding Times and Sample Transport

Since the samples will be analyzed at standard turn around, no exceedance of holding time is expected. Holding times will be calculated from the time the sample is collected to the subsequent extraction, if necessary, or analysis. All samples will be delivered to the laboratory by same day courier or overnight delivery in sealed coolers with ice.

Although trip blanks are prepared in the analytical laboratory and shipped to the site prior to the collection of environmental samples, for the purposes of determining holding time conformance, trip blanks will be considered to have been generated on the same day as the environmental samples with which they are shipped and delivered. Procurement of bottles and blanks will be scheduled to prevent trip blanks from being stored for excessive periods prior to their return to the laboratory; the goal is that trip blanks should be held for no longer than one week prior to use.

4.2 Chain-of-Custody

Sample bottles within each shipping container will be individually labeled with an adhesive identification label provided by the laboratory. Project personnel receiving the sample containers from the laboratory will check each cooler for the condition and integrity of the bottles prior to field work.

A Chain-of-Custody (COC) will accompany all samples from the point of sampling to delivery of the samples to the laboratory. The COC will be a record of the location where the sample was collected, the data and time collected, number of containers collected, type(s) of analyses requested, special remarks or requests, and the signature of each custodian of the samples.

Upon sample receipt, laboratory personnel will be responsible for sample custody. The laboratory sample custodian will verify sample integrity and compare the cooler contents against the field COC. If a sample container is broken or leaking, it will be noted on the COC and AECOM project personnel will be immediately notified. If the sample custodian observes any labeling or descriptive errors, AECOM project personnel will be contacted immediately to resolve any discrepancies. After all discrepancies (if any) are resolved, the laboratory will acknowledge receipt of the samples (i.e., by signing and dating the COC and the completed COC will be included in all hard copies of reports and become a permanent part of the project records.

4.3 Sample Containers

The selection of sample containers used to collect samples is based on the criteria of sample matrix, analytical method, potential contaminants of concern, reactivity of container material with the sample, QA/QC requirements, and any regulatory protocol requirements.

Sample containers and preservatives by matrix and analysis are listed in **Table 1**. Sample bottles will be provided by the analytical laboratory and will conform to the requirements of the USEPA Specifications and Guidance for Contaminant-Free Sample Containers.

4.4 Laboratory Sample Tracking

Upon receipt at the laboratory, a laboratory representative inspects the samples for integrity and checks the shipment against the chain-of-custody/analytical task order form. Discrepancies are addressed at this point and documented on the chain-of-custody form and the cooler checklist. Discrepancies are reported to the Laboratory Project Manager who contacts the AECOM Project Manager for resolution.

When the shipment and the chain-of-custody are in agreement, the custodian enters the samples into the Laboratory Information Management System and assigns each sample a unique laboratory number. This number is affixed to each sample bottle. The custodian then enters the sample and analysis information into the laboratory computer system.

4.4.1 Laboratory Sample Custody

The laboratory must satisfy the sample chain-of-custody requirements by implementing the following procedures for laboratory/sample security:

- Samples are stored in a secure area;
- Access to the laboratory is through a monitored area;
- Visitors sign a visitor's log and are escorted while in the laboratory;
- Only the designated sample custodians have keys to sample storage area(s); and
- Transfers of samples in and out of storage are documented.

4.4.2 Sample Storage, Security, and Disposal

While in the laboratory, the samples and aliquots that require storage at 4° C ± 2°C are maintained in a locked refrigerator unless they are being used for analysis. The laboratory is responsible for sample storage and security so that:

- Samples and extracts are stored for 60 days after the final analytical data report has been submitted to AECOM. The samples, extracts, and digestates are then disposed by the laboratory in accordance with laboratory SOPs and applicable regulations.
- Samples are not stored with standards or sample extracts.

5.0 Calibration Procedures

Each analysis will be performed in accordance with NYSDOH ELAP sanctioned methods or equivalent U.S. EPA analytical procedures. Each procedure specifies the method of frequency of calibration necessary to perform accurate and precise analyses. Each analytical instrument verifies the Method Detection Limit at least every six months as prescribed by the NYSDOH ELAP. The calibration of the instruments is verified at the beginning and end of each auto sampler run. Gas Chromatograph/Mass Spectrometers are tuned and calibrated every 12 hours, at a minimum.

All field equipment, for real time air analyses will be calibrated daily, in accordance with manufacturer's recommendations. All equipment will be calibrated more frequently if conditions warrant. The total organic analyzer equipped with a photo ionization detector (PID) used to measure volatile organic vapors will be calibrated to benzene with a 100 ppm isobutylene air standard.

6.0 Analytical Procedures

6.1 Laboratory Analyses

Table 1 identifies the sample preparation and analytical method, matrix, holding time, containers, and preservatives for the typical groundwater sample analyses to be performed as part of this SMP QAPP. The sampling matrix for this SMP QAPP is provided in **Table 2**. Sample analyses will typically utilize USEPA SW-846 methods as summarized below.

VOCs (monitoring well groundwater) – SW-846 8260C

VOCs (groundwater treatment system influent and effluent) - SW-846 624.1 (chloroethane, 1,1-dichloroethane, 1,1-dichloroethene, 1,1,1-trichloroethane, trichloroethane, benzene, toluene, o-chlorotoluene, chlorobenzene, and cis-1,2-dichloroethene)

Total Iron (groundwater treatment system influent and effluent) - SW-846 200.7

Total Suspended Solids (TSS [groundwater treatment system influent and effluent]) - Standard Method (SM) 2540D

pH (groundwater treatment system influent and effluent) - Collected in the field at the time of sampling

6.2 Laboratory Analyses

Laboratory analytical services are provided by Pace Analytical Services LLC (Pace), a NYSDOH ELAP and NYSDOH CLP accredited laboratory. If the laboratory for the project is changed, it must be certified, and maintain certification, under the NYSDOH ELAP and NYSDOH ELAP CLP for analyses of solid and hazardous waste.

7.0 Data Reduction, Validation, and Reporting

7.1 Data Reduction

7.1.1 Field Data Collection

Real time field data collected during sampling events will include qualitative information regarding the texture, appearance, odors, and any other observations made while water samples are being collected. Meteorological data and current site activity will be noted while collecting data for real time air monitoring. These observations will be recorded in the field logbook.

7.1.2 Laboratory Data Collection and Reduction

A significant portion of the analyses performed requires the use of automated laboratory instrumentation. Raw data collected from the instruments detectors will be converted to standard units of mg/L for water. All raw data will be stored in electronic form and in laboratory notebooks, in case the analysis needs to be recreated. Raw data for all analyses will be archived for a minimum of four years.

7.2 Data Review

All analytical data will be verified for precision and accuracy utilizing the laboratory's in-house Quality Assurance/Quality Control programs. In addition, all data packages will be reviewed by AECOM project personnel to ensure that all data deliverables have been properly provided.

7.3 Data Validation

The data validation process consists of a formal systematic review of analytical results and quality control documentation with regards to the parameters cited in Section 8.2. On the basis of this review, a data validator will make judgments and express concerns on the quality and limitations of the specific data and the validity of the data package as a whole. The data validator prepares documentation of his or her review using the standard USEPA Inorganics Regional Assessment and Organics Regional Assessment forms to summarize deficiencies and general laboratory performance. These forms are accompanied by appropriate supplementary documentation, which identifies specific problems.

7.4 Data Usability Summary Report

A Data Usability Summary Report (DUSR) provides a thorough review and evaluation of analytical data without the formality of a full third party data validation. A DUSR for the analytical results of samples will be generated in lieu of a full data validation to verify that the proper data deliverables and procedures have been rendered in accordance with the data quality objectives of the SMP.

7.5 Reporting

All data generated will be submitted in an electronic data deliverable (EDD) that complies with the DEC's Electronic Data Warehouse standards (EDWS) or as otherwise directed by DER.

Preliminary or final reports will be submitted to the DER in an electronic format that complies with NYSDEC's Electronic Document Standards (EDS) or as otherwise directed.

Final reports for analytical data will be reviewed and accepted by AECOM prior to submission to NYSDEC. Reports for analyses performed under the ELAP protocol will contain results sheets for the sample analyzed. These reports must include a minimum:

- Field Sample ID number;
- Laboratory sample ID number;
- Sample collection date;
- Extraction or digestion date (if applicable);
- Date Analyzed;
- Analytical method;
- Analytical results (with units clearly identified);
- Results of laboratory blank and field blanks;
- Results of spikes, matrix spikes, and duplicates;
- Surrogate recoveries (if applicable);
- Complete Chain-of-Custody forms; and,
- File log sheets (if available).

8.0 Quality Control Checks

8.1 Field Quality Control

Blank water generated for use during this project must be “demonstrated analyte-free.” The criteria for analyte-free water are based on the USEPA-assigned values for the Contract Required Quantitation Limits (CRQLs) for Contract Laboratory Program (CLP) analyses, or the RL for SW-846 or other methods.

However, specifically for the common laboratory contaminants (acetone and 2-butanone), the allowable limits are five times the CRQL (or RL). For methylene chloride, the limit is 2.5 times the CRQL. For common SVOC contaminants (phthalate esters such as bis(2-ethylhexyl) phthalate), the limit is 5 times the CRQL.

The analytical testing required for the water to be demonstrated as analyte-free must be performed prior to the start of sample collection; thus, blank water will be supplied by the laboratory.

Table 2 of this QAPP shows typical QA/QC samples and reporting limits. QA/QC samples are discussed below.

8.1.1 Field Duplicate Samples

Field duplicate samples are used to assess the variability of a matrix at a specific sampling point and to assess the reproducibility of the sampling method.

Aqueous field duplicate samples are second samples collected from the same location, at the same time, in the same manner as the first, and placed into a separate container (technically, these are co-located samples). Each duplicate sample will be analyzed for the same parameters as the original sample collected that day.

No sediment or soil samples are anticipated, but in the event they are required, sediment or soil duplicate samples are collected from a single location and device (e.g., trowel, etc.). Sediment or soil duplicates for VOC analysis are collected first, without homogenization. If other parameters are being analyzed, the remaining sample material is homogenized (e.g., by mixing in a clean stainless steel bowl) and prior to generating the sample and duplicate.

No air samples are anticipated, but in the event they are required, air field duplicates are typically collected by utilizing a “T” fitting on the sample line and splitting the air between two Summa canisters of the same size and set to the same flow rate.

The default field duplicate precision (RPD) objective is ≤50% percent RPD for all matrices where the sample concentration is at least two times the reporting limit. Where the analyte is detected in both samples but the concentration is less than 2 times the reporting limit, precision is assessed by the absolute difference, which should be less than the reporting limit. The RPD is not calculable when the analyte is not detected in one or both analyses. A more detailed discussion of the calculation is provided in Section 8.2.2.

Field duplicates will be collected at a frequency of one per 20 environmental samples for aqueous and non-aqueous sample. The default field duplicate frequency for air samples is 10 percent (one per 10 environmental samples).

8.1.2 Trip Blanks

The purpose of a VOC trip blank (using demonstrated analyte-free water) is to place a mechanism of control on sample bottle preparation and blank water quality, and sample handling. The trip blank travels from the lab to the site with the empty sample bottles and back from the site with the collected samples. There will be a minimum of one trip blank per shipment containing aqueous samples for VOC analysis.

Trip blanks will be collected only when aqueous volatile organics are being sampled and shipped; except that a trip blank is not required when the only aqueous samples in a shipment are QC samples (rinsate blanks).

8.1.3 Temperature Blanks

The laboratory will use either an infrared instrument to measure the temperature of liquid samples, or a temperature blank will be used to measure the temperature of liquid samples. If used, temperature blanks will be supplied by the analytical laboratory. If multiple coolers are necessary to store and transport aqueous samples, then each cooler will contain an individual temperature blank (if used).

8.2 Laboratory Quality Assurance

Data quality objectives (DQO) for measurement data in terms of sensitivity and the PARCC parameters (precision, accuracy, representativeness, comparability, and completeness) are established so that the data collected are sufficient and of adequate quality for their intended uses. Data collected and analyzed in conformance with the DQO process described in this QAPP will be used in assessing the uncertainty associated with decisions related to this site.

8.2.1 Sensitivity

The sensitivity or detection limit desired for each analysis or compound is based on the DQOs established for the project. The method detection limit is determined in accordance with the procedure in ASP Exhibit A, section 4.9.2.12, which is consistent with the procedure in 40 CFR Part 136 Appendix B.

The reporting limit (RL) for non-detected analytes will be the lowest calibration standard associated with the analysis. Reporting limits will be equal to or lower than those presented in Exhibit C of ASP 2005 for the applicable method. Analytes detected analytes at concentrations below the RL but above the MDL will be flagged "J" (estimated) by the laboratory. Typical RLs are summarized on **Table 1**.

The reporting limits and MDLs of the assigned laboratory will be reviewed by AECOM's QAO for each project to verify that the laboratory sensitivity is sufficient to meet the project objectives. These will typically include meeting the applicable standards, criteria, and guidance (SCGs) including soil cleanup objectives (6 NYCRR 375-6.8), supplemental soil cleanup objectives (NYSDEC, 2010b), groundwater and surface water criteria (compiled in TOGS 1.1.1), and indoor air screening levels (NYSDOH, 2006, 2007).

For VOCs in groundwater, an RL goal of 0.5 micrograms per liter (µg/L) has been established for the contaminants of concern.

Although no soil or sediment samples are planned, if needed in the future, the RL goal for soil / sediment is 5 micrograms per kilogram (µg/kg) for most VOCs (before adjustment for reporting on a dry weight basis) and 330 µg/kg for most SVOCs.

Although no air / vapor samples are planned, if needed in the future, RL goals for air/vapor samples are below 1 microgram per cubic meter ($\mu g/m^3$) for all compounds.

8.2.2 Precision

Precision is an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Specifically, it is a quantitative measurement of the variability of a group of measurements compared to their average value. Precision is usually stated in terms of standard deviation, but other estimates such as the coefficient of variation (relative standard deviation), range (maximum value minus minimum value), relative range, and relative percent difference (RPD) are common.

For this project, field sampling precision will be determined by analyzing coded duplicate samples (labeled so that the laboratory does not recognize them as duplicates) for the same parameters, and then, during data validation, calculating the RPD for field duplicate sample results.

The data quality objectives for analytical precision, calculated as the RPD between duplicate analyses, will be statistically calculated laboratory control limits based on historical data. Should there be insufficient data to calculate limits; the validation default RPD limits will be used: 20% for aqueous samples and 35% for soils.

8.2.3 Accuracy

Accuracy is a measure of the degree of agreement of a measured value with the true or expected value of the quantity of concern, or the difference between a measured value and the true or accepted reference value. The accuracy of an analytical procedure is best determined by the analysis of a sample containing a known quantity of material and is expressed as the percent of the known quantity which is recovered or measured (percent recovery).

Sampling accuracy may be determined through the assessment of the analytical results of field blanks and trip blanks for each sample set. Analytical accuracy is typically assessed by examining the percent recoveries of surrogate compounds that are added to each sample (organic analyses only), and the percent recoveries of matrix spike compounds added to selected samples and laboratory blanks. Additionally, initial and continuing calibrations must be established and be within method control limits. Instrument and method analytical accuracy can then be determined for any sample set.

The data quality objectives for analytical precision, calculated as the percent recovery, will be statistically calculated laboratory control limits based on historical data. Should there be insufficient data to calculate limits, the validation default percent recovery limits will be used: 70-130% for organic analyses, and 75-125% (matrix spike recovery) and 80-120% (laboratory control spike (LCS) recovery) for inorganic analyses.

8.2.4 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter which is most concerned with the proper design of the sampling program. Samples must be representative of the environmental media being sampled.

Selection of sample locations and sampling procedures will incorporate consideration of obtaining the most representative sample possible.

Field and laboratory procedures will be performed in such a manner as to ensure, to the degree that is technically possible, that the data derived represents the in-place quality of the material sampled. Every effort will be made to ensure that chemical compounds will not be introduced into the sample via sample containers, handling, and analysis. Decontamination of sampling devices and digging equipment will be performed between samples. Analysis of field blanks, trip blanks, and method blanks will also be performed to monitor for potential sample contamination from field and laboratory procedures.

The assessment of representativeness also must consider the degree of heterogeneity in the material from which the samples are collected. Sampling heterogeneity will be evaluated during data validation through the analysis of coded field duplicate samples. The analytical laboratory will also follow acceptable procedures to assure the samples are adequately homogenized prior to taking aliquots for analysis, so the reported results are representative of the sample received.

COC procedures will be followed to document that contamination of samples has not occurred during container preparation, shipment, and sampling.

8.2.5 Comparability

Comparability of analytical data among laboratories becomes more accurate and reliable when all labs follow the same procedure and share information for program enhancement. Some of these procedures include:

- Instrument standards traceable to National Institute of Standards and Technology (NIST), the US Environmental Protection Agency (USEPA), or the New York State Departments of Health or Environmental Conservation;
- Using standard methodologies;
- Reporting results for similar matrices in consistent units;
- Applying appropriate levels of quality control within the context of the laboratory quality assurance program; and
- Participation in inter-laboratory studies to document laboratory performance.

By using traceable standards and standard methods, the analytical results can be compared to other labs operating similarly. The QA Program documents internal performance. Periodic laboratory proficiency studies are instituted as a means of monitoring intra-laboratory performance.

Comparability within any specific project is also assessed by comparison of the project data to data generated previously; and, if available, comparison of the data for multiple sampling events conducted for the project. Comparability (consistency) of sampling techniques is also assessed, to some extent, by analysis of field duplicates; although it should be noted that large differences between field duplicates may result from a wide variety of causes, not just inconsistent sampling.

8.2.6 Completeness

The goal of completeness is to generate the maximum amount possible of valid data for all planned samples. Completeness of 100 percent indicates that all planned samples were collected; and the resultant data were fully valid and acceptable.

For typical work assignments, the default overall completeness goal is 90 percent useable data. The impact of rejected or unusable data will be made on a case-by-case basis. If the goals of the project can be achieved without the missing datum or data, or if data from a different sampling event can be used to fill the data gap, no further action would be necessary. However, loss of critical data may require resampling or reanalysis.

9.0 Preventative Maintenance

9.1 Field Instruments and Equipment

Equipment instruments, tools, gauges, and other items requiring preventative maintenance will be serviced in accordance with the manufacturer's specified recommendations or written procedures developed by the operators. All field equipment service will be conducted by qualified personnel. Prior to any field sampling, each piece of field equipment will be inspected to ensure that it is operational. If the equipment is not operational, it must be repaired prior to use. All equipment which required charging or batteries will be fully charged or have fresh batteries at the start of the project. An equipment repair/maintenance log will be kept for each field instrument. Any non-operational/non-repairable field equipment will be replaced.

9.2 Laboratory Instruments and Equipment

Each laboratory has an instrument/equipment maintenance program, which includes procedures for daily, weekly, monthly, or annual routine maintenance. In addition, maintenance is performed if the accuracy and/or precision of the instrument are in question.

9.2.1 Instrument Maintenance

Preventative maintenance of laboratory instruments will be conducted in accordance with the manufacturer's guidelines or written procedures developed by the operators. All instrument service will be performed by qualified personnel. To minimize potential downtime, the laboratory will maintain a sufficient supply of critical spare parts for its instruments and, where practical, maintain a service contract for rapid instrument repair. Wherever possible, the laboratory will retain backup instrumentation. An instrument repair/maintenance log will be maintained for each instrument.

9.2.2 Equipment Monitoring

On a daily basis, the operation of the laboratory equipment (e.g., balances, ovens, refrigerators, water purification systems) will be checked and documented. Any discrepancies will be immediately reported to the appropriate laboratory personnel for resolution.

10.0 PERFORMANCE AND SYSTEM AUDITS

Audits are systematic checks to determine the quality of operation of some activity or function in the field or laboratory. Field audits are conducted to verify adherence to proper field and sampling procedures. Audits are of two types, as described below.

- Performance audits are independent safety and health, procedure, and/or sample checks made by a supervisor or auditor to arrive at a quantitative measure of the quality of the data produced by one section or the entire measurement process.
- System audits are onsite qualitative inspections and reviews of the QA system used by some part of or the entire measurement system. The audits are performed against the QAPP. A checklist is typically generated from the requirements and becomes the basis for the audit. The results of any deficiencies noted during the audit are summarized in an audit report.

Laboratory performance and system audits are performed by the laboratory's QA staff to assess the effectiveness of the quality system. These internal audits are performed on a routine basis. Audits are also performed by certifying agencies. Audit reports and corrective actions are available to NYSDEC for review.

10.1 RESPONSIBILITY, AUTHORITY, AND TIMING

QA audits to be conducted for the project may include system, performance, and data audits. The Project QAO will keep a tentative schedule on record that details the number and types of audits.

10.2 FIELD AUDITS

The need for field audits will be determined on a project-specific basis on a periodic basis. Not all the aspects listed below will be necessary or appropriate for projects for which field audits are specified.

Field performance audits, if specified, will be conducted during the project as field data are generated, reduced, and analyzed. Numerical manipulations, including manual calculations, will be documented. Records of numerical analyses will be legible, of reproduction quality, and sufficiently complete to permit logical reconstruction by a qualified individual other than the originator.

Indicators of the level of field performance include the analytical results of the blank and replicate samples. Each blank analysis will be considered an indirect audit of the effectiveness of measures taken in the field to maintain sample integrity (e.g., field decontamination procedures).

The results of the field replicate analyses are an indirect audit of the ability of each field team to collect representative sample portions of each matrix type.

System audits of site activities will be accomplished by an inspection of all field site activities. During this audit, the auditor(s) will compare current field practices with standard procedures. The following elements will be evaluated during a field system audit:

- Field activities conducted in substantial compliance with the SMP FSP and SMP QAPP;
- Procedures and analyses conducted according to procedures outlined in the QAPP;
- Sample documentation;
- Working order of instruments and equipment;
- Level of QA conducted by field personnel;

- Contingency plans in case of equipment failure or other event preventing the planned activity from proceeding;
- Decontamination procedures;
- Level of efficiency with which each team conducts planned activities at one site and proceeds to the next; and
- Sample packaging and shipment.

After completion of the audit, any deficiencies will be discussed with the field staff and corrections identified. If any of these deficiencies could affect the integrity of the samples being collected, the auditor(s) will inform the field staff and corrections will be implemented immediately. The audit will be performed by the Project QA/QC Coordinator or the Site Manager.

10.3 LABORATORY PERFORMANCE AND SYSTEM AUDITS

The laboratory assigned to this project will be verified to be certified by the NYSDOH ELAP for the matrices and analytical protocols to be used. Therefore, no project-specific audit of the laboratory(s) will be performed unless warranted by a problem(s) that cannot be resolved by any other means, or at the discretion of AECOM.

10.4 AUDIT PROCEDURES

Prior to an audit, the designated lead auditor prepares an audit checklist. During an audit and upon its completion, the auditor(s) will discuss the findings with the individuals audited and discuss and agree on corrective actions to be initiated. The auditor will then prepare and submit an audit report to the manager of the audited group and the project manager.

The manager of the audited group will then prepare and submit to the key stakeholders a plan for implementing the corrective action to be taken on non-conformances indicated in the audit report, the date by which such corrective action will be completed, and actions taken to prevent reoccurrence. If the corrective action has been completed, supporting documentation should be attached to the reply. The auditor will ascertain (by re-audit or other means) if appropriate and timely corrective action has been implemented.

Records of audits will be maintained in the project files.

10.5 AUDIT DOCUMENTATION

A checklist will be completed during each audit so that the previously defined scope of the individual audits is accomplished and that the audits follow established procedures. The checklist will detail the activities to be executed as part of the auditing plan. Audit checklists will be prepared in advance and will be available for review. Following each system, performance, and data audit, the auditor will prepare a report to document the findings of the specific audit.

11.0 CORRECTIVE ACTIONS

If instrument performance or data fall outside acceptable limits, then corrective actions will be taken. These actions may include recalibration or standardization of instruments, acquiring new standards, replacing equipment, repairing equipment, and reanalyzing samples or redoing sections of work.

Subcontractors providing analytical services should perform their own internal laboratory audits and calibration procedures with data review conducted at a frequency so that errors and problems are detected early, thus avoiding the prospect of redoing large segments of work.

Situations related to this project requiring corrective action will be documented and made part of the project file. For each measurement system identified requiring corrective action, the responsible individual for initiating the corrective action and also the individual responsible for approving the corrective action, if necessary, will be identified.

As part of its quality management system (QMS) program, AECOM provides relevant excerpts and conclusions from data validation reports to the analytical laboratories. The laboratories are therefore made aware of non-critical items and areas where improvement may be made in subsequent NYSDEC ASP work.

The objectives of the corrective action procedures presented below are to ensure that recognized errors in performance of sample and data acquisition lead to effective remedial measures and that those steps are documented to provide assurance that any data quality deficiencies are recognized in later interpretation and are not recurrent.

11.1 RATIONALE

Many times corrective measures are undertaken in a timely and effective fashion but go undocumented. In other cases, corrective actions are of a complex nature and may require scheduled interactions between departmental groups. In either case, documentation in a formal or informal sense can reinforce the effectiveness and duration of the corrective measures taken.

11.2 CORRECTIVE ACTION METHODS

11.2.1 Immediate Corrective Actions

Immediate corrective actions are of a minor or routine nature such as correcting malfunctioning equipment, correction of data transcription errors, and other such activities routinely made in the field, laboratory, or office by technicians, analysts, and other project staff.

11.2.2 Long-Term Corrective Actions

Long-term corrective action will be used to identify and eliminate causes of non-conformances which are of a complex nature and that are formally reported between management groups.

11.2.3 Corrective Action Steps

For long-term corrective actions, steps comprising closed-loop corrective action system are as follows:

- Define the problem;
- Assign responsibility for investigating the problem;
- Investigate and determine the cause of the problem;

- Determine a corrective action to eliminate the problem;
- Assign and accept responsibility for implementing the corrective action; and
- Verify that the corrective action has eliminated the problem.

Non-conformance events associated with analytical work are documented by the laboratories' Non-Conformance Records, which are reviewed and approved by the laboratory's Quality Assurance Manager.

11.2.4 Audit-Based Non-Conformances

Following audits, corrective action is initiated by documenting the audit finding and recommended corrective action on an Audit Finding Report.

11.3 CORRECTIVE ACTION REPORT REVIEW AND FILING

Immediate and long-term corrective actions require review to assure that, during the time of non-conformance, erroneous data were not generated or that, if possible, correct data were acquired instead. Such confirmation and review is the responsibility of the supervisor of the staff implementing the corrective action. Confirmation will be acknowledged by notation and dated signature on the affected data record or appropriate form or by memorandum to AECOM project management.

12.0 REFERENCES

New York State Department of Environmental Conservation (NYSDEC), 2005. *Analytical Services Protocol (ASP) Manual*. July.

NYSDEC, 2008. *NYSDEC Modifications to EPA Region 9 TO-15 QA/QC Criteria provided in the July 2005 ASP*. February 2008.

NYSDEC, 2010a. *Technical Guidance for Site Investigation and Remediation. Draft. DER-10*. Division of Environmental Remediation. December.

NYSDEC, 2010b. CP-51 / *Soil Cleanup Guidance*. October.

New York State Department of Health (NYSDOH) Wadsworth Laboratory Environmental Laboratory Approval Program Certification Manual. Accessed online at http://www.wadsworth.org/labcert/elapcert/index.html. Revisions through April, 2011; accessed May, 2011.

NYSDOH ELAP Web site. http://www.wadsworth.org/labcert/elap/

NYSDOH Center for Environmental Health Bureau of Environmental Exposure Investigation, 2006. *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*. Final. October.

NYSDOH, 2007. Letter from Gary Litwin (Director) to Dale Desnoyers (NYSDEC DER) re: Soil Vapor/Indoor Air Matrices. (Adds additional chlorinated VOCs to the original matrices in the 2006 SVI guidance). June 25.

USEPA Region 2, Standard Operating Procedures for Data Review. Available at http://www.epa.gov/region02/qa/documents.htm#sop. Accessed May 2011.

USEPA Region 2, 1998. *Ground Water Sampling Procedure – Low Stress (Low Flow) Purging and Sampling*. Final. March 16.

USEPA, 2010. *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA 540/R-10-011. January.

USEPA, 2008. *Contract Laboratory Program National Functional Guidelines for Organic Data Review*, EPA/540/R-08-01. June.

USEPA, 1986. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, Third edition. EPA SW-846. With revisions and updates through March, 2009. Accessed on line (at "SW-846 On-Line") May 2011 at http://www.epa.gov/epaoswer/hazwaste/test/main.htm

USEPA, 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*. USEPA Office of Emergency and Remedial Response. OSWER Directive No. 355.3-01. October.

Table 1

Analytical Specifications - Reporting Limits, Sample Bottle, Volume, Preservation, and Holding Time Summary
for Site Management Plan
Chem-Trol Site
Hamburg, Erie County, New York

Matrix/Analysis	Sample Prep Method [1]	Analytical Method [1]	Reporting Limit -Typical (units as specified)	Sample Bottles [2]				Minimum Vol Rqd	Preservation [3]	Holding Time [4]		Comment
				Mat'l	Size	Qty	Source			Extraction	Analysis	
Aqueous Samples												
Volatile Organics	SW-846 5030C	SW-846 8260C	0.5 - 5.0 µg/L	Glass	40 mL	3	Lab	40 mL	HCl to pH ≤ 2	NA	14 days	7 days if not preserved
Volatile Organics	SW-846 5030C	SW-846 624.1	0.5 - 5.0 µg/L	Glass	40 mL	3	Lab	40 mL	$Na_2S_2O_3$	NA	14 days	
Total Recoverable Iron	SW-846 3005A	SW-846 200.7	50 µg/L	HDPE	250 mL	1	Lab	200 mL	HNO_3 to pH ≤ 2	NA	180 days	
Total Suspended Solids	-	SM 2540D	1.0 - 2.0 mg/L	Plastic	1000 mL	1	Lab	950 mL	None	NA	7 days	
Waste Characterization Non-Aqueous Samples (Potential as may be required by Disposal Facility)												

Notes:

(1) More recent versions of SW-846, EPA, and SM methods may be used subject to AECOM approval.

(2) Bottles typical.

(3) All samples for chemical analysis will be held at 4 degrees C in addition to any chemical preservation required.

(4) Holding time calculated from day of collection, unless noted as being from time of extraction.

SW-846: Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. USEPA SW-846. Complete through Update IV, March 2009.

SM - Standard Methods for the Examination of Water and Wastewater. AWWA. 20th Edition, 1998.

µg - microgram
mg - milligram
mL- milliliter
HCl - hydrochloric acid
HNO_3 - nitric acid
$Na_2S_2O_3$ - sodium thiosulfate
HDPE - high-density polyethylene
NA - not applicable

Table 2

Sampling Matrix for Analytical Parameters
for Site Management Plan
Chem-Trol Site
Hamburg, Erie County, New York

Location	Sampling Event	Parameters				
		Groundwater				
		VOCs (USEPA 8260C)	VOCs (USEPA 624.1)	Total Iron (USEPA 200.7)	TSS (SM 2540D)	Field Parameters[1]
MW-3S	Biennial Groundwater Sampling	1				
MW-7R		1				
MW-8R		1				
MW-9R		1				
MW-13R		1				
MW-15R		1				
Groundwater Treatment System Influent	System Sampling (every other month)		1	1	1	1
Groundwater Treatment System Effluent			1	1	1	1
Monitoring Subtotal		**6**	**2**	**2**	**2**	**2**
QA/QC						
Duplicate[2]		1				
Trip Blank[3]		1	1			
Total Per Sampling Event		**8**	**3**	**2**	**2**	**2**

Notes:
(1) Field collected parameters will include pH and temperature.
(2) Duplicates will be collected at a rate of 1 per 20 samples.
(3) Trip Blanks will be collected at a rate of 1 per shipping event.
VOC - Volatile Organic Compound
TSS - Total Suspended Solids

APPENDIX H – SITE MANAGEMENT FORMS

CHEM-TROL SITE, HAMBURG, NY
NYSDEC SITE NO. HW915015
SITE-WIDE INSPECTION FORM
(PAGE 1 of __)

GENERAL INFORMATION

Date:		**Inspector:**	
Weather:		**Signature:**	
Temperature:		**Company:**	

SITE INSPECTION LOG SHEET

Evidence of Ground Intrusion Disturbance(s) (Y/N):		**Description of Disturbance(s):***	
Evidence of Erosional Disturbance(s) (Y/N)		**Description of Disturbance(s):***	
Evidence of Stormwater Management Disturbance(s) (Y/N)		**Description of Disturbance(s):***	
Evidence of Demolition (Y/N):		**Description of Demolition:***	
Evidence of Building Construction (Y/N):		**Description of Building Construction:***	
SVE System Vents/ Laterals Inspected (Passive Operation) (Visual)		**Visual Inspection Comments:**	
Site Perimeter Fence Inspected (Visual)		**Visual Inspection Comments:**	
Evidence of site use change (Y/N):		**Description of New/Additional Site Use:***	
Comments:			

* Attach map showing locations and any other information as required.

Operation, Maintenance & Monitoring Checklist

Groundwater Treatment System
CHEM-TROL Site
Town of Hamburg, New York

This summary inspection checklist is to be completed during each site inspection. Note all items which require repair or maintenance. Use the last page to note any additional comments or unusual events.

General

Service by: _____ Weather/Temperature: _____
Date: _____ Arrival Time: _____ Departure Time: _____

Reason for Service: _____

	Operational/ Functional as Designed				
	Yes		**No**		**Comments:**
Inspection Items:					
Site Appearance/Condition					
Building Exterior					
Overhead Door					
Siding					
Roof and Discharge Pipe					
Building Interior					
Indication of Spills or Leaks					
Building Heater					
Fire Extinguisher					
First Aid & Eye Wash					

	Operational/ Functional as Designed				
	Yes		**No**		**Comments:**
Groundwater Treatment System					
Air Stripper Blower					
Flow Totalizer Meter					
Indication of Alarm					
Groundwater Treatment Wells					
EW-1 Pump					
EW-1 Transducer					
EW-2 Pump					
EW-2 Transducer					
EW-3 Pump					
EW-3 Transducer					
Effluent Discharge					
Outfall					
Cleanout					
SVE System Vents/Laterals					
Visual Inspection Performed					
Visual Damage Observed					

Instrumentation/Readings:

EW-1

Pumping Rate _____GPM (see Notes section)

Water Level Above Transducer _____Inches

Flow Meter Reading _____Gallons

EW-2

Pumping Rate _____GPM (see Notes section)

Water Level Above Transducer _____Inches

Flow Meter Reading _____Gallons

EW-3

Pumping Rate _____GPM (see Notes section)

Water Level Above Transducer _____Inches

Flow Meter Reading _____Gallons

Air Stripper

Stripper Blower Pressure (Panel) _____Inches H_2O

Stripper Blower Pressure (Stripper) _____Inches H_2O

Effluent Flow

Total System Meter Reading _____Gallons

Notes/Explanations
(Please include any additional information on those items that require attention as indicated above.)

[The system was [on/off] upon arrival.]

[Comment re: alarm conditions noted / cleared / not cleared]

[Comment re: flow meters]

[The most recent round of water levels was collected on [DATE].]

[The air stripper trays were last mechanically cleaned on [DATE].]

[The bi-monthly influent/effluent samples were last collected on [DATE].]

[Comment re: non-routine maintenance activity / observations, if any.]

Chemtrol: [CY] Semi-Annual Ground Water Elevations
1st Half

DATE: _____

Performed by:

Pumping Wells

Well ID	Monitoring Point (TIC)	Depth To Water (ft)	1st Half Elevation (ft)	1st Half Notes:	Well Details
EW-1	624.07				pumping ([Y/N]
EW-2	622.16				pumping ([Y/N]
EW-3	621.10				pumping ([Y/N]

East of Cap (North to South)

Well ID	Monitoring Point (TIC)	Depth To Water (ft)	1st Half Elevation (ft)	1st Half Notes:	Well Details
MW-6S	638.54				2-in PVC/4-in steel
MW-6R	638.64				4-in PVC/6-in steel
P-1S	642.80				3/4-in PVC/4-in PVC/6-in steel
MW-1R	645.36				4-in PVC/6-in steel
MW-1S	645.40				2-in PVC/4-in steel
MW-7S	642.85				2-in PVC/4-in steel
MW-7R	642.28				4-in PVC/6-in steel

Center of Cap (North to South)

Well ID	Monitoring Point (TIC)	Depth To Water (ft)	1st Half Elevation (ft)	1st Half Notes:	Well Details
P-5S	637.54				3/4-in PVC/4-in PVC
P-5R	637.88				3/4-in PVC/4-in PVC/6-in steel
MW-5S	636.28				2-in PVC/4-in steel
P-2R	646.96				1/2-in PVC/6-in steel
P-2S	646.44				1/2-in PVC/4-in steel
MW-2S	644.85				2-in PVC/4-in steel

West of Cap (North to South)

Well ID	Monitoring Point (TIC)	Depth To Water (ft)	1st Half Elevation (ft)	1st Half Notes:	Well Details
MW-4S	637.18				2-in PVC/4-in steel
MW-4R	637.02				4-in PVC/6-in steel
P-4S	636.54				3/4-in PVC/4-in steel
MW-3S	637.64				2-in PVC/4-in steel
P-3R	639.92				3/4-in PVC/4-in PVC/6-in steel
P-3S	639.46				3/4-in PVC/4-in PVC
OW-3R	638.78				2-in PVC/4-in sq. Alum.

West of Trench (North to South)

Well ID	Monitoring Point (TIC)	Depth To Water (ft)	1st Half Elevation (ft)	1st Half Notes:	Well Details
OW-1FR	620.42				2-in PVC
P97-5	613.65				3/4-in PVC
MW-10S	615.15				2-in PVC
MW-10R	615.47				4-in PVC
P97-4	614.8				3/4-in PVC
MW-8S	617.28				2-in PVC
MW-8R	617.38				4-in PVC
P97-3	617.66				3/4-in PVC
MW-9RD	619.13				2-in PVC
MW-9R	619.17				4-in PVC
MW-9S	619.91				2-in PVC
OW-2FR	624.14				2-in PVC
P97-2	619.07				1-in PVC
P97-1	619.97				1-in PVC
MW-12R	621.59				4-in PVC
MW-12S	621.17				2-in PVC

West of Smokes Creek (North to South)

Well ID	Monitoring Point (TIC)	Depth To Water (ft)	1st Half Elevation (ft)	1st Half Notes:	Well Details
MW-13R	615.14				4-in PVC/6-in steel; key lock
MW-14R	618.55				4-in PVC/6-in steel; key lock

All monitoring well locks keyed-alike (Master Lock key no. 0356)

Chemtrol: [CY] Semi-Annual Ground Water Elevations
2nd Half

DATE: _____

Performed by:

Pumping Wells

Well ID	Monitoring Point (TIC)	Depth To Water (ft)	2nd Half Elevation (ft)	2nd Half Notes:	Well Details
EW-1	624.07				pumping ([Y/N]
EW-2	622.16				pumping ([Y/N]
EW-3	621.10				pumping ([Y/N]

East of Cap (North to South)

Well ID	Monitoring Point (TIC)	Depth To Water (ft)	2nd Half Elevation (ft)	2nd Half Notes:	Well Details
MW-6S	638.54				2-in PVC/4-in steel
MW-6R	638.64				4-in PVC/6-in steel
P-1S	642.80				3/4-in PVC/4-in PVC/6-in steel
MW-1R	645.36				4-in PVC/6-in steel
MW-1S	645.40				2-in PVC/4-in steel
MW-7S	642.85				2-in PVC/4-in steel
MW-7R	642.28				4-in PVC/6-in steel

Center of Cap (North to South)

Well ID	Monitoring Point (TIC)	Depth To Water (ft)	2nd Half Elevation (ft)	2nd Half Notes:	Well Details
P-5S	637.54				3/4-in PVC/4-in PVC
P-5R	637.88				3/4-in PVC/4-in PVC/6-in steel
MW-5S	636.28				2-in PVC/4-in steel
P-2R	646.96				1/2-in PVC/6-in steel
P-2S	646.44				1/2-in PVC/4-in steel
MW-2S	644.85				2-in PVC/4-in steel

West of Cap (North to South)

Well ID	Monitoring Point (TIC)	Depth To Water (ft)	2nd Half Elevation (ft)	2nd Half Notes:	Well Details
MW-4S	637.18				2-in PVC/4-in steel
MW-4R	637.02				4-in PVC/6-in steel
P-4S	636.54				3/4-in PVC/4-in steel
MW-3S	637.64				2-in PVC/4-in steel
P-3R	639.92				3/4-in PVC/4-in PVC/6-in steel
P-3S	639.46				3/4-in PVC/4-in PVC
OW-3R	638.78				2-in PVC/4-in sq. Alum.

West of Trench (North to South)

Well ID	Monitoring Point (TIC)	Depth To Water (ft)	2nd Half Elevation (ft)	2nd Half Notes:	Well Details
OW-1FR	620.42				2-in PVC
P97-5	613.65				3/4-in PVC
MW-10S	615.15				2-in PVC
MW-10R	615.47				4-in PVC
P97-4	614.8				3/4-in PVC
MW-8S	617.28				2-in PVC
MW-8R	617.38				4-in PVC
P97-3	617.66				3/4-in PVC
MW-9RD	619.13				2-in PVC
MW-9R	619.17				4-in PVC
MW-9S	619.91				2-in PVC
OW-2FR	624.14				2-in PVC
P97-2	619.07				1-in PVC
P97-1	619.97				1-in PVC
MW-12R	621.59				4-in PVC
MW-12S	621.17				2-in PVC

West of Smokes Creek (North to South)

Well ID	Monitoring Point (TIC)	Depth To Water (ft)	2nd Half Elevation (ft)	2nd Half Notes:	Well Details
MW-13R	615.14				4-in PVC/6-in steel; key lock
MW-14R	618.55				4-in PVC/6-in steel; key lock

All monitoring well locks keyed-alike (Master Lock key no. 0356)

LOW FLOW GROUNDWATER PURGING/SAMPLING LOG

Project: _____ Site: Chem-Trol Well I.D.: _____

Date: _____ Sampling Personnel: _____ Company: _____

Purging/ Sampling Device: _____ Tubing Type: _____ Pump/Tubing Inlet Location: _____

Measuring Point: Below Top of Riser Initial Depth to Water: _____ Depth to Well Bottom: _____ Well Diameter: _____ Screen Length: _____

Casing Type: _____ Volume in 1 Well Casing (gallons): _____ Estimated Purge Volume (gallons): _____

Sample ID: _____ Sample Time: _____ QA/QC: _____

Sample Parameters: _____

PURGE PARAMETERS

TIME	pH	TEMP (°C)	COND. (mS/cm)	DISS. O_2 (mg/l)	TURB. (NTU)	Eh (mV)	FLOW RATE (ml/min.)	DEPTH TO WATER (btor)
Tolerance:	0.1	---	3%	10%	10%	+ or - 10	---	

Information: WATER VOLUMES--0.75 inch diameter well = 87 ml/ft; 1 inch diameter well = 154 ml/ft; 2 inch diameter well = 617 ml/ft; 4 inch diameter well = 2470 ml/ft ($vol_{cyl} = \pi r^2 h$)

Remarks:

WELL DEVELOPMENT LOG

AECOM

PROJECT TITLE: _____ WELL NO.: _____ PAGE: _____

PROJECT NO.: _____

STAFF: _____

DATE(S): _____

			WELL ID.	VOL. (GAL/FT)
1. TOTAL CASING AND SCREEN LENGTH (FT.)	=		1"	0.04
2. WATER LEVEL BELOW TOP OF CASING (FT.)	=		2"	0.17
3. NUMBER OF FEET STANDING WATER (#1 - #2)	=		3"	0.38
4. VOLUME OF WATER/FOOT OF CASING (GAL.)	=		4"	0.66
5. VOLUME OF WATER IN CASING (GAL.)(#3 x #4)	=		5"	1.04
6. VOLUME OF WATER TO REMOVE (GAL.)(#5 x 5)	=		6"	1.50
7. VOLUME OF WATER ACTUALLY REMOVED (GAL.)	=		8"	2.60

OR

$V=0.0408 \times (\text{CASING DIAMETER})^2$

	ACCUMULATED VOLUME PURGED (GALLONS)											
PARAMETERS	Init											
pH												
SPEC. COND. (mS)												
TURBIDITY												
TEMPERATURE (°C)												
APPEARANCE												
TIME												

COMMENTS:

NYSDEC Monitoring Well Decommissioning Procedure Selection

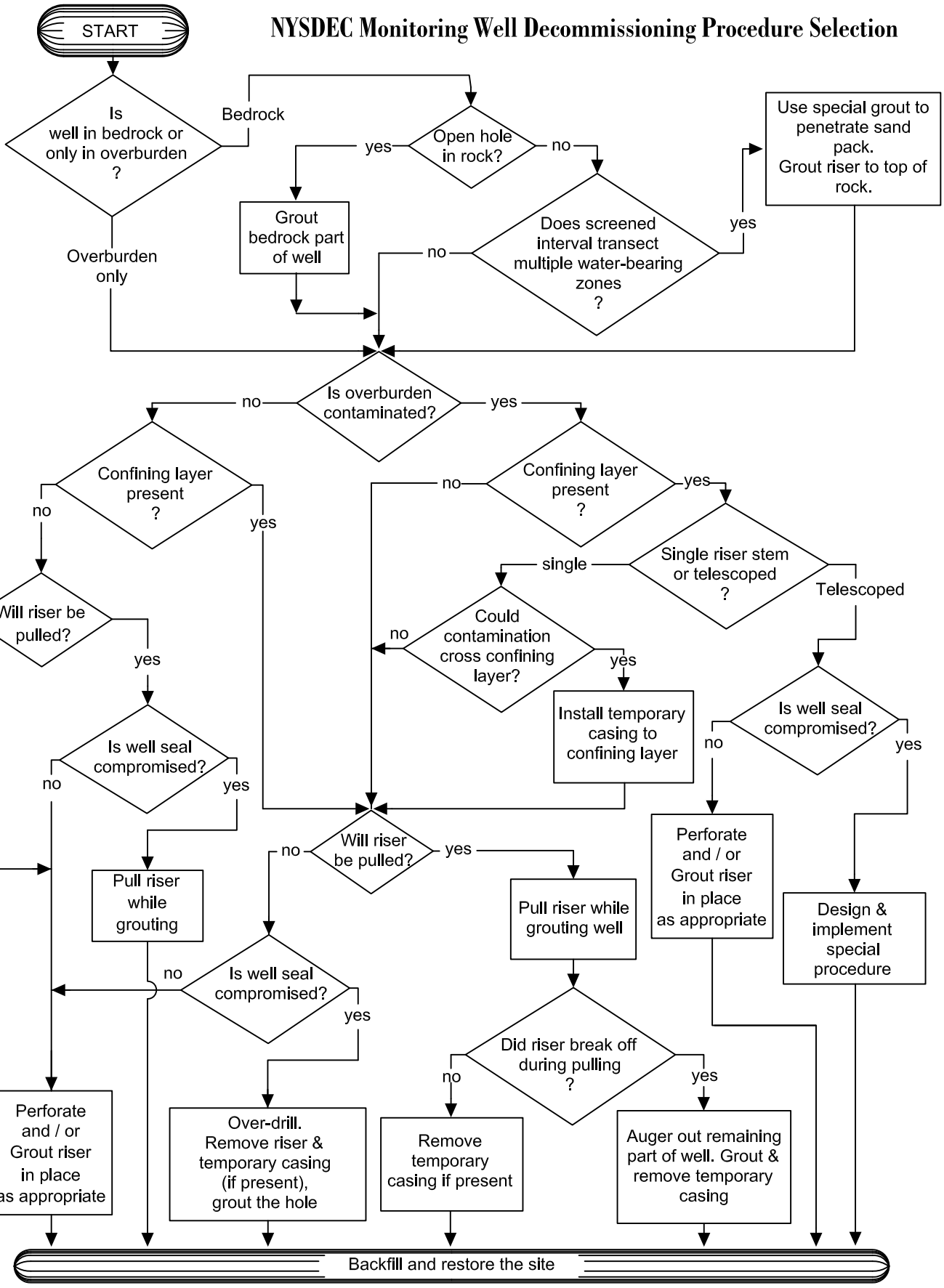


FIGURE 2

FIGURE 3

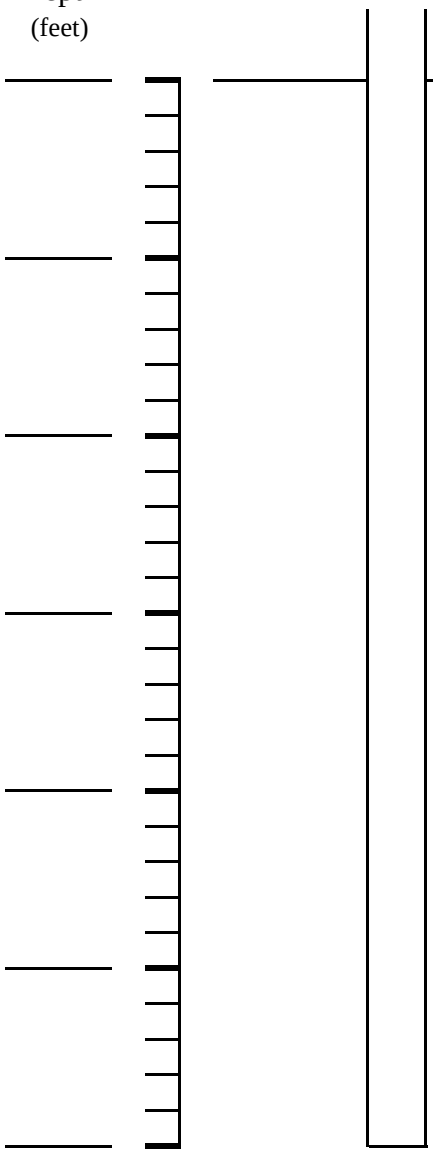
WELL DECOMMISSIONING RECORD

Site Name:	Well I.D.:
Site Location:	Driller:
Drilling Co.:	Inspector:
	Date:

DECOMMISSIONING DATA
(Fill in all that apply)

OVERDRILLING	
Interval Drilled	
Drilling Method(s)	
Borehole Dia. (in.)	
Temporary Casing Installed? (y/n)	
Depth temporary casing installed	
Casing type/dia. (in.)	
Method of installing	
CASING PULLING	
Method employed	
Casing retrieved (feet)	
Casing type/dia. (in)	
CASING PERFORATING	
Equipment used	
Number of perforations/foot	
Size of perforations	
Interval perforated	
GROUTING	
Interval grouted (FBLS)	
# of batches prepared	
For each batch record:	
Quantity of water used (gal.)	
Quantity of cement used (lbs.)	
Cement type	
Quantity of bentonite used (lbs.)	
Quantity of calcium chloride used (lbs.)	
Volume of grout prepared (gal.)	
Volume of grout used (gal.)	

WELL SCHEMATIC*



COMMENTS:

* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Drilling Contractor

Department Representative

Summary of Green Remediation Metrics for Site Management

Site Name: _____ Site Code: _____
Address: _____ City: _____
State: _____ Zip Code: _____ County: _____

Initial Report Period (Start Date of period covered by the Initial Report submittal)
Start Date: _____

Current Reporting Period
Reporting Period From: _____ To: _____

Contact Information
Preparer's Name: _____ Phone No.: _____
Preparer's Affiliation: _____

I. Energy Usage: Quantify the amount of energy used directly on-site 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 on-site.

	Current Reporting Period (tons)	**Total to Date (tons)**
Total waste generated on-site		
OM&M generated waste		
Of that total amount, provide quantity:		
Transported off-site to landfills		
Transported off-site to other disposal facilities		
Transported off-site for recycling/reuse		
Reused on-site		

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 on-site from various sources.

	Current Reporting Period (gallons)	**Total to Date (gallons)**
Total quantity of water used on-site (not including treated water)		
Of that total amount, provide quantity:		
Public potable water supply usage		
Surface water usage		
On-site 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 I – PERMITS AND PERMIT EQUIVALENTS

8275/Tech 4.2

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York, 12233-3505

John P. Cahill
Commissioner

JWH

MEMORANDUM

RECEIVED
MAR 06 2001
NYSDEC - REG. 9
X REL FOIL UNREL

TO: John Hyden, NYSDEC Region 9, DER
FROM: Sudhir Mahatma, CSS, BWP, DOW SM
SUBJECT: Chem-Trol Site # 9-15-015
DRAINAGE BASIN: 01-04
DATE: March 2, 2001

In response to your request received on May 26,1999 by Angus Eaton and a letter of Jan. 29,2001 from Thomas R. Heins of McMahon & Mann to John W. Hyden of NYSDEC, Buffalo, attached please find revised effluent criteria for the above noted groundwater remediation discharge.

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 criteria and approval of all engineering submissions. Footnote 1 identifies the Bureau of Site Control as the place to send 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 me at 518-457-9602.

Attachments (Effluent Criteria, General Conditions)

cc: John McMahon, Regional Water Engineer, R-9(w/Effluent Criteria)
A. Eaton, DOW (w/Effluent Criteria)
Terry Olmsted, DOW (w/Effluent Criteria)
Craig Jackson, DER, Rm: 348

Post-it® Fax Note 7671	Date 3/23/01	# of pages ▶ 3
To Tom Heins	From Jack Hyden	
Co./Dept.	Co.	
Phone #	Phone # 716/851-7220	
Fax # 834-8934	Fax # 851-7226	

91-2.0-2a (1/89)

Site No.:9-15-015
Part 1, Page 1 of 2

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning August 1999

and lasting until August 2004

the discharges from the treatment facility to Smokes Creek, water index number E-2-1 , Class C , RECEIVING WATER shall be limited and monitored by the operator as specified below:

Outfall Number and Parameter	Discharge Limitations		Units	Minimum Monitoring Requirements	
	Daily Avg.	Daily Max		Measurement Frequency	Sample Type
Outfall 001 - Treated Groundwater Remediation Discharge:					
Flow	72000	144000	GPD	Continuous	Meter
pH (range)	6.5 to 8.5		SU	Weekly	Grab
Total Dissolved Solids	Monitor	2500	mg/l	Weekly (7)	Grab
Total Suspended Solids	Monitor	20	mg/l	Weekly (7)	Grab
Chloroethane	Monitor	10	µg/l	Weekly (7)	Grab
1,1 Dichloroethane	Monitor	10	µg/l	Weekly (7)	Grab
1,1 Dichloroethene	Monitor	10	µg/l	Weekly (7)	Grab
1,1,1 Trichloroethane	Monitor	10	µg/l	Weekly (7)	Grab
Trichloroethene	Monitor	10	µg/l	Weekly (7)	Grab
Benzene	Monitor	5	µg/l	Weekly (7)	Grab
Toluene	Monitor	5	µg/l	Weekly (7)	Grab
o-Chlorotoluene	Monitor	10	µg/l	Weekly (7)	Grab
Chlorobenzene	Monitor	10	µg/l	Weekly (7)	Grab
cis- 1,2 Dichloroethene	Monitor	10	µg/l	Weekly (7)	Grab
Aluminum	Monitor	4000	µg/l	Weekly (7)	Grab
Boron	Monitor	1800	µg/l	Weekly (7)	Grab
Iron	Monitor	700	µg/l	Weekly (7)	Grab
Lead	Monitor	5.6	µg/l	Weekly (7)	Grab
Manganese	Monitor	2000	µg/l	Weekly (7)	Grab
Zinc	Monitor	110	µg/l	Weekly (7)	Grab

91-29-2a (1/89)

Site No.:9-15-015
Part 1, Page 2 of 2

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:

Chief - Operation Maintenance and Support Section
Bureau of Hazardous Site Control
Division of Environmental Remediation
NYSDEC
50 Wolf Road
Albany, N.Y. 12233-7010

With a copy sent to:

John McMahon, RWE, R-9
NYS Dept. of Env. Conservation
270 Michigan Avenue
Buffalo, NY 14203-2999

(2) Only site generated wastewater 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 or biocidal-type compounds used in the treatment process must be approved by the department prior to use.

(6) This discharge and adminstration of this discharge must comply with the attached General Conditions.

(7) The minimum measurement frequency for all parameters except flow and pH shall be MONTHLY following a period of 24 consecutive weekly sampling events showing no exceedances of stated discharge limitations. If discharge limitation of any parameter is exceeded, the measurement frequency for all parameters shall again be WEEKLY, until a period of 8 (eight) consecutive sampling events showing no exceedances at which point MONTHLY monitoring may resume.

82705 / Chem-Trol / Tech 4.1

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 9
270 Michigan Avenue, Buffalo, New York, 14203-2999
Phone: (716) 851-7220 • **FAX:** (716) 851-7226
Website: www.dec.ny.gov

Alexander B. Grannis
Commissioner

July 27, 2007

Mr. David M. Moreira
Project Manager, Northeast Group
S.C. Holdings, Inc.
4 Liberty Lane West
Hampton, New Hampshire 03842

Dear Mr. Moreira:

December 2005 Discharge Evaluation Report
Chem-Trol Site, Registry No. 915015
Hamburg, Erie County

The Department has completed a detailed review of the December 2005 Discharge Evaluation Report submitted by McMahon & Mann Consulting Engineers, P.C. (MMCE) on behalf of S.C. Holdings, Inc. This report was submitted at the request of the Department (letter dated February 27, 2004, from Glenn M. May to David M. Moreira) to present the results of MMCE's evaluation of the Chem-Trol wastewater treatment system's ability to remove orthochlorotoluene (OCT) and iron to acceptable discharge levels. Based upon this evaluation, MMCE requested modification to the discharge limits for OCT, iron, aluminum, boron, lead, manganese, zinc, and total dissolved solids. The rational for these requests, along with the Department's responses, are summarized as follows:

OCT: The treatment system effectively reduces OCT to levels consistent with the discharge limits when the air stripper is cleaned with HCl every three to four months, although OCT effluent concentrations occasionally exceed the 10 µg/l discharge limit. MMCE requests a modification of the discharge limit for OCT to 25 µg/l.

The air stripper, when periodically cleaned with HCl, is capable of consistently achieving the current discharge limit. As a result, the Department denies MMCE's request to modify the discharge limit for OCT to 25 µg/l.

Iron: The iron removal filter is not capable of treating wastewater to the discharge limit of 0.7 mg/l. MMCE requests a modification of the discharge limit for iron to 3.0 mg/l based upon iron concentrations in ambient groundwater and surface water samples, and the presence of ferric iron in the discharged water.

The groundwater monitoring well data provided in the Discharge Evaluation Report indicates that the concentration of iron in ambient groundwater ranges from 1.73 to 11.7 mg/l. Ambient surface water samples collected from an on-site tributary to the South Branch of Smokes Creek also contain iron at concentrations (3.13 to 4.48 mg/l) that exceed the current discharge limit. Further, as the form of iron in the discharge water (ferric) is already oxidized, there would be limited reduction in oxygen levels in the creek. In addition, iron staining at the discharge pipe has not been observed since the discharge water was diverted to the South Branch of Smokes Creek in February 2004. As a result, the Department agrees with the request to increase the iron discharge limit to 3.0 mg/l, recognizing that the need to treat groundwater captured by the site's extraction system to less than ambient conditions is not necessary. This modification will need to be reviewed, however, if iron staining is observed in the future.

Aluminum, Boron, Lead, Manganese, Zinc and Total Dissolved Solids: These parameters were generally not detected, or were detected at concentrations below the discharge limits. MMCE requests that these compounds be removed from the list of parameters analyzed in the influent and effluent samples.

Aluminum, boron, lead, manganese, zinc, and total dissolved solids are not indicators of treatment system performance. As a result, the Department agrees with the request to eliminate these compounds from the compliance monitoring program.

Should you have any questions, please feel free to contact me at (716) 851-7220.

Sincerely yours,

Glenn M. May

Glenn M. May, CPG
Environmental Geologist II

GMM:lg

cc: Mr. Gregory Sutton, NYSDEC, Region 9
Mr. Brian Sadowski, NYSDEC, Region 9
Mr. James Bojarski, McMahon & Mann Consulting Engineers, P.C.

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 9
270 Michigan Avenue, Buffalo, New York 14203-2915
Phone: (716) 851-7220 • **Fax:** (716) 851-7226
Website: www.dec.ny.gov

RECEIVED
MAR 3 1 2011

Joe Martens
Commissioner

March 29, 2011

Mark Snyder, P.E.
Waste Management
425 Perinton Parkway
Fairport, New York 14450-9104

Dear Mr. Snyder:

2010 Periodic Review Report
Chem-Trol Site, Registry No. 915015
Blasdell, Erie County

The New York State Department of Environmental Conservation (NYSDEC) is in receipt of the 2010 Periodic Review Report (PRR) submitted on February 10, 2011 by McMahon & Mann Consulting Engineers, P.C. (McMahon & Mann), on behalf of SC Holdings, Inc. This report: (1) describes the operation and maintenance activities completed during 2010 on the groundwater collection and treatment system; (2) describes the activities completed during 2010 to evaluate the passive operation of the SVE system; (3) presents the analytical results of groundwater samples collected in October 2010; (4) evaluates the SVE and groundwater collection and treatment systems for compliance with the 1996 ROD; (5) contains a signed Institutional and Engineering Controls (IC/EC) Certification Form; and (6) makes recommendations regarding the future operation of the SVE and groundwater collection and treatment systems. Specifically, McMahon & Mann recommends that: (1) monthly sampling of the groundwater treatment air stripper exhaust be eliminated; and (2) that active operation of the SVE system permanently cease.

Information contained in the 2010 PRR indicates that the SVE and groundwater collection and treatment systems are operating effectively and remain protective of public health and the environment. This letter, therefore, transmits formal NYSDEC approval of the 2010 PRR for the Chem-Trol Site. With this approval, please send us an electronic copy of the 2010 PRR.

Regarding McMahon & Mann's recommendations, I understand that McMahon & Mann has contacted the NYSDEC's Division of Air in Region 9 concerning the elimination of the monthly air stripper sampling. Please copy me on all correspondence to the Division of Air regarding this issue and the outcome of said correspondence.

The NYSDEC concurs with McMahon & Mann's recommendations to permanently cease the active operation of the SVE system. It is our understanding that passive venting of the SVE system laterals will continue in the future.

Should you have any questions, please feel free to contact me at (716) 851-7220.

Sincerely yours,

Glenn M. May, CPG
Environmental Geologist II

GMM:sz

ecc: Mr. Gregory Sutton, NYSDEC, Region 9
Mr. Alfred Carlacci, NYSDEC, Region 9
Mr. Brian Sadowski, NYSDEC, Region 9
Mr. Alan Zylinski, NYSDEC, Region 9
Mr. James Bojarski, McMahon & Mann

New York State Department of Environmental Conservation
Division of Air Resources, Region 9
270 Michigan Avenue, Buffalo, New York 14203-2915
Phone: (716) 851-7130 • **Fax:** (716) 851-7009
Website: www.dec.ny.gov

Joe Martens
Commissioner

April 26, 2011

Mr. John A. Minichiello, CPESC, CPSWQ
McMahon & Mann Consulting Engineers, P.C.
2495 Main Street, Suite 432
Buffalo, New York 14214

Dear Mr. Minichiello:

Chem-Trol Site, Registry No. 9-15-015
Blasdell, Erie County
Request to Eliminate Air Stripper Emissions Testing

The New York State Department of Environmental Conservation (Department) received a report requesting the elimination of the sampling and analytical testing of the air stripper exhaust associated with the groundwater collection and treatment system at the Chem-Trol Site. This report was submitted on April 6, 2011 by McMahon & Mann Consulting Engineers, P.C. (MMCE), on behalf of SC Holdings, Inc. After review of the report, the Department approves the request because the analytical data indicates that concentrations of o-chlorotoluene in the influent to the groundwater treatment system have stabilized.

Should you have any questions, please feel free to contact me at (716) 851-7130.

Sincerely yours,

Alan J. Zylinski, P.E.
Environmental Engineer II

AJZ:ed

ecc: Mr. Gregory Sutton, NYSDEC, Region 9
Mr. Alfred Carlacci, NYSDEC, Region 9
Mr. Brian Sadowski, NYSDEC, Region 9
Mr. Glenn May, NYSDEC, Region 9

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Environmental Remediation, Region 9
700 Delaware Avenue, Buffalo, NY 14209
P: (716) 851-7220 | F: (716) 851-7275
www.dec.ny.gov

May 4, 2023

Mr. Ryan Donovan, District Manager
SC Holdings, Inc.
600 New Ludlow Road
South Hadley, MA 01075

2021 Periodic Review Report
Chem-Trol, Site No. 915015
Blasdell, Erie County

Dear Mr. Donovan:

The New York State Department of Environmental Conservation (NYSDEC) has reviewed the Periodic Review Report (PRR) and IC/EC Certification for the period from February 15, 2022, to February 15, 2023. This PRR proposes a reduction in periodic monitoring requirements, which are summarized as follows:

- **Treated groundwater influent and effluent sampling**: Reduce the required monitoring from monthly to every other month. System cleanings would be performed on non-sample months to ensure a site visit is made and to monitor the operation of the system.

- **Annual groundwater monitoring**: Reduce long-term groundwater monitoring of the six wells from annual to bi-annual (every other year). Given the stability of these parameters, bi-annual sampling would continue to provide an adequate assessment of the stability of the groundwater recovery and treatment system.

- **Groundwater level gauging**: Reduce from quarterly to semi-annually in April and October. Groundwater contour figures would be prepared and submitted with the monitoring reports.

- **Periodic reporting**: A change to semi-annual reporting is proposed, to include system sampling, inspections, and groundwater contours for the reporting period.

The Department hereby accepts the PRR and associated Certification, and approves the proposed reduction in periodic monitoring requirements.

The frequency of Periodic Reviews for this site is one year, so your next PRR is due in March 2024. You will receive a reminder letter and updated certification form prior to that due date. Please note that if you do not receive the reminder notice, the next PRR including the signed certification form is still due on the date specified above.

Should you have any questions, please contact me at 716-851-7220 or via e-mail at: glenn.may@dec.ny.gov.

Sincerely,

Glenn M. May

Glenn M. May, PG
Professional Geologist I

ec: Stanley Radon, NYSDEC, Buffalo
Andrea Caprio, NYSDEC, Buffalo
James Kaczor, AECOM, Buffalo

APPENDIX J – FIELD ACTIVITIES PLAN

CHEM-TROL SITE
TOWN OF HAMBURG
ERIE COUNTY, NEW YORK
NYSDEC SITE NUMBER: HW915015
USEPA ID NUMBER: NYD980531180

FIELD ACTIVITIES PLAN

Prepared for:
SC Holdings, Inc.
600 New Ludlow Road
South Hadley, Massachusetts 01075

Prepared by:
AECOM USA, Inc.
50 Lakefront Boulevard, Suite 111
Buffalo, New York 14202

March 2026

TABLE OF CONTENTS

FIELD ACTIVITIES PLAN

Page No.

1.0 INTRODUCTION 1-1

2.0 MONITORING WELL ABANDONMENT AND RE-DEVELOPMENT PROCEDURES 2-1

2.1 Monitoring Well Abandonment Procedures 2-1

2.2 Monitoring Well Re-Development Procedures 2-2

3.0 GROUNDWATER SAMPLING PROCEDURES 3-3

3.1 Water Level Monitoring Procedures 3-3

3.2 Well Purging Procedures 3-4

3.3 Groundwater Sampling Procedures 3-4

4.0 GROUNDWATER TREATMENT SYSTEM INFLUENT AND EFFLUENT SAMPLING 4-1

5.0 SAMPLE LABELING 5-2

6.0 QUALITY ASSURANCE/ QUALITY CONTROL SAMPLING 6-1

7.0 FIELD DOCUMENTATION 7-1

8.0 SAMPLE SHIPPING 8-1

9.0 FIELD SAMPLING INSTRUMENTATION 9-1

10.0 SAMPLING EQUIPMENT DECONTAMINATION PROCEDURES 10-1

11.0 INVESTIGATION-DERIVED WASTE CHARACTERIZATION AND DISPOSAL 11-1

12.0 ANALYSIS 12-1

1.0 INTRODUCTION

This Field Activities Plan (FAP) is designed to provide detailed step-by-step procedures for the field activities performed during the long-term monitoring program at the Chem-Trol Site (Site) located in the Town of Hamburg, Erie County, New York (SMP Figure 1 and Figure 2). It will serve as the field procedures manual to be followed by all project personnel. Adherence to these procedures will ensure the quality and defensibility of the field data collected. In addition to the field procedures outlined in this document, all personnel performing field activities must do so in compliance with: (1) the Quality Assurance/Quality Control (QA/QC) measures outlined in the Quality Assurance Project Plan; (QAPP, Appendix G in the Site Management Plan (SMP) (AECOM, 2026)); (2) the appropriate Health and Safety guidelines found in the Health and Safety Plan (HASP, Appendix E in the SMP); and (3) the scope of work outlined in the SMP. Monitoring locations (i.e., monitoring wells) are shown on SMP Figure 2. Water levels will be collected from the 41 wells listed on SMP Table 2 on a semi-annual basis. Six of these monitoring wells (MW-3S, MW-7R, MW-8R, MW-9R, MW-13R, and MW-15R) will be sampled on a biennial (even-numbered year) basis. Aqueous influent and effluent samples will be collected from the groundwater treatment system on an every-other-month basis (odd-numbered month). The sampling matrix is provided in QAPP Table 2.

2.0 MONITORING WELL ABANDONMENT AND RE-DEVELOPMENT PROCEDURES

2.1 Monitoring Well Abandonment Procedures

Abandonment of Site monitoring wells is not currently planned. However, in the event this activity may be needed in the future it is discussed here.

Well abandoning will be performed in accordance with New York State Department of Environmental Conservation (NYSDEC) CP-43, using the following steps:

1) Each well will be tremie grouted from the bottom of the well to within five feet of the ground surface to ensure a continuous grout column. Grout slurry composition should be the following:

    a. 1.5 to 3.0 percent by weight - Bentonite (Quick Gel)

    b. 40 to 60 percent by weight - Cement (Portland Type I)

    c. 40 to 60 percent by weight - Water

2) The well casing will be removed at a depth of five feet below grade (if possible) and the outer protective casing "stick-up" and/or flush-mount curb box will be removed only after the well has been properly filled with grout.

3) The uppermost five feet of the borehole will be filled with approved/clean backfill or topsoil.

4) The surface of the borehole will be restored to the condition of the area surrounding the borehole (unimproved grass area, crushed stone, asphalt, etc.).

5) The solid waste should be handled is accordance with Section 10.0 of this plan.

6) Document well construction details in the field notebook and transfer the data onto the Well Decommissioning Record form (SMP Appendix H).

Reference: NYSDEC CP-43: Groundwater Monitoring Well Decommissioning Policy, November 3, 2009.

2.2 Monitoring Well Re-Development Procedures

Re-development of Site monitoring wells is not currently planned. However, in the event this activity may be needed in the future it is discussed here.

Summary: On occasion (e.g., due to excessive silt accumulation), it may be necessary to re-develop a monitoring well. Each well will be re-developed by surging and pumping until the discharged water is sediment free based on visual observations and the indicator parameters (pH, temperature, and specific conductivity) have reached a steady state. Re-developing the monitoring well not only removes any sediment, but also may improve the hydraulic properties of the formation. The effectiveness of the re-development measures will be closely monitored to keep the volume of discharged water to the minimum necessary to obtain sediment-free samples. A portable turbidimeter will be used to monitor the effectiveness of the re-development. A turbidity reading of < 50 Nephelometric Turbidity Units (NTU) and steady state pH, temperature, and specific conductivity readings will be used as a guide for discontinuing well re-development. The well will be re-developed as described below. Re-development water will be containerized in 55-gallon drums for off-site disposal.

Procedures:

1) An appropriate well re-development method should be selected, depending on water level depth, well productivity, and sediment content of water. Well re-development options include surging while manual pumping and powered suction-lift or hydrolift pumping.

2) Equipment should be assembled, decontaminated (if necessary), and installed in the well. Care should be taken not to introduce contaminants to the equipment during installation.

3) Well re-development should proceed by repeated surging and removal of water from the well until the discharged water is relatively sediment-free. The effectiveness of the re-development should be monitored at regular intervals using a portable turbidity meter. The volume of water removed and turbidity, pH, temperature, and conductivity measurements will be recorded on a Well Development Log (SMP Appendix H).

4) Well re-development will be discontinued when the turbidity of the discharged water is below 50 NTU.

Reference: ASTM Standard Practice for Design and Installation of Ground Water Monitoring Wells in Aquifers D5092-90.

3.0 GROUNDWATER SAMPLING PROCEDURES

3.1 Water Level Monitoring Procedures

Summary: Determination of groundwater depths in monitoring wells is necessary to make potentiometric surface maps. Water levels in monitoring wells scheduled to be sampled during the field work will be measured using an electronic interface probe/water level indicator. During each monitoring event, water levels to be used to generate potentiometric groundwater surface contour maps will be collected from all sampled monitoring wells. Water level measurement procedures are presented below.

Procedure:

1) Clean the water level probe and the lower portion of cable following standard decontamination procedures and test water level meter to ensure that the batteries are charged.
2) Lower the probe slowly into the monitoring well until the solid audible alarm indicates water.
3) Read the depth to the nearest hundredth of a foot from the graduated cable using the V-notch on the riser pipe as a reference.
4) Repeat the measurement for confirmation and record the water level.
5) Lower the probe slowly to the bottom of the monitoring well. Record the bottom depth of the well.
6) Remove the probe from the well slowly, drying the cable and probe with a clean paper towel.
8) Replace the well cap.
9) Decontaminate the water level meter if additional measurements are to be taken.

Water level measurements will be recorded on a Groundwater Elevation Log (SMP Appendix H).

3.2 Well Purging Procedures

Well purging will be completed using the low-flow purging technique as follows:

1) The well cover will be carefully removed to avoid having any foreign material enter the well.

2) Using an electronic interface probe, the water level below top of casing will be measured. The depth of the well will be measured to determine the volume of water in the well. The end of the probe will be decontaminated between wells. The depth to bottom of the well will be recorded from the V notch in the top of the casing.

3) Calibrate field instruments [e.g., pH, dissolved oxygen (DO), oxidation-reduction potential (ORP), specific conductance, temperature, and turbidity].

4) Start the flow rate low and maintain it between 100 and 500 ml/min, optimally at a rate where the water level remains stable.

5) Purge the required water volume (i.e., until stabilization of pH, DO, ORP, temperature, specific conductivity, and turbidity) using a low-flow pump (e.g., peristaltic pump) and dedicated high density polyethylene (HDPE) tubing (or similar). During purging, it is permissible to by-pass the flow cell until the groundwater has cleared. New dedicated tubing will be used for each well.

6) Purge the well until the water quality parameters have stabilized. Collect groundwater parameters every five minutes until the well has stabilized. The respective measurements of the parameters must fall within the stated range for three consecutive readings. If stability or five well volumes has been achieved for the parameters listed below, the well can be sampled. The stabilization criteria are: DO ± 10% full-scale range; ORP ± 10%; specific conductivity ± 3% full-scale range; pH ± 0.10 pH unit; temperature ± 0.2°C, and turbidity ± 10% if greater than 50 nephelometric turbidity unit (NTU).

7) Purging of three well volumes is not necessary if the indicator parameters are stable. However, a minimum of thirty minutes of purging is required before sampling, even if the parameters are stable. At the start of purging, it is permissible to by-pass the flow cell until the groundwater has cleared.

Well purging data are to be recorded on the Low-Flow Groundwater Purging/Sampling Log (SMP Appendix H).

3.3 Groundwater Sampling Procedures

The following groundwater sampling procedures will be used for monitoring wells after purging has been conducted:

Procedures

1) After well purging is completed, the flow cell will be disconnected and drained and a sample will be collected into the appropriate laboratory supplied containers from the well tubing, without changing the purge rate.

2) Direct water flow toward the inside wall of the sample container to minimize volatilization. Fill volatile sample containers so no headspace (air bubbles) is present. If containers are pre-preserved, do not overfill sample containers. Note if effervescence is observed.

3) All sample bottles will be labeled in the field using a waterproof permanent marker.

4) Samples will be collected into laboratory-provided sample bottles (containing required preservatives) and placed on ice in coolers for processing (preservation and packing) prior to shipment or delivery to the analytical laboratory. A chain-of-custody (COC) record (COC to be supplied by selected laboratory) will be initiated. The analytical laboratory will provide certified analyte-free sample bottles.

5) After the required sample containers have been filled, remove dedicated/disposable HDPE tubing (or similar). Decontaminate reusable sampling equipment with laboratory grade soap and distilled water and rinse with distilled water before reassembling.

6) Well sampling data are to be recorded in the field notebook and on the Low-Flow Groundwater Purging/Sampling Log (SMP Appendix H).

7) Groundwater samples will be placed on ice, and delivered to the laboratory either by the sampler, laboratory courier or common courier (e.g., FedEx) under COC control. The volume of sample required, bottle type and required QA/QC may be found in the QAPP, Table 1. Groundwater samples will be collected for the parameters referenced in the QAPP, Table 2. Samples must be received by the laboratory less than 24 hours after collection.

8) If samples are shipped via common courier, the sample cooler must be sealed with a custody seal.

Any observations of water quality that were made during sampling of groundwater are to be included in the Low-Flow Groundwater Purging/Sampling Log (SMP Appendix H).

4.0 GROUNDWATER TREATMENT SYSTEM INFLUENT AND EFFLUENT SAMPLING

The following groundwater sampling procedures will be used for collecting influent and effluent samples from the groundwater treatment system:

Procedures

1) Effluent samples will be collected from the air stripper surface water discharge pipe post-treatment. pH will be collected using an appropriate pH meter (ex. Environmental Express Oakton pHTestr® 30+ Waterproff Pocket Tester) and recorded on an appropriate log. Volatile samples will be collected first via a co-located aliquot which will be used to direct fill volatile sample containers so no headspace is present. The remaining samples will be collected by dipping the laboratory supplied bottle ware into the surface water body at the outfall location adjacent to the South Branch of Smokes Creek.

2) Influent groundwater samples will be collected from within the groundwater treatment building prior to treatment. The samples are collected by directing influent groundwater flow through a sampling port located along the northwest interior wall of the building. pH will be collected using an appropriate pH meter (ex. Environmental Express Oakton pHTestr® 30+ Waterproff Pocket Tester) and recorded on an appropriate log.

3) Direct water flow toward the inside wall of the sample container to minimize volatilization. Fill volatile sample containers so no headspace (air bubbles) is present. If containers are pre-preserved, do not overfill sample containers. Note if effervescence is observed.

4) All sample bottles will be labeled in the field using a waterproof permanent marker.

5) Samples will be collected into laboratory-provided sample bottles (containing required preservatives) and placed on ice in coolers for processing (preservation and packing) prior to shipment or delivery to the analytical laboratory. A chain-of-custody (COC) record (COC to be supplied by selected laboratory) will be initiated. The analytical laboratory will provide certified analyte-free sample bottles.

6) Influent/effluent samples will be placed on ice, and delivered to the laboratory either by the sampler, laboratory courier or common courier (e.g., FedEx) under COC control. The volume of sample required, bottle type and required QA/QC may be found in the QAPP, Table 1. Groundwater samples will be collected for the parameters referenced in the QAPP, Table 2. Samples must be received by the laboratory less than 24 hours after collection.

7) If samples are shipped via common courier, the sample cooler must be sealed with a custody seal.

5.0 SAMPLE LABELING

Summary: In order to prevent misidentification and to aid in the handling of environmental samples collected during the field investigation, the following procedures will be used:

Procedure: Each container will have the following information placed on the laboratory supplied sample label:

- Site name
- Sample identification
- Collection date/time
- Sampler's initials
- Analysis required and preservatives

Sample identification numbers will be assigned based on the well identification and will be the same for all parameters collected. The general sample identification format follows.

- MW = Monitoring Well
- FB = Field (Equipment Rinsate) Blank
- TB = Trip Blank
- XX = Numerical sample identifier (up to five characters). This will ordinarily be the number of the monitoring well from which the sample was obtained.

For example, a groundwater sample collected from monitoring well MW-17 would have the identifier assigned, MW-17.

Field duplicate samples will be assigned a unique identification alphanumeric code that specifies the data of collection, the letters FD (for field duplicate) and an ascending number that records the number of duplicate samples collected that day. For example, the first field duplicate collected on November 17, 2024 would be assigned the following sample number using the code shown below:

FD-MMDDYY = FD-111724

Subsequent duplicates collected on the same day would be assigned FD-111724-2, FD-111724-3, etc. The field duplicate IDs are "blind", so that the laboratory cannot trace them to their parent samples. Field sampling crew will record the duplicate sample information on the appropriate Sampling Field Data Sheets and also in the field notebook. The sample will be added to the COC with the time of collection of 0000.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples will use the same well identification name as the parent sample, with the acronym MS/MSD after it; for example, MS/MSD collected from well MW- 17: MW-17 (MS/MSD). The sample will be added to the COC with the same time of collection as the parent sample.

Rinsate (Equipment) Blank samples will be labeled with the letters RB (rinsate blank) and the date of collection in the same order as for the field duplicate and added to the COC (e.g., using the same date as above, RB-111724).

Trip blanks will be labeled with the letters TB (trip blank) and the date in the same order as the field duplicate and added to the COC (e.g., for example, using the same date as above, TB-111724).

6.0 QUALITY ASSURANCE/ QUALITY CONTROL SAMPLING

QA/QC samples will be collected as follows:

- Field duplicates will be collected per matrix at the rate of one per twenty (5%) samples collected. It will be collected immediately following the collection of the parent sample for the same parameters as the parent sample.
- Trip Blanks will be provided by the laboratory filled with analyte-free water and returned at the rate of one per sample pickup. Trip blanks will be analyzed for VOCs only.

Refer to the QAPP for additional project QA/QC information.

7.0 FIELD DOCUMENTATION

Field notebooks will be used during all on-site work. A dedicated permanently-bound field notebook will provide a legal record and will be maintained by the field technician overseeing the site activities. Entries will be written with waterproof ink and will be of sufficient detail that a complete daily record of significant events, observations, and measurements is developed. At the conclusion of each day of fieldwork, entries will be signed and dated. Erroneous entries will be corrected by the field technician that made the entries. Corrections will be made by drawing a single line through the error, entering the correct information, and initialing/dating the correction.

The field sampling team will maintain the daily field notebook and logs (SMP Attachment I), which will minimally include the following information:

1) Project name and location of field activity
2) Date and time of entry
3) Names and titles of field team members onsite
4) Names, titles of any site visitors, as well as date and time entering and leaving site
5) Weather information (e.g., temperature, precipitation, cloud coverage, wind speed and direction, etc.)
6) Purpose of field activity and detailed description of fieldwork conducted
7) Sample media to be collected
8) Sample Identification
9) Date and time of sample collection
10) Field observations and measurements (e.g., PID, water levels)
11) Sampling methods and devices
12) Purge volumes
13) Groundwater purge parameters (i.e., pH, temperature, ORP, DO, conductivity, water levels, turbidity, etc.)
14) COC and shipping information.

8.0 SAMPLE SHIPPING

Summary: Proper documentation of sample collection and the methods used to control these documents are referred to as COC procedures. COC procedures are essential for presentation of sample analytical chemistry results as evidence in litigation or at administrative hearings held by regulatory agencies. COC procedures also serve to minimize loss or misidentification of samples and to ensure that unauthorized persons do not tamper with collected samples.

The procedures used in this study follow the chain-of-custody guidelines outlined in NEIC Policies and Procedures, prepared by the National Enforcement Investigations Center (NEIC) of the U.S. Environmental Protection Agency Office of Enforcement.

Procedure:

1) A COC record is initiated at the analytical laboratory performing the sample analyses and will accompany the sample containers during preparation, delivery of the sample containers to the field, and during return shipment to the laboratory.
2) The COC record should be completely filled out by field personnel with all applicable/relevant information as samples are collected and packed for shipment e.g., project name and number, field technician name, sample ID, date/time of collection, matrix, requested parameters, number of sample bottles, relinquishing/receipt signatures, method of sample shipment with shipper airbill number, name of analytical laboratory, etc. Any erroneous markings will be crossed-out with a single line and initialed by the author.
3) The original COC accompanies the samples. It should be placed in a Ziploc® bag (or equivalent) and placed inside the cooler containing the samples. The sampler should retain a copy of the COC for the project records.
4) All groundwater samples should be placed and stored on ice immediately after sample collection in the laboratory supplied coolers.
5) If the laboratory provides a courier to collect the samples from the site, samples should be picked up on the day of collection. If that is not possible, the samples shall be stored on ice in a secure area then delivered to the laboratory the next day, or as soon as possible.
6) If the courier is not provided, samples can be shipped via common courier. Pack the coolers with the samples wrapped in bubble wrap, place ice in plastic baggies to prevent any melt from leaking out of the cooler, and make sure samples will not shift in the cooler. Place the lab address on top of sample cooler. Affix numbered custody seals across the cooler lid. Cover seals with wide, clear tape.
7) Ship samples via overnight carrier the same day that they are collected and must be delivered to the laboratory the following morning.

8) The COC seal must be applied in a manner where they must be broken in order to open the shipping container. Breakage of the seal before receipt at the laboratory may indicate tampering. If tampering is evident, the laboratory must immediately contact the laboratory Project Manager, who further contacts the consultant Project Manager for further instructions (i.e., cancel or proceed with analyses).

9.0 FIELD SAMPLING INSTRUMENTATION

Field sampling equipment will require no maintenance beyond decontamination between sampling locations. Calibration procedures for electronic instruments can be found in the equipment operating manuals. Calibration and maintenance procedures for the common instrumentation that will be used during field investigations are discussed in the equipment operating manuals. A copy of the manufacturer's operating manual for each instrument will be kept with the instrument or the operator. All field analytical equipment will be calibrated immediately prior to each day's use. Calibration procedures will conform to manufacturer's standard instructions. The calibration procedures and results will be recorded in the field notebook. All changes to instrumentation will be noted in the field notebook.

The following field instruments may be used during project site work:

1) Multi-Parameter Meter (e.g., MultiRAE PLUS PGM-50 Monitor (10.6 eV lamp) with PID, %LEL) - Calibration of the meter and a battery check will be performed daily in accordance with manufacturer's specifications. Standards used for calibration will be National Institute of Standards and Technology (NIST) traceable. All calibration data will be recorded in the field notebook.

2) Turbidity Meter – The turbidity meter will be checked daily in accordance with manufacturer's specifications. All daily data will be recorded in the field notebook.

3) Multi-Parameter Groundwater Quality Meter (e.g., Horiba U-22) – Calibration of the meter will be performed daily in accordance with manufacturer's specifications. All daily data will be recorded in the field notebook.

4) Multi-Parameter Meter (e.g., Environmental Express Oakton pHTestr® 30+ Waterproff Pocket Tester) - Calibration of the meter will be performed daily in accordance with manufacturer's specifications. All daily data will be recorded in the field notebook.

10.0 SAMPLING EQUIPMENT DECONTAMINATION PROCEDURES

Summary: To assure that no outside contamination will be introduced into the samples/data, thereby invalidating the samples/data, the following cleaning protocols will apply for all equipment used to collect samples/data during the field investigations.

Procedures:

1) Thoroughly clean equipment with laboratory-grade soap and water, until all visible contamination is gone.
2) Rinse with water, until all visible evidence of soap is removed.
3) Decontamination water will be collected and managed along with purge water.

After decontamination, equipment will be carefully stored to avoid contamination between sampling events.

11.0 INVESTIGATION-DERIVED WASTE CHARACTERIZATION AND DISPOSAL

There is no investigation derived waste (IDW) that requires characterization for off-site disposal.

12.0 ANALYSIS

Each groundwater sample will be analyzed by a NYSDOH Environmental Laboratory Approval Program (ELAP) certified laboratory for those parameters referenced in the QAPP, Table 2. Field personnel will coordinate with the laboratory for sample pick-up, delivery and/or shipment of the samples to the laboratory.

APPENDIX K – SEFA SUMMARY

AECOM
50 Lakefront Blvd., Suite 111
Buffalo, NY 14202
aecom.com

Project ref: 60779298

Memorandum

Date: February 24, 2026

To: New York State Department of Environmental Conservation (NYSDEC)

From: Edyta Chorostkowska

CC: Jim Kaczor

Project name: Spreadsheets for Environmental Footprint Analysis (SEFA)
Chem-Trol (Site No. 915015), Hamburg, Erie County, NY

1. Overview

AECOM conducted a sustainability assessment in support of the Site Management Plan (SMP) at the Chem-Trol Site, located in Hamburg, Erie County, NY (Site). This Site is New York State Department of Environmental Conservation (NYSDEC) State Superfund Program Site No. 915015.

The sustainability of remediation options is typically evaluated against a number of indicators using metrics to quantify each indicator. Indicators are generally grouped under the three sustainability pillars (environmental, social, and economic). A sustainability assessment may include a single pillar (most commonly environmental) or a combination of pillars depending on the stakeholders and goals for a site. For this project, environmental factors were quantified for the Long-Term Operations, Maintenance & Monitoring (OM&M) phase of the project as part of the SMP, using the United States Environmental Protection Agency (USEPA) Spreadsheets for Environmental Footprint Analysis (SEFA).

2. SEFA

The USEPA developed best management practices (BMPs) to help project managers and other stakeholders apply greener cleanup principles on a routine basis at remediation sites while maintaining the cleanup objectives, ensuring protectiveness of a remedy, and improving its environmental outcome. The USEPA's 2012[1] Methodology for Understanding and Reducing a Project's Environmental Footprint identifies metrics associated with an environmental footprint of a project, and a specific process to quantify and qualify those metrics. SEFA is a series of publicly available Microsoft Excel spreadsheets developed by the USEPA Office of Superfund Remediation and Technology Innovation and used to calculate the environmental footprint of remediation activities in terms of sustainability metrics. SEFA is intended for estimating footprints during key phases of a cleanup project, such as the evaluation of alternative remedies, development of remedy designs, and optimization of remedies, but may also be applied to other phases. It was originally developed for USEPA's internal use but is now publicly available for the benefit of others wishing to estimate the environmental footprint of site cleanups.

SEFA's core elements include:

1. Materials & Waste
2. Water (used on-site)
3. Energy
4. Air

[1] USEPA. 2012. Methodology for Understanding and Reducing a Project's Environmental Footprint. United States Environmental Protection Agency. EPA 542-R-12-002. February 2012.

There are 30 metrics for estimating the project footprint under the four core elements of SEFA.

Calculations for a typical footprint assessment include the following principal elements:

- Determining the goals and scope of the analysis.
- Gathering information about design, construction, and operation of the site's existing or anticipated remedy.
- Quantifying the on-site materials and waste metrics, which account for the materials used, the recycled content of those materials, various wastes generated, and portions of the waste that are recycled or reused.
- Quantifying the on-site water metrics, which consider the source and amount of water used on site as well as the fate of water after use.
- Using the combined information to quantify energy metrics and air metrics, which jointly consider the total amount of energy used (including the portion from renewable resources) and the air emissions associated with energy usage, on-site activities, and off-site support.
- Qualitatively describing ecosystem services that are affected during remedy implementation.
- Presenting results of each previous step and the overall results of analysis.

Once the conceptual designs, inputs, and assumptions were generated and reviewed by the assessment teams, the SEFA tool was run for the selected remedial approach and the metrics were generated. Refer to **Appendix A** for the input worksheets.

The SEFA tool then generates a summary table quantifying the environmental footprint metrics of each remedial action component, and also generates graphs of the energy usage and air emission metrics for each scope and component. Refer to **Appendix B** for the Environmental Footprint Summary table and to **Appendix C** for the energy use and air emission graphs.

3. Retained Components

A summary of the retained component as part of the SEFA includes the following:

- **Long-Term OM&M** is currently conducted at the Site as part of the SMP to maintain the passive soil vapor extraction (SVE) system and the groundwater extraction and treatment system (GWETS). The work includes the following annual activities:
  - Monthly operation and maintenance tasks, including visual inspections of the air stripper, SVE components, and GWETS components;
  - Every other month cleaning of the air stripper;
  - Every other month sampling of the GWETS influent and effluent;
  - Semi-annual gauging of 41 on-site monitoring wells; and,
  - Every other year groundwater sampling of six (6) on-site monitoring wells with chemical analysis, plus two (2) quality assurance / quality control (QA/QC) samples.

At this time, the SEFA evaluation is limited to the Long-Term OM&M component as part of the SMP, which is conducted annually.

4. Sustainability Assessment

The SEFA evaluation categorizes activities based on four different scopes, as defined by: Scope 1) on-site activities, which are those that occur within the Site boundaries; Scope 2) grid electricity generation activities, which are those that occur off-site at an electricity generation station; Scope 3a) transportation activities, which are those associated with the movement of

personnel, equipment and materials to / from a source and the Site; and, Scope 3b) other off-site activities, which are those associated with materials manufacturing, off-site services (e.g., laboratory analysis), transmission of electricity through the electrical gird, and resource extraction for fuels used in electricity generation.

Key findings specific to selected metrics as part of the SEFA evaluation of the Long-Term Groundwater Monitoring component are presented in **Appendices B** and **C** and summarized below.

1. **Materials & Waste:** Approximately 0.025 tons of materials will be used on-site.
2. **Water Usage:** Approximately 600 gallons of public water will be used on-site.
3. **Electricity Usage:** Approximately 593.4 MMBtus of total energy will be used. The majority (51.6%) of usage is from grid electricity generation, followed by on-site activities (25.4%), other off-site activities (19.8%), and transportation (3.2%).
4. **Air Emissions Generated:**
    a. A total of approximately 32.5 tons (in carbon dioxide equivalents of global warming potential) of greenhouse gas emissions (GHG). The majority (76.4%) of GHG emissions are from grid electricity generation, followed by other off-site activities (18.9%) and transportation (4.7%).
    b. A total of approximately 147.3 lbs of nitrous oxide (NOx). The majority (67.3%) of NOx emissions are from grid electricity generation, followed by other off-site activities (18%) and transportation (14.7%).
    c. A total of approximately 429 lbs of sulfur oxides (SOx). The majority (52.4%) of SOx emissions are from other off-site activities, followed by grid electricity generation (47.5%) and transportation (0.2%).
    d. A total of approximately 4.2 lbs of particulate matter (PM). The majority (60.9%) of PM emissions are from grid electricity generation, followed by other off-site activities (28.1%) and transportation (11%).
    e. A total of approximately 10.6 lbs of hazardous air pollutants (HAP). The majority (87.3%) of HAP emissions are from grid electricity generation, followed by other off-site activities (11.9%) and transportation (0.7%).

The majority of electricity usage and air emissions generated are from grid electricity generation, followed by other off-site activities, which are those associated with materials manufacturing, transmission of electricity through the electrical grid, and resource extraction for fuels used in electricity generation. Electricity usage and emissions from transportation are low.

List of Appendices

Appendix A SEFA Input Worksheet

Appendix B SEFA Environmental Footprint Summary

Appendix C SEFA Output Graphs

Appendix A – SEFA Input Worksheet

Input Summary

Remedy Component Number →		1	
Item		Column headings in Long Term OM&M	Total
On-Site			
On-site Renewable Energy			
Renewable electricity generated on-site	MWh	0	0
Landfill gas combusted on-site for energy use	ccf CH_4	0	0
On-site biodiesel use	gal	0	0
On-site biodiesel use - Other	gal	0	0
User-defined on-site renewable energy use #1	TBD	0	0
User-defined on-site renewable energy use #2	TBD	0	0
On-Site Conventional Energy			
Grid electricity	MWh	44.21	44.21
On-site diesel use - Other	Gal	0	0
On-site diesel use <75 hp	Gal	0	0
On-site diesel use 75<hp<750	Gal	0	0
On-site diesel use >750 hp	Gal	0	0
On-site gasoline use - Other	Gal	0	0
On-site gasoline use <25 hp	Gal	0	0
On-site gasoline use >25 hp	Gal	0	0
On-site natural gas use	ccf	0	0
On-site compressed natural gas use - Other	ccf	0	0
On-site compressed natural gas use	ccf	0	0
On-site liquified petroleum gas use - Other	gal	0	0
On-site liquified petroleum gas use	gal	0	0
Other forms of on-site conventional energy use #1	TBD	0	0
Other forms of on-site conventional energy use #2	TBD	0	0
Other On-site Emissions			
On-site HAP process emissions	Lbs	0	0
On-site GHG emissions	Lbs CO2e	0	0
On-site carbon storage	Lbs CO2e	0	0
GHG avoided by flaring on-site landfill methane	ccf CH4	0	0
Other on-site NOx emissions or reductions	Lbs	0	0
Other on-site SOx emissions or reductions	Lbs	0	0
Other on-site PM emissions or reductions	Lbs	0	0
Electricity Generation			
Grid electricity	MWh	44.21	44.21
Voluntary purchase of renewable electricity	MWh	0	0
Voluntary purchase of RECs	MWh	0	0

Input Summary

Remedy Component Number →		1	
Item		Column headings in Long Term OM&M	Total
Transportation			
Transportation Fuel Use Breakdown			
Biodiesel use - Personnel Transport	gal	0	0
Biodiesel use - Personnel Transport - User Defined	gal	0	0
Biodiesel use - Equipment Transport	gal	0	0
Biodiesel use - Equipment Transport - User Defined	gal	0	0
Biodiesel use - Material Transport	gal	0	0
Biodiesel use - Material Transport - User Defined	gal	0	0
Biodiesel use - Waste Transport	gal	0	0
Biodiesel use - Waste Transport - User Defined	gal	0	0
Diesel use - Personnel Transport - other vehicles	gal	0	0
Diesel use - Personnel Transport - car	gal	0	0
Diesel use - Personnel Transport - passenger truck	gal	0	0
Diesel use - Personnel Transport - User Defined	gal	0	0
Diesel use - Equipment Transport	gal	0	0
Diesel use - Equipment Transport - User Defined	gal	0	0
Diesel use - Material Transport	gal	125	125
Diesel use - Material Transport - User Defined	gal	0	0
Diesel use - Waste Transport	gal	0	0
Diesel use - Waste Transport - User Defined	gal	0	0
Gasoline use - Personnel Transport - other vehicles	gal	0	0
Gasoline use - Personnel Transport - car	gal	0	0
Gasoline use - Personnel Transport - passenger truck	gal	11.8	11.8
Gasoline use - Personnel Transport - User Defined	gal	0	0
Gasoline use - Equipment Transport	gal	0	0
Gasoline use - Equipment Transport - User Defined	gal	0	0
Natural Gas use - Personnel Transport	ccf	0	0
Natural Gas use - Personnel Transport - User Defined	ccf	0	0
Natural Gas use - Equipment Transport	ccf	0	0
Conventional Energy			
Transportation diesel use	gal	125	125
Transportation gasoline use	gal	11.8	11.8
Transportation natural gas use	ccf	0	0
User-defined conventional energy transportation #1	TBD	10	10
User-defined conventional energy transportation #2	TBD	0	0
Renewable Energy			
Transportation biodiesel use	gal	0	0
User-defined renewable energy transportation #1	TBD	0	0
User-defined renewable energy transportation #2	TBD	0	0

Input Summary

Remedy Component Number →		1	
Item		Column headings in Long Term OM&M	Total
Off-Site			
Construction Materials			
Aluminum, Rolled Sheet	lb	0	0
Asphalt, mastic	lb	0	0
Asphalt, paving-grade	lb	0	0
Ethanol, Corn, 95%	lb	0	0
Ethanol, Corn, 99.7%	lb	0	0
Ethanol, Petroleum, 99.7%	lb	0	0
Gravel/Sand Mix, 65% Gravel	lb	0	0
Gravel/sand/clay	lb	0	0
HDPE	lb	0	0
Photovoltaic system (installed)	W	0	0
PVC	lb	0	0
Portland cement, US average	lb	0	
Ready-mixed concrete, 20 MPa	ft3	0	0
Round Gravel	lb	0	0
Sand	lb	0	0
Stainless Steel	lb	0	0
Steel	lb	0	0
Other refined construction materials	lb	0	0
Other unrefined construction materials	lb	0	0
Treatment Materials & Chemicals			
Cheese Whey	lbs	0	0
Emulsified vegetable oil	lbs	0	0
Granular activated carbon, primary	lbs	0	0
Granular activated carbon, regenerated	lbs	0	0
Hydrogen Peroxide, 50% in H2O	lbs	0	0
Iron (II) Sulfate	lbs	0	0
Lime, Hydrated, Packed	lbs	0	0
Molasses	lbs	0	0
Phosphoric Acid, 70% in H2O	lbs	0	0
Potassium Permanganate	lbs	0	0
Sodium Hydroxide, 50% in H2O	lbs	0	0
Other Treatment Chemicals & Materials	lbs	50.04	50.04

Input Summary

Remedy Component Number →		1	
Item		Column headings in Long Term OM&M	Total
Material Type			
Total Virgin Refined Materials	tons	0	0
Total Recycled Refined Materials	tons	0	0
Total Reused Refined Materials	tons	0	0
Total Refined Material	tons	0	0
Total Virgin Unrefined Materials	tons	0	0
Total Recycled Unrefined Materials	tons	0.02502	0.02502
Total Reused Unrefined Materials	tons	0	0
Total Unrefined Material	tons	0.02502	0.02502
Fuel Processing			
Biodiesel produced	gal	0	0
Diesel produced	gal	125	125
Gasoline produced	gal	11.8	11.8
Compressed natural gas produced	ccf	0	0
Liquified petroleum gas produced	gal	0	0
Natural gas produced	ccf	0	0
Water Use			
Public Water Supply	gal x 1000	0.6	0.6
Extracted Groundwater	gal x 1000	0	0
Surface Water	gal x 1000	0	0
Reclaimed Water	gal x 1000	0	0
Collected/Diverted Storm Water	gal x 1000	0	0
User-defined water resource #1	gal x 1000	0	0
User-defined water resource #2	gal x 1000	0	0
Waste/Recycle Handling			
Hazardous waste incineration	lbs	0	0
Off-site waste water treatment (POTW)	gal x 1000	0	0
Off-site non-hazardous waste landfill	tons	0	0
Off-site hazardous waste landfill	tons	0	0
Recycled/Reused On-Site	tons	0	0
Recycled/Reused Off-Site	tons	0	0
Solid Waste Totals			
Total Non-Hazardous Waste	tons	0	0
Total Hazardous Waste	tons	0	0
Total Recycled/Reused	tons	0	0
Total Waste (all types)	tons	0	0

Input Summary

Remedy Component Number →		1	
Item		Column headings in Long Term OM&M	Total
Lab Services			
Off-site Laboratory Analysis - Other	sample	0	0
Off-site Laboratory Analysis - Metals	sample	0	0
Off-site Laboratory Analysis - Mercury	sample	0	0
Off-site Laboratory Analysis - Inorganic Anions	sample	0	0
Off-site Laboratory Analysis - Alkalinity	sample	0	0
Off-site Laboratory Analysis - Perchlorate	sample	0	0
Off-site Laboratory Analysis - Nitrogen/Nitrate	sample	0	0
Off-site Laboratory Analysis - Sulfate	sample	0	0
Off-site Laboratory Analysis - PCBs	sample	0	0
Off-site Laboratory Analysis - VOCs	sample	8	8
Off-site Laboratory Analysis - SVOCs	sample	0	0
Resource Extraction for Electricity			
Coal extraction and processing	MWh	13.48405	13.48405
Natural gas extraction and processing	MWh	14.98719	14.98719
Nuclear fuel extraction and processing	MWh	8.75358	8.75358
Oil extraction and processing	MWh	0.30947	0.30947
Other fuel extraction and processing	MWh	0.04421	0.04421
Electricity Transmission			
Transmission and distribution losses	MWh	44.21	44.21
Other			
User-defined material #1	TBD	0	0
User-defined material #2	TBD	0	0
User-defined material #3	TBD	0	0
User-defined material #4	TBD	0	0
User-defined material #5	TBD	0	0
User-defined material #6	TBD	0	0
User-defined material #7	TBD	0	0
User-defined material #8	TBD	0	0
User-defined material #9	TBD	0	0
User-defined material #10	TBD	0	0
User-defined material #11	TBD	0	0
User-defined material #12	TBD	0	0
User-defined material #13	TBD	0	0
User-defined material #14	TBD	0	0
User-defined material #15	TBD	0	0

Input Summary

Remedy Component Number →		1	
Item		Column headings in Long Term OM&M	Total
User-defined Waste Destinations			
User-defined recycled/reused on-site #1	TBD	0	0
User-defined recycled/reused on-site #2	TBD	0	0
User-defined recycled/reused on-site #3	TBD	0	0
User-defined recycled/reused off-site #1	TBD	0	0
User-defined recycled/reused off-site #2	TBD	0	0
User-defined recycled/reused off-site #3	TBD	0	0
User-defined non-hazardous waste destination #1	TBD	0	0
User-defined non-hazardous waste destination #2	TBD	0	0
User-defined non-hazardous waste destination #3	TBD	0	0
User-defined hazardous waste destination #1	TBD	0	0
User-defined hazardous waste destination #2	TBD	0	0
User-defined hazardous waste destination #3	TBD	0	0

Appendix B – SEFA Environmental Footprint Summary

Environmental Footprint Summary

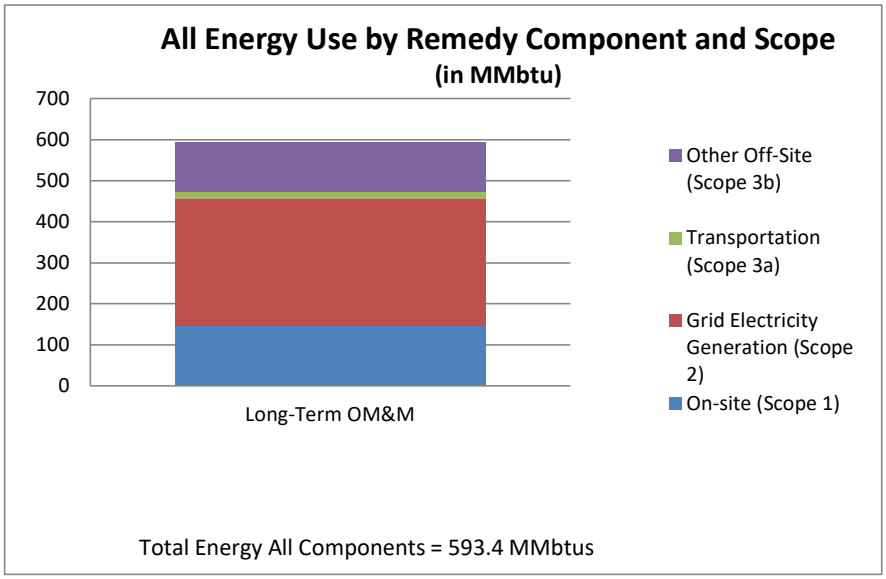
Core Element	Metric		Unit of Measure	Footprint	
				Long-Term OM&M	Total
Materials & Waste	M&W-1	Refined materials used on-site	Tons	0.0	0.0
	M&W-2	% of refined materials from recycled or reused material	%		
	M&W-3	Unrefined materials used on-site	Tons	0.025	0.025
	M&W-4	% of unrefined materials from recycled or reused material	%	100.0%	100.0%
	M&W-5	On-site hazardous waste disposed of off-site	Tons	0.0	0.0
	M&W-6	On-site non-hazardous waste disposed of off-site	Tons	0.0	0.0
	M&W-7	Recycled or reused waste	Tons	0.0	0.0
	M&W-8	% of total potential waste recycled or reused	%		
Water (used on-site)	W-1	Public water use	MG	0.0006	0.0006
	W-2	Groundwater use	MG	0.0000	0.0000
	W-3	Surface water use	MG	0.0000	0.0000
	W-4	Reclaimed water use	MG	0.0000	0.0000
	W-5	Storm water use	MG	0.0000	0.0000
	W-6	User-defined water resource #1	MG	0.0000	0.0000
	W-7	User-defined water resource #2	MG	0.0000	0.0000
	W-8	Wastewater generated	MG	0.0000	0.0000
Energy	E-1	Total energy used (on-site and off-site)	MMBtu	593.4	593.4
	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
	E-2B	Voluntary purchase of renewable electricity	MWh	0.0	0.0
	E-3	Voluntary purchase of RECs	MWh	0.0	0.0
	E-4	On-site grid electricity use	MWh	44.21	44.21
Air	A-1	On-site NOx, SOx, and PM emissions	Pounds	0.0000	0.0000
	A-2	On-site HAP emissions	Pounds	0.0000	0.0000
	A-3	Total NOx, SOx, and PM emissions	Pounds	580.5	580.5
	A-3A	Total NOx emissions	Pounds	147.3	147.3
	A-3B	Total SOx emissions	Pounds	429.0	429.0
	A-3C	Total PM emissions	Pounds	4.2	4.2
	A-4	Total HAP emissions	Pounds	10.6	10.6
	A-5	Total greenhouse gas emissions	Tons CO2e*	32.5	32.5
Land & Ecosystems	Work is conducted on an existing system on disturbed land.				

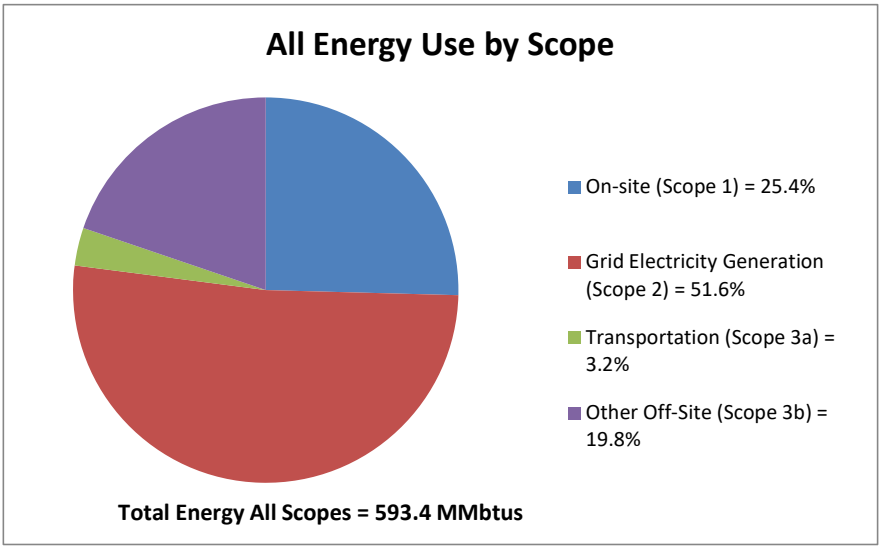
** Total greenhouse gases emissions (in CO2e) include consideration of CO2, CH4, and N2O (Nitrous oxide) emissions.*
"MMBtu" = millions of Btus
"MG" = millions of gallons
"CO2e" = carbon dioxide equivalents of global warming potential
"MWh" = megawatt hours (i.e., thousands of kilowatt-hours or millions of Watt-hours)
"Tons" = short tons (2,000 pounds)

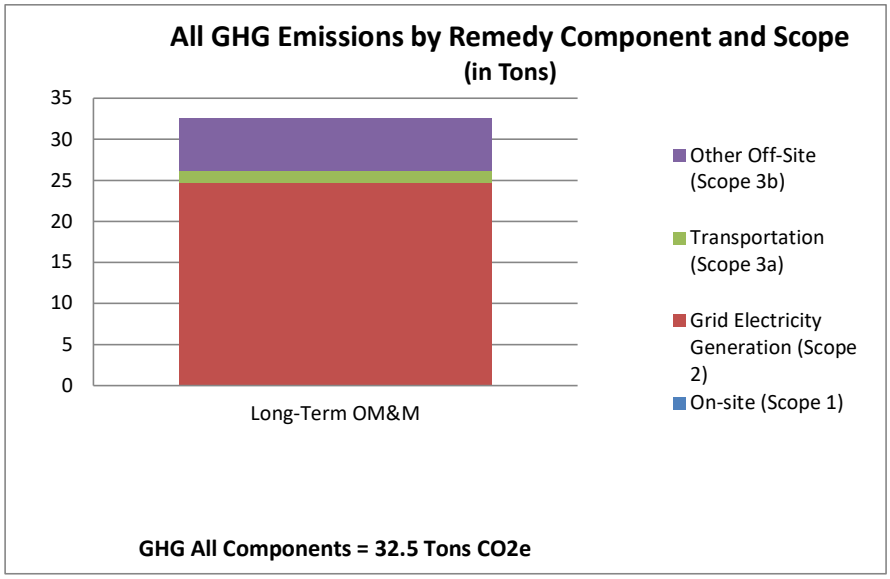
metrics are consistent with

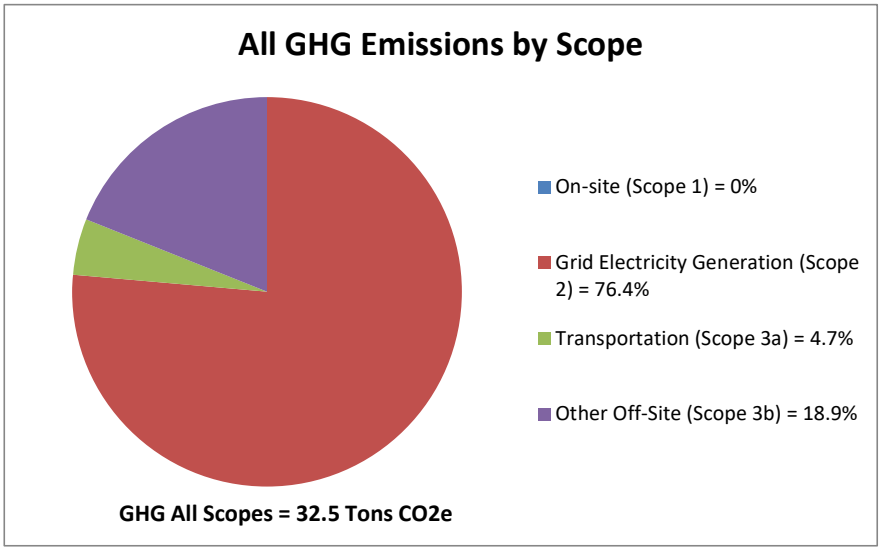
Notes:

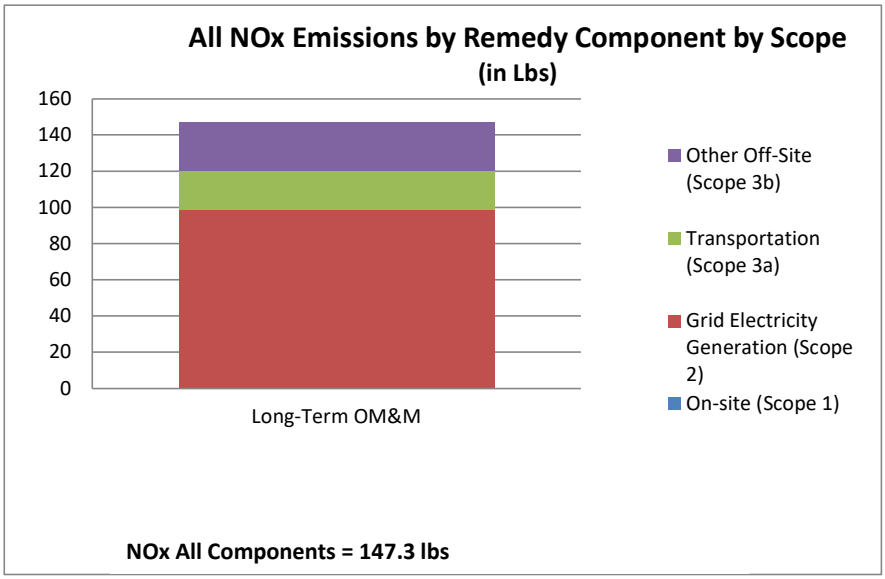
Appendix C – SEFA Output Graphs

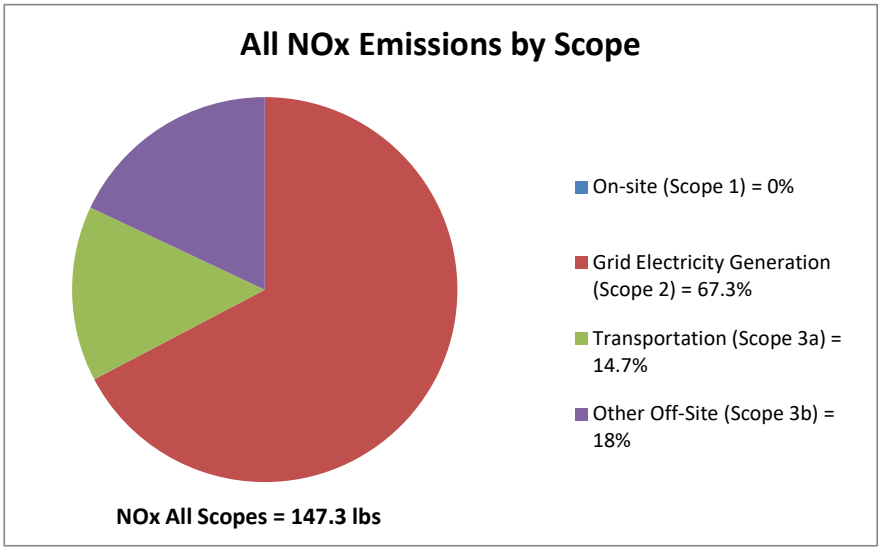

All Energy Use by Remedy Component and Scope
(in MMbtu)
700
600
500
400
300
200
100
0
Long-Term OM&M
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
Total Energy All Components = 593.4 MMbtus

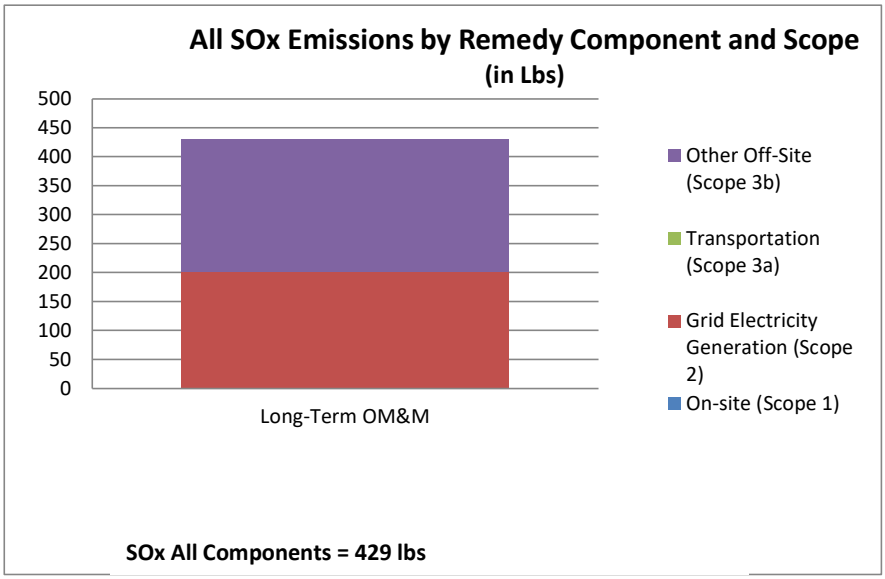

All Energy Use by Scope
On-site (Scope 1) = 25.4%
Grid Electricity Generation (Scope 2) = 51.6%
Transportation (Scope 3a) = 3.2%
Other Off-Site (Scope 3b) = 19.8%
Total Energy All Scopes = 593.4 MMbtus

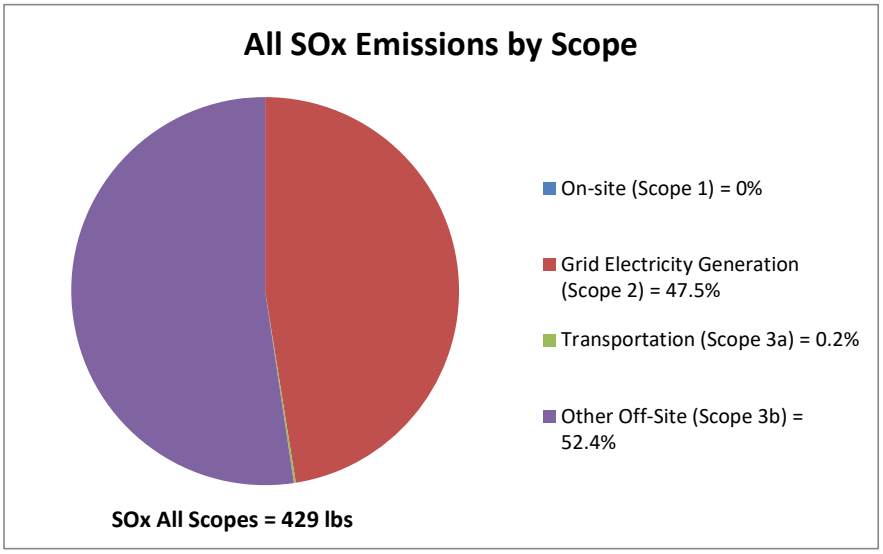

All GHG Emissions by Remedy Component and Scope
(in Tons)
35
30
25
20
15
10
5
0
Long-Term OM&M
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
GHG All Components = 32.5 Tons CO2e

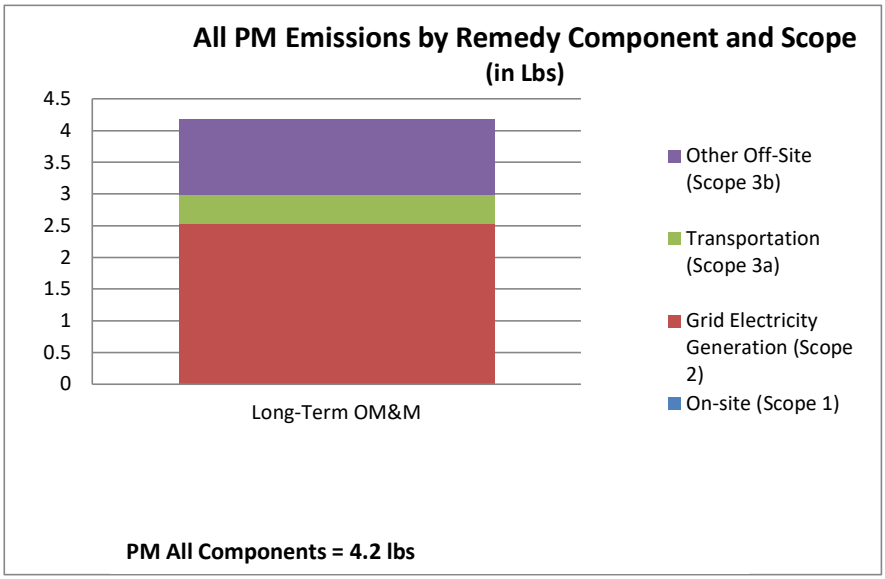

All GHG Emissions by Scope
On-site (Scope 1) = 0%
Grid Electricity Generation (Scope 2) = 76.4%
Transportation (Scope 3a) = 4.7%
Other Off-Site (Scope 3b) = 18.9%
GHG All Scopes = 32.5 Tons CO2e

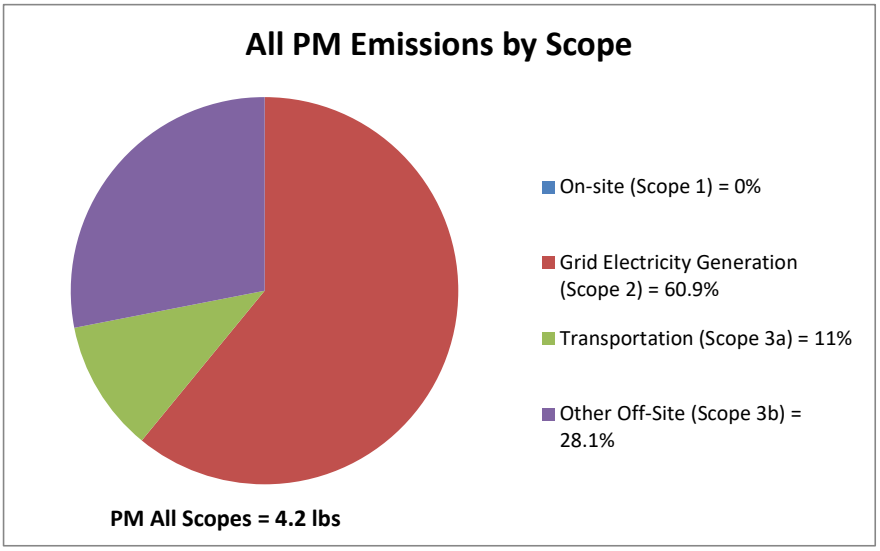

All NOx Emissions by Remedy Component by Scope
(in Lbs)
160
140
120
100
80
60
40
20
0
Long-Term OM&M
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
NOx All Components = 147.3 lbs

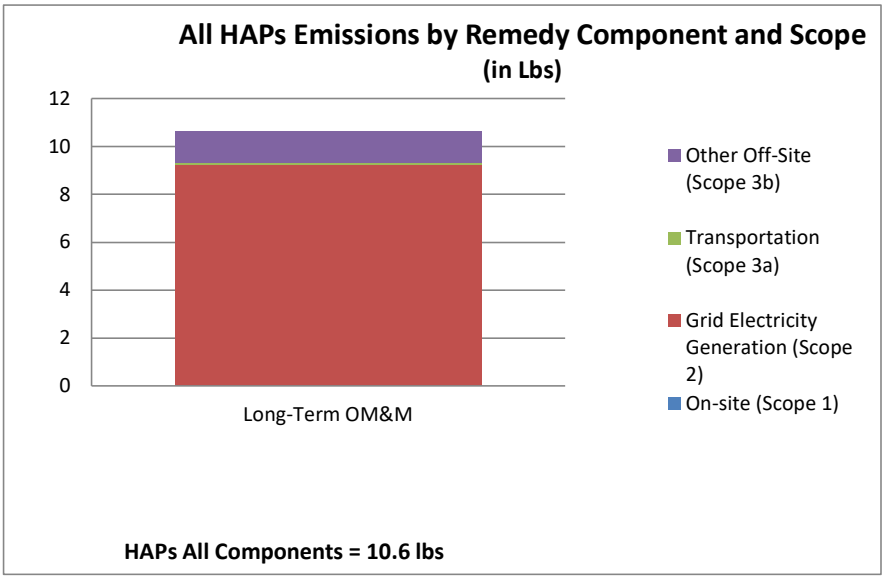

All NOx Emissions by Scope
On-site (Scope 1) = 0%
Grid Electricity Generation (Scope 2) = 67.3%
Transportation (Scope 3a) = 14.7%
Other Off-Site (Scope 3b) = 18%
NOx All Scopes = 147.3 lbs

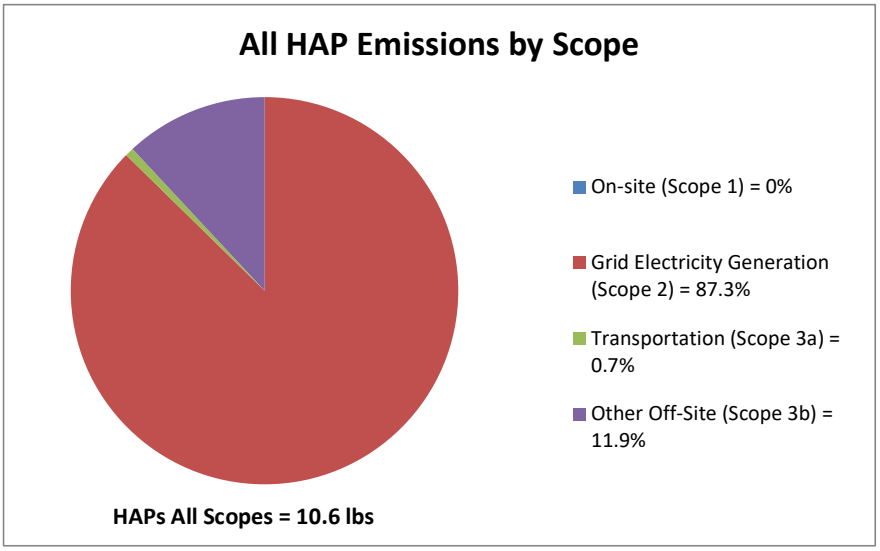

All SOx Emissions by Remedy Component and Scope
(in Lbs)
500
450
400
350
300
250
200
150
100
50
0
Long-Term OM&M
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
SOx All Components = 429 lbs


All SOx Emissions by Scope
On-site (Scope 1) = 0%
Grid Electricity Generation (Scope 2) = 47.5%
Transportation (Scope 3a) = 0.2%
Other Off-Site (Scope 3b) = 52.4%
SOx All Scopes = 429 lbs


All PM Emissions by Remedy Component and Scope
(in Lbs)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Long-Term OM&M
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
PM All Components = 4.2 lbs


All PM Emissions by Scope
On-site (Scope 1) = 0%
Grid Electricity Generation (Scope 2) = 60.9%
Transportation (Scope 3a) = 11%
Other Off-Site (Scope 3b) = 28.1%
PM All Scopes = 4.2 lbs


All HAPs Emissions by Remedy Component and Scope
(in Lbs)
12
10
8
6
4
2
0
Long-Term OM&M
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
HAPs All Components = 10.6 lbs


All HAP Emissions by Scope
On-site (Scope 1) = 0%
Grid Electricity Generation (Scope 2) = 87.3%
Transportation (Scope 3a) = 0.7%
Other Off-Site (Scope 3b) = 11.9%
HAPs All Scopes = 10.6 lbs

APPENDIX L – SAMPLE REMEDIAL SYSTEM OPTIMIZATION TABLE OF CONTENTS

SAMPLE REMEDIAL SYSTEM OPTIMIZATION OUTLINE FOR: CHEM-TROL, HAMBURG, NY, NYSDEC SITE NO. 915015, USEPA ID NO. NYD980531180

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