TIBETAN COMMUNITY OF NEW YORK & NEW JERSEY

32-01 57th STREET

QUEENS, NEW YORK

SITE MANAGEMENT PLAN

NYSDEC Site Number: 241197

Prepared for:

TIBETAN COMMUNITY OF NEW YORK AND NEW JERSEY

32-01 57TH STREET

QUEENS, NEW YORK

Prepared : June 2019

ATANE ENGINEERS, ARCHITECTS & LAND SURVEYORS D.P.C

40 WALL STREET, 11TH FLOOR, NEW YORK, NY 10005

Revised : May 2025

HYDRO TECH ENVIRONMENTAL ENGINEERING AND GEOLOGY, DPC
231 West 31st STREET, SUITE 1104, NEW YORK, NY 10005

Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

MAY 2025

CERTIFICATION STATEMENT

I Tarek Z. Khouri certify that I am currently a NYS registered professional engineer as defined in 6 NYCRR Part 375 and that this Site Management Plan was initially prepared by ATANE Engineers, Architects & Land Surveyors, D.P.C. (ATANE), the previous Remedial Consultant of Record that had the direct responsibility for the implementation of the remedial program activities at this Site. I certify that information presented in this SMP as provided by ATANE should be in conformance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and any other DER-Approved Modifications.

Tarek Z. Khouri P.E

05-16-2025

TABLE OF CONTENTS

List of Tables

List of Figures

List of Appendices

LIST OF ACRONYMS

AS	Air Sparging
ASP	Analytical Services Protocol
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CAMP	Community Air Monitoring Plan
C/D	Construction and Demolition
CFR	Code of Federal Regulation
CLP	Contract Laboratory Program
COC	Certificate of Completion
CO2	Carbon Dioxide
CP	Commissioner Policy
DER	Division of Environmental Remediation
EC	Engineering Control
ECL	Environmental Conservation Law
ELAP	Environmental Laboratory Approval Program
ERP	Environmental Restoration Program
EWP	Excavation Work Plan
GHG	Green House Gas
GWE&T	Groundwater Extraction and Treatment
HASP	Health and Safety Plan
IC	Institutional Control
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYCRR	New York Codes, Rules and Regulations
O&M	Operation and Maintenance
OM&M	Operation, Maintenance and Monitoring
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PID	Photoionization Detector
PRP	Potentially Responsible Party
PRR	Periodic Review Report
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RP	Remedial Party
RSO	Remedial System Optimization
SAC	State Assistance Contract
SCG	Standards, Criteria and Guidelines
SCO	Soil Cleanup Objective

SMP	Site Management Plan
SOP	Standard Operating Procedures
SOW	Statement of Work
SPDES	State Pollutant Discharge Elimination System
SSDS	Sub-slab Depressurization System
SVE	Soil Vapor Extraction
SVI	Soil Vapor Intrusion
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leachate Procedure
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VCA	Voluntary Cleanup Agreement
VCP	Voluntary Cleanup Program

EXECUTIVE SUMMARY

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

NYSDEC Site Number 241197
32-01 57th Street, Queens, New York

Institutional Controls:	1. The property may be used for restricted residential, commercial, and industrial uses as defined in Part 375-1.8(g), subject to local zoning laws;
	2. EC must be inspected at a frequency and in a manner defined in the SMP.
	3. ECs must be inspected at a frequency and in a manner defined in the SMP
	4. The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or NYC Department of Health and Mental Hygiene to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department
	5. Groundwater and other environmental or public health monitoring must be performed as defined in this SMP
	6. Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP
	7. All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP
	8. Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP
	9. Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP
	10. Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement

Engineering Controls:	1. Cover system	
	2. Active sub-slab depressurization (SSDS)	
	3. Soil vapor extraction (SVE) system	
Inspections:		Frequency
• Site wide cover system inspection		Annually and following severe weather events
• SSDS/SVE inspection (vacuum gauges, vacuum alarms light/sound, risers piping, suction fans)		Annually and following severe weather events
Monitoring		
• SSDS performance monitoring (sub-slab vacuum pressure measurements at Probe #1 to Probe #5)		Annually
• On-site SSDS performance monitoring (indoor air IA-1 and IA-2 sampling)		As needed, per NYSDEC's Request
Testing		
• On-site Indoor Air Assessment		As needed
Maintenance:		
• Cover system		As needed
• SSDS		As needed
• SVE system		As needed
Reporting:		
• 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 property occupied by the Tibetan Community of New York and New Jersey and located at 32-01 57th Street, in Queens, (Tax Block 1159, Lot 1) New York (hereinafter referred to as the "Site"). See Figure 1 provides for Site Location Map and Figure 2 for the Site plan. This Site has been classified by the New York State Department of Environmental Conservation (the "NYSDEC") as a Class 2 Inactive Hazardous Waste Disposal Site (Site #241197).

Tibetan Community of New York and New Jersey executed an Order On Consent And Administrative Settlement (Index No. R2-20170321-111**)** with the New York State Department of Environmental Conservation (NYSDEC) on June 7, 2017 to remediate the site. The site was remediated in accordance with the remedy selected by the NYSDEC in the Interim Remedial Measures Work Plan (IRMWP) dated May 18, 2017, and the IRMWP Addendum dated August 7, 2017, and other NYSDEC correspondences dated April 2022 and January 2025. The boundaries of the site are more fully described in the metes and bounds site description that is part of the Environmental Easement provided in Appendix A.

After completion of the remedial work, some contamination was left 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. An Environmental Easement granted to the NYSDEC, and recorded with the Queens County Clerk, requires compliance with this SMP and all ECs and ICs placed on the site.

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

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the Environmental Easement, which is grounds for revocation of the Certificate of Completion (COC);

- ❖ Failure to comply with this SMP is also a violation of Environmental ConservationLaw, 6NYCRR Part 375 and the Order on Consent, (Index #R2-20170321-111; Site #241197 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 initially prepared as a draft in June 2019 by ATANE Engineers, Architects and Land Surveyors D.P.C (herein referred to as "ATANE"), formerly known as "HAKS Engineers, Architects and Land Surveyors D.P.C" on behalf of Tibetan Community of New York and New Jersey (TCNYNJ), in accordance with the requirements of the NYSDEC's DER-10 ("Technical Guidance for Site Investigation and Remediation"), dated May 2010, and the guidelines provided by the NYSDEC. ATANE was the previous Remedial Consultant of Record that had the direct responsibility for the implementation of the remedial program activities at this Site. The draft SMP was then revised to the extent possible by Hydro Tech Environmental Engineering and Geology DPC ((herein referred to as "HydroTech") in May 2025 on behalf of TCNYNJ based on information provided by ATANE. This SMP addresses the means for implementing the ICs and/or ECs that are required by the Environmental Easement for the site.

1.2 Revisions and Alterations

Revisions and alterations to this plan will be proposed in writing to 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 Environmental Easement for the site, the NYSDEC project manager will provide a notice of any approved changes to the SMP, and append these notices to the SMP that is retained in its files.

1.3 Notifications

Notifications will be submitted by the property owner to 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, Index Number R2-20170321-111, 6NYCRR Part 375 and/or Environmental Conservation Law.

2. 7-day advance notice of any field activity associated with the remedial program.
3. 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan.
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 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, Index Number R2-20170321-111, 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 below 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*

Name	Contact Information	Required Notifications**
Marlen Salazar NYSDEC Project Manager	718-482-7129 marlen.salazar@dec.ny.gov	Notifications 1 through 9
Jane O'Connell NYSDEC Region 2 Section Chief	718-482-4599 jane.oconnell@dec.ny.gov	Notifications 1 through 9
Kelly Lewandowski, NYSDEC Site Control Section Chief	kelly.lewandowski@dec.ny.gov	Notifications 1 and 8
Saita Wagh NYSDOH Project Manager	518-402-7817 sarita.Wagh@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 Queens County, New York and is identified as Block 1159 and Lot 1 on the NYC Tax Map. The Site is 20,000-square feet and is bounded by 32nd Avenue on the north, a 2-story commercial/industrial facility (auto parts shop, a tire repair shop, and an auto repair shop) and house of worship/community center on the southwest, a 2-story residential building on the southeast, 58th Street on the east, and 57th Street on the west. Currently, the Site consists of 1-story house of worship/community service center with full basement and an adjacent asphalt paved parking lot. A Site Location Map is provided in Figure 1 and a Site Plan is provided in Figure 2. The boundaries of the site are more fully described in Appendix A –Environmental Easement.

2.2 Physical Setting

2.2.1 Land Use

The Site consists of the following: a 1-story house of worship/community service building occupying approximately 12,600 square feet and a paved parking area on the east and southeast of approximately 7,400 square feet. The perimeter of the Site is covered with a concrete slab in build area and asphalt pavement in parking lot as shown on Figure 3. The Site is zoned as a manufacturing district (M1-1) as per NYC Department of Planning. The Site is currently used as a temple and community services by the Tibetan Community of New York and New Jersey.

The area immediately surrounding the Site is predominantly residential, commercial and industrial. The property immediately to the southwest include a 2-story commercial/industrial facility (auto parts shop, a tire repair shop, and an auto repair shop) and a house of worship/community center. The properties immediately to the southeast and across the eastern vicinity include three 2- to 3-story residential buildings. The properties across the northern vicinity include two 1-story light manufacturing and industrial facility (auto repair shop) and the property across the western vicinity include a 1-story wood manufacturing facility.

2.2.2 Geological and Hydrogeological Setting

The Site is in the western portion of Queens County, New York. Queens County is in the western portion of Long Island, which consists of a wedge-shaped mass of unconsolidated deposits that overlie ancient basement rock. The thickness of these deposits ranges from approximately 100 feet on the Island's north

shore to approximately 2,000 feet in some portions of the south shore. These deposits contain ground water that is the sole source of drinking water for the Island's over 3.1 million residents.

The major landforms of Long Island of importance to the hydrologic system are the moraines and outwash plains, which originated from glacial activity. The moraines represent the farthest extent of the glacial advances. The moraines consist of till, which is a poorly sorted mixture of sand, silt, clay, gravel and boulders. The till is poor to moderately permeable in most areas. Outwash plains are located to the south of the moraines. The outwash plains were formed by the action of glacial melt water streams, which eroded the headland material of the moraines and laid down deposits of well-sorted sands, silts and gravels. These outwash deposits have a moderate to high permeability.

The **Upper Glacial Aquifer** is the uppermost hydrogeologic unit. This aquifer encompasses the moraine and outwash deposits, in addition to some localized lacustrine, marine, and reworked materials. A relatively high horizontal hydraulic conductivity and a low vertical hydraulic conductivity characterize the outwash plain portion of this unit. Since the water table is situated in the Upper Glacial Aquifer.

The **Magothy Formation** directly underlies the Upper Glacial Aquifer in the vicinity of the site. This formation is a Cretaceous coastal-shelf deposit, which consists principally of layers of sand and gravel with some interbedded clay. This formation ranges from moderate to highly permeable. A clay layer in some parts of Long Island confines the uppermost portion of the aquifer. The Magothy is Long Island's principal aquifer for public water supply. The United States Environmental Protection Agency (USEPA) has classified the Long Island aquifer system as a sole source aquifer.

The **Raritan Formation** is the deepest unit and rests directly above the bedrock units. This formation is comprised of a sand member (**Lloyd Aquifer**) and a clay member (**Raritan Clay**). The Lloyd sand extends southward from Flushing Bay to the Atlantic Ocean. The thickness of the sand member increases to the southeast and ranges in depth from 200 to 800 feet below sea level (from northwest to southeast). The clay member acts as an aquitard confining the lower Lloyd aquifer between the clay and the underlying bedrock.

According to the USGS Long Island Depth to Water Viewer, groundwater beneath the Site is located at a depth of approximately 79 bgs. Groundwater beneath the Site was reported during previous subsurface investigations to be perched above a refusal and was only encountered beneath the southeastern corner of the Site at the depth of 37 feet bgs.

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**.**

In 2011, prior to the Tibetan Community's ownership of the Site, AKRF Engineering, PC performed a Phase II Subsurface Investigation (ESI) at the Site on behalf of the New York City School Construction Authority (NYCSCA). The purpose of the activities was to fully investigate and characterize the nature and extent of the RECs identified during a July 2011 Phase I Environmental Site Assessment (ESA) in order to determine whether the recognized environmental conditions (RECs) had affected the suitability of the Site for the construction of a public school facility. Ultimately, the NYCSCA decided not to acquire the property. However, the results of these investigations were not immediately made public and were not made available to the Tibetan Community until 2016.

The Phase II ESI field activities included the following:

- A geophysical survey of accessible areas of the Site to clear proposed boring locations for subsurface utilities and to verify the location of two closed-in-place USTs identified during the Phase I ESA;
- Advancement of ten (10) soil borings at locations originally proposed in AKRF's July 22, 2011 scope of work, including four (4) borings within the on-site building (SB-1, SB-2, SB-3, and SB-10), and six (6) borings in the east-adjacent parking lot and grassy area (SB-4 through SB-9);
- Advancement of three (3) additional soil borings (SB-7-2D, SB-7-3D, and SB-7-4D) located east, north, and west of SB-7 to further investigate field evidence of contamination observed in SB-7;
- Installation of one (1) temporary groundwater sampling point (TW-5);
- Installation of seven (7) soil vapor sampling points (SV-1 through SV-5, SV-9, and SV-10); and
- Collection and laboratory analysis of 17 soil samples, one (1) groundwater sample, and seven (7) soil vapor samples.

Overall findings of the site investigation indicated sporadic detections of VOCs, SVOCs, and metals. Soil borings indicated historic urban fill with the exception of one location (SB-7) which indicated the presence of petroleum contamination in soil media. The contamination was visual in nature and was observed at (5'-6') and at (17'-18'). Photoionization Detector (PID) readings at 5'-6' were 157.1 PPM. Step out borings were performed (SB-7/D-2),and indicated PID readings (173 PPM) and petroleum like odor at 11'-15'. PID readings were 197.3 at 16'-20'. Soil analytical results indicated spot detections of petroleum constituents (trimethylbenzene, ethyl benzene) and chlorinated compounds (trichloroethene or TCE).

The following were the noted detections in soil vapor samples:

Sampling Location	Tetrachloroethene (PCE) (ug/m^3)	Trichloroethene (TCE) (ug/m^3)
SV-1	110	370
SV-2	7000	2400
SV-3	230	1200
SV-4	230	1.5
SV-5	95	-
SV-9	280	10,000
SV-10	1400	20,000

The elevated TCE and PCE concentrations detected in soil vapors at the Site were evaluated with the assumption they are not present in indoor air and they found to fall within the mitigate category of their respective May 2017 NYSDOH Decision Matrices A and B.

Prior to the Tibetan Community's purchase of the Site, it retained Airtek Environmental Corporation to perform a Phase I ESA at the Site. Airtek performed a Phase I at the Site in March of 2012. This assessment identified the following RECs:

- Fuel Oil Underground Storage Tank – 1,080 Gallon. Installed in 1968, Closed in Place in 1994.
- Fuel Oil Underground Storage Tank – 3,000 Gallon. Associated with NYSDEC Spill Case #0307705. No direct evidence tank leak but failed tightness testing in 2003. Spill case closed in 2004 after tank subsequently passed tightness test.
- Subject Property – 1950, 1962 – Subject Property identified as Akron Hardware Manufacturing Corporation and Forgecraft Products, Inc Hardware Manufacturing.
- The neighborhood has significant industrial uses surrounding Subject Property. Most of these were identified as RECs by Airtek, from uses related to oil storage, automotive repair, manufacturing, sheet metal works, etc.

Airtek also prepared a Phase II Subsurface Investigation Report in May of 2012. The subsurface investigation involved advancement of three soil borings in the parking lot portion of the Site. Groundwater was not encountered up to a depth of 25 feet below ground surface (bgs). However, according to the USGS Long Island Depth to Water Viewer, groundwater is located at a depth of approximately 79 bgs. Overall findings for this investigation indicated no petroleum odor or staining in the soil cores and no samples exceeding CP-51 for VOCs, SVOCs, pesticides, and PCBs. However, slight metals exceedances were noted. Similar to the results of the Phase II conducted in 2011, the soil borings were typical of historic urban fill.

In April 2017, ATANE performed an off-site soil vapor intrusion assessment at the southeast-adjacent property at 31-12 58th Street during the implementation of the IRM activities. This assessment

consisted of sub-slab vapor and indoor air sampling. Findings of this investigation indicated TCE vapors are only detected in the sub-slab sample at a concentration of 59.2 that is marginally below the mitigate action level of 60.

2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for the Site as listed in the Order of Consent (Index. No. R2-20170321-111) dated June 17, 2017 are as follows:

Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.

Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater.

Soil Vapor

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings on-site.

2.5 Remaining Contamination

2.5.1 Soil

Previous environmental investigations indicated the presence Site-wide historic fill material from zero to variable depths which contained levels of petroleum constituents, chlorinated compounds and PAHs that were detected below the Restricted Residential SCOs (RRSCOS). Soil waste characterization exercise performed for the shallow soil layer beneath the entire parking lot at the Site did not exceed the Restricted Residential Soil Cleanup Objectives (RRSCOs).

As presented in the draft Construction Completion Report (CCR) dated may 2025, on-site remedial excavation activities were completed in accordance with the approved IRMWP on July and August 2017.

Materials removed from the Site during the remediation project included asphalt milling and non-hazardous historic fill material during the excavation of shallow soil for the re-pavement of the open parking lot area in the eastern and southeastern portions of the Site. Additional excavation was also performed in the open parking lot for the installation of a drywell along with a stormwater retention system. Information on the drywell and stormwater retention system installation in the open parking space was not available from ATANE. HydroTech identified a visual evidence of a drywell that is approximately 8 feet deep and 8 feet in diameter and two manholes associated with a retention tank system that is approximately 8 feet wide and 16 feet long. Also, soil was likely disposed of four SSDS pits that were excavated beneath the basement slab in sections that are each 24 cubic inches. Figure 3 provides the area of the four SSDS pits, the area of the excavated parking lot and the approximate footprint of the drywell and the stormwater retention system.

An estimated total of 300 cubic yards of non-hazardous soil/fill material was removed from the Site and disposed of at PPark NJ (PPark) located at 100 Planten Avenue, Prospect Park, NJ.

2.5.2 Groundwater

Groundwater sampling was attempted beneath the southeastern corner of the Site at the depth of refusal encountered at 37 feet bgs. No groundwater was encountered across the remaining portions of the Site due to the presence of refusal that was encountered between 13.5 feet and 29 feet bgs.

2.5.3 Soil Vapors

The SVI investigations performed prior to finalizing the proposed Site remedy indicated PCE, TCE were detected on-site at concentrations that indicate the potential for soil vapor intrusion impact in the on-site building based on NYSDOH SVI Guidance decision matrix tables. The greatest on-site PCE concentration of 7,000 µg/m3 was detected in the southwestern portion of the building at the Site followed by 1,400 µg/m3 detected in the central portion of the building. The greatest on-site TCE concentrations of 20,000 µg/m3 was also detected in the central portion of the building followed by 10,000 µg/m3 detected in the northern portion of the parking lot and 2,400 µg/m3 and 1,200 µg/m3 detected in across southern portion of the building. A moderate concentration of TCE of 59.2 µg/m3 was detected off-site in the sub-slab vapor sample collected inside the former residential building at the southeast-adjacent building at 31-12 58th Street which suggest the potential for soil vapor intrusion impact at this property. Based on these findings, an active SSDS and was proposed beneath the building at the site to mitigate the potential SVI impacts on-site and a soil vapor extraction system was proposed beneath the southeastern portion of the parking lot at the Site in order to prevent the migration of soil vapors into southeast-adjacent building at 31-12 58th Street.

An SSDS system was then installed at the Site and started on September 18, 2018. On-site indoor air assessment was performed during September and October 2018 in accordance with the May May 2017

IRMWP and during March 2025 in accordance with NYSDEC requirements communicated in April 2022 and January 2025. The purpose of this sampling is to verify the effectiveness of the installed SSDS mitigation system at the Site by investigating the presence of chlorinated solvents in indoor air. Findings of this assessment indicated the SSDS no soil vapor intrusion impact was identified in the indoor air quality inside the building at the Site. This was evidenced by the relatively low concentrations of PCE (maximum 3.6 $\mu g/m^3$), of TCE (2.8 $\mu g/m^3$) and methylene chloride (maximum of 9.4 $\mu g/m^3$) that were detected during SSDS mitigation effort, which were below their respective NYSDOH air guideline values. Petroleum-related VOCs were also detected in indoor air samples collected at the site during post SSDS start-up and they were associated to a background condition in the area. SSDS monitoring has been shown to provide a satisfactory and adequate negative pressure communication beneath the building slab by preventing vapors from entering the building, eliminating SVI impacts and the potential for VOC exposure via inhalation.

An SVI sampling was also required post SVE startup at the adjacent residential house located at 32-12 58th Street. This sampling could not be performed due to no access granted to this property. The residential home at this adjacent property is no longer present and this property is currently redeveloped with a new 3-story residential building with an open driveway along the southeastern boundary of the Site. It should be noted that a concentration of TCE of 59.2 $\mu g/m^3$ was historically detected below its respective NYSDOH Decision Matrix in the sub-slab vapor sample collected inside the former residential home and given its current built condition an SVI sampling is should not be warranted inside this building.

A summary of post SSDS system startup on-site ambient air samples results are provided in Table 2. Figure 3 provides the as-build plans of the SSDS and SVE system.

3.0 INSTITUTIONAL AND ENGINEERING CONTROLS PLAN

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.

This plan provides:

- A description of all IC/ECs on the site;
- The basic implementation and intended role of each IC/EC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of IC/ECs, such as the implementation of the Excavation Work Plan (EWP) (as provided in Appendix C) 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.

3.2 Institutional Controls

A series of ICs is required by the Interim Remedial (IRM) Work Plan 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 Restricted Residential as described in 6 NYCRR Part 375-1.8(g)(2)(ii), Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv) uses only. Adherence to these ICs on the site is required by the Environmental Easement and will be implemented under this SMP. ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement.

- The property may be used for Restricted Residential, Commercial and Industrial use;
- All ECs must be operated and maintained as specified in this SMP;
- The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health and Mental Hygiene to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;
- All ECs must be inspected at a frequency and in a manner defined in the SMP.

- Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP;
- All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP;
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;
- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP;
- Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement.

Appendix D details the site responsibilities and responsibilities remedial party and key personnel.

3.3 Engineering Controls

3.3.1 Cover System

Exposure to remaining contamination at the Site is prevented by a cover system placed over the Site. The parking lot has been covered with a 3-inch asphalt pavement and the build area at the Site consists of an 8-inch thick structural slab. This cover system will be subject to a Site Management Plan (SMP), which outlines the procedures required to be implemented in the event the cover system is breached, penetrated or temporarily removed, and any underlying remaining contamination is disturbed. The SMP will also present a protocol for annual assessment of the performance of the cover system to be reported to NYSDEC via annual periodic review reports. Figure 3 provides the as-build layout of the cover system.

The Excavation Work Plan (EWP) provided in Appendix C outlines the procedures required to be implemented in the event the cover system is breached, penetrated or temporarily removed, and any underlying remaining contamination is disturbed. Any work conducted pursuant to the Excavation Work Plan must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP), provided as Appendix E, and Community Air Monitoring Plan (CAMP), included in Appendix F. A 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 the PE.

3.3.2 Sub Slab Depressurization System (SSDS)

In order to implement immediate remedial measures to reduce potential exposure to chlorinated solvent vapors on-site, an active Slab Depressurization System (SSDS) has been built on the Site. The system consists of four (4) suction pits that are identified as SSDS Pit 1 through SSDS Pit 4. Each pit is 24 cubic inches in dimensions. Each pit is fitted with an open ended 4-inch PVC pipes embedded with ¾-inch

bluestone. The PVC pipe protruding from each pit is then connected to 4-inch diameter cast iron riser pipe. Riser pipes from SSDS Pit 1 to SSDS Pit 3 are manifold inside basement to one riser pipe which travels through the building toward the rooftop. Individual riser pipe from SSDS Pit 4 travels the building toward the rooftop. The two SSDS riser pipes are then coupled to two RadonAway suction fans model RP145 located on the roof of the building. The two effluents of the SSDS are each terminated with a gooseneck located at least 3 feet above the roof line and 10 feet from air intakes of HVACs or from operable windows. The four riser pipes from SSDS Pit 1 to SSDS Pit 4 are each fitted with a visible and audible vacuum monitoring/Alarm (model 28001/2) with electronic light and audio indicating loss of system vacuum or malfunctioning and a visible Dwyer Magnehelic dial type vacuum gauge (model 2100). The vacuum gauges and alarms for SSDS Pit 1 to SSDS Pit 3 are fitted inside a panel located in the southwestern portion of the basement and for SSDS Pit 4 is fitted inside a panel located in the northwestern portion of the first floor. As part of the specifications of the SSDS installation, a total of five sub-slab vacuum monitoring points identified as Probe #1 to Probe #5 were installed in the basement slab of the building at the Site in accordance with the IRMWP. Each probe consisted of a small diameter (1/2") holes drilled in the existing concrete slab of the building. The purpose of these pressure probes is to verify a sufficient subsurface communication and pressure differentials by the system. A metric of -0.001 inches of water column of pressure gradient was used as the basis for determining operational effectiveness.

The SSDS was started on September 18, 2018 with 100% applied suction from the two fans in order to maximize the suction of vapors drawn from the sub-slab. Following this system startup the organic vapor concentrations were measured at the effluents with the PID and a quantitative SSDS post startup diagnostic test was performed in accordance with the specifications in the NYSDEC-approved IRMWP. This monitoring was conducted by ATANE at the five sub-slab vacuum monitoring points Probe #1 to Probe #5 using an Extech HD755 Differential Pressure manometer. Since startup monitoring results of the SSDS could not be produced by ATANE, the same measurements were performed by HydroTech on February 18, 2025, per NYSDEC correspondence dated January 2025. During the February 2025 SSDS monitoring event, the organic vapors were measured at the effluent from SSDS Pit 1 to SSDS Pit 3 and the effluent from SSDS Pit 4 utilizing a PID and quantitative SSDS diagnostic test was also measured at the five sub-slab vacuum monitoring points with an Extech HD755 Differential Pressure manometer. Differential pressure readings obtained from the vacuum monitoring Probe #5 located in the southeastern potion of the basement did not record any vacuum readings due to unknown reason. Per NYSDEC requirements, Probe #5 was re-installed by HydroTech on March 28, 2025, and it was relocated approximately 8 feet from its original location. The results of the SSDS monitoring performed by HydroTech are presented below:

SSDS Suction Fan: Vacuum (Inch H2O or WC)	
SSDS Pit 1	-1.9
SSDS Pit 2	-1.8
SSDS Pit 3	-1
SSDS Pit 4	-1.9
SSDS Effluent PID (ppm)	
SSDS Pit 1 to SSDS Pit 3	0
SSDS Pit 4	0
Vacuum Monitoring Points (Inch H2O or WC)	
Probe #1	-0.01
Probe #2	-0.01
Probe #3	-0.04
Probe #4	-0.4
Probe #5	-0.02

As noted above, the measured negative pressure at the sub-slab vacuum monitoring points ranged between and -0.01 WC at PT-1 and PT-2 and -0.4 WC at PT-4. This range of negative pressure achieved during the quantitative SSDS startup diagnostic testing is an indication of a good vacuum communication across the soil vapor mitigation area at the Site.

Procedures for monitoring, operating and maintaining the SSDS are provided in the Operation, Monitoring and Maintenance Plan (OM&M) provided as Appendix G in this SMP.

Figure 3 provides the as-built SSDS drawings. Specification cut sheets of ventilation fan and related components are included in the Operation and Maintenance Plan in Appendix G of this SMP.

3.3.3 Soil Vapor Extraction (SVE) System

In order to implement immediate remedial measures to reduce potential exposure to chlorinated solvent vapors at the southeast-adjacent residential property, an SVE system was installed in the parking lot beneath the southeastern portion of the Site.

According to draft as-build plans provided by ATANE, the SVE system consists of two SVE wells that are manifolded together through piping installed in a 24 inches wide by 12 inches deep trench excavated beneath the asphalt pavement in the parking lot that runs laterally toward the southeast footprint of the building at the Site. ATANE indicated that the two SVE wells were installed using a Geoprobe. The as-build construction of the underground portion of the SVE system could not be verified due to the presence of asphalt pavement in the parking lot and the SVE wells were not accessible. The aboveground portion

of the SVE system consists of 4-inch diameter cast iron riser pipe protruding from the ground near the southeastern corner of the building at the Site. The SVE riser pipe runs vertically on the southeastern façade of the building and is connected to a RadonAway suction fan model RP260 located above the roof parapet. The effluent from the SVE fan terminates with a gooseneck located at least 3 feet above the roof line and 10 feet from air intakes of HVACs or from operable windows. The SVE riser pipe is fitted with a visible and audible vacuum monitoring/Alarm (model 28001/2) with electronic light and audio indicating loss of system vacuum or malfunctioning and a visible Dwyer Magnehelic dial type vacuum gauge (model 2100). The SVE vacuum gauge and alarm are fitted inside a panel located on the southeastern wall of the building. The aboveground installation of the SVE system is consistent with the IRMWP Addendum. The as-built drawings of the verified portions of the SVE system by HydroTech are included in Figure 3.

The SVE system was started on September 18, 2018 with 100% applied suction from the RadonAway fan in order to maximize the extraction of soil vapors and prevent its migration off-site. Following the SVE system startup the organic vapor concentrations were measured by ATANE at the effluent with the PID. Since SVE startup monitoring results could not be produced by ATANE, monitoring was performed by HydroTech on February 18, 2025 at the request of NYSDEC. During the February 2025 SSDS monitoring event, the organic vapors were measured at the effluent from the SVE system utilizing a PID. The results of the SVE monitoring performed by Hydrotech are presented below:

SVE System	
Vacuum (Inch H2O)	-5
Effluent PID (ppm)	0

A post SVE system startup effluent sampling was also performed at the effluent from the SVE blower on September 19, 2018 in accordance with the IRMWP Addendum. Effluent sample was designated as SVE-1 and it was collected utilizing 6 liter pre-cleaned, passivated, evacuated whole air Summa Canister. Effluent sampling analytical results indicate three individual VOCs were detected at trace concentrations including acetone (24 ug/m^3), methylene chloride (3.8 ug/m^3), p- & m- xylenes (14 ug/m^3), and toluene (18 ug/m^3). Based on the current SVE RadonAway fan, which is specified with a relatively low flow rate, this system does not emit High Toxicity Air Contaminant (HTAC) or the potential to emit more than 0.5 lb/hr of a non-HTAC VOCs; therefore, no treatment is necessary prior to discharge at the effluent of SVE system. Table 3 provides the SVE effluent sample analytical data for SVE-1 collected at system start-up.

Figure 3 provides the as-built drawings of the verified portions of the SVE system by HydroTech. Specification cut sheets of ventilation fan and related components are included in the Operation and Maintenance manual in Appendix G of this SMP.

The SVE 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 SVE system may no longer be required, a

proposal to discontinue the system will be submitted by the remedial party to the NYSDEC project manager. Conditions that may warrant discontinuing the SVE system include a soil vapor intrusion assessment of TCE and PCE at the southeastern site vicinity that: (1) indicate their concentrations are below their respective NYSDOH Decision Matrices for mitigation and; (2) the NYSDEC has determined that the SVE system has reached the limit of its effectiveness. Systems will remain in place and operational until permission to discontinue their use is granted in writing by the NYSDEC project manager.

Procedures for monitoring, operating and maintaining the Soil Vapor Extraction system are provided in the Operation and Maintenance Plan of the Site Management Plan (SMP). The OM&M Plan also addresses inspection procedures that must occur after any severe weather condition has taken place that may affect on-site ECs. Procedures for monitoring, operating and maintaining the SVE system are provided in the Operation, Monitoring and Maintenance Plan (OM&M) included in Appendix G – Operation and Maintenance Manual.

3.3.4 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 the termination of a remedial or mitigation system. When a remedial party receives this approval, the remedial party will decommission all site-related monitoring, injection and recovery wells as per the NYSDEC CP-43 policy.

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

3.3.4.1 Cover System:

The composite 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.

3.3.4.2 Sub-Slab Depressurization System (SSDS)

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

3.3.4.3 Soil Vapor Extraction (SVE) System:

The SVE 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 SVE system may no longer be required, a proposal to discontinue the system will be submitted by the remedial party. Conditions that may warrant discontinuing the SVE system include a soil vapor intrusion assessment of TCE and PCE at the southeastern site vicinity that: (1) indicate their concentrations are below their respective NYSDOH Decision Matrices for mitigation and; (2) the NYSDEC has determined that the SVE system has reached the limit of its effectiveness. Systems will remain in place and operational until permission to discontinue their use is granted in writing by the NYSDEC project manager.

4.0 MONITORING PLAN

4.1 General

This Monitoring Plan describes the measures for evaluating the overall performance and effectiveness of the Engineering controls in reducing or mitigating contamination at site. This Monitoring may only be revised with the approval of the NYSDEC.

This Monitoring Plan describes the methods to be used for:

- Sampling and analysis of appropriate media (indoor air and soul/sub-slab vapor)
- 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 provides information on:

- Sampling locations, protocol and frequency;
- Information on designed monitoring systems;
- Analytical sampling program requirements;
- Monitoring locations, protocol and frequency, as applicable
- Annual inspection and periodic certification.

4.2 Site – Wide Inspection

Site-wide inspections will be performed at a minimum of once per year. These periodic inspections must be conducted when the ground surface is visible (i.e. no snow cover). Site-wide inspections will be performed by a 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. 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. Inspections of all remedial components installed at the site will be conducted. 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;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;
- General site conditions at the time of the inspection;

- The site management activities being conducted including, where appropriate, a health and safety inspection; and
- Confirm that site records are 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 Engineering Control Systems Monitoring

4.3.1 Sub-Slab Depressurization System (SSDS) Monitoring

Monitoring of the SSDS will be performed on a routine basis as identified in Table 4 -SSDS Remedial System Monitoring Requirements and Schedule (see below). Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager. The monitoring of remedial systems must be conducted by a Professional Engineer (PE), who is licensed and registered in New York State or a qualified person who directly reports to the PE. 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 SSDS has been reported, or an emergency occurs that is deemed likely to affect the operation of the system. SSDS components to be monitored include, but are not limited to, the components included in Table 4 below.

Table 4 – SSDS Monitoring Requirements and Schedule

Remedial System Component	Monitoring Parameter	Operating Range	Monitoring Schedule
SSDS Pit 1 to SSDS Pit 4	Magnehelic Vacuum Gauge	-1.9 to -1.0 Inch H2O	Monthly
	Effluent PID	0.0 ppm	Annually

	Alarm	Light / Audio	Monthly
	System Piping	Not Applicable	Monthly
Vacuum Monitoring Points (Probe #1 to Probe #5)	Sub-Slab Vacuum	≤-0.01 Inch H2O	Annually

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 SSDS Operation and Maintenance Plan, is required immediately.

4.3.2 Soil Vapor Extraction (SVE) System Monitoring

Monitoring of the SVE system will be performed annually on a routine basis as identified in Table 5 -SVE System Remedial System Monitoring Requirements and Schedule (see below). Modification to the frequency or sampling requirements will require approval from the NYSDEC. The monitoring of remedial systems must be conducted by a Professional Engineer (PE) who is licensed and registered in New York State or a qualified person, who directly reports to a the PE. 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 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 5 below.

Table 5 – SVE System Monitoring Requirements and Schedule

Remedial System Component	Monitoring Parameter	Operating Range	Monitoring Schedule
SVE Riser	Magnehelic Vacuum Gauge	-5 Inch H2O	Monthly
	Effluent PID	0.0 ppm	Annually
	Alarm	Light / Audio	Monthly
	System Piping	Not Applicable	Monthly

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 SVE system Operation and Maintenance Plan, is required immediately.

4.3.3 Engineering Controls System Sampling

On-Site indoor Air Assessment

In the event an additional on-site indoor air assessment shall be performed at the Site per NYSDEC request to further evaluate the effectiveness of the SSDS installed at the Site, the two indoor air samples IA-1 and IA-2 and the background outdoor air sample OA-1 will be re-collected at their previous locations; i.e., IA-1 inside the cellar and IA-2 inside the main hall of the building. This sampling will be performed in accordance with October 2006 NYSDOH Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York. Details regarding the sampling procedures, data quality usability objectives, analytical methods for all samples collected as part of site management for the Site are included in the Quality Assurance Project Plan (QAPP), provided in Appendix I. Sampling shall be performed for the duration of 8 hours on-site while utilizing 6 liter pre-cleaned (as certified by the laboratory), passivated and evacuated whole air Summa® Canister and analyzed for VOCs via EPA Method TO-15. Figure 4 provides the proposed locations of on-site ambient air samples . Sampling analytical parameters are provided in Table 6 – Soil vapor Intrusion Sampling Requirements. The schedule and the requirements for this sampling will be determined in the future at the recommendation of NYSDEC prior to a permanent remedial system shutdown or as warranted by Site condition.

Table 6 – Soil Vapor Intrusion Evaluation Sampling Requirements and Schedule

Sampling Location	Analytical Method	Schedule
On-Site: IA-1, IA-2, OA-1	VOC (EPA Method TO-15)	TBD

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 soil vapor sampling program are specified in Section 7.0 – Reporting Requirements.

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 SSDS and SVE system;
- Will be updated periodically to reflect changes in site conditions or the manner in which the SSDS and SVE system are operated and maintained.

Further details regarding the Operation and Maintenance of the SSDS and SVE system are provided in Appendix G - 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. The Operation and Management Plan is subject to NYSDEC revision.

5.2 Engineering Control Systems Operation and Maintenance

The ECs for the site consists of a cover system, an SSDS and SVE system. The following sections provide a description of the operations and maintenance of the two mechanical systems SSDS and SVE system. As-Build drawings and details of the installed SSDS and SVE system at the Site are provided in Figure 3. Cut-sheets and as-built drawings for the two systems are provided in Appendix G - Operations and Maintenance Manual.

5.2.1 SSDS Performance Criteria

The SSD installation for this Site is intended to prevent chlorinated VOCs present in the subsurface from entering the building on-Site. The installed SSDS at the Site consists of four suction pits that are identified as SSDS 1 through SSDS 4. Key parts of the SSDS include two individual RadonAway suction fans, four vacuum monitoring/Alarms and four Dwyer Magnehelic manometers. The SSDS will operate continuously. Maintenance will be performed on each individual SSDS component at least annually. Maintenance will consist of replacing worn parts when necessary.

In the event that a suction fan fails, this fan will be repaired or replaced and documented in the Annual Site Management Report. Key spare parts will be kept at the Site to reduce the time necessary to replace the parts. Once a spare system part for the SSDS has been put into operation, a new part will be ordered and kept at the store as a spare.

A visual inspection of the complete system will be conducted by the Tibetan Community during each monitoring event by a Professional Engineer (PE), who is licensed and registered in New York State or a qualified person who directly reports to the PE. SSDS components to be monitored include, but are not limited to, the suction fans, Dwyer Magnehelic vacuum gauges, alarms, and general system piping.

If any equipment readings are not within their typical range listed in Table 4, any equipment is observed to be malfunctioning, or the system is not performing within specifications, maintenance and repair is to be initiated immediately, and the SSDS restarted.

5.2.2 SSDS Startup Procedure

To start the SSDS, the following procedure will be used:

1. Perform an initial system check to ensure that all electrical and piping connections are secure, and all relevant valves are open.
2. Check initial Dwyer Magnehelic manometer prior to startup (reading should be zero).
3. Switch system power on.
4. Inspect aboveground portions of piping for audible leaks or bad connections.
5. Allow 5 minutes for system to equilibrate, and collect Dwyer Magnehelic manometer reading.
6. Document all readings and other observations as appropriate in monitoring field sheet (see System Observations below).

As part of the specifications of the SSDS installation and operation, a quantitative pressure field extension testing will be conducted at the five permanent vacuum monitoring points (Probe #1 to Probe #5) in order to evaluate the effectiveness of the SSDS to make any necessary repairs or replacements to the system. The pressure field extension measurements will need to achieve a minimum of 0.01 Inch H2O at the furthest distance from SSDS suction pits in order to meet the performance requirements of the October 2006 NYSDOH Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York and also to ensure that the SSDS is effective across the entire property perimeter. If these criteria are not met, adjustments will be made to increase the vacuum influence including replacement of the fan, if necessary.

The system testing described above will be conducted if, in the course of the SSDS lifetime, the system goes down or significant changes are made to the system and the system must be restarted.

To shut down the system for maintenance, simply switch the system power off and document the time and date on the field sheets.

5.2.3 SSDS Routine System Operation and Maintenance

The two suction fans of the SSDS will operate continuously in accordance with the manufacturer's recommendations. The building maintenance personnel will be provided with all manufacturers' product data, manuals, and drawings related to the SSDS components including the fans, switches, alarms and Magnehelic manometers. Monthly inspections of the SSDS will be performed by the building maintenance personnel to determine whether a fan is found to be non-operational and the alarm audible alert has not gone off, or if the fan is operating, but the vacuum readings observed on the Magnehelic gauge is less than -1 inch H2O. The Tibetan Community of New York and New Jersey representative(s) shall be immediately contacted the determine the appropriate parties to perform these repairs. Any required maintenance, adjustments, or repairs to the SSDS fans will be conducted as per the manufacturer's recommendations. The non-mechanical components of the system (i.e., alarms and gauges) are passive; therefore, maintenance, adjustments, or repairs are not anticipated, but inspection for physical damage will be conducted annually.

Routine equipment maintenance (e.g., replacing vent fans), repairs, and/or adjustments will be determined based on the life expectancy and warranty for the specific part as well as visual observations over time. The need for repairs and/or adjustments will be based on comparisons between the ongoing system performance and the performance when system operations were initiated. Routine maintenance activities and minimum schedules are provided in the SSDS manual, which can be found in Appendix G**.** Routine maintenance of the accessible, non-mechanical SSDS components (i.e., riser) is not anticipated.

Following the balance of SSDS, all gauges settings will be recorded for future comparison purposes if the system is malfunctioning. The manufacturer's recommendations regarding operation of the blower will be followed.

5.2.4 SSDS Non-Routine Operation and Maintenance

Non-routine maintenance may also be required during the operation of the SSDS, including the following situations:

- The building maintenance personnel report that the warning device indicates the system is not operating properly;
- The system becomes damaged; and/or,
- The building undergoes renovations that may reduce the effectiveness of the system.

Activities conducted during non-routine maintenance visits will vary depending upon the reason for the visit. NYSDEC project manager will be informed of any failure of the SSDS within 48-hours. Repairs or adjustments will be made to the system as appropriate and as per manufacturer guidelines within 15 days of the equipment failure, whenever possible (i.e., pending availability of parts). If

necessary, the system will be redesigned and restarted. Operational problems will be noted in the Periodic Review Report to be prepared for that reporting period.

5.2.5 SSDS System Monitoring Devices

The SSDS has warning devices to indicate which segmengt of the system is not operating properly. This warning device consists of an audible alarm that sounds off with a red light indicator in the event of vacuum failure between the suction fan and the SSDS pit. In the event that a warning device is activated, applicable maintenance and repairs will be conducted, as specified in the Operation and Maintenance Plan, and the SSDS fan will be restarted. Operational problems will be noted in the Periodic Review Report to be prepared for that reporting period.

5.3 Soil Vapor Extraction (SVE) System

5.3.1 SVE Performance Criteria

The SVE system installation for this Site is intended to prevent the migration of chlorinated VOCs present beneath the Site into the neighboring residential building located in the immediate southeastern vicinity of the Site at 32-12 58th Street. The installed SVE system at the Site consists of two SVE wells that are manifolded together. Key parts of the SVE system include an individual RadonAway suction fan, a vacuum monitoring/Alarm and a Dwyer Magnehelic manometer. The SVE system will operate continuously. Maintenance will be performed on the SVE system component at least annually. Maintenance will consist of replacing worn parts when necessary.

In the event that a the suction fan fails, this fan will be repaired or replaced and documented in the Annual Site Management Report. Key spare parts will be kept at the Site to reduce the time necessary to replace the parts. Once a spare system part for the SVE system has been put into operation, a new part will be ordered and kept at the store as a spare.

A visual inspection of the complete system will be conducted during each monitoring event by a Professional Engineer (PE), who is licensed and registered in New York State or a qualified person who directly reports to the PE. SVE system components to be monitored include, but are not limited to, the suction fan, Magnehelic manometer, alarm, and general system piping.

If any equipment readings are not within their typical range listed in Table 5, any equipment is observed to be malfunctioning, or the system is not performing within specifications, maintenance and repair is to be initiated immediately, and the SVE system restarted.

5.3.2 SVE System Startup Procedure

To start the SVE system the following procedure will be used:

1. Perform an initial system check to ensure that all electrical and piping connections are secure, and all relevant valves are open.
2. Check initial Dwyer Magnehelic manometer prior to startup (reading should be zero).
3. Switch system power on.
4. Inspect aboveground portions of piping for audible leaks or bad connections.
5. Allow 5 minutes for system to equilibrate, and collect Dwyer Magnehelic manometer reading.
6. Document all readings and other observations as appropriate in monitoring field sheet (see System Observations below).

The system testing described above will be conducted if, in the course of the SVE system lifetime, the system goes down or significant changes are made to the system and the system must be restarted.

To shut down the system for maintenance, simply switch the system power off and document the time and date on the field sheets.

5.3.3 SVE Routine System Operation and Maintenance

The individual suction fan of the SVE system will operate continuously in accordance with the manufacturer's recommendations. The building maintenance personnel will be provided with all manufacturers' product data, manuals, and drawings related to the SVE system components including the fans, switches, alarm and Magnehelic manometer. Monthly inspections of the SVE system will be performed by the building maintenance personnel to determine whether the fan is found to be non-operational and the alarm audible alert has not gone off, or if the fan is operating, but the vacuum reading observed on the Magnehelic gauge is less than -1 inch H2O. The Tibetan Community of New York and New Jersey representative(s) shall be immediately contacted the determine the appropriate parties to perform these repairs. Any required maintenance, adjustments, or repairs to the SVE fan will be conducted as per the manufacturer's recommendations. The non-mechcanical components of the system (i.e., alarms and gauges) are passive; therefore, maintenance, adjustments, or repairs are not anticipated, but inspection for physical damage will be conducted annually.

Routine equipment maintenance (e.g., replacing vent fan), repairs, and/or adjustments will be determined based on the life expectancy and warranty for the specific part as well as visual observations over time. The need for repairs and/or adjustments will be based on comparisons between the ongoing system performance and the performance when system operations were initiated. Routine maintenance activities and minimum schedules are provided in the SVE system manual, which can be found in Appendix G. Routine maintenance of the accessible, non-mechanical SVE components (i.e., riser) is not anticipated.

Following the balance of SVE system, the gauge setting will be recorded for future comparison purposes if the system is malfunctioning. The manufacturer's recommendations regarding operation of the blower will be followed.

5.3.4 SVE Non-Routine Operation and Maintenance

Non-routine maintenance may also be required during the operation of the SVE system, including the following situations:

- The building maintenance personnel report that the warning device indicates the system is not operating properly;
- The system becomes damaged; and/or,
- The building undergoes renovations that may reduce the effectiveness of the system.

Activities conducted during non-routine maintenance visits will vary depending upon the reason for the visit. NYSDEC project manager will be informed of any failure of the SVE system within 48-hours. Repairs or adjustments will be made to the system as appropriate and as per manufacturer guidelines within 15 days of the equipment failure, whenever possible (i.e., pending availability of parts). If necessary, the system will be redesigned and restarted. Operational problems will be noted in the Periodic Review Report to be prepared for that reporting period.

5.3.5 SVE System Monitoring Devices

The SVE system has a warning device to indicate that the system is not operating properly. This warning device consists of an audible alarm that sounds off with a red light indicator in the event of vacuum failure at the suction fan. In the event that warning device is activated, applicable maintenance and repairs will be conducted, as specified in the Operation and Maintenance Plan, and the SVE system will be restarted. Operational problems will be noted in the Periodic Review Report to be prepared for that reporting period.

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 summary of vulnerability assessments that will be conducted for the site during periodic assessments, and briefly summarizes 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: According to Effective Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) No. 3604970063B, the Site is not located within the 100-year or 500-year flood zones. As such, it does not appear that the Site is vulnerable to flooding or storm surge events.

Sea Level Rise: The Site is located in the western portion of Queens County, over 1.3 miles from Bowery Bay on the East River, and the Site is approximately 73 feet above sea level. Furthermore, the SSDS pits and the subgrade piping for SVE Systems are set more than ten feet above the static groundwater table elevation. The Site, and its subgrade remedial and mitigation components, is unlikely to be flooded during a storm surge event or be susceptible to sea level rise.

Site Drainage and Storm Water Management: The Site is designed with a drywell and stormwater retention system in the open parking space; therefore, the Site has minimal risk of flooding relating to stormwater management.

Erosion: The Site is fully capped with concrete building slab and asphalt pavement in parking space.

High Wind: The building at Site was established in accordance with NYC Building Code that requires structural design capable of resisting high winds and avoid wind damages.

Drought: There are no wells beneath the Site that rely on the presence of water; therefore, the lack of groundwater would have minimal effect.

Electricity: The Site receive electrical service from Consolidated Edison, Inc. (Con Edison). A power loss

or dips/surges in voltage may impact the building's equipment and operations. The SSDS and SVE System control panels may shut down the system in the event of a dip or surge in voltage. The daily presence of office personnel and visitor at the at the Tibetan community center will help determine whether these systems are not operating.

Spill/Contaminant Release: The current community use at the Site does not involve any petroleum or chemical storage and there is limited potential for release of common chemicals used for cleaning and maintenance of the building.

Wildfires: The Site is in a dense, urban area with minimal trees or landscaping in the surrounding area; therefore, it is unlikely to be impacted by wildfire. ECs will be inspected after severe weather or other emergency conditions (natural disasters or fires) that are known to have inflicted damage at the Site or adjoining properties and repaired, as necessary.

Overall, the Site ECs are not expected to be vulnerable to the effects of global climate change, including severe weather and flooding events. walkways; therefore, the Site has minimal risk of erosion.

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 of the SMP provides a summary of any green remediation evaluations to be completed for the site during site management, and as reported in the Periodic Review Report (PRR).

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. 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 and consumables. Waste materials generated from repairs or modifications of the remedial systems at the Site 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.

Components to be evaluated as part of building operations should include, but are not limited to:

- Heating/cooling systems and temperature set-points;
- Building skin, insulation and building use and occupancy;
- Ventilation;
- Lighting and plug loads; and
- Grounds and property management.

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.

As part of this effort, consideration shall be given to:

- reduced sampling frequencies;
- Reduced site visits and system checks;
- Installation of remote sensing/operations and telemetry;
- Coordination/consolidation of activities to maximize foreman/labor time; and
- Use of mass transit for site visits, where available.

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 Optimizations

A Remedial Site Optimization (RSO) study will be conducted any time that the NYSDEC 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 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;
- 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 focuses 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 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.

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 8 and summarized in the Periodic Review Report.

Table 8: Schedule of Interim Monitoring/Inspection Reports

Task/Report	Reporting Frequency*
Periodic Review Report	Annually, or as otherwise determined by the NYSDEC

* The frequency of events will be conducted as specified until otherwise modified 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., sub-slab vapor, indoor air, outdoor air);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);
- Any observations, conclusions, or recommendations; and
- A determination as to whether contaminant conditions have changed since the last reporting event.
-

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

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

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

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

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

7.2 Periodic Review Report

A Periodic Review Report (PRR) will be submitted to the Department beginning sixteen (16) months after the CCR approval and a Certificate of Completion or equivalent document is issued. After submittal of the initial Periodic Review Report, the next PRR shall be submitted annually to the Department or at another frequency as may be required by the Department. In the event that the site is subdivided into separate parcels with different ownership, a single Periodic Review Report will be prepared that addresses the site described in Appendix A-Environmental Easement. The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the site.
- Results of the required monthly and annual inspections site inspections, and severe condition inspections, if applicable.

- 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 depicting system influent analytical data on a per event and cumulative basis;
    - O&M data summary tables;

- 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^{TM} database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html.
- A site evaluation, which includes the following:
    - The compliance of the remedy with the requirements of the site-specific Remedial Action Work Plan (RAWP), ROD or Decision Document;
    - The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications;
    - Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;
    - Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan;
    - An evaluation of trends in contaminant levels in the affected media to determine if the remedy continues to be effective in achieving remedial goals as specified by the RAWP, ROD or Decision Document; and
    - The overall performance and effectiveness of the remedy.

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 environmental easement;*
- *The engineering control systems are performing as designed and are effective;*
- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program and generally accepted engineering practices; and*
- *The information presented in this report is accurate and complete.*

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

The signed certification will be included in the 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, a Corrective Measures Work Plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing the work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC project manager.

7.4 Remedial Site Optimization Report

In the event that an RSO is to be performed (see Section 6), upon completion of an RSO, an RSO report must be submitted to the Department for approval. 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

- 6NYCRR Part 375, Environmental Remediation Programs. December 14, 2006.
- NYSDEC DER-10 – "Technical Guidance for Site Investigation and Remediation".
- NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. June 1998 (April 2000 addendum).
- 32-01 57th Street NYSDEC Site no. 241197 Interim Remedial Measure Work Plan (IRMWP)
- 32-01 57th Street NYSDEC Site no. 241197 Addendum to the Interim Remedial Measure Work Plan (IRMWP)
- Phase II Environmental Site Investigation, AKRF, Inc. 32-01 57th Street, Woodside, NY, October 31, 2011.
- Phase I Environmental Site Assessment, Airtek Environmental Corporation, 32-01 57th Street, Woodside, NY, March 12, 2012.
- Phase II Subsurface Investigation Report, Airtek Environmental Corporation, 32-01 57th Street, Woodside, NY, May 30, 2012.

TABLES

Table 2
SVE Effluent Sample Analytical Results
32-05 67th Street, Queens NY

Sample ID	SVE-1	
Sampling Date	9/19/2018	
Client Matrix	Soil Vapor	
Compound	Results	Q
Units	ug/m^3	
1,1,1,2-Tetrachloroethane	1.40	U
1,1,1-Trichloroethane	1.10	U
1,1,2,2-Tetrachloroethane	1.40	U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	1.60	U
1,1,2-Trichloroethane	1.10	U
1,1-Dichloroethane	0.83	U
1,1-Dichloroethylene	0.20	U
1,2,4-Trichlorobenzene	1.50	U
1,2,4-Trimethylbenzene	1	U
1,2-Dibromoethane	1.60	U
1,2-Dichlorobenzene	1.20	U
1,2-Dichloroethane	0.83	U
1,2-Dichloropropane	0.94	U
1,2-Dichlorotetrafluoroethane	1.40	U
1,3,5-Trimethylbenzene	1	U
1,3-Butadiene	1.40	U
1,3-Dichlorobenzene	1.20	U
1,3-Dichloropropane	0.94	U
1,4-Dichlorobenzene	1.20	U
1,4-Dioxane	1.50	U
2-Butanone	0.60	U
2-Hexanone	1.70	U
3-Chloropropene	3.20	U
4-Methyl-2-pentanone	0.84	U
Acetone	**24**	**D**
Acrylonitrile	0.44	U
Benzene	0.65	U
Benzyl chloride	1.10	U
Bromodichloromethane	1.40	U
Bromoform	2.10	U
Bromomethane	0.79	U
Carbon disulfide	0.64	U
Carbon tetrachloride	0.32	U
Chlorobenzene	0.94	U
Chloroethane	0.54	U
Chloroform	1	U
Chloromethane	0.42	U
cis-1,2-Dichloroethylene	0.20	U
cis-1,3-Dichloropropylene	0.93	U
Cyclohexane	0.70	U
Dibromochloromethane	1.70	U
Dichlorodifluoromethane	1	U
Ethyl acetate	1.50	U
Ethyl Benzene	0.89	U
Hexachlorobutadiene	2.20	U
Isopropanol	1	U
Methyl Methacrylate	0.84	U
Methyl tert-butyl ether (MTBE)	0.74	U
Methylene chloride	**3.80**	D
n-Heptane	0.84	U
n-Hexane	0.72	U
o-Xylene	0.89	U
p- & m- Xylenes	**14**	**D**
p-Ethyltoluene	1	U
Propylene	0.35	U
Styrene	0.87	U
Tetrachloroethylene	0.35	U
Tetrahydrofuran	1.20	U
Toluene	**18**	**D**
trans-1,2-Dichloroethylene	0.81	U
trans-1,3-Dichloropropylene	0.93	U
Trichloroethylene	0.27	U
Trichlorofluoromethane (Freon 11)	1.10	U
Vinyl acetate	0.72	U
Vinyl bromide	0.89	U
Vinyl Chloride	0.13	U

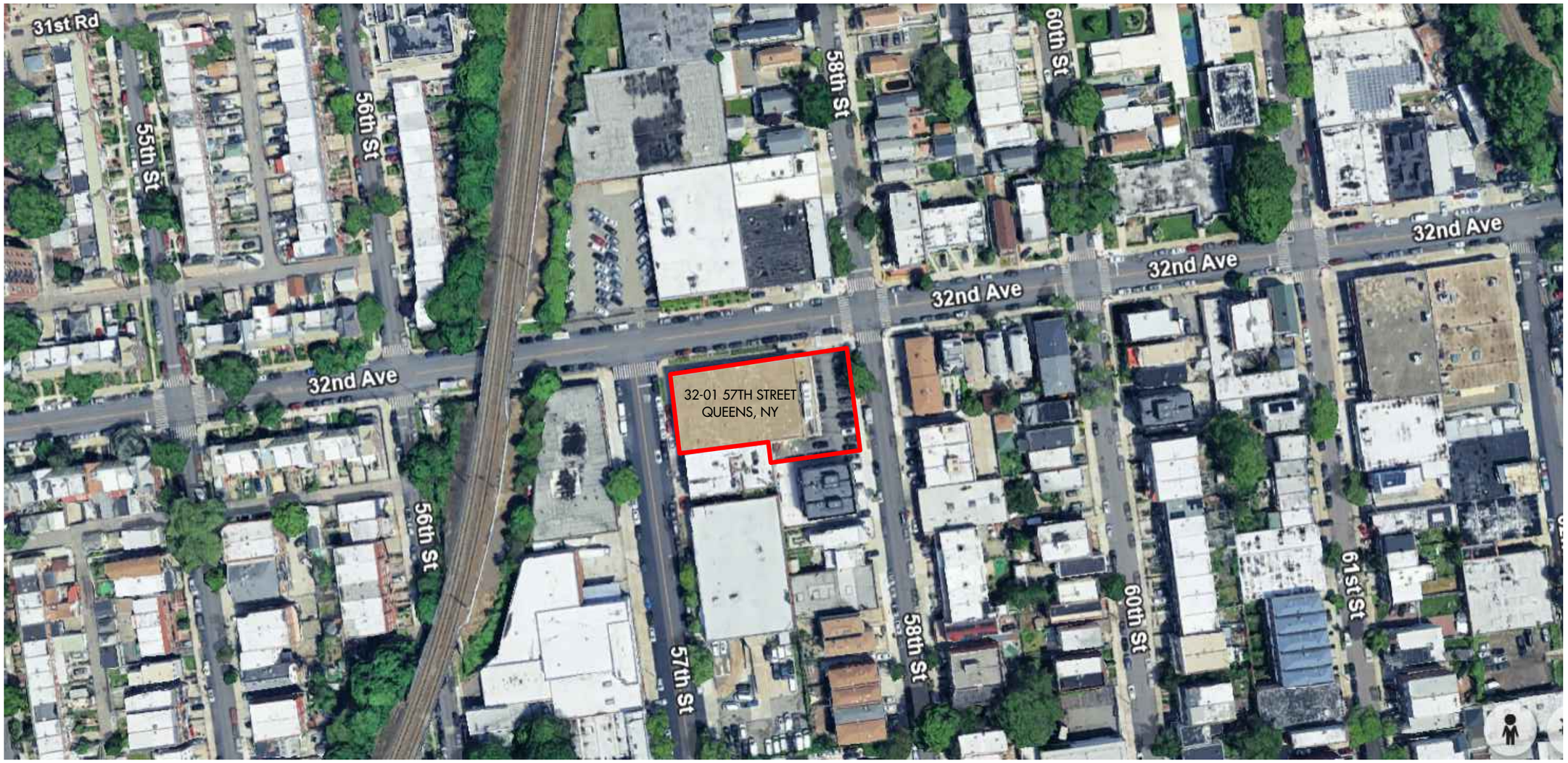
NOTES:
Q is the Qualifier Column with definitions as follows:
U=analyte not detected at or above the level indicated

Table 3
Post-SSDS Statup On-Site Ambient Air Samples Analytical Results
32-05 67th Street, Queens NY

Sample ID	IA-1 (Cellar)						IA2 (Main Hall)						OA1 (Outdoor)					
Sampling Date	9/29/2018		10/23/2018		3/28/2025		9/29/2018		10/23/2018		3/28/2025		9/29/2018		10/23/2018		3/28/2025	
Client Matrix	Indoor Air		Indoor Air		Indoor Air		Indoor Air		Indoor Air		Indoor Air		Outdoor Air		Outdoor Air		Outdoor Air	
Units	ug/m3		ug/m3		ug/m3		ug/m3		ug/m3		ug/m3		ug/m3		ug/m3		ug/m3	
Compound	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
1,1,1,2-Tetrachloroethane	0.630	U	0.540	U	0.620	U	0.580	U	0.650	U	0.580	U	0.630	U	0.580	U	0.740	U
1,1,1-Trichloroethane	0.500	U	0.430	U	0.490	U	0.460	U	0.520	U	0.460	U	0.500	U	0.460	U	0.590	U
1,1,2,2-Tetrachloroethane	0.630	U	0.540	U	0.620	U	0.580	U	0.650	U	0.580	U	0.630	U	0.580	U	0.740	U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	**0.92**	D	0.600	U	0.690	U	0.650	U	0.730	U	0.650	U	0.710	U	0.650	U	0.830	U
1,1,2-Trichloroethane	0.500	U	0.430	U	0.490	U	0.460	U	0.520	U	0.460	U	0.500	U	0.460	U	0.590	U
1,1-Dichloroethane	0.370	U	0.320	U	0.360	U	0.340	U	0.390	U	0.340	U	0.370	U	0.340	U	0.440	U
1,1-Dichloroethylene	**0.18**	D	0.0780	U	0.0890	U	0.0840	U	0.0940	U	0.0840	U	0.0910	U	0.0840	U	0.110	U
1,2,4-Trichlorobenzene	**4.60**	D	0.590	U	0.670	U	0.630	U	0.710	U	0.630	U	0.680	U	0.630	U	0.800	U
1,2,4-Trimethylbenzene	**13**	D	**5.50**	D	**1.50**	D	**13**	D	**11**	D	**1.80**	D	**2**	D	**1.40**	D	0.530	U
1,2-Dibromoethane	0.710	U	0.610	U	0.690	U	0.650	U	0.730	U	0.650	U	0.710	U	0.650	U	0.830	U
1,2-Dichlorobenzene	**0.83**	D	0.470	U	0.540	U	0.510	U	0.570	U	0.510	U	0.550	U	0.510	U	0.650	U
1,2-Dichloroethane	**1.10**	D	**0.510**	D	0.360	U	**0.550**	D	0.390	U	0.340	U	0.370	U	0.340	U	0.440	U
1,2-Dichloropropane	0.430	U	0.360	U	0.420	U	0.390	U	0.440	U	0.390	U	0.430	U	0.390	U	0.500	U
1,2-Dichlorotetrafluoroethane	0.640	U	0.550	U	0.630	U	0.590	U	0.67	U	0.590	U	0.640	U	0.590	U	0.760	U
1,3,5-Trimethylbenzene	**4.20**	D	**1.90**	D	**0.53**	D	**4.90**	D	**4.20**	D	**0.71**	D	**0.68**	D	**0.42**	D	0.530	U
1,3-Butadiene	0.61	U	0.520	U	0.600	U	0.560	U	0.630	U	0.560	U	0.610	U	0.560	U	0.720	U
1,3-Dichlorobenzene	**0.66**	D	0.470	U	0.540	U	0.510	U	0.570	U	0.510	U	0.550	U	0.510	U	0.650	U
1,3-Dichloropropane	0.430	U	0.360	U	0.420	U	0.390	U	0.440	U	0.390	U	0.430	U	0.390	U	0.500	U
1,4-Dichlorobenzene	**1.60**	D	0.470	U	0.540	U	0.510	U	**0.920**	D	0.510	U	0.550	U	0.510	U	0.650	U
1,4-Dioxane	0.660	U	0.570	U	0.650	U	0.610	U	0.690	U	0.610	U	0.660	U	0.610	U	0.780	U
2,2,4-Trimethylpentane	NT		NT		0.210	U	NT		NT		0.200	U	NT		NT		0.250	U
2-Butanone	**17**	BD	**8.40**	D	**18**	D	**34**	BD	**23**	D	**37**	D	**4.50**	BD	**2**	D	**12**	D
2-Hexanone	**0.87**	D	0.650	U	0.740	U	**0.94**	D	**1.40**	D	0.700	U	0.750	U	0.700	U	0.890	U
3-Chloropropene	1.400	U	1.200	U	1.400	U	1.300	U	1.50	U	1.300	U	1.400	U	1.300	U	1.700	U
4-Methyl-2-pentanone	**1.90**	D	**0.71**	D	**7.20**	D	**4.40**	D	**1.80**	D	**16**	D	**0.49**	D	**0.45**	D	**2.80**	D
Acetone	**130**	D	**68**	D	**52**	D	**160**	D	**160**	D	**85**	D	**18**	BD	**31**	D	**21**	D
Acrylonitrile	0.200	U	0.170	U	2.500	U	0.180	U	0.210	U	2.400	U	0.20	U	0.180	U	3.100	U
Benzene	**1.70**	D	**1.10**	D	**1.60**	D	**1.70**	D	**1.90**	D	**1.20**	D	**0.82**	D	**0.79**	D	**0.66**	D
Benzyl chloride	0.480	U	0.410	U	0.470	U	0.440	U	0.490	U	0.440	U	0.480	U	0.440	U	0.560	U
Bromodichloromethane	0.620	U	0.530	U	0.600	U	0.570	U	0.640	U	0.570	U	0.620	U	0.570	U	0.730	U
Bromoform	0.950	U	0.810	U	0.930	U	0.880	U	0.990	U	0.880	U	0.950	U	0.880	U	1.100	U
Bromomethane	0.360	U	0.310	U	0.350	U	0.330	U	0.370	U	**0.56**	D	0.360	U	0.330	U	0.420	U
Carbon disulfide	**0.60**	D	0.250	U	0.280	U	1.40	D	0.300	U	0.270	U	0.290	U	0.260	U	0.340	U
Carbon tetrachloride	**0.75**	D	**0.50**	D	**0.34**	D	**0.48**	D	**0.48**	D	**0.37**	D	**0.46**	D	**0.43**	D	**0.34**	D
Chlorobenzene	0.420	U	0.360	U	0.410	U	0.39	U	0.440	U	0.390	U	0.420	U	0.390	U	0.500	U
Chloroethane	0.240	U	0.210	U	0.240	U	0.220	U	0.250	U	0.220	U	0.240	U	0.220	U	0.290	U
Chloroform	**0.94**	D	0.380	U	0.440	U	0.420	U	0.470	U	0.420	U	0.450	U	0.420	U	0.530	U
Chloromethane	**1.50**	D	**1.30**	D	**1.30**	D	**1**	D	0.200	U	**1.30**	D	0.190	U	0.180	U	**1.30**	D
cis-1,2-Dichloroethylene	**0.18**	D	0.0780	U	0.0890	U	0.0840	U	0.0940	U	0.0840	U	0.0910	U	0.0840	U	0.110	U
cis-1,3-Dichloropropylene	0.420	U	0.360	U	0.410	U	0.390	U	0.430	U	0.390	U	0.420	U	0.390	U	0.490	U
Cyclohexane	**1.10**	D	**0.76**	D	**0.37**	D	**1.50**	D	**3.80**	D	**0.47**	D	**0.35**	D	**0.59**	D	0.370	U
Dibromochloromethane	0.780	U	0.670	U	**0.77**	U	0.720	U	0.810	U	0.720	U	0.780	U	0.720	U	0.920	U
Dichlorodifluoromethane	**1.80**	D	1.60	D	**2.50**	D	**1.60**	D	**1.50**	D	**2.40**	D	**1.70**	D	1.600	D	**2.40**	D
Ethyl acetate	**2.50**	D	**1.40**	D	**19**	D	**3.10**	D	**2.80**	D	**13**	D	**1.50**	D	1.100	D	**5.50**	D
Ethyl Benzene	**9.20**	D	**4.30**	D	**5.80**	D	**15**	D	**13**	D	**14**	D	**2**	D	**1.90**	D	**3.40**	D
Hexachlorobutadiene	**1.80**	D	0.840	U	0.960	U	0.910	U	1	U	0.910	U	0.980	U	0.910	U	1.200	U
Isopropanol	**12**	D	7.100	D	**9.70**	D	**13**	D	**12**	D	**9.80**	D	**3**	D	**3**	D	**4.70**	D
Methyl Methacrylate	**1.40**	D	**0.55**	D	0.370	U	**0.80**	D	**0.90**	D	0.350	U	0.380	U	**1.70**	D	0.440	U
Methyl tert-butyl ether (MTBE)	0.330	U	0.280	U	0.320	U	0.31	U	0.340	U	0.310	U	0.330	U	0.310	U	0.390	U
Methylene chloride	**9.40**	D	**5.80**	D	**1.90**	J	**6.30**	D	**8.30**	D	**1.80**	J	**4.80**	D	**8.40**	D	**2.30**	J
Naphthalene	NT		NT		0.940	U	NT		NT		0.890	U	NT		NT		1.100	U
n-Heptane	**12**	D	**7.30**	D	**2.80**	D	**22**	D	**35**	D	**4.60**	D	**3**	D	**4.50**	D	**0.80**	D
n-Hexane	**2.40**	D	**1.30**	D	**1.30**	D	**4.50**	D	**3.30**	D	**1.70**	D	**1.10**	D	**1.50**	D	**0.57**	D
o-Xylene	**11**	D	**5.60**	D	**5.50**	D	**16**	D	**16**	D	**12**	D	**2.10**	D	**2.20**	D	**3.30**	D
p- & m- Xylenes	**36**	D	**18**	D	**21**	D	**53**	D	**52**	D	**44**	D	**7.10**	D	**7.70**	D	**12**	D
p-Ethyltoluene	**9.60**	D	**4.30**	D	**1.20**	D	**10**	D	**11**	D	**1.60**	D	**2**	D	**1.50**	D	0.530	U
Propylene	**2.10**	D	**1.30**	D	0.150	U	**2**	D	**2.50**	D	0.150	U	**0.74**	D	**0.78**	D	0.190	U
Styrene	**8.50**	D	**5.70**	D	0.380	U	**9.60**	D	**10**	D	0.360	U	**0.90**	D	**1.20**	D	0.460	U
Tetrachloroethylene	**2.50**	D	**1.10**	D	**0.79**	D	**3.60**	D	**1.80**	D	0.580	U	**1**	D	**0.87**	D	0.740	U
Tetrahydrofuran	**0.65**	D	**0.49**	D	0.530	U	**1.50**	D	**1.70**	D	0.500	U	**0.57**	D	0.500	U	0.640	U
Toluene	**40**	D	**46**	D	**24**	D	**93**	D	**170**	D	**38**	D	**12**	D	**21**	D	**7.20**	D
trans-1,2-Dichloroethylene	0.360	U	0.310	U	0.360	U	0.340	U	0.380	U	0.340	U	0.360	U	0.340	U	0.430	U
trans-1,3-Dichloropropylene	0.420	U	0.360	U	0.410	U	0.390	U	0.430	U	0.390	U	0.420	U	0.390	U	0.490	U
Trichloroethylene	**2.80**	D	**1.30**	D	**0.24**	D	**1.80**	D	**0.82**	D	**0.14**	D	**0.120**	U	0.110	U	0.150	U
Trichlorofluoromethane (Freon 11)	**1.80**	D	**1.60**	D	**1.30**	D	1.500	D	**1.70**	D	**1.20**	D	**1.40**	D	**1.30**	D	**1.30**	D
Vinyl acetate	0.320	U	0.280	U	0.320	U	0.300	U	0.340	U	0.300	U	0.320	U	0.300	U	0.380	U
Vinyl bromide	0.400	U	0.340	U	0.390	U	0.370	U	0.420	U	0.370	U	0.400	U	0.370	U	0.470	U
Vinyl Chloride	0.0590	U	0.0500	U	0.120	U	0.0540	U	0.0610	U	0.110	U	0.0590	U	0.0540	U	0.140	U

NOTES:
Q is the Qualifier Column with definitions as follows:
D=result is from an analysis that required a dilution
J=analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated
U=analyte not detected at or above the level indicated
B=analyte found in the analysis batch blank
NT=this indicates the analyte was not a target for this sample
Bolded indicates concentration is greater than MDL

FIGURES



N

0 200

APPROXIMATE SCALE IN FEET

DATE	DESCRIPTION	CHK

SEAL & SIGNATURE

HYDROTECH ENVIRONMENTAL ENGINEERING AND GEOLOGY, DPC

231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY. 10001

TEL: (631) 462-5866

BASE DRAWING PREPARED BY

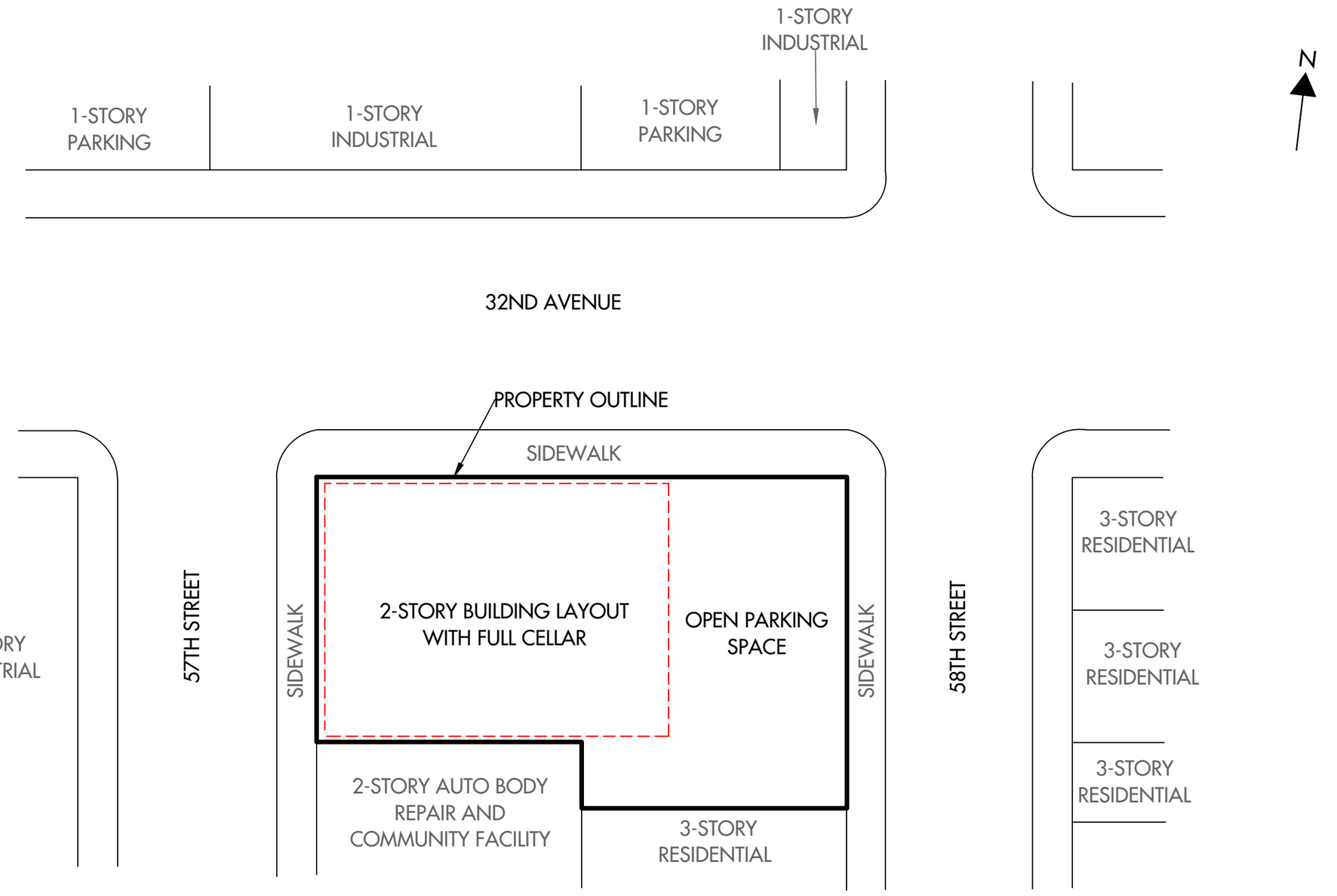
PROJECT NAME AND ADDRESS

32-01 57TH STREET, QUEENS, NY

PROJECT FIGURE

FIGURE 1: SITE LOCATION MAP

PROJECT NO.	DATE
240047	04/24/25
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS NOTED	APPROVED BY P.M.



DATE	DESCRIPTION	CHK

SEAL & SIGNATURE

HYDROTECH ENVIRONMENTAL ENGINEERING AND GEOLOGY, DPC

231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY. 10001

TEL: (631) 462-5866

BASE DRAWING PREPARED BY

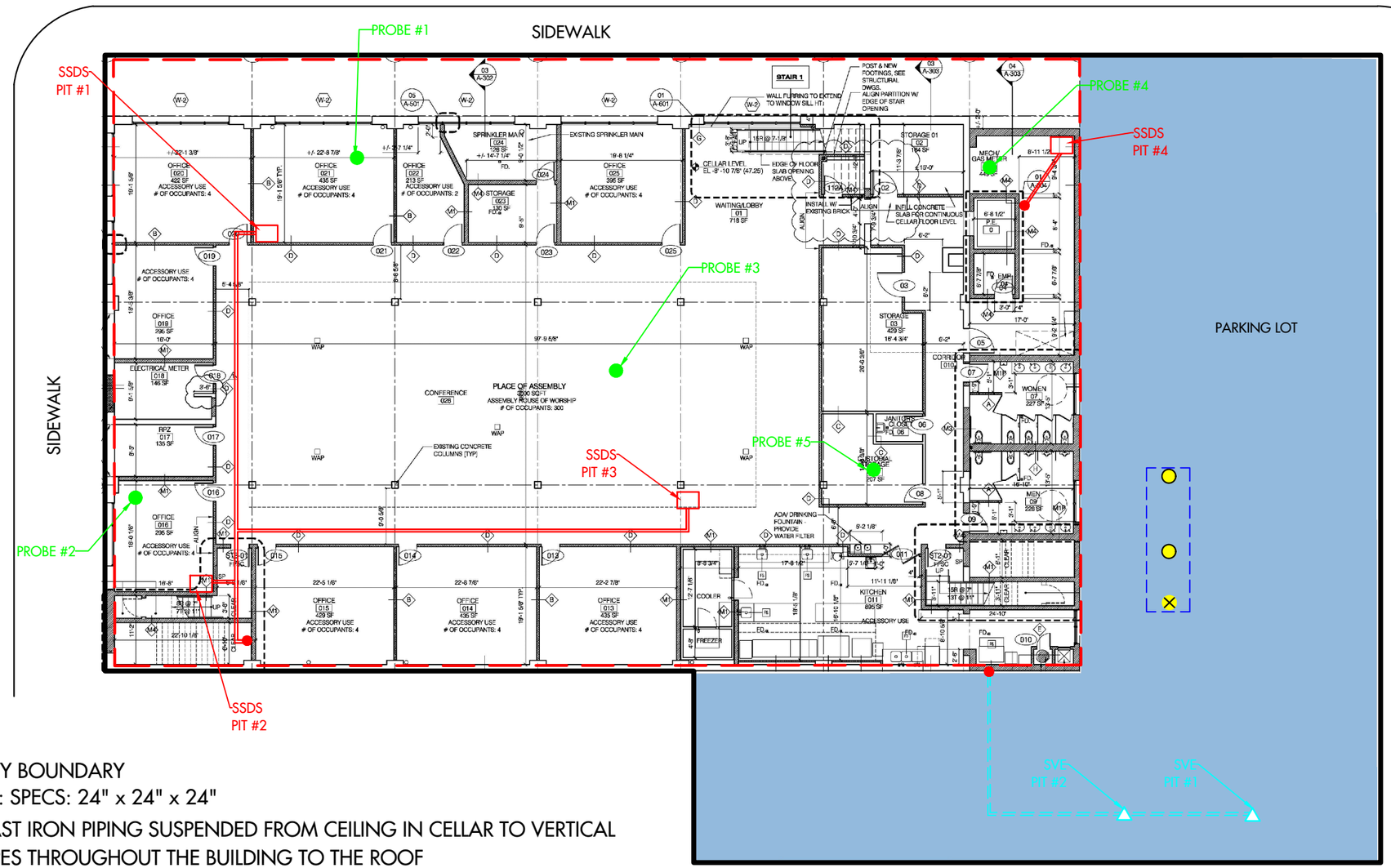
PROJECT NAME AND ADDRESS

32-01 57TH STREET, QUEENS, NY

PROJECT FIGURE

FIGURE 2: SITE PLAN

PROJECT NO.	DATE
240047	04/24/25
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS NOTED	APPROVED BY P.M.



LEGEND:

- PROPERTY BOUNDARY
- SSDS PIT: SPECS: 24" x 24" x 24"
- 4" ⌀ CAST IRON PIPING SUSPENDED FROM CEILING IN CELLAR TO VERTICAL RISER PIPES THROUGHOUT THE BUILDING TO THE ROOF
- RISER TO ROOF
- VACUUM MONITORING PROBE
- TRENCH MANHOLE COVER OF DRYWELL
- MANHOLE COVER
- APPROXIMATE FOOTPRINT OF INSTALLED DRYWELL AND STORM WATER RETENTION SYSTEM
- SVE WELL - UNCONFIRMED AS-BUILD*
- UNDERGROUND SVE PIPING - UNCONFIRMED AS-BUILD*

*AS-BUILD DESIGN COULD NOT BE CONFIRMED DUE TO THE LACK OF DOCUMENTATION OF INSTALLATION PER PROPOSED SVE DESIGN

- 3" ASPHALT PAVEMENT (TYPICAL AT PARKING LOTS)
- 8" BASEMENT SLAB AS CONFIRMED BY HYDROTECH DURING THE INSTALLATION OF VACUUM MONITORING PROBE #5

0 30

APPROXIMATE SCALE IN FEET

DATE	DESCRIPTION	CHK

SEAL & SIGNATURE

HYDROTECH ENVIRONMENTAL ENGINEERING AND GEOLOGY, DPC

231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY. 10001

TEL: (631) 462-5866

BASE DRAWING PREPARED BY

NANDINEE PHOOKAN ARCHITECTS PC

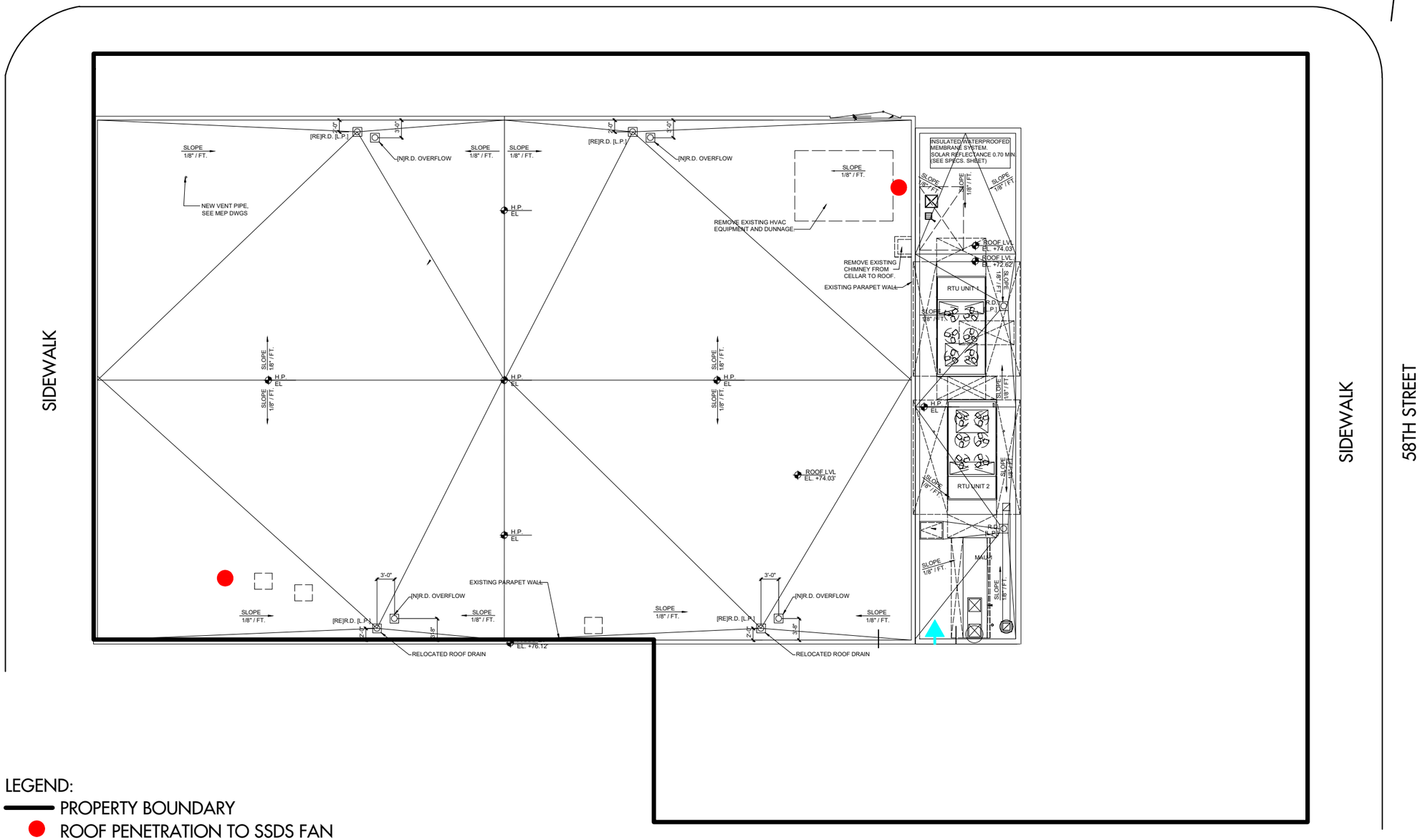
PROJECT NAME AND ADDRESS

32-01 57TH STREET, QUEENS, NY

PROJECT FIGURE

FIGURE 3A: AS-BUILD DRAWINGS OF COVER SYSTEM, SSDS AND SVE SYSTEM - CELLAR AND GROUND LEVEL PLAN VIEW

PROJECT NO.	DATE
240047	04/24/25
DRAWN BY: A.S.	REVIEWED BY: P.M.
SCALE (11X17): AS NOTED	APPROVED BY: P.M.



DATE	DESCRIPTION	CHK

SEAL & SIGNATURE

HYDROTECH ENVIRONMENTAL ENGINEERING AND GEOLOGY, DPC

231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY. 10001

TEL: (631) 462-5866

BASE DRAWING PREPARED BY

NANDINEE PHOOKAN ARCHITECTS PC

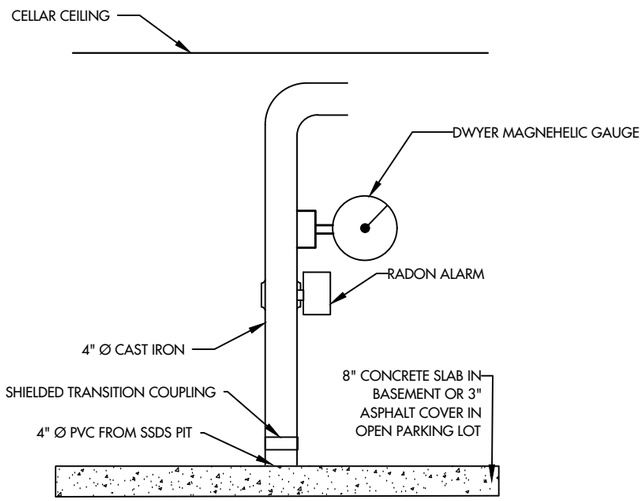
PROJECT NAME AND ADDRESS

32-01 57TH STREET, QUEENS, NY

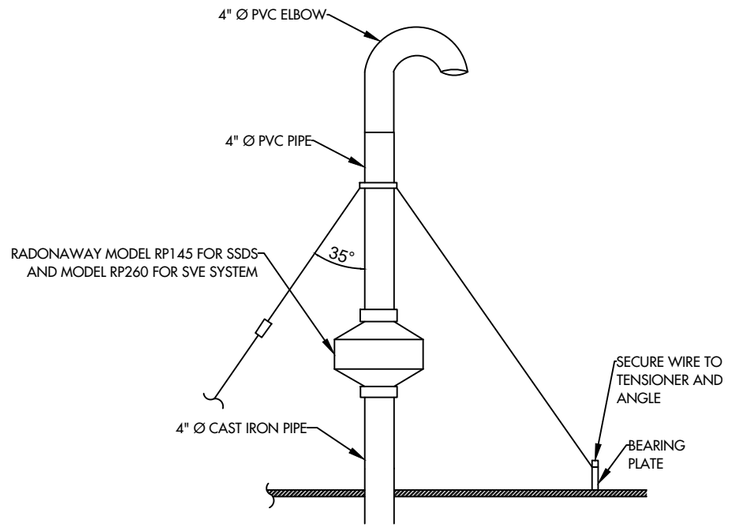
PROJECT FIGURE

FIGURE 3B: AS-BUILD DRAWINGS OF COVER SYSTEM, SSDS AND SVE SYSTEM - ROOF VIEW

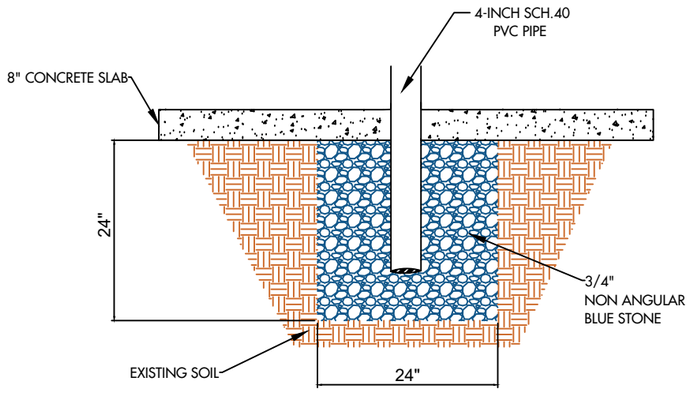
PROJECT NO.	DATE
250001	04/28/25
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS NOTED	APPROVED BY P.M.



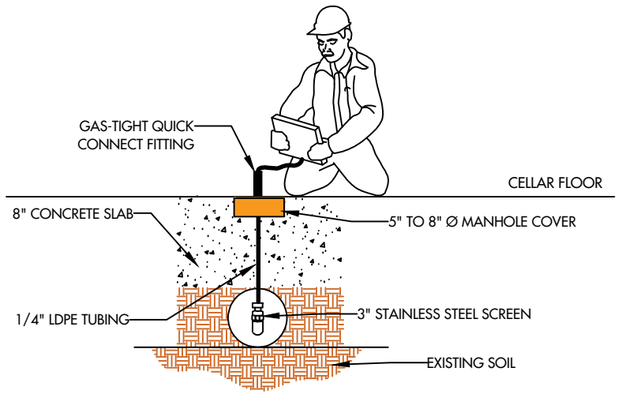
SSDS VENT RISER AT CELLAR/SVE RISER AT GRADE LEVEL IN PARKING LOT



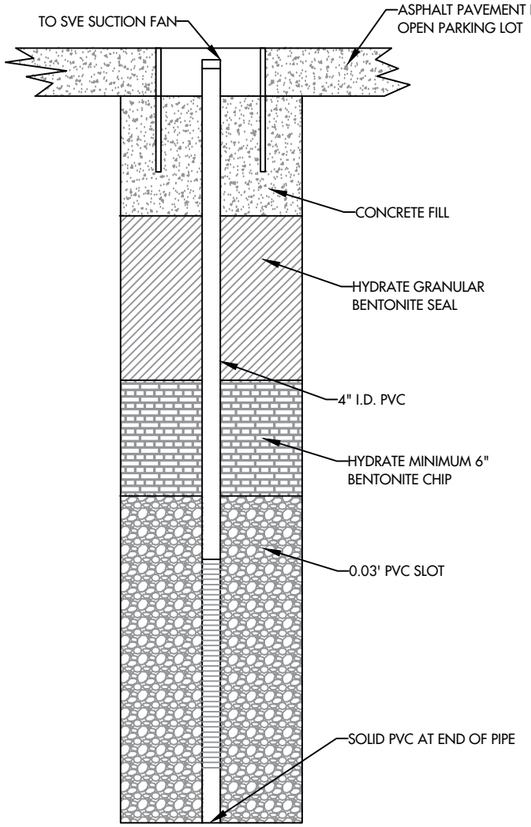
SSDS/SVE VENT RISER AT ROOF FOR SSDS OR ROOF PARAPET FOR SVE SYSTEM



SSDS PITS



SSDS PRESSURE MONITORING POINT



SVE WELL ID	SCREENED INTERVAL	WELL SCREEN DIA.
SVE-1	10' - 15'	0.03'
SVE-2	10' - 15'	0.03'

SOIL VAPOR EXTRACTION WELL (SVE WELL DESIGN DETAILS ADOPTED FROM IRM WP) AS-BUILD DESIGN COULD NOT BE CONFIRMED DUE TO THE LACK OF DOCUMENTATION OF INSTALLATION PER PROPOSED SVE DESIGN

DATE	DESCRIPTION	CHK

SEAL & SIGNATURE

HYDROTECH ENVIRONMENTAL ENGINEERING AND GEOLOGY, DPC

231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY. 10001

TEL: (631) 462-5866

BASE DRAWING PREPARED BY

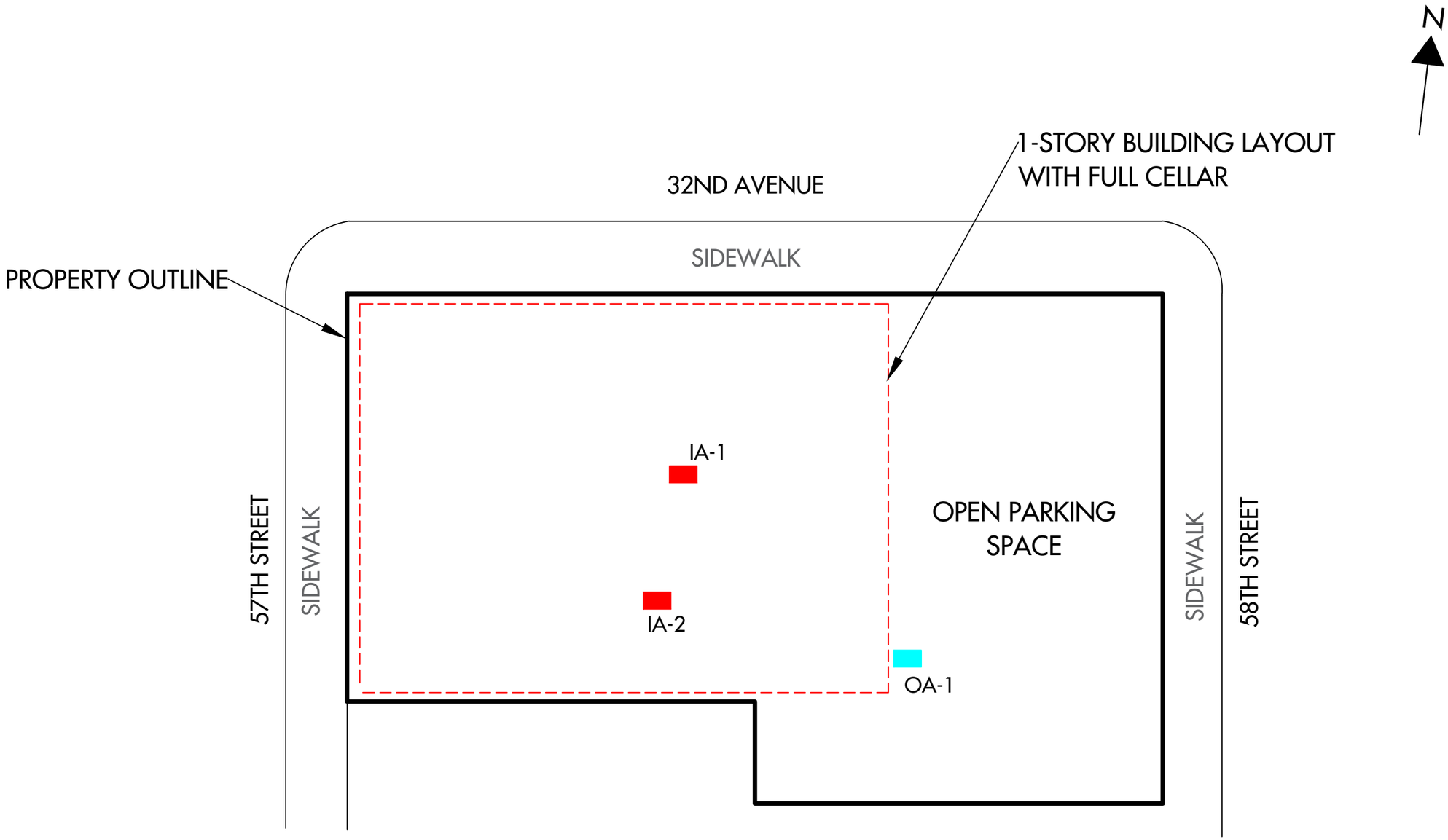
PROJECT NAME AND ADDRESS

32-01 57TH STREET, QUEENS, NY

PROJECT FIGURE

FIGURE 3C: AS-BUILD DRAWUNGS OF COVER SYSTEM, SSDS AND SVE SYSTEM-SECTIONS VIEW

PROJECT NO.	DATE
240047	04/24/25
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS NOTED	APPROVED BY P.M.



LEGEND:

- OUTDOOR AIR SAMPLE (OA-)
- ON-SITE INDOOR AIR SAMPLES (IA-)
  - IA-1 CELLAR
  - IA-2 MAIN HALL ON FIRST FLOOR

0 — 50

APPROXIMATE SCALE IN FEET

DATE	DESCRIPTION	CHK

SEAL & SIGNATURE

HYDROTECH ENVIRONMENTAL ENGINEERING AND GEOLOGY, DPC

231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY. 10001

TEL: (631) 462-5866

BASE DRAWING PREPARED BY

PROJECT NAME AND ADDRESS

32-01 57TH STREET, QUEENS, NY

PROJECT FIGURE

FIGURE 4: PROPOSED LOCATIONS OF ON-SITE AMBIENT AIR SAMPLES

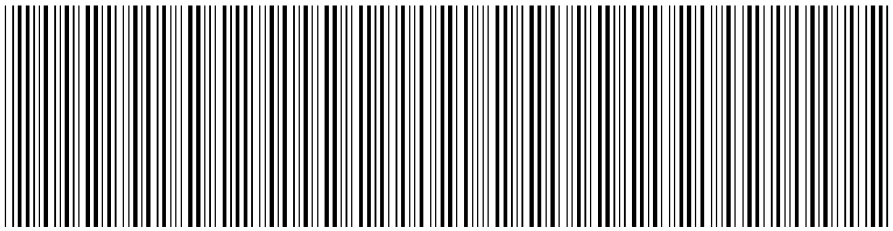
PROJECT NO. 240047	DATE 05/14/25
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS NOTED	APPROVED BY P.M.

APPENDICES

APPENDIX A
ENVIRONMENTAL EASEMENT

NYC DEPARTMENT OF FINANCE
OFFICE OF THE CITY REGISTER

This page is part of the instrument. The City Register will rely on the information provided by you on this page for purposes of indexing this instrument.The information on this page will control for indexing purposes in the event of any conflict with the rest of the document.



2019041200825001001EB89A

RECORDING AND ENDORSEMENT COVER PAGE **PAGE 1 OF 10**

Document ID: 2019041200825001 Document Date: 03-25-2019 Preparation Date: 04-12-2019
Document Type: EASEMENT
Document Page Count: 9

PRESENTER:
CHICAGO TITLE INSURANCE CO. (PICK-UP)
711 THIRD AVE, 5TH FLOOR
CT19-80050-Q (CES)
NEW YORK, NY 10017
212-880-1200
CTINYRECORDING@CTT.COM

RETURN TO:
BROWN DUKE & FOGEL, P.C.
ATTN: GEORGE DUKE, ESQ.
350 FIFTH AVENUE, SUITE 4640
NEW YORK, NY 10118

PROPERTY DATA

Borough	Block	Lot	Unit	Address
QUEENS	1159	1	Entire Lot	32-01 57TH STREET

Property Type: OTHER Easement

CROSS REFERENCE DATA

CRFN_____ *or* DocumentID_____ *or* _____ Year_____ Reel____ Page_____ *or* File Number_____

PARTIES

GRANTOR/SELLER:
TIBETAN COMMUNITY OF NEW YORK AND NEW JERSEY, INC.
32-01 57TH STREET
WOODSIDE, NY 11377

GRANTEE/BUYER:
NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION
625 BROADWAY
ALBANY, NY 12207-2942

FEES AND TAXES

Mortgage :

Mortgage Amount:	$	0.00
Taxable Mortgage Amount:	$	0.00
Exemption:		
TAXES: County (Basic):	$	0.00
City (Additional):	$	0.00
Spec (Additional):	$	0.00
TASF:	$	0.00
MTA:	$	0.00
NYCTA:	$	0.00
Additional MRT:	$	0.00
TOTAL:	$	0.00
Recording Fee:	$	82.00
Affidavit Fee:	$	0.00

Filing Fee: $ 100.00

NYC Real Property Transfer Tax: $ 0.00

NYS Real Estate Transfer Tax: $ 0.00

RECORDED OR FILED IN THE OFFICE OF THE CITY REGISTER OF THE CITY OF NEW YORK
Recorded/Filed 04-23-2019 10:03
City Register File No.(CRFN): **2019000128336**

City Register Official Signature

ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36 OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW

THIS INDENTURE made as of this 25th day of March, 2019, between Owner(s) The Tibetan Community of New York and New Jersey, Inc., having an office at 241 East 32nd Street, New York, New York 10016 (the "Grantor"), and The People of the State of New York (the "Grantee."), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor, is the owner of real property located at the address of 32-01 57th Street in the City of New York, County of Queens and State of New York, known and designated on the tax map of the New York City Department of Finance as tax map parcel number: Block 1159 Lot 1, being a portion of the property conveyed to Grantor by deed dated October 12, 2012 and recorded in the City Register of the City of New York as CRFN # 2013000033405. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately 0.45914 +/- acres, and is hereinafter more fully described in the Land Title Survey dated June 19, 2018 and last revised October 3, 2018 prepared by Frank I. Galluzzo, P.L.S. of Empire State Land Surveyor, P.C., which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation established for the Controlled Property until such time as this Environmental Easement is

extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of Order on Consent Index Number: R2-20170321-111, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement").

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

Restricted Residential as described in 6 NYCRR Part 375-1.8(g)(2)(ii), Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv)

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health and Mental Hygiene to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

(5) Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;

(6) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP;

(8) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(9) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;

(10) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Residential purposes as defined in 6NYCRR 375-1.8(g)(2)(i), and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation

pursuant to Title 36 of Article 71 of the Environmental Conservation Law.

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved by the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5) the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

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

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to:

Site Number: 241197
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, NY 12233

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail

and return receipt requested. The Parties may provide for other means of receiving and communicating notices and responses to requests for approval.

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

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

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

11. Consistency with the SMP. To the extent there is any conflict or inconsistency between the terms of this Environmental Easement and the SMP, regarding matters specifically addressed by the SMP, the terms of the SMP will control.

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

The Tibetan Community of New York and New Jersey, Inc.:

By: Sonam D. Gyephel

Print Name: SONAM D. GYEPHEL

Title: PRESIDENT Date: 3/12/2019

Grantor's Acknowledgment

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

On the 12 day of MARCH, in the year 2019, before me, the undersigned, personally appeared SONAM GYEPHEL, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public - State of New York

MARGHERITA LOSA GIVNEY
NOTARY PUBLIC-STATE OF NEW YORK
No. 01GI6205464
Qualified In Queens County
My Commission Expires 05-11-2021

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

By: _____
Michael J. Ryan, Director
Division of Environmental Remediation

Grantee's Acknowledgment

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

On the 25th day of March, in the year 2019, before me, the undersigned, personally appeared Michael J. Ryan, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

_____
Notary Public - State of New York

David J. Chiusano
Notary Public, State of New York
No. 01CH5032146
Qualified in Schenectady County
Commission Expires August 22, 2022

SCHEDULE "A" PROPERTY DESCRIPTION

ALL THAT CERTAIN PLOT, PIECE OR PARCEL OF LAND WITH THE BUILDINGS AND IMPROVEMENTS THEREON ERECTED, SITUATE, LYING AND BEING IN THE BOROUGH OF QUEENS, CITY AND STATE OF NEW YORK, BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT THE CORNER FORMED BY THE INTERSECTION OF THE SOUTHERLY SIDE OF 32ND AVENUE WITH THE WESTERLY SIDE OF 58TH STREET;

RUNNING THENCE SOUTHERLY ALONG THE WESTERLY SIDE OF 58TH STREET 100.00 FEET TO A POINT;

THENCE WESTERLY AND AT RIGHT ANGLES 200.00 FEET TO A POINT;

THENCE NORTHERLY ALONG THE EASTERLY SIDE OF 57TH STREET 100.00

FEET TO THE SOUTHERLY SIDE OF 32ND AVENUE;

THENCE EASTERLY ALONG THE SOUTHERLY SIDE OF 32ND AVENUE 200.00 FEET TO THE POINT OR PLACE OF BEGINNING.

APPENDIX B
LIST OF SITE CONTACTS

APPENDIX B – LIST OF SITE CONTACTS

Name	Phone/Email Address
Tibetan Community of New York And New Jersey - Site Owner Contact: Kelsang Tsering	718-626-0348, president@tcnynj.org
Tibetan Community of New York And New Jersey - Remedial Party Contact: Kelsang Tsering	718-626-0348, Jamchoe27@gmail.com
Dorina Aliu / Basit Rahman - Qualified Environmental Professionals at ATANE formerly HAKS)	860-761-1001, rmumtaz@ataneconsulting.com
Tarek Z. Khouri and Anish Deshpande - Remedial Engineers at ATANE (formerly HAKS)	860-761-1001, rmumtaz@ataneconsulting.com
Marlen Salazar - NYSDEC Project Manager	718-482-7129, marlen.salazar@dec.ny.gov
Jane O'Connell - NYSDEC Region 2 Section Chief	718-482-4599, jane.oconnell@dec.ny.gov
Kelly Lewandowski - NYSDEC Site Control Section Chief	Kelly.lewandowski@dec.ny.gov
Sarita Wagh - NYSDOH Project Manager	518- 402-7817, sarita.Wagh@health.ny.gov
George Duke - Remedial Party Attorney	(201) 736-0948, gduke@foxrothschild.com

APPENDIX C
EXCAVATION WORK PLAN

EXCAVATION WORK PLAN (EWP)

C-1 Notification

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination, the site owner or their representative will notify the NYSDEC. 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 of the SMP.

Table 1: Notifications*

Name	Contact Information	Required Notifications**
Marlen Salazar NYSDEC Project Manager	718-482-7129 marlen.salazar@dec.ny.gov	Notifications 1 through 9
Jane O'Connell NYSDEC Region 2 Section Chief	718-482-4599 jane.oconnell@dec.ny.gov	Notifications 1 through 9
Kelly Lewandowski, NYSDEC Site Control Section Chief	kelly.lewandowski@dec.ny.gov	Notifications 1 and 8
Sarrita Wagh NYSDOH Project Manager	518-402-7817 sarita.Wagh@health.ny.gov	Notifications 4,6 and 7

* 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 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;
- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120;
- 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 the SMP;
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

C-2 Soil Screening Methods

Visual, olfactory and instrument-based (e.g. photoionization detector) soil screening will be performed by a qualified environmental professional during all excavations into known or potentially contaminated material (remaining contamination). 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 later sections of this Appendix.

C-3 Stockpiling and Staging of Waste Materials

Stockpile management includes measures to minimize erosion and sediment transport from soil stockpiles. Stockpile management should be used when soils or other erodible materials are stored at the construction site.

Locate stockpiles away from all drainage system components including storm sewer inlets. Where practical, choose stockpile locations that that will remain undisturbed for the longest period of time as the phases of construction progress. Place sediment control around the perimeter of the stockpile, such as sediment control logs, rock socks, silt fence, straw bales and sand bags.

Stockpiling and staging of waste materials will be performed as follows:

- All excavated materials that are not direct loaded are to be stored within a staging area.
- Wastes being stored in the staging area will be kept covered and protected from the weather at all times except for actual loading and unloading. Stockpiles will be managed in a manner so as to minimize the generation of dust and odors.
- The staging areas will be lined with 6 mil, minimum, poly sheeting. All staged materials will be promptly tarped to prevent dust migration and infiltration of stormwater.
- Waste materials may also be bulked and stored in containers or drums to facilitate Waste transportation. Containers will be lined, covered, and sealed.
- All hazardous waste materials temporarily stockpiled on site, as determined through waste characterization sampling, must be properly labeled identifying the type of waste being stored and date of generation.
- During project closeout, the staging areas will be disassembled and all materials and equipment either properly cleaned/decontaminated and/or disposed of.
- 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 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.

C-4 Waste Characterization

Waste characterization sampling will be performed on the stockpile using composite or grab sampling techniques. Waste characterization will be performed as follows:

- The Contractor will characterize the waste material for proper transport, recycling or disposal in accordance with all applicable federal, state and local laws, orders, rules and regulations. The Contractor will also obtain approvals from the disposal facilities for the various waste streams prior to mobilization.
- The Contractor will conduct all analytical testing necessary to properly characterize the waste in order to obtain approval from the recycling and disposal facilities.
- Sampling of stockpiled soils for Waste Classification:
  - Contractor will collect samples of stockpiled soil for waste characterization analysis to properly classify the soil for off-site disposal. Soil sampling will be analyzed for the parameters specified by the disposal facility.
  - Samples will be logged and transported to a laboratory under chain of custody for analysis in accordance with approved disposal site acceptance criteria.
- The Contractor will contract with approved, certified, eligible disposal facilities for the disposal of all remedial related waste streams, in compliance with all applicable Federal, state and local requirements. The disposal facility must be able to accept waste at a rate that would not limit the rate at which the Contractor can excavate and transport the material to the facility. The Contractor must submit the name of the chosen landfill with all pertinent information and certifications for review and approval before the work begins
- The Contractor may use more than one disposal facility to dispose of the remedial waste materials so long as each are approved, certified, eligible disposal facilities.

C-5 Materials Loading & Transportation

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.

A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material. The Contractor responsible for loading and transport of excavated soil will comply with the following:

- The Contractor will carefully load the transport vehicles to insure there is no spillage. All transport vehicles will be properly lined prior to loading.
- Excavated materials should be neither in a liquid state, nor exhibiting any free water, when they are placed in hauling equipment. Excavated materials not meeting the above criteria should be dewatered to an acceptable level prior to transport off-site.
- The Contractor is responsible for ensuring that all loaded vehicles are within DOT weight restriction limits.
- Prior to off-site transport, vehicles will be decontaminated. After decontamination, while the vehicle is on the decontamination pad, the Contractor will inspect the vehicle, and cover the load as required by the regulations.

- All vehicles hauling wastes from the site will be inspected prior to leaving the site. No vehicle that is dripping or leaking any quantity of material will be allowed to leave the site. Vehicles transporting soils will be lined and securely covered. Contractor will be responsible for ensuring that no vehicle is dripping or leaking any quantity of materials even after vehicle leaves the site.
- All vehicles leaving the site will be inspected to ensure that no excess soil adheres to its wheels or undercarriage. All excess soil and waste material detected will be removed at the decontamination area. Contractor will be responsible for ensuring no excess soils adhered to its wheel or undercarriage even after vehicle leaves the site.
- A waste manifest will be prepared for all loads taken off-site. The Contractor will complete the track and waste shipment manifest required by the NYSDEC, RCRA and the state where the treatment/disposal facility is located.
- The Contractor will provide a load receipt for each waste load taken off-site to include the empty weight of the truck, the estimated loaded weight of each truck upon leaving the site, and the loaded weight of the truck upon arrival at the off-site facility.
- Each truck carrying materials off-site will be covered with tarpaulin, free of rips or tears.
- 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.
- 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).
- 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.
- 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.
- Trucks will be prohibited from stopping and idling in the neighborhood outside the project site.

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.

C-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 in accordance with all local, State (including 6NYCRR Part 360) and

Federal regulations. Unregulated off-site management of materials from this site will not occur without formal NYSDEC 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, i.e. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C/D recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include: 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, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2. Material that does not meet Unrestricted SCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

Disposal facility records will be maintained as follows:

- Each truck will be weighed once it arrives at the disposal facility. After removal of the waste material, the empty truck will again be weighed at the disposal facility. The disposal facility will complete the manifest or bill of lading and mail all copies to the appropriate regulatory agencies.

Disposal Facilities

- The facility must have all applicable permits required by federal, state and local agencies to operate and permitted to accept the type of waste material to be shipped from the Site.
- The facility must not have any significant violations or other environmental conditions.
- The facility must be approved by the Engineer prior to use.

C-7 Materials Reuse On-Site

The qualified environmental professional will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material 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 the demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

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 will not be reused on-site.

C-8 Fluids Management

All liquids to be removed from the site, including but not limited to, excavation dewatering, decontamination waters and groundwater monitoring well purge and development waters, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. 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.

Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river) will be performed under a SPDES permit.

C-9 Cover System Restoration

After the completion of soil removal and any other invasive activities the cover system will be restored in in a manner that complies with this SMP. The perimeter of the Site is currently covered with an 8-inch thick structural concrete slab in build area and a 3-inch asphalt pavement in parking lot. Figure 3 presents the location of the cover system at the Site. Restoration will include repairing the asphalt cover to match the pre-existing thickness. A figure showing the modified surface will be included in the subsequent Periodic Review Report and in an updated SMP. The alteration and restoration and modification of engineering controls must conform with Article 145 Section 7209 of the Education Law regarding the application professional seals and alterations.

C-10 Backfill from Off-Site Sources

All materials proposed for import onto the site will be approved by the Professional Engineer (PE) who is licensed and registered in New York State 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.

Material from industrial sites, spill sites, or 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 6NYCRR 375-6.7(d). Based on an evaluation of the land use, protection of groundwater and protection of ecological resources criteria. Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this site, will not be imported onto the site without prior approval by NYSDEC. 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.

C-11 Community Air Monitoring Plan

A figure showing the location of air sampling stations will be provided after soil disturbing activities are performed, if necessary. These 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, which is provided in Appendix F of this SMP will be reported to NYSDEC and NYSDOH Project Managers.

C-12 Odor Control Plan

This odor control plan is capable of controlling emissions of nuisance odors off-site and on-site. Specific odor control methods to be used on a routine basis will include limiting open excavations, use of tarping, hydromulch, or encapsulant to cover soils during excavations, direct loading of soils, use of chemical odorants, piping discharge SVE and SSDS air outside and away from occupied areas, use of vapor phase carbon units to filter air, and monitoring air at and beyond property lines. 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.

All necessary means will be employed to prevent on- and off-site nuisances. At a minimum, these measures will include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-site disposal; (e) use of chemical odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

C-13 Dust Control Plan

A dust suppression plan that addresses dust management during invasive on-site work be performed in accordance with the CAMP provided in the Appendix F of this SMP and it will include, at a minimum, the items listed below:

- Dust suppression will be achieved though the use of 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 will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.
- Gravel will 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.

C-14 Other Nuisances

A plan for rodent control will be developed and utilized by the contractor prior to and during site clearing and site grubbing, and during all remedial work.

A plan will be developed and utilized by the contractor for all remedial work to ensure compliance with local noise control ordinances.

APPENDIX D
RESPONSIBILITIES OF THE OWNER AND REMEDIAL PARTY

Responsibilities

The implementation of the Site Management Plan ("SMP") for the property located at 32-01 57th Street in Queens county, New York (hereinafter referred to as the "Site"), number 241197, is the responsibility of the current Site owner that is also the Remedial Party ("RP") listed as:

Tibetan Community of New York and New Jersey, Inc.
32-01 57th Street, Woodside NY 11377
Office: 718 626-0348

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

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

Site Owner's Responsibilities:

1) The owner shall follow the provisions of the SMP as they relate to future construction and excavation at the site.

2) In accordance with a periodic time frame determined by the NYSDEC, the owner shall periodically certify, in writing, that all Institutional Controls set forth in an Environmental Easement remain in place and continue to be complied with. The owner shall provide a written certification to the RP, upon the RP's request, in order to allow the RP to include the certification in the site's Periodic Review Report (PRR) certification to the NYSDEC.

3) In the event the site is delisted, the owner remains bound by the Environmental Easement and shall submit, upon request by the NYSDEC, a written certification that the Environmental Easement is still in place and has been complied with.

4) The owner shall grant access to the site to the RP and the NYSDEC and its agents for the purposes of performing activities required under the SMP and assuring compliance with the SMP.

5) The owner is responsible for assuring the security of the remedial components located on its property to the best of its ability. In the event that damage to the remedial components or vandalism is evident, the owner shall notify the site's RP and the NYSDEC in accordance with the timeframes indicated in Notifications Section of the SMP.

6) In the event some action or inaction by the owner adversely impacts the site, the owner must notify the site's RP and the NYSDEC in accordance with the time frame indicated in Notifications section of the SMP and (ii) coordinate the performance of necessary corrective actions with the RP.

7) The owner must notify the RP and the NYSDEC of any change in ownership of the site property (identifying the tax map numbers in any correspondence) and provide contact information for the new owner of the site. 6 NYCRR Part contains notification requirements applicable to any construction or activity changes and changes in ownership. Among the notification requirements is the following: Sixty days prior written notification must be made to the NYSDEC. Notification is to be submitted to the NYSDEC Division of Environmental Remediation's Site Control Section. Notification requirements for a change in use are detailed in Section 2.4 of the SMP. A 60-Day Advance Notification Form and Instructions are found at http://www.dec.ny.gov/chemical/76250.html.

8) The owner will maintain a structural concrete slab in build areas and asphalt cover in the parking lot and ensure the integrity of the cover system and the continuous operation of the active SSDS and SVE system and their additional components on behalf of the RP. The RP remains ultimately responsible for maintaining the engineering controls.

9) Until such time as the NYSDEC deems the vapor mitigation system is necessary, the owner shall operate the system, pay for the utilities for the system's operation, and report any maintenance issues to the NYSDEC.

11) In accordance with the tenant notification law, within 15 days of receipt, the owner must supply a copy of any vapor intrusion data collected off-site, that is produced with respect to structures and that exceeds NYSDOH or OSHA guidelines on the site, whether produced by the NYSDEC, RP/owner, to the tenants/owner of the adjacent property. The owner must otherwise comply with the tenant and occupant notification provisions of Environmental Conservation Law Article 27, Title 24.

Remedial Party Responsibilities

1) The RP must follow the SMP provisions regarding any construction and/or excavation it undertakes at the site.

2) The RP shall report to the NYSDEC all activities required for remediation, operation, maintenance, monitoring, and reporting. Such reporting includes, but is not limited to, periodic review reports and certifications, electronic data deliverables, corrective action work plans and reports, and updated SMPs.

3) Before accessing the site property to undertake a specific activity, the RP shall provide the owner advance notification that shall include an explanation of the work expected to be completed. The RP shall provide to (i) the owner, upon the owner's request, (ii) the NYSDEC, and (iii) other entities, if required by the SMP, a copy of any data generated during the site visit and/or any final report produced.

4) If the NYSDEC determines that an update of the SMP is necessary, the RP shall update the SMP and obtain final approval from the NYSDEC. Within 5 business days after NYSDEC approval, the RP shall submit a copy of the approved SMP to the owner(s).

5) The RP shall notify the NYSDEC and the owner of any changes in RP ownership and/or control and of any changes in the party/entity responsible for the operation, maintenance, and monitoring of and reporting with respect to any remedial system (Engineering Controls). The RP shall provide contact information for the new party/entity. Such activity constitutes a Change of Use pursuant to 375-1.11(d) and requires 60-days prior notice to the NYSDEC. A 60-Day Advance Notification Form and Instructions are found at http://www.dec.ny.gov/chemical/76250.html .

6) The RP shall notify the NYSDEC of any damage to or modification of the installed remedial systems as required under the Notification section of the SMP.

~~7)~~ The RP is responsible for the proper maintenance of any installed vapor intrusion mitigation systems associated with the site, as required in the Operation and Maintenance Manual in Appendix G of the SMP.

8) Prior to a change in use that impacts the remedial system or requirements and/or responsibilities for implementing the SMP, the RP shall submit to the NYSDEC for approval an amended SMP.

9) Any change in use, change in ownership, change in site classification (*e.g.*, delisting), reduction or expansion of remediation, and other significant changes related to the site may result in a change in responsibilities and, therefore, necessitate an update to the SMP and/or updated legal documents. The RP shall contact the Department to discuss the need to update such documents.

Change in RP ownership and/or control and/or site ownership does not affect the RP's obligations with respect to the site unless a legally binding document executed by the NYSDEC releases the RP of its obligations.

Future site owners and RPs and their successors and assigns are required to carry out the activities set forth above.

APPENDIX E
HEALTH AND SAFETY PLAN

HEALTH & SAFETY PLAN

TIBETAN COMMUNITY OF NEW YORK & NEW JERSEY

32-01 57th STREET
QUEENS, NEW YORK

NYSDEC Site Number: 241197

Table of Content

Figure
1. Directions to Hospital

Attachment
A. Health and Safety Fact Sheets

1.0 Introduction

The HASP has been prepared in conformance with applicable regulations, safe work practices and the project's requirements. It addresses those activities associated with the Excavation Work Plan (EWP) as part of the Site Management Plan (SMP) developed for the Tibetan Community of New York & New Jersey Site located at 32-01 57th Street in Queens, NY and identified as New York State Department of Environmental Conservation (NYSDEC) Site Number 241197. These activities consist of the potential alterations of the existing cover system installed at this site and any other activities that will requires sub-surface soil excavation and disposal. The Project Manager (PM), Site Safety Officer (SSO) and HydroTech field staff will implement the Plan during site work. Compliance with this HASP is required of all persons and third parties who perform fieldwork for this project. Assistance in implementing this HASP can be obtained from the SSO. The content of this HASP may change or undergo revision based upon additional information that is made available to health and safety personnel, monitoring results or changes in the technical scope of work. Any changes proposed must be reviewed by the SSO.

SCOPE OF WORK

The Scope of Work activities will include the following:

- Alteration of existing cover system and subsurface soil excavation and disposal

EMERGENCY NUMBERS

Contact	Phone Number
NYC Health/Belleview Hospital Center	212-562-4141
New York City EMS	911
NYPD	911
NYFD	911
National Response Center	800-424-8802
Poison Information Center	800-562-8816
Chemtree	800-424-9555

Project Management/Health and Safety Personnel

Title	Contact	Phone Number	Cell Phone
PM	Paul I. Matli	(718) 636-0800	(631) 241-7165
QAO	Ruijie Xu	(718) 636-0800	(631) 229-7090
Site Safety Officer	Kelsang Tsering	718-626-0348	

Directions to Mount Sinai Queens Hospital (See Figure 1)

Upon leaving the Site, head north on 57th Street and then turn left onto 32nd Avenue. Turn right at the first cross street onto 56th Street and then turn right onto 31st Avenue. Turn left onto 57th Street and then left onto 30th Avenue. Drive for 1.2 miles and arrive at the hospital on the left.

2.0 Health and Safety Staff

This section briefly describes the personnel and their health and safety responsibilities for the:

Project Manager (PM)

- Has the overall responsibility for the health and safety of site personnel
- Ensures that adequate resources are provided to the field health and safety staff to carry out their responsibilities as outlined below.
- Ensures that fieldwork is scheduled with adequate personnel and equipment resources to complete the job safely.
- Ensures that adequate telephone communication between field crews and emergency response personnel is maintained.
- Ensures that field site personnel are adequately trained and qualified to work at the Site.

SITE SAFETY OFFICER (SSO)

- Conducts initial onsite screening of body temperature of personnel and/or subcontractors before entering the job site and monitor all field personnel for health-related symptoms that could be indicative of Covid-19 infection.
- Documents individual temperature screening and any other observations for every field personnel in a daily log.
- Directs and coordinates health and safety monitoring activities pertaining to the performance of all aspects of fieldwork.
- Conduct a briefing on social distancing and other specific field training prior to personnel and/or subcontractors proceeding to work.
- Ensures that field teams utilize proper personal protective equipment (PPE).
- Conduct and document periodic safety briefings; ensures that field team members comply with this HASP.
- Completes and maintains Accident/Incident Report Forms.
- Notifies Hydro Tech corporate administration of all accidents/incidents.
- Determines upgrade or downgrade of PPE based on site conditions and/or downgrade of PPE based on site conditions and/or real-time monitoring results.
- Ensures that monitoring instruments are calibrated daily or as determined by manufactured suggested instructions.
- Maintains health and safety field logbooks.

- Develops and ensures implementation of the HASP.
- Approves revised or new safety protocols for field operations.
- Coordinates revisions of this HASP with field personnel and the SSO Division Contracting Officer.
- Responsible for the development of new company safety protocols and procedures and resolution of any outstanding safety issues which may arise during the conduction of site work.
- Reviews personnel and subcontractors current and up-to-date medical examination and acceptability of health and safety training.

FIELD PERSONNEL AND SUBCONTRACTORS (IF ANY)
- Reports any unsafe or potentially hazardous conditions to the SSO.
- Maintains knowledge of the information, instructions and emergency response actions contained in this HASP.
- Comply with rules, regulations and procedures as set forth in this HASP and any revisions that are instituted.
- Prevents admittance to work sites by unauthorized personnel.

3.0 Chemical & Waste Description/Characterization

The following list of chemicals that were previously detected onsite:

- Chlorinated Solvents
- Petroleum Hydrocarbons

Attachment A contains information regarding assessing health risks from contaminants of concern.

The following information references are presented in order to identify the properties and hazards of the materials that may/will be encountered at the Site.

- Dangerous Properties of Industrial Materials - Sax
- Chemical Hazards of the Workplace - Proctor/Hughes
- Condensed Chemical Dictionary – Hawley
- Rapid Guide to Hazardous Chemical in the Workplace - Lewis 1990.
- NIOSH Guide to Chemical Hazards - 1990
- ACGIH TLV Values and Biological Exposure Indices - 1991-1992

4.0 Hazard Assessment

The potential hazards associated with planned site activities include chemical, physical and biological hazards. This section discusses those hazards that are anticipated to be encountered during the activities listed in the scope of work.

The potential to encounter chemical hazards is dependent upon the work activity performed (invasive or non-invasive), the duration and location of the work activity. Such hazards could include inhalation or skin contact with chemicals that could cause dermatitis, skin burn, being overcome by vapors or asphyxiation. In addition, the handling of contaminated materials and chemicals could result in fire and/or explosion.

The potential to encounter physical hazards during site work includes heat stress, exposure to excessive noise, loss of limbs, being crushed, head injuries, cuts and bruises and other physical hazards due to motor vehicle operation, heavy equipment and power tools.

CHEMICAL HAZARDS

The potential for personnel and subcontractors to come in contact with chemical hazards may occur during the following tasks:

- Alteration of existing cover system and subsurface soil excavation and disposal

Exposure Pathways
Exposure to these compounds during ongoing activities may occur through inhalation of contaminated dust particles, inhalation of volatile (VOC) and semi-volatile (SVOC) vapor fume compounds, by way of dermal absorption, and accidental ingestion of the contaminant by either direct or indirect cross contamination activities (eating, smoking, poor hygiene). Indirectly, inhalation of contaminated dust particles (VOCs, SVOCs) can occur during adverse weather conditions (high or changing wind directions) or during operations that may generate airborne dust such as excavation, and sampling activities. Dust control measures such as applying water to roadways and work sites will be implemented, where visible dust is generated from non-contaminated and contaminated soils. Where dust control measures are not feasible or effective, respiratory protection will be used.

Additional Precautions
Dermal absorption or skin contact with chemical compounds is possible during invasive activities at the Site, including removal of product, excavation of tanks, and handling of contaminated soils. The use of PPE in accordance with Section 9.2 and strict adherence to proper decontamination procedures should significantly reduce the risk of skin contact.

The potential for accidental ingestion of potentially hazardous chemicals is expected to be remote, when good hygiene practices are used.

PHYSICAL HAZARDS

A variety of physical hazards may be present during Site activities. These hazards are similar to those associated with any construction type project. These physical hazards

are due to motor vehicles, and heavy equipment operation, the use of improper use of power and hand tools, misuse of pressurized cylinders, walking on objects, tripping over objects, working on surfaces which have the potential to promote falling, mishandling and improper storage of solid and hazardous materials, skin burns, crushing of fingers, toes, limbs, hit on the head by falling objects or hit one's head due to not seeing the object of concern, temporary loss of one's hearing and/or eyesight. Theses hazards are not unique and are generally familiarly to most hazardous waste site workers at construction sites. Additional task specific safety requirements will be covered during safety briefings.

Noise

Noise is a potential hazard associated with operation of heavy equipment, power tools, pumps and generators. High noise operators will be evaluated at the discretion of the SSO. Employees with an 8-hour time weighted average exposure exceeding 85 decibels (db) will be included in the hearing conservation program in accordance with 29 CFR 1910.85.

It is mandated that employees working around heavy equipment or using power tools that dispense noise levels exceeding 95 db are to wear hearing protection that shall consist of earplugs and earphones. This is particularly relevant as the jet engines of modern airplanes can give sound level readings of greater than 110 db.

Heat/Cold Stress

Extremes in temperature and the effects of hard work in impervious clothing can result in heat stress and/or hypothermia. The human body is designed to function at a certain internal temperature. When metabolism or external sources (fire, hot summer day, winter weather, etc.) cause the body temperature to rise or fall excessively, the body seeks to protect itself by triggering cooling/warming mechanisms. Profuse sweating is an example of a cooling mechanism, while uncontrollable shivering is an example of a warming mechanism. The SSO monitor the temperature to determine potential adverse effects the weather can cause on site personnel.

Protective clothing worn to guard against chemical contact effectively stops the evaporation of perspiration. Thus, the use of protective clothing increases heat stress problems. Cold stress can easily occur in winter with sub-freezing ambient temperatures. Workers in protective garments may heat-up and sweat, only to rapidly cool once out of the tank and the PPE. The major disorders due to heat stress are heat cramps, heat exhaustion and heat stroke.

HEAT CRAMPS are painful spasms that occur in the skeletal muscles of workers who sweat profusely in the heat and drink large quantities of water but fail to replace the body's lost salts or electrolytes. Drinking water while continuing to lose salt tends to dilute the body's extra cellular fluids. Soon water seeps by osmosis into active muscles and causes pain. Muscles fatigued from work as usually most susceptible to cramps.

HEAT EXHAUSTION is characterized by extreme weakness or fatigue, dizziness, nausea, and headache. In serious cases, a person may vomit or lose consciousness. The skin is clammy and moist, complexion pale or flushed, and body temperature normal or slightly higher than normal. Treatment is rest in a cool place and replacement of body water lost by perspiration. Mild cases may recover spontaneously with this treatment; severe cases may require care for several days. There are no permanent effects.

HEAT STROKE is a very serious condition caused by the breakdown of the body's heat regulating mechanisms. The skin is very dry and hot with red mottled or bluish appearance. Unconsciousness, mental confusion or convulsions may occur. Without quick and adequate treatment, the result can be death or permanent brain damage. Get medical assistance quickly! As first aid treatment, the person should be moved to a cool place. Soaking the person's clothes with water and fanning them should reduce body heat artificially, but not too rapidly.

Steps that can be taken to reduce heat stress are:

- Acclimatize the body. Allow a period of adjustment to make further heat exposure endurable.
- Drink more liquids to replace body water lost during sweating.
- Rest is necessary and should be conducted under the monitoring condition from the SSO and the effect personnel physiological state.
- Wearing personal cooling devices. There are two basic designs; units with pockets for holding frozen packets and units that circulate a cooling fluid from a reservoir through tubes to different parts of the body. Both designs can be in the form of a vest, jacket or coverall. Some circulating units also have a copy for cooling the head.

Cold temperatures can cause problems. The severe effects are FROSTBITE and HYPOTHERMIA.

FROSTBITE is the most common injury resulting from exposure to cold. The extremities of the body are often affected. The signs of frostbite are:

- The skin turns white or grayish-yellow
- Pain is sometimes felt early but subsides later. Often there is no pain
- The affected part feels intensely cold and numb

Shivering, numbness, drowsiness, muscular weakness and a low internal body temperature characterize the condition known as HYPOTHERMIA. This can lead to unconsciousness and death. With both frostbite and hypothermia, the affected areas need to be warmed quickly. Immersing in warm, not hot, water best does this. In such cases medical assistance will be sought.

To prevent these effects from occurring, persons working in the cold should wear

adequate clothing and reduce the time spent in the cold area. The field SSO, to determine appropriate time personnel may spend in adverse weather conditions, will monitor this.

Lockout/Tagout
PURPOSE -- This program establishes procedures for de-energizing, isolating and ensuring the energy isolation of equipment and machinery. The program will be used to ensure that equipment and machinery is de-energizing and isolated from unexpected energization by physically locking (Lockout) energy isolation devices or, in the absence of locking capabilities, tagout (Tagout) the device to warn against energization. These procedures will provide the means of achieving the purpose of this program, prevention of injury to Hydro Tech employees from the unexpected energization or start-up of equipment and machinery, or from the release of stored energy.

APPLICATION -- This program applies to the control of energy during the servicing and/or maintenance of equipment and machinery. This program covers normal operations only if a guard or other safety device is removed or bypassed, or any part of the body is placed into an area of the equipment or machinery where work is performed on the material, or a danger zone exists during the operating cycle. Minor tool changes, adjustments, and other minor servicing activities which take place during normal production operations do not require isolation and lockout/tagout if they are routine and integral to the use of the equipment.

SCOPE -- This program will include all employees whose duties require them to service, install, repair, adjust, lubricate, inspect or perform work on powered equipment or machinery that may also have the potential for stored energy.

PROGRAM RESPONSIBILITIES -- The SSO will have the overall responsibility of the program to ensure that; authorized and affected employees receive adequate training and information, the program is evaluated annually, and the lockout/tagout equipment is properly used and the procedures of this program are followed.

The program evaluation will be conducted to ensure that the procedures and requirements of the program are being followed and will be utilized to correct any deviations or inadequacies that may be discovered. The evaluation will consist of one or more inspections or audits of actual lockout/tagout procedures being used to isolate equipment. A review of the authorized and affected employee's responsibilities will be conducted at the time of the inspection /audit. Any authorized employee, except the one(s) utilizing the energy isolation procedure being inspected, may perform the inspection/audit.

A record will be maintained of program evaluation inspections and will include:

1. The identity of the equipment or machine on which energy control procedures were being utilized.

2. The date(s) of the inspection(s).
3. The employee(s) included in the inspection(s).
4. The person performing the inspection.

Authorized employees (persons who implement lockout/tagout procedures) will be responsible for following the procedures established by this program.

Affected employees are responsible for understanding the significance of a lockout/tagout device and the prohibition relating to attempts to restart or re-energize equipment or machinery that is locked out or tagged out.

TRAINING – Where applicable, Hydro Tech employees will be provided instruction in the purpose and functions of the energy control program to ensure that they understand the significance of locked or tagged out equipment and also have the knowledge and skill to correctly apply and remove energy controls. Training will include:

The recognition of applicable hazardous energy source(s), the type and magnitude of energy available, and the policies and procedures of the Hydro Tech energy control program.

1. Affected employees will be made aware of the purpose and use of energy control procedures and the prohibition relating to attempts to remove lockout or tagout devices.
2. Instruction in the limitations of tagout as a sole means of energy control.
   a. Tags are warning devices and <u>do not</u> provide the physical restraint that a lock would.
   b. Tags may provide a false sense of security.
   c. Tags may become detached during use.

Initial training will be provided during to energy control program implementation, when new employees are hired or when job responsibilities change to include utilization of energy control procedures.

Retraining will be conducted whenever there is a change in job assignments that require the employee to utilize energy control procedures, a change in equipment that presents a new hazard, a change in the energy control procedures or when the program evaluation identifies inadequacies in the energy control program procedures.

Records of employee training will be maintained and will include the employee's name and date(s) of training.

STANDARD OPERATING PROCEDURES –where necessary, Hydro Tech will provide the necessary devices to effectively lockout or tagout energy isolating devices. Lockout/tagout devices will be the only devices used for controlling energy and shall

not be used for other purposes. Any device used for lockout/tagout will be capable of withstanding the environment to which they are exposed for the maximum period they are to be exposed. The devices will be substantial enough to prevent removal without excessive force. Excessive force for a locking device would be bolt cutters or other metal cuttings tools. Tagout devices will be attached by a non-reusable method, attachable by hand, and very difficult to remove by hand. A nylon cable tie or equivalent will be used.

Lockout/tagout devices will indicate the identity of the employee who applied the device, and the tagout device will warn against the hazards if the equipment is energized.

Lockout is the preferred method of energy isolation. When physical lockout is not possible, the energy isolation will be tagged out of service with a warning tag attached at the power source. In the case of plug-in power source, the tag will be attached at the male plug. To ensure full employee protection using tagout instead of lockout, additional steps should be taken to guard against accidental or inadvertent energization. These steps may include, where applicable: removal of fuses, blocking switches, removal of a valve handle.

STANDARD OPERATING PROCEDURES

I. APPLICATION OF CONTROLS

A. Preparing to Shut Down Equipment

1. Prior to equipment shutdown, the authorized employee(s) must have knowledge of:
    a. The type(s) and magnitude of power.
    b. The hazards of the energy to be controlled.
    c. The method(s) to control the energy.
    d. The location and identity of all isolating devices that control or feed the equipment to be locked/tagged out.
2. Notify all affected employees that the lockout/tagout system will be in effect.
3. Assemble applicable lockout/tagout devices, i.e., padlocks, tags, multiple lock hasps, etc.

B. Equipment Shutdown and Isolation

1. If equipment is in operation, shut it down by the normal stopping procedure (stop button, switch).
2. Operate disconnects, switches, valves, or other energy isolating devices so that the equipment is de-energizing and isolated from its energy source(s).
3. Verify that equipment is shut down by operating equipment from the normal operating location and any remote locations.

C. Installation of Lockout/Tagout Device, Release of Stored Energy, and Verification

1. Attach individually assigned lock(s) or tag(s) to energy isolating device(s). Where it is not possible to lock a switch, valve or other isolating device, electrical fuses must be removed, blank flanges installed in piping, lines disconnected, or other suitable methods used to ensure that equipment is

isolated from energy sources. A tag must be installed at the point of power interruption to warn against energizing.

a. Each lock or tag must positively identify the person who applied it and locks must be individually keyed.
b. If more than one person is involved in the task, employees will place their own lock and tag. Multiple lock hasps are available for this.

2. Release, restrain, or dissipate stored energy such spring tension, elevated machine members, rotating flywheels, hydraulic pressure, pistons and air, gas, steam, water pressure, etc. by repositioning, blocking bleeding, or other suitable means.
3. Prior to starting work on equipment and after ensuring that no personnel are exposed, the authorized employee will verify that isolation and de-energization have been accomplished by:

a. Attempting, through normal effort, to operate energy isolating devices such as switches, valves, or circuit breaker with locks or tags installed.
b. Attempting to operate the equipment or machinery that is locked or tagged out. This includes all sources of energy, i.e. electrical, hydraulic, gravity, air, water, stream pressure, etc.
c. Verifying the presence and effectiveness of restraint (blocking) and energy dissipation or release (bleeding).

4. If there is a possibility of the re-accumulation of stored energy to a hazardous level, verification of isolation will be contained until the servicing or maintenance is completed, or until the possibility of such accumulation no longer exists.

D. Group Lockout/Tagout

1. When more than one individual is involved in locking or tagging equipment out of operation, each individual will attach their individual lock or tag, or the equivalent, to the energy isolating device(s).

a. An equivalent lockout device may be in the form of a group lockout device such as a multiple lock hasp or lock box.
b. Primary responsibility for a group of authorized employees working under a group lockout device will be vested in a designated authorized employee.
c. Group lockout methods will provide a level of protection equal to that afforded by a personal lockout/tagout device.

II. RETURNING EQUIPMENT TO SERVICE

A. Restore Equipment to Normal Operating Status

1. Re-install all parts or subassemblies removed for servicing or maintenance.
2. Re-install all tools, rests, or other operating devices
3. Re-install all guards and protective devices (i.e. limit switches).
4. Remove all blocks, wedges, or other restraints from the operating area of the equipment (ways, slides, etc.).

5. Remove all tools, equipment, and shop towels from the operating area of the equipment.

B. Verify Equipment Ready for Operation

1. Inspect area for non-essential items
2. Ensure that all employees are safely positioned clear of the operating areas of the equipment. Post a watch if energy isolation devices are not in line of sight of the equipment.

C. Notify Affected Employees of Impending Start-up

1. The sudden noise of start-up may startle nearby employees.
2. Equipment may need to be tested to determine operational safety by a qualified operator.

D. Remove Energy Isolation Devices - Only by authorized employee(s) who installed it/them.

1. Remove line blanks, reconnect piping (if applicable), and remove warning tag.
2. Close bleeder valves, remove warning tag.
3. Replace fuse(s), close circuit breaker(s) and remove warning tag.
4. Remove lock and tag from control panel, valve, etc.

Employee(s) who installed them may make an exception for removal of lockout/tagout devices. If it is necessary to operate a piece of equipment that is locked/tagged out, every effort must be made to locate the employee whose lock or tag is on the equipment. If he or she cannot be located and only after positive assurance is made that no one is working on the locked-out equipment, the supervisor may personally remove the lock. The supervisor must assure that the equipment is once again locked out, or the employee notified that the equipment has been re-energized, before the employee resumes work. Employees will recheck locked out equipment if they have left the equipment (breaks, lunch, and end of shift) to make sure it is still de-energized and locked out.

III. TEMPORARY REMOVAL OF LOCKOUT/TAGOUT PROTECTION

A. In situations when the equipment must be temporarily energized to test or position the equipment or its components, the following steps will be followed:

1. Clear the equipment of tools and materials that are non-essential to the operation.
2. Ensure the equipment components are operationally intact.
3. Remove employees from the equipment area.
4. Remove the lockout/tagout devices by the employee who installed in/them.
5. Energize and proceed with testing or positioning.
6. De-energize all systems and re-install all energy control measures.
7. Verify re-installed energy control measures are effective.

IV. SHIFT OR PERSONNEL CHANGES

A. The following steps will be followed to ensure continuity of employee protection during personnel changes.

1. All personnel involved in the maintenance or servicing activity will be notified that a transfer of personal locks/tags is about to occur.
2. Clear all personnel from hazardous area(s) of equipment.
3. Under the supervision of the shift supervisor or group designee, the off-going employee will immediately install theirs.
    a. If an entire group or more than one employee will be transferring work responsibility, locks/tags will be removed and replaced one at a time in order of installation.
4. When the transfer of lockout/tagout devices is complete, the effectiveness of all energy isolation devices will be verified to the satisfaction of all personnel involved.
5. Once the effectiveness of energy isolation protection is confirmed, the service/maintenance operation may continue.

V. CONTRACTOR NOTIFICATION

A. Whenever outside personnel may be engaged in activities covered by this program, they will inform the contractor of applicable lockout/tagout procedures used to protect Hydro Tech employees from the hazards of working near energized equipment.

1. The contractor will be expected to ensure that his/her employees understand and comply with the restrictions and prohibitions of this program.
2. Hydro Tech requires, under these circumstances, the contractor to inform us of their lockout/tagout procedures so that HTE employees can comply with the restrictions and prohibitions of the contractor's program.
3. Hydro Tech also requires the contractor to notify the program administrator, the area supervisor, and affected Hydro Tech employees prior to de-energizing, isolating and locking out Hydro Tech equipment. Conversely, notification is also required when this equipment will be returned to service.

DEFINITIONS

Affected employee - An employee whose job requires him/her to operate or use a machine or equipment on which servicing, or maintenance is being performed under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

Authorized employee(s) - A person or persons who locks or implements a tagout system procedure to perform servicing or maintenance on a machine or equipment. An authorized employee and an affected employee may be the same person when the affected employee's duties also include performing maintenance or service on a machine or equipment that must be locked or tagged out.

"Capable of being locked out" - An energy isolating device will be considered to be capable of being locked out either if it is designed with a hasp or other attachment or integral part to which, or through which, a lock can be affixed, or if it has a locking mechanism built into it. Other energy isolating devices will also be considered to be capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy-isolating device or permanently alter its energy control capability.

Energized - Connected to an energy source or containing residual or stored energy.

Energy isolating device - A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: a manually operated electrical circuit breaker; a disconnect switch; a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors and, in addition, no pole can be operated independently; a slide gate; a slip blind; a line valve; a block; and any similar device used to block or isolate energy. The term does not include a push button, selector switch, and other control circuit type devices.

Energy source - any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal or other type of energy.

Lockout - The placement of lockout device on an energy-isolating device, in accordance with an established procedure, is ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Lockout device - A device that utilizes positive means such as a lock, either key or combination type, to hold an energy isolating device in the safety position and prevent the energizing of a machine or equipment.

Normal production operations - The utilization of a machine or equipment to perform its intended production function.

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 making adjustments or tool changes, where the employee may be exposed to the unexpected energization or startup of the equipment or release of hazardous energy.

Setting up - Any work performed to prepare a machine or equipment to perform its normal production operation.

Stored energy - Energy that is available and may cause movement even after energy sources have been isolated. Stored energy may be in the form of compressed springs,

elevated equipment components, hydraulic oil pressure, pressurized water, air, steam, or gas, or rotating flywheels, shafts or cams.

Tagout - The placement of a tagout device on an energy-isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

Tagout device - A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

GENERAL MACHINERY AND EQUIPMENT LIST

EQUIPMENT/LOCATION	ENERGY SOURCES/LOCATION
A. Backhoe Machine	Diesel Engine

5.0 Training

GENERAL HEALTH AND SAFETY TRAINING

In accordance with Hydro Tech corporate policy, and pursuant to 29 CFR 1910.120, hazardous waste site workers shall, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste site operations. As a minimum, the training shall have consisted of instruction in the topics outlined in the above reference. Personnel who have not met the requirements for initial training will not be allowed to work in any site activities in which they may be exposed to hazards (chemical or physical).

Completion of the Hydro Tech Health and Safety Training Course for Hazardous Waste Operations or an approved equivalent will fulfill the requirements of this section. In addition to the required initial training, each employee shall have received 3 days of directly supervised on-the-job training. This training will address the duties the employees are expected to perform.

The Hydro Tech SSO the responsibility of ensuring that personnel assigned to this project complies with these requirements. Written certification of completion of the required training will be provided to the SSO.

MANAGER/SUPERVISOR TRAINING

In accordance with 29 CFR 1910.120, onsite management and supervisors who will be directly responsible for, or who supervise employees engaged in hazardous waste operation shall receive training as required in this HASP and at least eight (8) additional hours of specialized training on managing such operations at the time of job assignment.

ANNUAL 8-HOUR REFRESHER TRAINING

Annual 8-hour refresher training will be required of all hazardous waste site field personnel in order to maintain their qualification for fieldwork. The following topics will be reviewed: toxicology, respiratory protection, including air purifying devices and self-contained breathing apparatus (SCBA), medical surveillance, decontamination procedures and personnel protective clothing. In addition, topics deemed necessary by the SSO may be added to the above list.

SITE SPECIFIC TRAINING

Prior to commencement of field activities, all personnel assigned to the project will be provided training that will specifically address the activities, procedures, monitoring and equipment for the site operations. It will include Site and facility layout, hazards, and emergency services at the Site, and will highlight all provisions contained within this HASP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity.

ONSITE SAFETY BRIEFINGS

Project personnel and visitors will be given periodic onsite health and safety briefings by the SSO, or their designee, to assist site personnel in safely conducting their work activities. The briefings will include information on new operations to be conducted, changes in work practices or changes in the Site's environmental conditions. The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety audits.

ADDITIONAL TRAINING

Additional training may be required by the SSO for participation in certain field tasks during the course of the project. Such additional training could be in the safe operation of heavy or power tool equipment or hazard communication training.

SUBCONTRACTOR TRAINING

Subcontractor personnel who work onsite, only occasionally, for a specific limited task and who are unlikely to be exposed over permissible exposure limits, may be exempted from the initial 40-hour training requirement. The SSO will determine if this exemption is allowed. In any case, the subcontractor personnel who are exposed to hazards are not

exempted from the 40-hours training requirement nor medical surveillance requirements found in Section 8.1.

6.0 Medical Surveillance

GENERAL

All contractor and subcontractor personnel performing field work at the Site are required to have passed a complete medical surveillance examination in accordance with 29 CFR 1910.120 (f). A physician's medical release for work will be confirmed by the SSO before an employee can begin site activities. Such examinations shall include a statement as to the worker's present health status, the ability to work in a hazardous environment (including any required PPE which may be used during temperature extremes), and the worker's ability to wear respiratory protection.

A medical data sheet will be completed by all onsite personnel and kept at the Site. Where possible, this medical data sheet will accompany the personnel needing medical assistance or transport to hospital facilities.

MEDICAL SURVEILLANCE PROTOCOL
The medical surveillance protocol to be implemented is the occupational physicians' responsibility but shall meet the requirements of CFR 1910.120 and ANSI Z88.2 (1980). The medical surveillance protocol shall, as a minimum, cover the following:

a. Medical and Occupational History
b. General physical examination (including evaluation of major organ system)
c. Serum lead and ZPP
d. Chest X-ray (performed no more frequently that every four years, except when otherwise indicated).
e. Pulmonary Function Testing (FVC and FEV1.0).
f. Ability to wear respirator
g. Audiometric testing.

Additional clinical tests may be included at the discretion of the occupational physician.

7.0 Site Control, PPE & Communications

SITE CONTROL

A Support Zone (SZ) is an uncontaminated area that will be the field support area for most operations. The SZ provides for field team communications and staging for emergency response. Appropriate sanitary facilities and safety equipment will be located in this zone. Potentially contaminated personnel or materials are not allowed in this zone. The only exception will be appropriately packaged/decontaminated and labeled samples. A contamination reduction corridor will be established. This is the route of entry and egress to the Site, and it provides an area for decontamination of personnel and portable equipment as well.

The area where contamination exists is considered to be the Exclusion Zone (EZ). All areas where excavation and handling of contaminated materials take place are considered the EZ. This zone will be clearly delineated by cones, tape or other means. The SSO may establish more than one EZ where different levels of protection may be employed or where different hazards exist. Personnel are not allowed in the EZ without:

- A buddy
- Appropriate personal protective equipment
- Medical authorization
- Training certification

PERSONAL PROTECTIVE EQUIPMENT

GENERAL
The level of protection worn by field personnel will be enforced by the SSO. Levels of protection for general operations are provided below and are defined in this section. Levels of protection may be upgraded or downgraded at the discretion of the SSO. The decision shall be based on real-time air monitoring, site history data, and prior site experience. Any changes in the level of protection shall be recorded in the health and safety field logbook.

PERSONAL PROTECTIVE EQUIPMENT SPECIFICATIONS

For tasks requiring Level B PPE, the following equipment shall be used:
- Cotton or disposable coveralls
- Chemical protective suit (e.g. Saran-coated Tyvek®)
- Gloves, inner (latex)
- Gloves, outer (Nitrile®)
- Boots (PVC), steel toe/shank
- Boot Covers (as needed)
- Hard Hat
- Hearing protection (as needed)

For tasks requiring Level C PPE, the following equipment shall be used:

- Cotton or disposable coveralls
- Disposable outer coveralls (Poly-coated Tyvek)
- Gloves, inner (latex)
- Gloves, outer (Nitrile®)
- Boots (PVC), steel toe/shank
- Boot covers (as needed)
- Hard Hat
- Hearing protection (as needed)
- Splash suit and face shield for decontamination operations (as needed)

For tasks requiring Level D PPE, the following equipment shall be used:

- Cotton or disposable coveralls
- Gloves, inner (latex)
- Gloves, outer (Nitrile®)
- Boots (PVC) steel toe/shank
- Boot covers (as needed)
- Hard hat
- Hearing protection (as needed)
- Safety glasses

For tasks requiring respiratory protection, the following equipment shall be used:

Level D - No respiratory protective equipment necessary except for a dust mask
Level C - A full-face air-purifying respirator equipped with organic vapor/pesticide-HEPA cartridges
Level B - An airline respirator or a self-contained breathing apparatus (SCBA)

INITIAL LEVELS OF PROTECTION
Levels of protection for the activities may be upgraded or downgraded depending on direct-reading instruments or personnel monitoring. The following are the initial levels of protection that shall be used for each planned field activity.

LEVEL OF PERSONAL PROTECTIVE EQUIPMENT REQUIRED

Activity	**Level of Protection Respiratory/PPE**
Drilling/Coring	C/D
Sampling	C/D
Ground-Penetrating Radar/Magnetometer	C/D

COMMUNICATIONS

Communications is the ability to talk with others. While working in Level C/B Protection, personnel may find that communication becomes a more difficult task and process to accomplish. This is further complicated by distance and space. In order to address this problem, electronic instruments, mechanical devices or hand signals will be used as follows:

- Walkie-Talkies - Hand held radios would be utilized as much as possible by field teams for communication between downrange operations and the Command Post base station.

- Telephones - A mobile telephone will be located in the Command Post vehicle in the Support Zone for communication with emergency support services/facilities. If a telephone is demobilized, the nearest public phones will be identified.

- Air Horns - A member of the downrange field team will carry an air horn, and another will be evident in the Support Zone to alert field personnel to an emergency situation.

- Hand Signals - Members of the field team long with use of the buddy system will employ this communication method. Signals become especially important when in the vicinity of heavy moving equipment and when using Level B respiratory equipment. The signals shall become familiar to the entire field team before site operations commence and they will be reinforced and reviewed during site-specific training.

HAND SIGNALS FOR ONSITE COMMUNICATION

Signal	**Meaning**
Hand gripping throat	Out of air, can't breathe
Grip partners' wrist	Leave area immediately; no debate
Hands on top of head	Need assistance
Thumbs up	OK, I'm all right; I understand
Thumbs down	No; negative, unable to understand you. I'm not all right

8.0 Air Monitoring Plan

GENERAL

Continuous air monitoring in the EZ during invasive tasks will accompany site operations, as indicated in this HASP or as required by the SSO. Monitoring will be performed to verify the adequacy of respiratory protection, to aid in site layout and to document work exposure. All monitoring instruments shall be operated by qualified personnel only and will be calibrated daily prior to use, or more often as necessary.

REAL-TIME MONITORING

INSTRUMENTATION
At least one (1) of the following monitoring instruments will be available for use during field operations as necessary:

- Photoionization Detector (PID), Rae Instruments with 10.2 EV probe or equivalent

- Flame Ionization Detector (FID), Foxboro Model 128 or equivalent

- Combustible Gas Indicator (CGI)/Oxygen (O_2) Meter, MSA or equivalent.

A FID or PID shall be used to monitor the organic vapor concentrations in active work areas. Organic vapor concentrations shall be measured upwind of the work areas to determine background concentrations. The SSO will interpret monitoring results using professional judgment. The PPE utilized shall always be the most protective, thus the action level criteria are flexible guidelines.

A CGI/O_2 meter shall be used to monitor for combustible gases and oxygen content in the boreholes during drilling activities.

Calibration records shall be documented and included in the health and safety logbook or instrument calibration logbook. All instruments shall be calibrated before and after each daily use in accordance with the manufacturers' procedures.

ACTION LEVELS
Action levels for upgrading of PPE in this HASP will apply to all site work during the duration of field activities at the Site. Action levels are for unknown contaminants using direct reading in the Breathing Zone (BZ) for organic vapors and dusts, and at the source for combustible gases.

MONITORING DURING FIELD ACTIVITIES
Hydro Tech shall perform real time air monitoring prior to the commencement of work to establish baseline conditions. Baseline conditions will be established at the approximate center of the Site and at the perimeter of the Site both upwind and downwind.

During all work activities real time monitoring will occur. As necessary, Hydro Tech shall have at each applicable workstation a PID, explosimeter and oxygen deficiency meter. The real time monitoring for remedial activities will be conducted approximating the Breathing Zone of the workers. The monitoring will be continuous during working operations.

The air-monitoring instrument may indicate that personnel working in the exclusion zone increase their level of protection. All personnel will be trained in the action levels. When conditions warrant an increase in protection, all personnel will stop working and immediately leave the exclusion zone. They will then don the appropriate safety equipment necessary and return to their current workstation. All of this activity will be monitored by the SSO. The SSO will keep the Hydro Tech Project Manager aware of any extraordinary situations and conditions that may occur. Working conditions and monitoring levels will be noted in the Field Notebook along with the time, date and page number. Verbal reports will be given to the Project Manager when there is a change in the PPE level.

The previous day's results shall be reviewed each morning to determine what actions are necessary and the general conditions resulting from and around the Site.

The record keeping will include:

- Date & Time of Monitoring
- Air Monitoring Location
- Instrument, Model #, Serial #
- Calibration/Background Levels
- Results of Monitoring
- SSO Signature
- Comments

Excavation Operations - Monitoring will be performed continuously during all excavation and demolition operations. A PID and/or FID shall be utilized to monitor the breathing zone, the excavated area and any material taken from the excavation. A CGI/O_2 meter shall be used to monitor the excavation for the presence of combustible gases.

ACTION LEVELS OF AIRBORNE CONTAMINANTS

Instrument	Action Level	Action to be taken
FID/PID	< 100 ppm, for a	Stop work & initiate vapor control
	15-minute average	
	> 100 ppm, for a	Stop work & initiate evacuation
	15-minute average	procedure
CGI	10% LEL	Stop work, initiate ventilating
	50% LEL	Stop work, initiate evacuation procedure and contact fire dept.

PERSONNEL MONITORING PROCEDURE

The Site SSO, concurrent with activities that may generate the contaminants in excess of OSHA PEL's, may perform assessment and evaluation of field personnel exposures to airborne contaminants.

Procedures to be followed include:

The SSO may select high-risk individuals who may be subject to contaminant exposure based on job assignment.

The Personal Sampling is being conducted to determine the proper levels of respiratory protection required, to document potential exposures to compounds, and to assure compliance with OSHA standards. Therefore, it is important that the data collected be from "worst case" locations and personnel.

For example: when work is being conducted to excavate at an underground tank location, those persons closest to the excavation and most intimately involved with the work should be sampled. If a backhoe operator solely conducted the excavation, then that employee should be monitored. However, if there are additional workers who must enter the excavation and work with the freshly excavated soil, these persons would be closer to the potential contaminants and they should be sampled.

To meet the intent of the sampling will require sampling at periods of the most disturbances. To be accurate in determining potential exposures, as many tasks/trades shall be sampled as possible during the course of this project. At completion of the project, a goal of 20% of all workers who must perform their duties in or around the contaminated soil, tanks and excavations is sought.

Hydro Tech must provide all sampling data in writing to the employees within three (3) days of receipt of results.

Air sampling pumps used to collect employee exposure samples shall be calibrated before and after use each day. Calibration shall be accomplished using a primary standard calibration system, e.g. the bubble tube method. Results of the calibrations shall be included in the health and safety field logbook and with the exposure report.

Chemical analysis of samples collected for assessment of employee exposures shall be performed in accordance with NIOSH or OSHA analytical methods only by laboratories accredited by the American Industrial Hygiene Association.

Results of the personal exposure assessment shall be provided to the individual, in writing within fifteen (15) working days after receipt of laboratory reports. Reports to field personnel shall provide calculated time-weighted average exposures and shall provide comparative information relative to established permissible exposure limits. The air sampling data sheet and laboratory report is considered a part of the employee exposure report. A copy of the employee personal exposure assessment report shall also be included in the project file and the employees' medical record for Hydro Tech employees. Reports for subcontractor employees will be sent directly to the subcontractors' employer.

AIR MONITORING REPORTS

Air Monitoring Reports will be completed by the SSO and/or authorized personnel and submitted to the Project Manager in the daily safety logs and will include the following:

- Date of monitoring
- Equipment utilized for air monitoring
- Real-time air monitoring results from each work location
- Calibration method of equipment and results

9.0 Safety Considerations

GENERAL

In addition to the specific requirements of this HASP, common sense should be used at all times. The general safety rules and practices below will be in effect at the Site at the discretion of the Project Manager, SSO or other authorized personnel.

- The site will be suitably marked or barricaded as necessary to prevent unauthorized visitors but not hinder emergency services if needed.

- As needed, all open holes, trenches and obstacles will be properly barricaded in accordance with local site requirements. These requirements will be determined by proximity to traffic ways, both pedestrian and vehicular, and site of the hole, trench or obstacle. If holes are required to be left open during non-working hours, they will be adequately decked over or barricaded and sufficiently lighted.

- Before any digging or boring operations are conducted, underground utility locations will be identified. All boring, excavation and other site work will be planned and performed with consideration for underground lines. Any excavation work will be performed in accordance with Hydro Tech's Standard Operating Procedures for Excavations.

- Either workers or other people will enact dust-mitigating procedures when there exists the potential for the inhalation of dust particles.

- The act of smoking and ignition sources in the vicinity of potentially flammable or contaminated material is strictly prohibited.

- Drilling, boring, and use of cranes and drilling rigs, erection of towers, movement of vehicles and equipment and other activities will be planned and performed with consideration for the location, height, and relative position of aboveground utilities and fixtures, including signs; canopies; building and other structures and construction; and natural features such as trees, boulders, bodies of water, and terrain.

- When working in areas where flammable vapors may be present, particular care shall be exercised with tools and equipment that may be sources of ignition. All tools and equipment provided must be properly bonded and/or grounded. Metal

buttons and zippers are prohibited on safety clothing for areas that may contain a flammable or explosive atmosphere.

- Approved and appropriate safety equipment (as specified in this HASP), such as eye protection, hard hats, foot protection, and respirators, must be worn in areas where required. In addition, eye protection must be worn when sampling soil or water that may be contaminated.

- Beards interfere with respirator fit and are not allowed within the site boundaries because all site personnel may be called upon to use respirator protection is some situations.

- No smoking, eating, chewing tobacco, gum chewing, or drinking will be allowed in the contaminated areas.

- Contaminated tools and hands must be kept away from the face.

- Personnel must use personal hygiene safeguards (washing up) at the end of the shift or as soon as possible after leaving the Site.

- Each sample must be treated and handled as though it were contaminated.

- Persons with long hair and/or loose-fitting clothing that could become entangled in power equipment must take adequate precautions.

- Horseplay is prohibited in the work area.

- Work while under the influence of intoxicants, narcotics or controlled substances is prohibited.

POSTED SIGNS

Posted danger signs will be used where an immediate hazard exists. Caution signs will be posted to warn against potential hazards and to caution against unsafe practices. Traffic control methods and barricades will be used as needed. Wooden stakes and flagging tape, or equally effective material will be used to demarcate all restricted areas.

Other postings may include the OSHA poster, emergency hospital route and telephone numbers of contact personnel.

INVASIVE OPERATIONS

The SSO will be present onsite during all invasive work (e.g. demolition, excavations). The SSO will ensure that appropriate levels of protection and safety procedures are followed. No personnel will enter any excavations for any reasons. All personnel will

stay at least 10 feet back from the edge of the excavation and out of the swing radius of the backhoe. No drums or other potential sources will be sampled or removed during this phase without further additions to the HASP.

The proximity of water, sewer and electrical lines will be identified prior to invasive operations. The possibility of the presence of underground conduits or vessels containing materials under pressure will also be investigated prior to invasive operations. Properly sized containment systems will be utilized, and consideration of the potential volume of liquid or waste released during operations will be discussed with members of the field team to minimize the potential for spills and provide a method for collection of waste materials. Emergency evacuation procedures and the location of safety equipment will be established prior to start up operations. The use of protective clothing, especially hard hats, boots, and gloves will be required during drilling and other heavy equipment work.

SOIL AND GROUNDWATER SAMPLING

Personnel must wear prescribed protective clothing and equipment including eye protection, chemical resistant gloves and splash aprons (where appropriate) when sampling solids and liquids. Sample bottles are to be bagged prior to sampling to ease decontamination. Personnel must be aware of the location of emergency equipment, including spill containment materials prior to sampling. Personnel are to practice contamination avoidance at all times, as well as to utilize the buddy system and maintain communications with the Command Post.

SAMPLE HANDLING

Personnel responsible for the handling of samples will wear the prescribed level of protection. Samples are to be identified as to their hazard and packaged as to prevent spillage or breakage. Any unusual sample conditions shall be noted. Laboratory personnel and all field personnel shall be advised of sample hazard levels and the potential contaminants present. This can be accomplished by a phone call to the lab coordinator and/or including a written statement with the samples reviewing lab safety procedures in handling in order to assure that the practices are appropriate for the suspected contaminants in the sample.

HEAVY EQUIPMENT DECONTAMINATION

Personnel steam cleaning heavy equipment shall use the prescribed level of protection and adhere to the buddy system. Initially this task usually employs level C. The heavy equipment decontamination shall be restricted to authorized personnel only. Special consideration will be given to wind speed and direction. Downwind areas are to be kept free of personnel to avoid unnecessary exposure to potential airborne contamination.

ADDITIONAL SAFETY CONSIDERATIONS

No other additional safety considerations at this time.

10.0 Decontamination and Disposal Procedures

CONTAMINATION PREVENTION

One of the most important aspects of decontamination is the prevention of contamination. Good contamination prevention should minimize worker exposure and help ensure valid sample results by precluding cross-contamination. Procedures for contamination avoidance include:

Personnel:
Do not walk through areas of obvious or known contamination
Do not directly handle or touch contaminated materials
Make sure that there are no cuts or tears on PPE
Fasten all closures in suits; cover with tape if necessary
Particular care should be taken to prevent any skin injuries
Stay upwind of airborne contaminants
Do not carry cigarettes, cosmetics, gum, etc. into contaminated areas

Sampling and Monitoring:
When required by the SSO, cover instruments with clear plastic, leaving openings for sampling ports and bag sample containers prior to emplacement of sample material.

Heavy Equipment:
Care should be taken to limit the amount of contamination that comes in contact with heavy equipment (tires, contaminated augers). Dust control measures may be needed on roads inside the site boundaries.

PERSONNEL DECONTAMINATION

All personnel shall pass through an outlined decontamination procedure when exiting the hot zone at each location. Field washes for equipment and PPE shall be set up at each drilling location. The system will include a gross wash and rinse for all disposable clothing and boots worn in the EZ. Upon exiting the EZ, all personnel will wash their hands, arms, neck, and face before entering the Support Zone.

EQUIPMENT DECONTAMINATION

Equipment used at the Site that is potentially contaminated shall be decontaminated to prevent hazardous materials from leaving the Site. All heavy equipment will be decontaminated at the decontamination pad and inspected by the SSO and Project Manager before it leaves the Site. The decontamination area will

provide for the containment of all wastewater from the decontamination process. Respirators, airline and any other personnel equipment that comes in contact with contaminated soils shall pass through a field wash.

DECONTAMINATION DURING MEDICAL EMERGENCIES

If emergency lifesaving first aid and/or medical treatment are required, normal decontamination procedures may need to be abbreviated or omitted. The Site SSO or desigee will accompany contaminated victims to the medical facility to advice on matters involving decontamination, when necessary. The outer garments can be removed if they do not cause delays, interfere with treatment or aggravate the problem. Respiratory equipment must always be removed. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed, a plastic barrier between the individual and clean surfaces should be used to help prevent contaminating the inside of ambulances and /or medical personnel. Outer garments are then removed at the medical facility.

No attempt will be made to wash or rinse the victim, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material that could also cause severe injury or loss of life to emergency response personnel. For minor medical problems or injuries, the normal decontamination procedures will be followed. Note that heat stroke requires prompt treatment to prevent irreversible damage or death. Protective clothing must be promptly removed. Less serious forms of heat stress also require prompt attention and removal of protective clothing immediately; unless the victim is obviously contaminated, decontamination should be omitted or minimized, and treatment begun immediately.

DISPOSAL PROCEDURES

A segregating system of non-hazardous waste and hazardous waste will be developed by the SSO and PM. All discarded material, waste materials or other objects shall be handled in such a way as to preclude the potential for spreading contamination, creating sanitary hazards, or causing litter to be left on site. All potentially contaminated materials, e.g. clothing, gloves, etc., will be bagged or drummed as necessary, labeled and segregated for disposal. All non-contaminated materials shall be collected and bagged for appropriate disposal as normal domestic waste.

11.0 Emergency Plan

The potential for the development of an emergency situation is low considering the low concentrations of hazardous substances at the work site. Nevertheless, an emergency situation could occur. All Hydro Tech and subcontractor field team members prior to the start of work will know the emergency plan outlined in this section. The emergency plan will be available for use at all times during site work.

Various individual site characteristics will determine preliminary actions taken to assure that this emergency plan is successfully implemented in the event of a site emergency. Careful consideration must be given to the proximity of neighborhood housing or places of employment, and to the relative possibility of site fire, explosion or release of vapors or gases that could affect the surrounding community.

The Project Manager shall make contact with local fire, police and other emergency units prior to beginning work on site. In these contacts, the Project Manager will inform the emergency units about the nature and duration of work expected to the Site and the type of contaminants and the possible health or safety effects of emergencies involving these contaminants. At this time, the Project Manager and the emergency response units shall make the necessary arrangements to be prepared for any emergencies that could occur.

The Project Manager shall implement the contingency plan whenever conditions at the Site warrant such action. The Project Manager will be responsible for coordination of the evacuation emergency treatment, and transportation of site personnel as necessary, and notification of emergency response units and the appropriate management staff.

The cases where the PM is not available, the SSO shall serve as the alternate emergency coordinator.

EVACUATION

In the event of an emergency situation, such as fire, explosion, or significant release of toxic gases, an air horn or other appropriate device will be sounded for approximately 10 second intervals indicating the initiation of evacuation procedures. All personnel will evacuate and assemble near the entrance to the site. The location shall be upwind of the Site where possible.

For efficient and safe site evacuation and assessment of the emergency situation, the Project Manager will have authority to initiate action if outside services are required. Under no circumstances will incoming personnel or visitors be allowed to proceed into the area once the emergency signal has been given. The SSO or designated SSO must ensure that access for emergency equipment is provided and that all combustion apparatuses have been shut down once the alarm has been sounded. Once the safety of all personnel is established, the Fire Department and other emergency response groups as necessary will be notified by telephone of the emergency.

POTENTIAL OR ACTUAL FIRE OR EXPLOSION

Immediately evacuate the Site (air horn will sound for 10-second intervals), notify the local fire and police departments, and other appropriate emergency response groups if an actual fire or explosion has taken place.

PERSONNEL INJURY

Emergency first aid shall be applied on site as deemed necessary. If necessary, the individual shall be decontaminated and transported to the nearest medical facility.

The ambulance/rescue squad shall be contacted for transport as necessary in an emergency. However, since some situations may require transport of an injured party by other means, the hospital route is identified below. A map to this facility provided with this HASP in Section 2.2.3.

ACCIDENT/INCIDENT REPORTING

As soon as first aid and/or emergency response needs have been met, the following parties are to be contacted by telephone:

1. Mark E. Robbins-Cell phone (631) 457-0030
2. The employer of any injured worker if not a HydroTech employee

Written confirmation of verbal reports is to be submitted within 24 hours. The report form entitled "Accident Data Report" is to be used for this purpose. All Hydro Tech representatives contacted by telephone are to receive a copy of this report. If the employee involved is not a Hydro Tech employee, his employer shall receive a copy of this report.

For reporting purposes, the term accident refers to fatalities, lost time injuries, spill or exposure to hazardous materials (toxic materials, explosive or flammable materials). Any information released from the health care provider, which is not deemed confidential patient information, is to be attached to the appropriate form. Any medical information that is released by patient consent is to be filed in the individuals' medical records and treated as confidential.

OVERT PERSONNEL EXPOSURE

SKIN CONTACT:	Use copious amounts of soap and water. Wash/rinse affected area thoroughly, and then provide appropriate medical attention. Eyes should be rinsed for 15 minutes upon chemical contamination.
INHALATION:	Move personnel to fresh air and if necessary, decontaminate and transport to hospital.
INGESTION:	Decontamination and transport to emergency medical facility.

PUNCTURE WOUND
OR LACERATION: Decontaminate and transport to emergency medical facility.

ADVERSE WEATHER CONDITIONS

In the event of adverse weather conditions, the SSO or designee will determine if work can continue without sacrificing the health and safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress and heat-related injuries
- Potential for cold stress and cold-related injuries
- Treacherous weather-related conditions
- Limited visibility
- Potential for electrical storms

Site activities will be limited to daylight hours and acceptable weather conditions. Inclement working conditions include heavy rain, fog, high winds, and lighting. Observe daily weather reports and evacuate if necessary, in case of inclement weather conditions.

EMERGENCY RESPONSE EQUIPMENT LIST

Some or all of the following will either be available onsite or be able to be brought to the Site within a 2-hour period:

- 55 Gallon Drums
- 85 Gallon Drums
- Absorbent Pads
- Absorbent Booms
- Speedy-Dry
- Plastic Sheeting
- Hay Bales
- Pneumatic Nibbler
- Backhoe
- Pressure Washer
- Air Compressor
- Wilden Pumps
- Equipment Storage Trailer
- Submersible Pumps
- Miscellaneous Hand Tools
- Portable Lighting

LARGE EQUIPMENT

If necessary, Hydro Tech can have the following large equipment brought to the Site within 2-hours:

- Large Vacuum Truck
- Super Sucker
- Dump Trucks
- Drill Rig
- Utility Vehicle

12.0 Logs, Reports and Record Keeping

MEDICAL AND TRAINING RECORDS

The employer keeps medical and training records. All subcontractors must provide verification of training and medical qualifications to the SSO. The SSO will keep a log of personnel meeting appropriate training and medical qualifications for site work. The log will be kept in the project file. Medical records will be maintained in accordance with 29 CFR 1910.20.

ONSITE LOG

A log of personnel onsite each day will be kept by the SSO or designee. A copy of these logs will be sent to the Hydro Tech records coordinator for data entry. Originals will be kept in the project file.

EXPOSURE RECORDS

Any personal monitoring results, laboratory reports, calculations and air sampling data sheets are part of an employee exposure record. These records will be kept in accordance with 29 CFR 1910.20. For Hydro Tech employees, the originals will be sent to the Hydro Tech records coordinator. For subcontractor employees, the original will be sent to the subcontractor employer and a copy kept in the project file.

ACCIDENT/INCIDENT REPORTS

An accident/incident report must be completed for all accidents and incidents. Hydro Tech will send the originals to the appropriate Hydro Tech records coordinator for maintenance. Copies will be distributed as stated. A copy of the forms will be kept in the project file.

OSHA FORM 200

An OSHA Form 200 (Log of Occupational Injuries and Illnesses) will be kept at the Site. All recordable injuries or illnesses will be recorded on this form. At the end of the project, the original will be sent to the Hydro Tech corporate records administrator for maintenance. Subcontractor employers must also meet the requirements of maintaining an OSHA 200 form.

The Hydro Tech accident/incident report meets the requirements of the OSHA Form 101 (Supplemental Record) and must be maintained with the OSHA Form 200 for all recordable injuries or illnesses.

HEALTH AND SAFETY FIELD LOGBOOK

The SSO or designee will maintain the logbook in accordance with standard Hydro Tech procedures. Daily site conditions, activities, personnel, calibration records, monitoring results and significant events will be recorded. The original logbooks will become part of the exposure records file.

13.0 Sanitation

If sanitary sewers are not provided at the Site, provisions shall be made for access to sanitary systems by using nearby public facilities consistent with provisions of governing local ordinance codes. In the latter case, provisions are required for the removal of accumulated waste products within those units.

If a commercial/industrial laundry is used to clean or launder clothing that is potentially contaminated, they shall be informed of the potential harmful effects of exposure to hazardous substances related to the affected clothing.

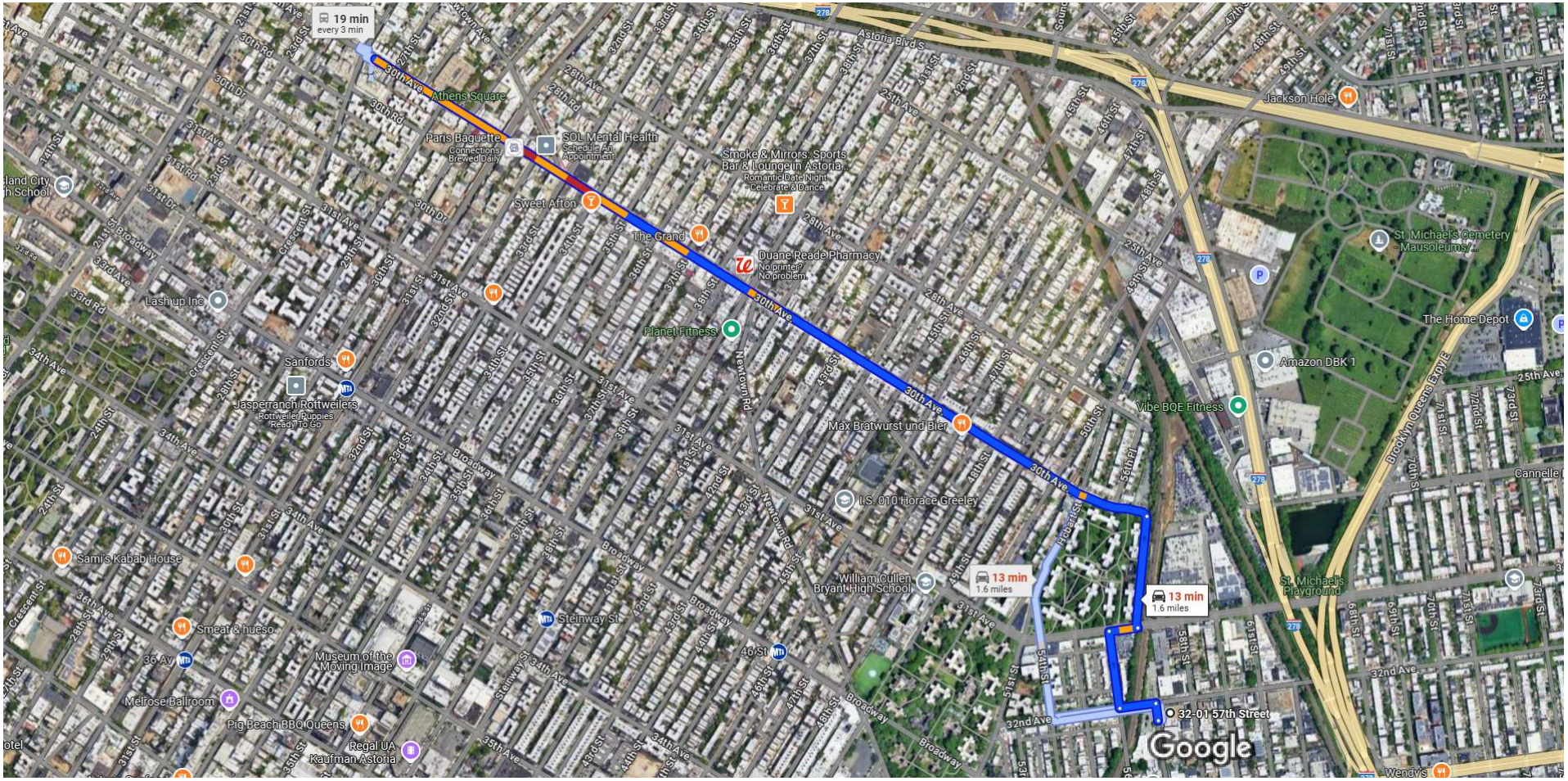
Personnel and subcontractors' sites shall follow decontamination procedures described in the HASP, or as directed by the SSO. This will generally include at a minimum site-specific training in shower usage and cleanup, personal hygiene requirements and the donning of protective equipment/clothing.

FIGURE 1
DIRECTIONS TO HOSPITAL

Google Maps

32-01 57th St, Flushing, NY 11377 to Mount Sinai Queens

Drive 1.6 miles, 13 min



Imagery ©2025 Airbus, Maxar Technologies, Map data ©2025 Google 500 ft

32-01 57th St
Flushing, NY 11377

1. Head north on 57th St toward 32nd Ave

128 ft

2. Turn left onto 32nd Ave

266 ft

3. Turn right at the 1st cross street onto 56th St

0.1 mi

4. Turn right onto 31st Ave

210 ft

5. Turn left onto 57th St

0.2 mi

6. 57th St turns left and becomes 30th Ave.

Destination will be on the left

1.2 mi

Mount Sinai Queens
25-10 30th Ave., Long Island City, NY 11102

ATTACHMENT A
HEALTH AND SAFETY FACT SHEETS

Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
p-Xylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: p-Xylene

Catalog Codes: SLX1120

CAS#: 106-42-3

RTECS: ZE2625000

TSCA: TSCA 8(b) inventory: p-Xylene

CI#: Not applicable.

Synonym: p-Methyltoluene

Chemical Name: 1,4-Dimethylbenzene

Chemical Formula: C6H4(CH3)2

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
{p-}Xylene	106-42-3	100

Toxicological Data on Ingredients: p-Xylene: ORAL (LD50): Acute: 5000 mg/kg [Rat.]. DERMAL (LD50): Acute: 12400 mg/kg [Rabbit.]. VAPOR (LC50): Acute: 4550 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant). Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant).
Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation.
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to blood, kidneys, the nervous system, liver.
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation: Not available.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 527°C (980.6°F)

Flash Points: CLOSED CUP: 25°C (77°F). OPEN CUP: 28.9°C (84°F) (Cleveland).

Flammable Limits: LOWER: 1.1% UPPER: 7%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid, insoluble in water.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:
Explosive in the form of vapor when exposed to heat or flame. Vapor may travel considerable distance to source of ignition and flash back. When heated to decomposition it emits acrid smoke and irritating fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Toxic flammable liquid, insoluble or very slightly soluble in water.
Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes Keep away from incompatibles such as oxidizing agents.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 100 STEL: 150 (ppm) from ACGIH (TLV)
TWA: 434 STEL: 651 (mg/m3) from ACGIHConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Liquid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 106.17 g/mole

Color: Colorless.

pH (1% soln/water): Not applicable.

Boiling Point: 138°C (280.4°F)

Melting Point: 12°C (53.6°F)

Critical Temperature: Not available.

Specific Gravity: 0.86 (Water = 1)

Vapor Pressure: 9 mm of Hg (@ 20°C)

Vapor Density: 3.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.62 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether.

Solubility:
Easily soluble in methanol, diethyl ether.
Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.
Acute oral toxicity (LD50): 5000 mg/kg [Rat.].
Acute dermal toxicity (LD50): 12400 mg/kg [Rabbit.].
Acute toxicity of the vapor (LC50): 4550 ppm 4 hour(s) [Rat].

Chronic Effects on Humans: The substance is toxic to blood, kidneys, the nervous system, liver.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant).
Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

0347 Animal: embryotoxic, foetotoxic, passes through the placental barrier.
0900 Detected in maternal milk in human.
Narcotic effect; may cause nervous system disturbances.

Special Remarks on other Toxic Effects on Humans: Material is irritating to mucous membranes and upper respiratory tract.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : Xylene : UN1307 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: p-Xylene
Florida: p-Xylene
Massachusetts RTK: p-Xylene
New Jersey: p-Xylene
TSCA 8(b) inventory: p-Xylene
SARA 313 toxic chemical notification and release reporting: p-Xylene
CERCLA: Hazardous substances.: p-Xylene

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R10- Flammable.
R38- Irritating to skin.
R41- Risk of serious damage to eyes.
R48/20- Harmful: danger of serious

damage to health by prolonged exposure through inhalation.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.
-Material safety data sheet emitted by: la Commission de la SantÃ© et de la SÃ©curitÃ© du Travail du QuÃ©bec.
-SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984.
-The Sigma-Aldrich Library of Chemical Safety Data, Edition II.
-Guide de la loi et du rÃ¨glement sur le transport des marchandises dangeureuses au canada. Centre de conformitÃ© internatinal LtÃ©e. 1986.

Other Special Considerations: Not available.

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Health	2
Fire	3
Reactivity	0
Personal Protection	J

Material Safety Data Sheet
m-Xylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: m-Xylene

Catalog Codes: SLX1066

CAS#: 108-38-3

RTECS: ZE2275000

TSCA: TSCA 8(b) inventory: m-Xylene

CI#: Not applicable.

Synonym: m-Methyltoluene

Chemical Name: 1,3-Dimethylbenzene

Chemical Formula: C6H4(CH3)2

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
{m-}Xylene	108-38-3	100

Toxicological Data on Ingredients: m-Xylene: ORAL (LD50): Acute: 5000 mg/kg [Rat.]. DERMAL (LD50): Acute: 14100 mg/kg [Rabbit.].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant). Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant).
Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation.
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to blood, kidneys, the nervous system, liver.
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation: Not available.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 527°C (980.6°F)

Flash Points: CLOSED CUP: 25°C (77°F). OPEN CUP: 28.9°C (84°F) (Cleveland).

Flammable Limits: LOWER: 1.1% UPPER: 7%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid, insoluble in water.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:
Explosive in the form of vapor when exposed to heat or flame. Vapor may travel considerable distance to source of ignition and flash back. When heated to decomposition it emits acrid smoke and irritating fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid, insoluble in water.

Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes Keep away from incompatibles such as oxidizing agents.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection: Splash goggles. Lab coat. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 100 STEL: 150 (ppm) from ACGIH (TLV)
TWA: 434 STEL: 651 (mg/m3) from ACGIHConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Liquid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 106.17 g/mole

Color: Colorless.

pH (1% soln/water): Not applicable.

Boiling Point: 139.3°C (282.7°F)

Melting Point: -47.87°C (-54.2°F)

Critical Temperature: Not available.

Specific Gravity: 0.86 (Water = 1)

Vapor Pressure: 6 mm of Hg (@ 20°C)

Vapor Density: 3.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.62 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether.

Solubility:
Easily soluble in methanol, diethyl ether.
Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact.

Toxicity to Animals:
Acute oral toxicity (LD50): 5000 mg/kg [Rat.].
Acute dermal toxicity (LD50): 14100 mg/kg [Rabbit.].

Chronic Effects on Humans: The substance is toxic to blood, kidneys, the nervous system, liver.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant).
Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
0347 Animal: embryotoxic, foetotoxic, passes through the placental barrier.
0900 Detected in maternal milk in human.
Narcotic effect; may cause nervous system disturbances.

Special Remarks on other Toxic Effects on Humans: Material is irritating to mucous membranes and upper respiratory tract.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : Xylene : UN1307 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: m-Xylene
Massachusetts RTK: m-Xylene
TSCA 8(b) inventory: m-Xylene
SARA 313 toxic chemical notification and release reporting: m-Xylene
CERCLA: Hazardous substances.: m-Xylene

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R10- Flammable.
R38- Irritating to skin.
R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.
-Material safety data sheet emitted by: la Commission de la SantÃ© et de la SÃ©curitÃ© du Travail du QuÃ©bec.
-SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984.
-The Sigma-Aldrich Library of Chemical Safety Data, Edition II.
-Guide de la loi et du rÃ¨glement sur le transport des marchandises dangeureuses au canada. Centre de conformitÃ© internatinal LtÃ©e. 1986.

Other Special Considerations: Not available.

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Last Updated: 10/10/2005 08:33 PM

Health	0
Fire	2
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Mesitylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Mesitylene

Catalog Codes: SLM2410

CAS#: 108-67-8

RTECS: OX6825000

TSCA: TSCA 8(b) inventory: Mesitylene

CI#: Not available.

Synonym: 1,3,5-Trimethylbenzene

Chemical Formula: C9H12

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Mesitylene	108-67-8	100

Toxicological Data on Ingredients: Mesitylene: VAPOR (LC50): Acute: 4881.9 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of eye contact (irritant), of ingestion, of inhalation (lung irritant). Slightly hazardous in case of skin contact (irritant, permeator), .

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes,

keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 559°C (1038.2°F)

Flash Points: CLOSED CUP: 43°C (109.4°F).

Flammable Limits: Not available.

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid.
Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Be careful that the product is not present at a

concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Avoid contact with eyes Wear suitable protective clothing If ingested, seek medical advice immediately and show the container or the label.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 25 CEIL: 35 (ppm)
TWA: 125 CEIL: 170 (mg/m3)
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Aromatic.

Taste: Not available.

Molecular Weight: 120.2 g/mole

Color: Not available.

pH (1% soln/water): Not available.

Boiling Point: 164.7°C (328.5°F)

Melting Point: -44.8°C (-48.6°F)

Critical Temperature: Not available.

Specific Gravity: 0.8637 (Water = 1)

Vapor Pressure: 1.86 mm of Hg (@ 20°C)

Vapor Density: 4.14 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.23 ppm

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; log(oil/water) = 0

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.
Acute toxicity of the vapor (LC50): 4881.9 ppm 4 hour(s) [Rat].

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans:
Hazardous in case of ingestion, of inhalation (lung irritant).
Slightly hazardous in case of skin contact (irritant, permeator), .

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : 1,3,5-Trimethylbenzene : UN2325 PG: III

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Florida: Mesitylene
New Jersey: Mesitylene
TSCA 8(b) inventory: Mesitylene

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).

DSCL (EEC):
R10- Flammable.
R36/37- Irritating to eyes and respiratory system.

HMIS (U.S.A.):

Health Hazard: 0

Fire Hazard: 2

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 0

Flammability: 2

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 06:06 PM

Last Updated: 10/09/2005 06:06 PM

International Chemical Safety Cards

BENZO(B)FLUORANTHENE

ICSC: 0720

BENZO(B)FLUORANTHENE
Benzo(e)acephenanthrylene
2,3-Benzofluoroanthene
$C_{20}H_{12}$
Molecular mass: 252.3

CAS # 205-99-2
RTECS # CU1400000
ICSC # 0720

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, powder.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID ALL CONTACT!	IN ALL CASES CONSULT A DOCTOR!
• **INHALATION**		Local exhaust or breathing protection.	Fresh air, rest.
• **SKIN**	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention. Wear protective gloves when administering first aid.
• **EYES**		Safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**		Do not eat, drink, or smoke during work.	Wear protective gloves when inducing vomiting. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Tightly closed.	Unbreakable packaging; put breakable packaging into closed unbreakable container.

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0720

International Chemical Safety Cards

BENZO(B)FLUORANTHENE

ICSC: 0720

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS TO YELLOW CRYSTALS. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV not established.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Melting point: 168°C Solubility in water: none	Vapour pressure, Pa at 20°C: <10 Octanol/water partition coefficient as log Pow: 6.04
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to the total environment. In the food chain important to humans, bioaccumulation takes place, specifically in oils and fats.	

NOTES

Depending on the degree of exposure, periodic medical examination is indicated. Data are insufficiently available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home.

ADDITIONAL INFORMATION

ICSC: 0720 **BENZO(B)FLUORANTHENE**

International Chemical Safety Cards

BENZO(K)FLUORANTHENE

ICSC: 0721

BENZO(K)FLUOROANTHENE
11,12-Benzofluoroanthene
Dibenzo(b,j,k)fluorene
$C_{20}H_{12}$
Molecular mass: 252.3

CAS # 207-08-9
RTECS # DF6350000
ICSC # 0721

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, powder.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID ALL CONTACT!	IN ALL CASES CONSULT A DOCTOR!
• **INHALATION**		Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
• **SKIN**	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention. Wear protective gloves when administering first aid.
• **EYES**		Safety goggles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**		Do not eat, drink, or smoke during work.	Wear protective gloves when inducing vomiting. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Separated from strong oxidants. Tightly closed.	

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0721

International Chemical Safety Cards

BENZO(K)FLUORANTHENE

ICSC: 0721

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** YELLOW CRYSTALS. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. Reacts with strong oxidants. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV not established.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 480°C Melting point: 215.7°C	Solubility in water: none Octanol/water partition coefficient as log Pow: 6.84
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to the total environment. In the food chain important to humans, bioaccumulation takes place, specifically in oils and fats.	

NOTES

Data are insufficiently available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home.

ADDITIONAL INFORMATION

ICSC: 0721 **BENZO(K)FLUORANTHENE**

International Chemical Safety Cards

BENZ(a)ANTHRACENE

ICSC: 0385

BENZ(a)ANTHRACENE
1,2-Benzoanthracene
Benzo(a)anthracene
2,3-Benzphenanthrene
Naphthanthracene
$C_{18}H_{12}$
Molecular mass: 228.3

CAS # 56-55-3
RTECS # CV9275000
ICSC # 0385
EC # 601-033-00-9

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.		Water spray, powder. In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		AVOID ALL CONTACT!	
• **INHALATION**		Local exhaust or breathing protection.	Fresh air, rest.
• **SKIN**		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
• **EYES**		Safety goggles, face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place (extra personal protection: complete protective clothing including self-contained breathing apparatus).	Well closed.	T symbol R: 45 S: 53-45

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0385

International Chemical Safety Cards

BENZ(a)ANTHRACENE

ICSC: 0385

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS TO YELLOW-BROWN FLUORESCENT FLAKES OR POWDER. **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV not established.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation, through the skin and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is probably carcinogenic to humans.
PHYSICAL PROPERTIES	Sublimation point: 435°C Melting point: 162°C Relative density (water = 1): 1.274	Solubility in water: none Vapour pressure, Pa at 20°C: 292 Octanol/water partition coefficient as log Pow: 5.61
ENVIRONMENTAL DATA	In the food chain important to humans, bioaccumulation takes place, specifically in seafood.	

N O T E S

This substance is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles. However, it may be encountered as a laboratory chemical in its pure form. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home. Tetraphene is a common name.

ADDITIONAL INFORMATION

IMPORTANT LEGAL NOTICE:	Neither the CEC or the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

Material Safety Data Sheet

Benzo[a]pyrene, 98%

ACC# 37175

Section 1 - Chemical Product and Company Identification

MSDS Name: Benzo[a]pyrene, 98%
Catalog Numbers: AC105600000, AC105600010, AC105601000, AC377200000, AC377200010, AC377201000 AC377201000
Synonyms: 3,4-Benzopyrene; 3,4-Benzpyrene; Benzo[def]chrysene.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
50-32-8	Benzo[a]pyrene	>96	200-028-5

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: yellow to brown powder.
Danger! May cause harm to the unborn child. May impair fertility. May cause eye, skin, and respiratory tract irritation. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Cancer hazard. May cause allergic skin reaction. May cause heritable genetic damage.
Target Organs: Reproductive system, skin.

Potential Health Effects

Eye: May cause eye irritation.
Skin: May cause skin irritation. May be harmful if absorbed through the skin. May cause an allergic reaction in certain individuals.
Ingestion: May cause irritation of the digestive tract. The toxicological properties of this substance have not been fully investigated. May be harmful if swallowed.
Inhalation: May cause respiratory tract irritation. The toxicological properties of this substance have not been fully investigated. May be harmful if inhaled.
Chronic: May cause cancer in humans. May cause reproductive and fetal effects. Laboratory experiments have resulted in mutagenic effects.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Never give anything by mouth to an unconscious person. Get medical aid. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: Not available.
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 2; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.
Storage: Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs

Benzo[a]pyrene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).

OSHA Vacated PELs: Benzo[a]pyrene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: 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: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Powder
Appearance: yellow to brown
Odor: faint aromatic odor
pH: Not available.
Vapor Pressure: Not available.
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 495 deg C @ 760 mm Hg
Freezing/Melting Point:175 - 179 deg C
Decomposition Temperature: Not available.
Solubility: 1.60x10-3 mg/l @25°C
Specific Gravity/Density: Not available.
Molecular Formula:C20H12
Molecular Weight:252.31

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Dust generation.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 50-32-8: DJ3675000
LD50/LC50:

Not available.

Carcinogenicity:
CAS# 50-32-8:

- **ACGIH:** A2 - Suspected Human Carcinogen
- **California:** carcinogen, initial date 7/1/87
- **NTP:** Suspect carcinogen
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: Adverse reproductive effects have occurred in experimental animals.
Mutagenicity: Mutagenic effects have occurred in humans.Mutagenic effects have occurred in experimental animals.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 50-32-8: waste number U022.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	NOT REGULATED FOR DOMESTIC TRANSPORT	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOL (Benzo{a} pyrene)
Hazard Class:		9
UN Number:		UN3077
Packing Group:		III

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 50-32-8 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 50-32-8: 1 lb final RQ; 0.454 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 50-32-8: immediate, delayed.

Section 313

This material contains Benzo[a]pyrene (CAS# 50-32-8, >96%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 50-32-8 is listed as a Priority Pollutant under the Clean Water Act.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 50-32-8 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Benzo[a]pyrene, a chemical known to the state of California to cause cancer.

California No Significant Risk Level: CAS# 50-32-8: 0.06 æg/day NSRL

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T N

Risk Phrases:

R 43 May cause sensitization by skin contact.
R 45 May cause cancer.
R 46 May cause heritable genetic damage.
R 60 May impair fertility.
R 61 May cause harm to the unborn child.
R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 53 Avoid exposure - obtain special instructions before use.
S 60 This material and its container must be disposed of as hazardou
s waste.
S 61 Avoid release to the environment. Refer to special instructions
/safety data sheets.

WGK (Water Danger/Protection)
CAS# 50-32-8: No information available.

Canada - DSL/NDSL
CAS# 50-32-8 is listed on Canada's DSL List.

Canada - WHMIS
This product has a WHMIS classification of D2A.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List
CAS# 50-32-8 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 9/02/1997
Revision #7 Date: 6/30/2006

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Material Safety Data Sheet

Chrysene, 98%

ACC# 95251

Section 1 - Chemical Product and Company Identification

MSDS Name: Chrysene, 98%
Catalog Numbers: AC224140000, AC224140010, AC224140050, AC224145000
Synonyms: 1,2-Benzophenanthrene; Benzo(a)phenanthrene; 1,2,5,6-Dibenzonaphthalene.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
218-01-9	Chrysene	98	205-923-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: very light beige solid.
Caution! May cause eye and skin irritation. May cause respiratory tract irritation. May cause cancer in humans.
Target Organs: Liver, skin.

Potential Health Effects

Eye: May cause eye irritation.
Skin: May cause skin irritation.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea.
Inhalation: May cause respiratory tract irritation.
Chronic: May cause cancer according to animal studies.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air

immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. This material in sufficient quantity and reduced particle size is capable of creating a dust explosion.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or chemical foam.
Flash Point: Not applicable.
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: ; Flammability: 1; Instability:

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Wash hands before eating. Avoid contact with eyes, skin, and clothing. Use only with adequate ventilation. Avoid breathing dust.
Storage: Store in a tightly closed container. Store in a cool, dry area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Chrysene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).

OSHA Vacated PELs: Chrysene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: 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: 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.

Section 9 - Physical and Chemical Properties

Physical State: Solid
Appearance: very light beige
Odor: Not available.
pH: Not available.
Vapor Pressure: Not available.
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 448 deg C @ 760 mm Hg
Freezing/Melting Point:250-255 deg C
Decomposition Temperature: Not available.
Solubility: insoluble
Specific Gravity/Density: Not available.
Molecular Formula:C18H12
Molecular Weight:228.29

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Dust generation.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 218-01-9: GC0700000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 218-01-9:

- **ACGIH:** A3 - Confirmed animal carcinogen with unknown relevance to humans

- **California:** carcinogen, initial date 1/1/90
- **NTP:** Known carcinogen (listed as Coal tar pitches).
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: Chrysene was mutagenic to S. Typhimurium in the presence of an exogenous metabolic system.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Water flea LC50 = 1.9 mg/L; 2 Hr.; Unspecified Fish toxicity : LC50 (96hr) Neauthes arenacedentata >1ppm.(Rossi,S.S. et al Marine Pollut. Bull. 1978) Invertebrate toxicity : lethal treshold concentration (24hr) Daphnia Magna 0,7æg/l.(* Newsted,J.L. et al Environ. Toxicol. Chem. 1987) Bioaccumulation : 24hr Daphnia Magna log bioconcentration factor 3.7845 (*)
Environmental: Degradation studies : biodegradated by white rot fungus (Proc.Annu.Meet.Am.Wood-Preserv.Assoc.1989) May be utilised by axenic cultures of microorganisms e.g. Pseudomonas pancimobilis EPA505, which may have novel degradative systems(Mueller,J.G. et al ppl.Environ.Microbiol.1990; Mueller, J.G. et al Environ.Sci.Technol.1991).
Physical: Not found.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 218-01-9: waste number U050.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	Not regulated as a hazardous material	No information available.
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 218-01-9 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 218-01-9: 100 lb final RQ; 45.4 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

Section 313

This material contains Chrysene (CAS# 218-01-9, 98%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 218-01-9 is listed as a Priority Pollutant under the Clean Water Act.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 218-01-9 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Chrysene, a chemical known to the state of California to cause cancer.

California No Significant Risk Level: CAS# 218-01-9: 0.35 æg/day NSRL (oral)

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T

Risk Phrases:

R 45 May cause cancer.
R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 53 Avoid exposure - obtain special instructions before use.
S 60 This material and its container must be disposed of as hazardou s waste.

S 61 Avoid release to the environment. Refer to special instructions /safety data sheets.

WGK (Water Danger/Protection)

CAS# 218-01-9: No information available.

Canada - DSL/NDSL

CAS# 218-01-9 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D2A.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 218-01-9 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 6/30/1999
Revision #4 Date: 10/03/2005

Material Safety Data Sheet

Fluoranthene, 98%

ACC# 80991

Section 1 - Chemical Product and Company Identification

MSDS Name: Fluoranthene, 98%
Catalog Numbers: AC119170000, AC119170250, AC119171000, AC119175000
Synonyms: 1,2-(1,8-Naphthalenediyl)benzene; 1,2-(1,8-Naphthylene)benzene; 1,2-Benzacenaphthene; Benzene, 1,2-(1,8-naphthylene)-; Benzo(j,k)fluorene; Benzo(jk)fluoranthene; Benzo(jk)fluorene
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
206-44-0	Fluoranthene	98	205-912-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: yellow needles.
Caution! Harmful. Causes eye and skin irritation and possible burns. May be harmful if absorbed through the skin. May be harmful if swallowed. May cause heart and liver injury.
Target Organs: Heart, liver, lungs.

Potential Health Effects

Eye: Causes eye irritation and possible burns.
Skin: May be harmful if absorbed through the skin. Causes severe skin irritation and possible burns.
Ingestion: May be harmful if swallowed. May cause rapid heartbeat and cardiac arrythmias. May cause liver injury, pulmonary edema, and respiratory arrest. May cause gastrointestinal disturbances such as nausea.
Inhalation: May cause effects similar to those described for ingestion. May produce cardiac failure and pulmonary edema.
Chronic: Prolonged or repeated skin contact may cause defatting and dermatitis.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the

upper and lower eyelids. Get medical aid imme diately. Do NOT allow victim to rub eyes or keep eyes closed. Extensiv e irrigation with water is required (at least 30 minutes).
Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Remove contaminated clothing and shoes.
Ingestion: Never give anything by mouth to an unconscious person. Get medical aid immediately. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.

Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
Extinguishing Media: In case of fire, use water, dry chemical, chemical foam, or alcohol-resistant foam.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 2; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well-ventilated area. Do not get in eyes, on skin, or on clothing. Do not ingest or inhale. Use only in a chemical fume hood. Do not breathe dust.
Storage: Keep containers tightly closed. Store in a cool, dry area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Fluoranthene	none listed	none listed	none listed

OSHA Vacated PELs: Fluoranthene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: 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: Wear appropriate protective gloves and clothing to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Needles
Appearance: yellow
Odor: None reported.
pH: Not available.
Vapor Pressure: 0.01 mm Hg @ 20 deg C
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 384 deg C @ 760.00mmHg
Freezing/Melting Point:107.00 - 110.00 deg C
Decomposition Temperature: Not available.
Solubility: insoluble
Specific Gravity/Density:1.252 g/cm3
Molecular Formula:C16H10
Molecular Weight:202.25

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, strong oxidants.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, acrid smoke and fumes.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 206-44-0: LL4025000
LD50/LC50:
CAS# 206-44-0:
Oral, rat: LD50 = 2 gm/kg;

Skin, rabbit: LD50 = 3180 mg/kg;
.

Carcinogenicity:
CAS# 206-44-0: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: IARC Group 3: Limited or insufficient evidence for carcinogenicity in both animals and humans.Experimental tumorigenic data has been reported.
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: Mutation in microorganisms: Salmonella typhimurium = 5ug/plate.Mutation in mammalian somatic cells: Human Lymphocyte = 2 umol/L.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Bluegill/Sunfish: 3980 um/L; 96 H; (not specified) No data available.
Environmental: Remains in the upper few cm of soil, but can be transported to groundwater. Biodegrades from soil in a few years. Will not volatilize from soil or water. Rapidly absorbed to sediment and particulates and will readily bioconcentrate. Unadsorbed substance in water will degrade by photolysis in a days to weeks. Stable in sediment for decades or more. In the atmostphere, photodegrades with half life of 4 - 5 days, but may transport long distances without settling or raining out.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 206-44-0: waste number U120.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	Not regulated as a hazardous material	No information available.
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 206-44-0 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 206-44-0: 100 lb final RQ; 45.4 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 206-44-0: immediate.

Section 313

This material contains Fluoranthene (CAS# 206-44-0, 98%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 206-44-0 is listed as a Priority Pollutant under the Clean Water Act. CAS# 206-44-0 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 206-44-0 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XN

Risk Phrases:

R 21/22 Harmful in contact with skin and if swallowed.

Safety Phrases:

S 22 Do not breathe dust.
S 24/25 Avoid contact with skin and eyes.

WGK (Water Danger/Protection)

CAS# 206-44-0: No information available.

Canada - DSL/NDSL

CAS# 206-44-0 is listed on Canada's NDSL List.

Canada - WHMIS

This product has a WHMIS classification of D2B.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 206-44-0 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 9/02/1997
Revision #5 Date: 10/03/2005

MSDS Number: **L2347** * * * * * *Effective Date:* ***08/10/04*** * * * * * *Supercedes:* ***11/02/01***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

LEAD METAL

1. Product Identification

Synonyms: Granular lead, pigment metal; C.I. 77575
CAS No.: 7439-92-1
Molecular Weight: 207.19
Chemical Formula: Pb
Product Codes:
J.T. Baker: 2256, 2266
Mallinckrodt: 5668

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Lead	7439-92-1	95 - 100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! MAY BE FATAL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. NEUROTOXIN. AFFECTS THE GUM TISSUE, CENTRAL NERVOUS SYSTEM, KIDNEYS, BLOOD AND REPRODUCTIVE SYSTEM. POSSIBLE CANCER HAZARD. MAY CAUSE CANCER BASED ON ANIMAL DATA. Risk of cancer depends on duration and level of exposure.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Life)
Flammability Rating: 0 - None
Reactivity Rating: 0 - None
Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:

Lead can be absorbed through the respiratory system. Local irritation of bronchia and lungs can occur and, in cases of acute exposure, symptoms such as metallic taste, chest and abdominal pain, and increased lead blood levels may follow. See also Ingestion.

Ingestion:

POISON! The symptoms of lead poisoning include abdominal pain and spasms, nausea, vomiting, headache. Acute poisoning can lead to muscle weakness, "lead line" on the gums, metallic taste, definite loss of appetite, insomnia, dizziness, high lead levels in blood and urine with shock, coma and death in extreme cases.

Skin Contact:

Lead and lead compounds may be absorbed through the skin on prolonged exposure; the symptoms of lead poisoning described for ingestion exposure may occur. Contact over short periods may cause local irritation, redness and pain.

Eye Contact:

Absorption can occur through eye tissues but the more common hazards are local irritation or abrasion.

Chronic Exposure:

Lead is a cumulative poison and exposure even to small amounts can raise the body's content to toxic levels. The symptoms of chronic exposure are like those of ingestion poisoning; restlessness, irritability, visual disturbances, hypertension and gray facial color may also be noted.

Aggravation of Pre-existing Conditions:

Persons with pre-existing kidney, nerve or circulatory disorders or with skin or eye problems may be more susceptible to the effects of this substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.
Skin Contact:
Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard. Powder/dust is flammable when heated or exposed to flame.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire. Do not allow water runoff to enter sewers or waterways.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Can produce toxic lead fumes at elevated temperatures and also react with oxidizing materials.

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6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

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7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Areas in which exposure to lead

metal or lead compounds may occur should be identified by signs or appropriate means, and access to the area should be limited to authorized persons. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For lead, metal and inorganic dusts and fumes, as Pb:
-OSHA Permissible Exposure Limit (PEL): 0.05 mg/m3 (TWA)
For lead, elemental and inorganic compounds, as Pb:
-ACGIH Threshold Limit Value (TLV): 0.05 mg/m3 (TWA), A3 animal carcinogen
ACGIH Biological Exposure Indices (BEI): 30 ug/100ml, notation B (see actual Indices for more information).
For lead, inorganic:
-NIOSH Recommended Exposure Limit (REL): 0.1 mg/m3 (TWA)
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face high efficiency particulate respirator (NIOSH type N100 filter) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece high efficiency particulate respirator (NIOSH type N100 filter) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.
Other Control Measures:
Eating, drinking, and smoking should not be permitted in areas where solids or liquids containing lead compounds are handled, processed, or stored. See OSHA substance-specific standard for more information on personal protective equipment, engineering and work practice controls, medical surveillance, record keeping, and reporting requirements. (29 CFR 1910.1025).

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9. Physical and Chemical Properties

Appearance:
Small, white to blue-gray metallic shot or granules.
Odor:
Odorless.
Solubility:
Insoluble in water.
Density:
11.34
pH:
No information found.
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
1740C (3164F)
Melting Point:
327.5C (622F)
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
1.77 @ 1000C (1832F)
Evaporation Rate (BuAc=1):
No information found.

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Does not decompose but toxic lead or lead oxide fumes may form at elevated temperatures.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Ammonium nitrate, chlorine trifluoride, hydrogen peroxide, sodium azide, zirconium, disodium acetylide, sodium acetylide and oxidants.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

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11. Toxicological Information

Toxicological Data:
Investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
Lead and other smelter emissions are human reproductive hazards. (Chemical Council on

Environmental Quality; Chemical Hazards to Human Reproduction, 1981).
Carcinogenicity:
EPA / IRIS classification: Group B2 - Probable human carcinogen, sufficient animal evidence.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Lead (7439-92-1)	No	No	2B

12. Ecological Information

Environmental Fate:
When released into the soil, this material is not expected to leach into groundwater. This material may bioaccumulate to some extent.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Lead (7439-92-1)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

	--Canada--

Ingredient	Korea	DSL	NDSL	Phil.
Lead (7439-92-1)	Yes	Yes	No	Yes

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Lead (7439-92-1)	No	No	Yes	No

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Lead (7439-92-1)	10	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Pure / Solid)

WARNING:
THIS PRODUCT CONTAINS CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER AND BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: None allocated.
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **3** Flammability: **1** Reactivity: **0**
Label Hazard Warning:
POISON! DANGER! MAY BE FATAL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. NEUROTOXIN. AFFECTS THE GUM TISSUE, CENTRAL NERVOUS SYSTEM, KIDNEYS, BLOOD AND REPRODUCTIVE SYSTEM. POSSIBLE CANCER HAZARD. MAY CAUSE CANCER BASED ON ANIMAL DATA. Risk of cancer depends on duration and level of exposure.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe dust.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not

breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.

Product Use:
Laboratory Reagent.

Revision Information:
No Changes.

Disclaimer:
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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **M1599** * * * * * *Effective Date:* ***12/19/05*** * * * * * *Supercedes:* ***08/10/04***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

MERCURY

1. Product Identification

Synonyms: Quicksilver; hydrargyrum; Liquid Silver
CAS No.: 7439-97-6
Molecular Weight: 200.59
Chemical Formula: Hg
Product Codes:
J.T. Baker: 2564, 2567, 2569
Mallinckrodt: 1278, 1280, 1288

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Mercury	7439-97-6	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

DANGER! CORROSIVE. CAUSES BURNS TO SKIN, EYES, AND RESPIRATORY TRACT. MAY BE FATAL IF SWALLOWED OR INHALED. HARMFUL IF ABSORBED THROUGH SKIN. AFFECTS THE KIDNEYS AND CENTRAL NERVOUS SYSTEM. MAY CAUSE ALLERGIC SKIN REACTION.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Life)
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:
Mercury vapor is highly toxic via this route. Causes severe respiratory tract damage. Symptoms include sore throat, coughing, pain, tightness in chest, breathing difficulties, shortness of breath, headache, muscle weakness, anorexia, gastrointestinal disturbance, ringing in the ear, liver changes, fever, bronchitis and pneumonitis. Can be absorbed through inhalation with symptoms similar to ingestion.

Ingestion:
May cause burning of the mouth and pharynx, abdominal pain, vomiting, corrosive ulceration, bloody diarrhea. May be followed by a rapid and weak pulse, shallow breathing, paleness, exhaustion, tremors and collapse. Delayed death may occur from renal failure. Gastrointenstinal uptake of mercury is less than 5% but its ability to penetrate tissues presents some hazard. Initial symptoms may be thirst, possible abdominal discomfort.

Skin Contact:
Causes irritaton and burns to skin. Symptoms include redness and pain. May cause skin allergy and sensitization. Can be absorbed through the skin with symptoms to parallel ingestion.

Eye Contact:
Causes irritation and burns to eyes. Symptoms include redness, pain, blurred vision; may cause serious and permanent eye damage.

Chronic Exposure:
Chronic exposure through any route can produce central nervous system damage. May cause muscle tremors, personality and behavior changes, memory loss, metallic taste, loosening of the teeth, digestive disorders, skin rashes, brain damage and kidney damage. Can cause skin allergies and accumulate in the body. Repeated skin contact can cause the skin to turn gray in color. A suspected reproductive hazard; may damage the developing fetus and decrease fertility in males and females.

Aggravation of Pre-existing Conditions:
Persons with nervous disorders, or impaired kidney or respiratory function, or a history of allergies or a known sensitization to mercury may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire. Do not allow water runoff to enter sewers or waterways.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Undergoes hazardous reactions in the presence of heat and sparks or ignition. Smoke may contain toxic mercury or mercuric oxide. Smoke may contain toxic mercury or mercuric oxide.

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6. Accidental Release Measures

Ventilate area of leak or spill. Clean-up personnel require protective clothing and respiratory protection from vapor.

Spills: Pick up and place in a suitable container for reclamation or disposal in a method that does not generate misting. Sprinkle area with sulfur or calcium polysulfide to suppress mercury. Do not flush to sewer. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker CINNASORB® and RESISORB® are recommended for spills of this product.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Do not use or store on porous work surfaces (wood, unsealed concrete, etc.). Follow strict hygiene practices. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
- OSHA Acceptable Ceiling Concentration:
mercury and mercury compounds: 0.1 mg/m3 (TWA), skin
- ACGIH Threshold Limit Value (TLV):
inorganic and metallic mercury, as Hg: 0.025 mg/m3 (TWA) skin, A4 Not classifiable as a human carcinogen.
- ACGIH Biological Exposure Indices:
total inorganic mercury in urine (preshift): 35 ug/g creatinine;
total inorganic mercury in blood (end of shift): 15 ug/l.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face respirator with a mercury vapor or chlorine gas cartridge may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece respirator with a mercury vapor or chlorine gas cartridge may be worn up to 50 times the exposure limit, or the maximum use concentraiton specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Silver-white, heavy, mobile, liquid metal.
Odor:
Odorless.
Solubility:
Insoluble in water.
Density:
13.55
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
356.7C (675F)
Melting Point:
-38.87C (-38F)
Vapor Density (Air=1):
7.0
Vapor Pressure (mm Hg):
0.0018 @ 25C (77F)
Evaporation Rate (BuAc=1):
4

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
At high temperatures, vaporizes to form extremely toxic fumes.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Acetylenes, ammonia, ethylene oxide, chlorine dioxide, azides, metal oxides, methyl silane, lithium, rubidium, oxygen, strong oxidants, metal carbonyls.
Conditions to Avoid:
Heat, flames, ignition sources, metal surfaces and incompatibles.

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11. Toxicological Information

Toxicological Data:
Investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
All forms of mercury can cross the placenta to the fetus, but most of what is known has

been learned from experimental animals. See Chronic Health Hazards.
Carcinogenicity:
EPA / IRIS classification: Group D1 - Not classifiable as a human carcinogen.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Mercury (7439-97-6)	No	No	3

12. Ecological Information

Environmental Fate:
This material has an experimentally-determined bioconcentration factor (BCF) of greater than 100. This material is expected to significantly bioaccumulate.
Environmental Toxicity:
This material is expected to be toxic to aquatic life. The LC50/96-hour values for fish are less than 1 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: RQ, MERCURY
Hazard Class: 8
UN/NA: UN2809
Packing Group: III
Information reported for product/size: 1LB

International (Water, I.M.O.)

Proper Shipping Name: MERCURY
Hazard Class: 8
UN/NA: UN2809
Packing Group: III
Information reported for product/size: 1LB

International (Air, I.C.A.O.)

Proper Shipping Name: MERCURY
Hazard Class: 8
UN/NA: UN2809
Packing Group: III
Information reported for product/size: 1LB

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Mercury (7439-97-6)	Yes	Yes	No	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Mercury (7439-97-6)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Mercury (7439-97-6)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Mercury (7439-97-6)	1	U151	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Pure / Liquid)

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: 2Z
Poison Schedule: S7
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
DANGER! CORROSIVE. CAUSES BURNS TO SKIN, EYES, AND RESPIRATORY TRACT. MAY BE FATAL IF SWALLOWED OR INHALED. HARMFUL IF ABSORBED THROUGH SKIN. AFFECTS THE KIDNEYS AND CENTRAL NERVOUS SYSTEM. MAY CAUSE ALLERGIC SKIN REACTION.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 3.
Disclaimer:
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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Material Safety Data Sheet

Phenanthrene, 90%

ACC# 59921

Section 1 - Chemical Product and Company Identification

MSDS Name: Phenanthrene, 90%
Catalog Numbers: AC130100000, AC130100010, AC130102500
Synonyms:
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
85-01-8	Phenanthrene	90.0	201-581-5

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: brown solid.
Caution! Powdered material may form explosive dust-air mixtures. May cause allergic skin reaction. May cause eye and skin irritation. May cause respiratory tract irritation. Cancer suspect agent.
Target Organs: None.

Potential Health Effects

Eye: May cause eye irritation.
Skin: May cause skin irritation. May cause photosensitive skin reactions in certain individuals.
Ingestion: May cause irritation of the digestive tract.
Inhalation: Inhalation of dust may cause respiratory tract irritation.
Chronic: No information found.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid imme diately.
Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Dusts at sufficient concentrations can form explosive mixtures with air. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
Extinguishing Media: Use water spray or dry chemical.
Flash Point: Not available.
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 1; Flammability: 1; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions. Provide ventilation. Do not let this chemical enter the environment.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.
Storage: Keep container closed when not in use. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use adequate ventilation to keep airborne concentrations low.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Phenanthrene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).

OSHA Vacated PELs: Phenanthrene: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment
Eyes: 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: 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.

Section 9 - Physical and Chemical Properties

Physical State: Solid
Appearance: brown
Odor: none reported
pH: Not available.
Vapor Pressure: 1 mm Hg @116c
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 340 deg C
Freezing/Melting Point:101 deg C
Decomposition Temperature: Not available.
Solubility: insoluble
Specific Gravity/Density:1.0630g/cm3
Molecular Formula:C14H10
Molecular Weight:178.23

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, dust generation, strong oxidants.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 85-01-8: SF7175000
LD50/LC50:
CAS# 85-01-8:
Oral, mouse: LD50 = 700 mg/kg;
Oral, rat: LD50 = 1.8 gm/kg;
.

Carcinogenicity:
CAS# 85-01-8:

- **ACGIH:** A1 - Confirmed Human Carcinogen (as benzene soluble aerosol) (listed as 'Coal tar pitches').
- **California:** Not listed.
- **NTP:** Known carcinogen (listed as Coal tar pitches).
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

Epidemiology: No data available.
Teratogenicity: No data available.
Reproductive Effects: No data available.
Mutagenicity: No data available.
Neurotoxicity: No data available.
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	Not regulated as a hazardous material	No information available.
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 85-01-8 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 85-01-8: 5000 lb final RQ; 2270 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 85-01-8: immediate.
Section 313
This material contains Phenanthrene (CAS# 85-01-8, 90.0%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 85-01-8 is listed as a Priority Pollutant under the Clean Water Act.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 85-01-8 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, (listed as Coal tar pitches), Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
T
Risk Phrases:
R 45 May cause cancer.

Safety Phrases:
S 24/25 Avoid contact with skin and eyes.

WGK (Water Danger/Protection)
CAS# 85-01-8: No information available.
Canada - DSL/NDSL
CAS# 85-01-8 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of D2B.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.
Canadian Ingredient Disclosure List
CAS# 85-01-8 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 7/14/1998
Revision #3 Date: 10/03/2005

Health	3
Fire	1
Reactivity	2
Personal Protection	E

Material Safety Data Sheet
Arsenic MSDS

Section 1: Chemical Product and Company Identification

Product Name: Arsenic

Catalog Codes: SLA1006

CAS#: 7440-38-2

RTECS: CG0525000

TSCA: TSCA 8(b) inventory: Arsenic

CI#: Not applicable.

Synonym:

Chemical Name: Arsenic

Chemical Formula: As

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Arsenic	7440-38-2	100

Toxicological Data on Ingredients: Arsenic: ORAL (LD50): Acute: 763 mg/kg [Rat]. 145 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to kidneys, lungs, the nervous system, mucous membranes.
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks, of heat, of oxidizing materials.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits highly toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not

present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.01 from ACGIH (TLV) [United States] [1995]
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 74.92 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: Not available.

Melting Point: Sublimation temperature: 615°C (1139°F)

Critical Temperature: Not available.

Specific Gravity: 5.72 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents, acids, moisture.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 145 mg/kg [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH.
Causes damage to the following organs: kidneys, lungs, the nervous system, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion, of inhalation.
Slightly hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Arsenic UNNA: UN1558 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Arsenic
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Arsenic
Pennsylvania RTK: Arsenic
Massachusetts RTK: Arsenic
TSCA 8(b) inventory: Arsenic

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R22- Harmful if swallowed.
R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 2

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 1

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Safety glasses.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.
-Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec.
-Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec.
-SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984.
-The Sigma-Aldrich Library of Chemical Safety Data, Edition II.
-Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

Created: 10/09/2005 04:16 PM

Last Updated: 10/09/2005 04:16 PM

Health	2
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Nickel metal MSDS

Section 1: Chemical Product and Company Identification

Product Name: Nickel metal

Catalog Codes: SLN2296, SLN1342, SLN1954

CAS#: 7440-02-0

RTECS: QR5950000

TSCA: TSCA 8(b) inventory: Nickel metal

CI#: Not applicable.

Synonym: Nickel Metal shot; Nickel metal foil.

Chemical Name: Nickel

Chemical Formula: Ni

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Nickel metal	7440-02-0	100

Toxicological Data on Ingredients: Nickel metal LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant), of ingestion.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer), of ingestion, of inhalation (lung sensitizer).
CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to skin.
The substance may be toxic to kidneys, lungs, liver, upper respiratory tract.
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Material in powder form, capable of creating a dust explosion. This material is flammable in powder form only.

Special Remarks on Explosion Hazards:
Material in powder form, capable of creating a dust explosion.
Mixtures containing Potassium Perchlorate with Nickel & Titanium powders & infusorial earth can explode.
Adding 2 or 3 drops of approximately 90% peroxyformic acid to powdered nickel will result in explosion.
Powdered nickel reacts explosively upon contact with fused ammonium nitrate at temperatures below 200 deg. C.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Keep away from incompatibles such as oxidizing agents, combustible materials, metals, acids.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 (mg/m3) from ACGIH (TLV) [United States] Inhalation Respirable.
TWA: 0.5 (mg/m3) [United Kingdom (UK)]
TWA: 1 (mg/m3) from OSHA (PEL) [United States] InhalationConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid. Lustrous solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 58.71 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: 2730°C (4946°F)

Melting Point: 1455°C (2651°F)

Critical Temperature: Not available.

Specific Gravity: Density: 8.908 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Insoluble in cold water, hot water.
Insoluble in Ammonia.
Soluble in dilute Nitric Acid.
Slightly soluble in Hydrochloric Acid, Sulfuric Acid.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, combustible materials, metals, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with strong acids, selenium, sulfur, wood and other combustibles, nickel nitrate, aluminum, aluminum trichloride, ethylene, p-dioxan, hydrogen, methanol, non-metals, oxidants, sulfur compounds, aniline, hydrogen sulfide, flammable solvents, hydrazine, and metal powders (especially zinc, aluminum, and magnesium), ammonium nitrate, nitryl fluoride, bromine pentafluoride, potassium perchlorate + titanium powder + indusorial earth.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available.
LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP.
Causes damage to the following organs: skin.
May cause damage to the following organs: kidneys, lungs, liver, upper respiratory tract.

Other Toxic Effects on Humans:

Hazardous in case of inhalation.
Slightly hazardous in case of skin contact (irritant, sensitizer), of ingestion.

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose/Conc:
LDL [Rat] - Route: Oral; Dose: 5000 mg/kg
LDL [Guinea Pig] - Route: Oral; Dose: 5000 mg/kg

Special Remarks on Chronic Effects on Humans: May cause cancer based on animal test data

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: Nickel dust and fume can irritate skin.
Eyes: Nickel dust and fume can irritate eyes.
Inhalation: Inhalation of dust or fume may cause respiratory tract irritation with non-productive cough, hoarseness, sore throat, headache, vertigo, weakness, chest pain, followed by delayed effects, including tachypnea, dyspnea, and ARDS. Death due to ARDS has been reported following inhalation of high concentrations of respirable metallic nickel dust. Later effects may include pulmonary edema and fibrosis.
Ingestion: Metallic nickel is generally considered not to be acutely toxic if ingested. Ingestion may cause nausea, vomiting, abdominal , and diarrhea. Nickel may damage the kidneys(proteinuria), and may affect liver function. It may also affect behavior (somnolence), and cardiovascular system (increased cornary artery resistance, decreased myocardial contractility, myocardial damage, regional or general arteriolar or venus dilation).
Chronic Potential Health Effects:
Skin: May cause skin allergy. Nickel and nickel compounds are among the most common sensitizers inducing allergic contact dermatitis.
Inhalation: Chronic inhalation nickel dust or fume can cause chronic hypertrophic rhinitis, sinusitis, nasal polyps, perforation of the nasal septum, chronic pulmonary irritation, fibrosis, pulmonary edema, pulmonary eosinophilia, Pneumoconiosis, allergies (asthma-like allergy), and cancer of the nasal sinus cavities, lungs, and possibly other organs. Future exposures can cause asthma attacks with shortness of breath, wheezing, cough, and/or chest tightness. Chronic inhalation of nickel dust or fume may also affect the liver (impaired liver function tests), and blood (changes in red blood cell count).
Ingestion: Prolonged or repeated ingestion of nickel can be a source chronic urticaria and other signs of allergy. Chronic ingestion of NIckel may also affect respiration and cause pneumoconiosis or fibrosis.
Note: In the general population, sensitization occurs from exposure to nickel-containing coins, jewelry, watches,

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Nickel metal
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Nickel metal
Connecticut hazardous material survey.: Nickel metal
Illinois toxic substances disclosure to employee act: Nickel metal
Illinois chemical safety act: Nickel metal
New York release reporting list: Nickel metal
Rhode Island RTK hazardous substances: Nickel metal
Pennsylvania RTK: Nickel metal
Michigan critical material: Nickel metal
Massachusetts RTK: Nickel metal
Massachusetts spill list: Nickel metal
New Jersey: Nickel metal
New Jersey spill list: Nickel metal
Louisiana spill reporting: Nickel metal
California Director's List of Hazardous Substances: Nickel metal
TSCA 8(b) inventory: Nickel metal

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R40- Possible risks of irreversible effects.
R43- May cause sensitization by skin contact.
S22- Do not breathe dust.
S36- Wear suitable protective clothing.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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U.S. Environmental Protection Agency

Pesticides: Topical & Chemical Fact Sheets

Assessing Health Risks from Pesticides

January 1999
735-F-99-002

The Federal Government, in cooperation with the States, carefully regulates pesticides to ensure that they do not pose unreasonable risks to human health or the environment. As part of that effort, the Environmental Protection Agency (EPA) requires extensive test data from pesticide producers that demonstrate pesticide products can be used without posing harm to human health and the environment. EPA scientists and analysts carefully review these data to determine whether to register (license) a pesticide product or a use and whether specific restrictions are necessary. This fact sheet is a brief overview of EPA's process for assessing potential risks to human health when evaluating pesticide products.

Background

There are more than 865 active ingredients registered as pesticides, which are formulated into thousands of pesticide products that are available in the marketplace. About 350 pesticides are used on the foods we eat, and to protect our homes and pets.

EPA plays a critical role in evaluating these chemicals prior to registration, and in reevaluating older pesticides already on the market, to ensure that they can be used with a reasonable certainty of no harm. The process EPA uses for evaluating the health impacts of a pesticide is called risk assessment.

EPA uses the National Research Council's four-step process for human health risk assessment:

Step One: Hazard Identification
Step Two: Dose-Response Assessment
Step Three: Exposure Assessment
Step Four: Risk Characterization

Step One: Hazard Identification (Toxicology)

The first step in the risk assessment process is to identify potential health effects that may occur from different types of pesticide exposure. EPA considers the full spectrum of a pesticide's potential health effects.

Generally, for human health risk assessments, many toxicity studies are conducted on animals by pesticide companies in independent laboratories and evaluated for acceptability by EPA scientists. EPA evaluates pesticides for a wide range of adverse effects, from eye and skin irritation to cancer and birth defects in laboratory animals. EPA may also consult the public literature or other sources of supporting information on any aspect of the chemical.

Step Two: Dose-Response Assessment

Paracelsus, the Swiss physician and alchemist, the "father" of modern toxicology (1493-1541) said,

> "The dose makes the poison."

In other words, **the amount of a substance a person is exposed to** is as important as **how toxic the chemical might be**. For example, small doses of aspirin can be beneficial to people, but at very high doses, this common medicine can be deadly. In some individuals, even at very low doses, aspirin may be deadly.

Dose-response assessment involves considering the dose levels at which adverse effects were observed in test animals, and using these dose levels to calculate an equal dose in humans.

Step Three: Exposure Assessment

People can be exposed to pesticides in three ways:

1. Inhaling pesticides (inhalation exposure),
2. Absorbing pesticides through the skin (dermal exposure), and
3. Getting pesticides in their mouth or digestive tract (oral exposure).

Depending on the situation, pesticides could enter the body by any one or all of these routes. Typical sources of pesticide exposure include:

- **Food**
  Most of the foods we eat have been grown with the use of pesticides. Therefore, pesticide residues may be present inside or on the surfaces of these foods.

- **Home and Personal Use Pesticides**
  You might use pesticides in and around your home to control insects, weeds, mold, mildew, bacteria, lawn and garden pests and to protect your pets from pests such as fleas. Pesticides may also be used as insect repellants which are directly applied to the skin or clothing.

- **Pesticides in Drinking Water**
  Some pesticides that are applied to farmland or other land structures can make their way in small amounts to the ground water or surface water systems that feed drinking water supplies.

- **Worker Exposure to Pesticides**
  Pesticide applicators, vegetable and fruit pickers and others who work around pesticides can be exposed due to the nature of their jobs. To address the unique risks workers face from occupational exposure, EPA evaluates occupational exposure through a separate program. All pesticides registered by EPA have been shown to be safe when used properly.

Step Four: Risk Characterization

Risk characterization is the final step in assessing human health risks from pesticides. It is the process of combining the hazard, dose-response and exposure assessments to describe the overall risk from a pesticide. It explains the assumptions used in assessing exposure as well as the uncertainties that are built into the dose-response assessment. The strength of the overall database is considered, and broad

conclusions are made. EPA's role is to evaluate both toxicity and exposure and to determine the risk associated with use of the pesticide.

Simply put,

RISK = TOXICITY x EXPOSURE.

This means that the risk to human health from pesticide exposure depends on both the toxicity of the pesticide and the likelihood of people coming into contact with it. At least *some* exposure and *some* toxicity are required to result in a risk. For example, if the pesticide is very poisonous, but no people are exposed, there is no risk. Likewise, if there is ample exposure but the chemical is non-toxic, there is no risk. However, usually when pesticides are used, there is some toxicity and exposure, which results in a potential risk.

EPA recognizes that effects vary between animals of different species and from person to person. To account for this variability, *uncertainty factors* are built into the risk assessment. These uncertainty factors create an additional margin of safety for protecting people who may be exposed to the pesticides. FQPA requires EPA to use an extra 10-fold safety factor, if necessary, to protect infants and children from effects of the pesticide.

Types of Toxicity Tests EPA Requires for Human Health Risk Assessments

EPA evaluates studies conducted over different periods of time and that measure specific types of effects. These tests are evaluated to screen for potential health effects in infants, children and adults.

Acute Testing: Short-term exposure; a single exposure (dose).

- Oral, dermal (skin), and inhalation exposure
- Eye irritation
- Skin irritation
- Skin sensitization
- Neurotoxicity

Sub-chronic Testing: Intermediate exposure; repeated exposure over a longer period of time (i.e., 30-90 days).

- Oral, dermal (skin), and inhalation
- Neurotoxicity (nerve system damage)

Chronic Toxicity Testing: Long-term exposure; repeated exposure lasting for most of the test animal's life span. Intended to determine the effects of a pesticide after prolonged and repeated exposures.

- Chronic effects (non-cancer)
- Carcinogenicity (cancer)

Developmental and Reproductive Testing: Identify effects in the fetus of an exposed pregnant female (birth defects) and how pesticide exposure affects the ability of a test animal to successfully reproduce.

Mutagenicity Testing: Assess a pesticide's potential to affect the cell's genetic components.

Hormone Disruption: Measure effects for their potential to disrupt the endocrine system. The endocrine system consists of a set of glands and the hormones they produce that help guide the development, growth, reproduction, and behavior of animals including humans.

Risk Management

Once EPA completes the risk assessment process for a pesticide, we use this information to determine if (when used according to label directions), there is a reasonable certainty that the pesticide will not harm a person's health.

Using the conclusions of a risk assessment, EPA can then make a more informed decision regarding whether to approve a pesticide chemical or use, as proposed, or whether additional protective measures are necessary to limit occupational or non-occupational exposure to a pesticide. For example, EPA may prohibit a pesticide from being used on certain crops because consuming too much food treated with the pesticide may result in an unacceptable risk to consumers. Another example of protective measures is requiring workers to wear personal protective equipment (PPE) such as a respirator or chemical resistant gloves, or not allowing workers to enter treated crop fields until a specific period of time has passed.

If, after considering all appropriate risk reduction measures, the pesticide still does not meet EPA's safety standard, the Agency will not allow the proposed chemical or use. Regardless of the specific measures enforced, EPA's primary goal is to ensure that legal uses of the pesticide are protective of human health, especially the health of children, and the environment.

Human Health Risk Assessment and the Law

Federal law requires detailed evaluation of pesticides to protect human health and the environment. In 1996, Congress made significant changes to strengthen pesticide laws through the Food Quality Protection Act (FQPA). Many of these changes are key elements of the current risk assessment process. FQPA required that EPA consider:

- **A New Safety Standard**: FQPA strengthened the safety standard that pesticides must meet before being approved for use. EPA must ensure with a reasonable certainty that no harm will result from the legal uses of the pesticide.
- **Exposure from All Sources**: In evaluating a pesticide, EPA must estimate the combined risk from that pesticide from all non-occupational sources, such as:
    - Food Sources
    - Drinking Water Sources
    - Residential Sources
- **Cumulative Risk**: EPA is required to evaluate pesticides in light of similar toxic effects that different pesticides may share, or "a common mechanism of toxicity." At this time, EPA is developing a methodology for this type of assessment.
- **Special Sensitivity of Children to Pesticides**: EPA must ascertain whether there is an increased susceptibility from exposure to the pesticide to infants and children. EPA must build an additional 10-fold safety factor into risk assessments to ensure the protection of infants and children, unless it is determined that a lesser margin of safety will be safe for infants and children.

For More Information

If you would like more information about EPA's pesticide programs, contact the Communication Service Branch at (703) 305-5017 or visit the Pesticides Web site.

For more information on specific pesticides, or to inquire about the symptoms of pesticide poisoning, call the National Pesticide Information Center (NPIC), a toll-free hotline information at: 1-800-858-7378, or visit their Web site EXIT Disclaimer .

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

CONTENTS

February 2001

ToxFAQs™ for Polychlorinated Biphenyls (PCBs)

(Bifenilos Policlorados (BPCs))

This fact sheet answers the most frequently asked health questions about polychlorinated biphenyls (PCBs). For more information, you may call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Polychlorinated biphenyls (PCBs) are a mixture of individual chemicals which are no longer produced in the United States, but are still found in the environment. Health effects that have been associated with exposure to PCBs include acne-like skin conditions in adults and neurobehavioral and immunological changes in children. PCBs are known to cause cancer in animals. PCBs have been found in at least 500 of the 1,598 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polychlorinated biphenyls (PCBs)?

Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor.

PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors,

Contact Information

RELATED RESOURCES

ToxFAQ™ 35k

ToxFAQ™ en Español 32k

Public Health Statement 125k

Public Health Statement en Español 321k

Toxicological Profile 13.6MB

A-Z INDEX

A B C
D E
F G H I
J K
L M N O P
Q R S
T U
V W X Y Z

ATSDR RESOURCES

ToxFAQs™

ToxFAQs™ en Español

Public Health Statements

Toxicological Profiles

Minimum Risk Levels

MMGs

MHMIs

Interaction Profiles

Priority List of Hazardous Substances

Division of Toxicology

and old microscope and hydraulic oils.

back to top

What happens to polychlorinated biphenyls (PCBs) when they enter the environment?

- PCBs entered the air, water, and soil during their manufacture, use, and disposal; from accidental spills and leaks during their transport; and from leaks or fires in products containing PCBs.
- PCBs can still be released to the environment from hazardous waste sites; illegal or improper disposal of industrial wastes and consumer products; leaks from old electrical transformers containing PCBs; and burning of some wastes in incinerators.
- PCBs do not readily break down in the environment and thus may remain there for very long periods of time. PCBs can travel long distances in the air and be deposited in areas far away from where they were released. In water, a small amount of PCBs may remain dissolved, but most stick to organic particles and bottom sediments. PCBs also bind strongly to soil.
- PCBs are taken up by small organisms and fish in water. They are also taken up by other animals that eat these aquatic animals as food. PCBs accumulate in fish and marine mammals, reaching levels that may be many thousands of times higher than in water.

back to top

How might I be exposed to polychlorinated biphenyls (PCBs)?

- Using old fluorescent lighting fixtures and electrical devices and appliances, such as television sets and refrigerators, that were made 30 or more years ago. These items may leak small amounts of PCBs into the air when they get hot during operation, and could be a source of skin exposure.
- Eating contaminated food. The main dietary sources of PCBs are fish (especially sportfish caught in contaminated lakes or rivers), meat, and dairy products.
- Breathing air near hazardous waste sites and drinking contaminated well water.
- In the workplace during repair and maintenance of PCB transformers; accidents, fires or spills involving transformers, fluorescent lights, and other old electrical devices; and disposal of PCB materials.

back to top

How can polychlorinated biphenyls (PCBs) affect my health?

The most commonly observed health effects in people exposed to large amounts of PCBs are skin conditions such as acne and rashes. Studies in exposed workers have shown changes in blood and urine that may indicate liver damage. PCB exposures in the general population are not likely to result in skin and liver effects. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs.

Animals that ate food containing large amounts of PCBs for short periods of time had mild liver damage and some died. Animals that ate smaller amounts of PCBs in food over several weeks or months developed various kinds of health effects, including anemia; acne-like skin conditions; and liver, stomach, and thyroid gland injuries. Other effects of PCBs in animals include changes in the immune system, behavioral alterations, and impaired reproduction. PCBs are not known to cause birth defects.

back to top

How likely are polychlorinated biphenyls (PCBs) to cause cancer?

Few studies of workers indicate that PCBs were associated with certain kinds of cancer in humans, such as cancer of the liver and biliary tract. Rats that ate food containing high levels of PCBs for two years developed liver cancer. The Department of Health and Human Services (DHHS) has concluded that PCBs may reasonably be anticipated to be carcinogens. The EPA and the International Agency for Research on Cancer (IARC) have determined that PCBs are probably carcinogenic to humans.

back to top

How do polychlorinated biphenyls (PCBs) affect children?

Women who were exposed to relatively high levels of PCBs in the workplace or ate large amounts of fish contaminated with PCBs had babies that weighed slightly less than babies from women who did not have these exposures. Babies born to women who ate PCB-contaminated fish also showed abnormal responses in tests of infant behavior. Some of these behaviors, such as problems with motor skills and a decrease in short-term memory, lasted for several years. Other studies suggest that the immune system was affected in children born to and nursed by mothers exposed to increased levels of PCBs. There are no reports of structural birth defects caused by exposure to PCBs or of health effects of PCBs in older children. The most likely way infants will be exposed to PCBs is from breast milk. Transplacental transfers of PCBs were also reported In most cases, the benefits of breast-feeding outweigh any risks from exposure to PCBs in mother's milk.

back to top

How can families reduce the risk of exposure to polychlorinated biphenyls (PCBs)?

- You and your children may be exposed to PCBs by eating fish or wildlife caught from contaminated locations. Certain states, Native American tribes, and U.S. territories have issued advisories to warn people about PCB-contaminated fish and fish-eating wildlife. You can reduce your family's exposure to PCBs by obeying these advisories.
- Children should be told not play with old appliances, electrical equipment, or transformers, since they may contain PCBs.
- Children should be discouraged from playing in the dirt near hazardous waste sites and in areas where there was a transformer fire. Children should also be discouraged from eating dirt and putting dirty hands, toys or other objects in their mouths, and should wash hands frequently.
- If you are exposed to PCBs in the workplace it is possible to carry them home on your clothes, body, or tools. If this is the case, you should shower and change clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

back to top

Is there a medical test to show whether I've been exposed to polychlorinated biphenyls (PCBs)?

Tests exist to measure levels of PCBs in your blood, body fat, and breast milk, but these are not routinely conducted. Most people normally have low levels of PCBs in their body because nearly everyone has been environmentally exposed to PCBs. The tests can show if your PCB levels are elevated, which would indicate past exposure to above-normal levels of PCBs, but cannot determine when or how long you were exposed or whether you will develop health effects.

back to top

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 0.0005 milligrams of PCBs per liter of drinking water (0.0005 mg/L). Discharges, spills or accidental releases of 1 pound or more of PCBs into the environment must be reported to the EPA. The Food and Drug Administration (FDA) requires that infant foods, eggs, milk and other dairy products, fish and shellfish, poultry and red meat contain no more than 0.2-3 parts of PCBs per million parts (0.2-3 ppm) of food. Many states have established fish and wildlife consumption advisories for PCBs.

back to top

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for polychlorinated biphenyls (PCBs). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

back to top

Where can I get more information?

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

For more information, contact:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road NE, Mailstop F-32
Atlanta, GA 30333
Phone: 1-888-42-ATSDR (1-888-422-8737)
FAX: (770)-488-4178
Email: ATSDRIC@cdc.gov

back to top

ATSDR Department of Health and Human Services
Agency for Toxic Substances & Disease Registry

2007 CERCLA Priority List of Hazardous Substances

2007 RANK	SUBSTANCE NAME	TOTAL POINTS	2005 RANK	CAS #
1	ARSENIC	1672.58	1	007440-38-2
2	LEAD	1534.07	2	007439-92-1
3	MERCURY	1504.69	3	007439-97-6
4	VINYL CHLORIDE	1387.75	4	000075-01-4
5	POLYCHLORINATED BIPHENYLS	1365.78	5	001336-36-3
6	BENZENE	1355.96	6	000071-43-2
7	CADMIUM	1324.22	8	007440-43-9
8	POLYCYCLIC AROMATIC HYDROCARBONS	1316.98	7	130498-29-2
9	BENZO(A)PYRENE	1312.45	9	000050-32-8
10	BENZO(B)FLUORANTHENE	1266.55	10	000205-99-2
11	CHLOROFORM	1223.03	11	000067-66-3
12	DDT, P,P'-	1193.36	12	000050-29-3
13	AROCLOR 1254	1182.63	13	011097-69-1
14	AROCLOR 1260	1177.77	14	011096-82-5
15	DIBENZO(A,H)ANTHRACENE	1165.88	15	000053-70-3
16	TRICHLOROETHYLENE	1154.73	16	000079-01-6
17	DIELDRIN	1150.91	17	000060-57-1
18	CHROMIUM, HEXAVALENT	1149.98	18	018540-29-9
19	PHOSPHORUS, WHITE	1144.77	19	007723-14-0
20	CHLORDANE	1133.21	21	000057-74-9
21	DDE, P,P'-	1132.49	20	000072-55-9
22	HEXACHLOROBUTADIENE	1129.63	22	000087-68-3
23	COAL TAR CREOSOTE	1124.32	23	008001-58-9
24	ALDRIN	1117.22	25	000309-00-2
25	DDD, P,P'-	1114.83	24	000072-54-8
26	BENZIDINE	1114.24	26	000092-87-5
27	AROCLOR 1248	1112.20	27	012672-29-6
28	CYANIDE	1099.48	28	000057-12-5
29	AROCLOR 1242	1093.14	29	053469-21-9
30	AROCLOR	1091.52	62	012767-79-2
31	TOXAPHENE	1086.65	30	008001-35-2
32	HEXACHLOROCYCLOHEXANE, GAMMA-	1081.63	32	000058-89-9
33	TETRACHLOROETHYLENE	1080.43	31	000127-18-4
34	HEPTACHLOR	1072.67	33	000076-44-8
35	1,2-DIBROMOETHANE	1064.06	34	000106-93-4
36	HEXACHLOROCYCLOHEXANE, BETA-	1060.22	37	000319-85-7
37	ACROLEIN	1059.07	36	000107-02-8
38	DISULFOTON	1058.85	35	000298-04-4
39	BENZO(A)ANTHRACENE	1057.96	38	000056-55-3
40	3,3'-DICHLOROBENZIDINE	1051.61	39	000091-94-1

41	ENDRIN	1048.57	41	000072-20-8
42	BERYLLIUM	1046.12	40	007440-41-7
43	HEXACHLOROCYCLOHEXANE, DELTA-	1038.27	42	000319-86-8
44	1,2-DIBROMO-3-CHLOROPROPANE	1035.55	43	000096-12-8
45	PENTACHLOROPHENOL	1028.01	45	000087-86-5
46	HEPTACHLOR EPOXIDE	1027.12	44	001024-57-3
47	CARBON TETRACHLORIDE	1023.32	46	000056-23-5
48	AROCLOR 1221	1018.41	47	011104-28-2
49	COBALT	1015.57	50	007440-48-4
50	DDT, O,P'-	1014.71	49	000789-02-6
51	AROCLOR 1016	1014.33	48	012674-11-2
52	DI-N-BUTYL PHTHALATE	1007.49	52	000084-74-2
53	NICKEL	1005.40	55	007440-02-0
54	ENDOSULFAN	1004.65	54	000115-29-7
55	ENDOSULFAN SULFATE	1003.56	53	001031-07-8
56	DIAZINON	1002.08	57	000333-41-5
57	ENDOSULFAN, ALPHA	1001.30	58	000959-98-8
58	XYLENES, TOTAL	996.07	59	001330-20-7
59	CIS-CHLORDANE	995.08	51	005103-71-9
60	DIBROMOCHLOROPROPANE	994.87	60	067708-83-2
61	METHOXYCHLOR	994.47	61	000072-43-5
62	BENZO(K)FLUORANTHENE	981.26	63	000207-08-9
63	ENDRIN KETONE	978.99	64	053494-70-5
64	TRANS-CHLORDANE	973.99	56	005103-74-2
65	CHROMIUM(VI) OXIDE	969.58	66	001333-82-0
66	METHANE	959.78	67	000074-82-8
67	ENDOSULFAN, BETA	959.19	65	033213-65-9
68	AROCLOR 1232	955.64	68	011141-16-5
69	ENDRIN ALDEHYDE	954.86	69	007421-93-4
70	BENZOFLUORANTHENE	951.48	70	056832-73-6
71	TOLUENE	947.50	71	000108-88-3
72	2-HEXANONE	942.02	72	000591-78-6
73	2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN	938.11	73	001746-01-6
74	ZINC	932.89	74	007440-66-6
75	DIMETHYLARSINIC ACID	922.06	75	000075-60-5
76	DI(2-ETHYLHEXYL)PHTHALATE	919.02	76	000117-81-7
77	CHROMIUM	908.52	77	007440-47-3
78	NAPHTHALENE	896.67	78	000091-20-3
79	1,1-DICHLOROETHENE	891.19	79	000075-35-4
80	METHYLENE CHLORIDE	888.96	81	000075-09-2
81	AROCLOR 1240	888.11	80	071328-89-7
82	2,4,6-TRINITROTOLUENE	883.59	82	000118-96-7
83	BROMODICHLOROETHANE	870.00	83	000683-53-4
84	HYDRAZINE	864.41	85	000302-01-2
85	1,2-DICHLOROETHANE	863.99	84	000107-06-2
86	2,4,6-TRICHLOROPHENOL	863.71	86	000088-06-2
87	2,4-DINITROPHENOL	860.45	87	000051-28-5
88	BIS(2-CHLOROETHYL) ETHER	859.88	88	000111-44-4
89	THIOCYANATE	849.21	89	000302-04-5
90	ASBESTOS	841.54	90	001332-21-4
91	CHLORINE	840.37	92	007782-50-5
92	CYCLOTRIMETHYLENETRINITRAMINE (RDX)	840.28	91	000121-82-4
93	HEXACHLOROBENZENE	838.34	93	000118-74-1

94	2,4-DINITROTOLUENE	837.88	96	000121-14-2
95	RADIUM-226	835.93	94	013982-63-3
96	ETHION	834.03	97	000563-12-2
97	1,1,1-TRICHLOROETHANE	833.81	95	000071-55-6
98	URANIUM	833.41	98	007440-61-1
99	ETHYLBENZENE	832.13	99	000100-41-4
100	RADIUM	828.07	100	007440-14-4
101	THORIUM	825.17	101	007440-29-1
102	4,6-DINITRO-O-CRESOL	822.78	102	000534-52-1
103	1,3,5-TRINITROBENZENE	820.17	103	000099-35-4
104	CHLOROBENZENE	819.69	105	000108-90-7
105	RADON	817.89	104	010043-92-2
106	RADIUM-228	816.76	106	015262-20-1
107	THORIUM-230	814.72	107	014269-63-7
107	URANIUM-235	814.72	107	015117-96-1
109	BARIUM	813.46	109	007440-39-3
110	FLUORANTHENE	812.40	113	000206-44-0
111	URANIUM-234	812.11	110	013966-29-5
112	N-NITROSODI-N-PROPYLAMINE	811.05	111	000621-64-7
113	THORIUM-228	810.36	112	014274-82-9
114	RADON-222	809.78	114	014859-67-7
115	HEXACHLOROCYCLOHEXANE, ALPHA-	809.56	116	000319-84-6
116	1,2,3-TRICHLOROBENZENE	808.41	143	000087-61-6
117	MANGANESE	807.90	115	007439-96-5
118	COAL TARS	807.07	117	008007-45-2
119	CHRYSOTILE ASBESTOS	806.68	119	012001-29-5
119	STRONTIUM-90	806.68	119	010098-97-2
121	PLUTONIUM-239	806.67	118	015117-48-3
122	POLONIUM-210	806.39	122	013981-52-7
123	METHYLMERCURY	806.39	121	022967-92-6
124	PLUTONIUM-238	806.01	123	013981-16-3
125	LEAD-210	805.90	124	014255-04-0
126	PLUTONIUM	805.23	125	007440-07-5
127	CHLORPYRIFOS	804.93	125	002921-88-2
128	COPPER	804.86	133	007440-50-8
129	AMERICIUM-241	804.55	128	086954-36-1
130	RADON-220	804.54	127	022481-48-7
131	AMOSITE ASBESTOS	804.07	129	012172-73-5
132	IODINE-131	803.48	130	010043-66-0
133	HYDROGEN CYANIDE	803.08	132	000074-90-8
134	TRIBUTYLTIN	802.61	131	000688-73-3
135	GUTHION	802.32	134	000086-50-0
136	NEPTUNIUM-237	802.13	135	013994-20-2
137	CHRYSENE	802.10	139	000218-01-9
138	CHLORDECONE	801.64	136	000143-50-0
138	IODINE-129	801.64	136	015046-84-1
138	PLUTONIUM-240	801.64	136	014119-33-6
141	S,S,S-TRIBUTYL PHOSPHOROTRITHIOATE	797.88	140	000078-48-8
142	BROMINE	789.15	142	007726-95-6
143	POLYBROMINATED BIPHENYLS	789.11	141	067774-32-7
144	DICOFOL	787.56	144	000115-32-2
145	PARATHION	784.14	145	000056-38-2
146	1,1,2,2-TETRACHLOROETHANE	782.15	146	000079-34-5

147	SELENIUM	778.98	147	007782-49-2	
148	HEXACHLOROCYCLOHEXANE, TECHNICAL GRADE	774.91	148	000608-73-1	
149	TRICHLOROFLUOROETHANE	770.74	149	027154-33-2	
150	TRIFLURALIN	770.12	150	001582-09-8	
151	DDD, O,P'-	768.73	151	000053-19-0	
152	4,4'-METHYLENEBIS(2-CHLOROANILINE)	766.66	152	000101-14-4	
153	HEXACHLORODIBENZO-P-DIOXIN	760.42	153	034465-46-8	
154	HEPTACHLORODIBENZO-P-DIOXIN	754.47	154	037871-00-4	
155	PENTACHLOROBENZENE	753.58	155	000608-93-5	
156	1,3-BUTADIENE	747.31	201	000106-99-0	
157	AMMONIA	745.55	156	007664-41-7	
158	2-METHYLNAPHTHALENE	743.24	157	000091-57-6	
159	1,4-DICHLOROBENZENE	737.32	159	000106-46-7	
160	1,1-DICHLOROETHANE	736.23	158	000075-34-3	
161	ACENAPHTHENE	731.25	160	000083-32-9	
162	1,2,3,4,6,7,8,9-OCTACHLORODIBENZOFURAN	726.14	161	039001-02-0	
163	1,1,2-TRICHLOROETHANE	724.96	162	000079-00-5	
164	TRICHLOROETHANE	723.32	163	025323-89-1	
165	HEXACHLOROCYCLOPENTADIENE	719.01	164	000077-47-4	
166	HEPTACHLORODIBENZOFURAN	718.58	165	038998-75-3	
167	1,2-DIPHENYLHYDRAZINE	713.90	166	000122-66-7	
168	2,3,4,7,8-PENTACHLORODIBENZOFURAN	710.71	167	057117-31-4	
169	TETRACHLOROBIPHENYL	709.21	168	026914-33-0	
170	CRESOL, PARA-	707.83	169	000106-44-5	
171	OXYCHLORDANE	706.32	170	027304-13-8	
172	1,2-DICHLOROBENZENE	704.91	171	000095-50-1	
173	1,2-DICHLOROETHENE, TRANS-	704.04	178	000156-60-5	
174	INDENO(1,2,3-CD)PYRENE	703.30	180	000193-39-5	
175	GAMMA-CHLORDENE	702.59	172	056641-38-4	
176	CARBON DISULFIDE	702.55	174	000075-15-0	
177	TETRACHLOROPHENOL	702.54	173	025167-83-3	
178	AMERICIUM	701.62	175	007440-35-9	
178	URANIUM-233	701.62	175	013968-55-3	
180	PALLADIUM	700.66	177	007440-05-3	
181	HEXACHLORODIBENZOFURAN	700.56	179	055684-94-1	
182	PHENOL	696.96	183	000108-95-2	
183	CHLOROETHANE	693.90	182	000075-00-3	
184	ACETONE	693.31	181	000067-64-1	
185	P-XYLENE	690.20	185	000106-42-3	
186	DIBENZOFURAN	689.19	187	000132-64-9	
187	ALUMINUM	688.13	186	007429-90-5	
188	2,4-DIMETHYLPHENOL	685.76	189	000105-67-9	
189	CARBON MONOXIDE	684.49	188	000630-08-0	
190	TETRACHLOROETHANE	677.97	190	025322-20-7	
191	HYDROGEN SULFIDE	676.51	193	007783-06-4	
192	PENTACHLORODIBENZOFURAN	673.21	192	030402-15-4	
193	CHLOROMETHANE	670.19	191	000074-87-3	
194	BIS(2-METHOXYETHYL) PHTHALATE	666.08	194	034006-76-3	
195	BUTYL BENZYL PHTHALATE	659.38	195	000085-68-7	
196	CRESOL, ORTHO-	658.66	196	000095-48-7	
197	HEXACHLOROETHANE	653.10	199	000067-72-1	
198	VANADIUM	651.70	198	007440-62-2	

199	N-NITROSODIMETHYLAMINE	650.71	200	000062-75-9
200	1,2,4-TRICHLOROBENZENE	647.30	203	000120-82-1
201	BROMOFORM	643.53	202	000075-25-2
202	TETRACHLORODIBENZO-P-DIOXIN	635.74	204	041903-57-5
203	1,3-DICHLOROBENZENE	631.41	205	000541-73-1
204	PENTACHLORODIBENZO-P-DIOXIN	625.12	207	036088-22-9
205	N-NITROSODIPHENYLAMINE	624.79	208	000086-30-6
206	1,2-DICHLOROETHYLENE	622.49	206	000540-59-0
207	2,3,7,8-TETRACHLORODIBENZOFURAN	622.15	210	051207-31-9
208	2-BUTANONE	620.01	209	000078-93-3
209	2,4-DICHLOROPHENOL	616.45	212	000120-83-2
210	1,4-DIOXANE	616.29	215	000123-91-1
211	FLUORINE	613.28	214	007782-41-4
212	NITRITE	612.64	216	014797-65-0
213	CESIUM-137	612.50	217	010045-97-3
214	SILVER	612.19	213	007440-22-4
215	CHROMIUM TRIOXIDE	610.85	218	007738-94-5
216	NITRATE	610.66	219	014797-55-8
217	POTASSIUM-40	608.91	220	013966-00-2
218	DINITROTOLUENE	607.65	221	025321-14-6
219	ANTIMONY	605.37	222	007440-36-0
220	COAL TAR PITCH	605.33	224	065996-93-2
221	THORIUM-227	605.32	223	015623-47-9
222	2,4,5-TRICHLOROPHENOL	604.83	225	000095-95-4
223	ARSENIC ACID	604.45	226	007778-39-4
224	ARSENIC TRIOXIDE	604.36	227	001327-53-3
225	PHORATE	603.10	228	000298-02-2
226	BENZOPYRENE	603.00	230	073467-76-2
227	CRESOLS	602.74	229	001319-77-3
228	CHLORDANE, TECHNICAL	602.62	231	012789-03-6
229	DIMETHOATE	602.61	232	000060-51-5
230	ACTINIUM-227	602.57	233	014952-40-0
230	STROBANE	602.57	233	008001-50-1
232	4-AMINOBIPHENYL	602.51	235	000092-67-1
232	PYRETHRUM	602.51	235	008003-34-7
234	ARSINE	602.42	237	007784-42-1
235	NALED	602.32	238	000300-76-5
236	DIBENZOFURANS, CHLORINATED	602.13	239	042934-53-2
236	ETHOPROP	602.13	239	013194-48-4
238	ALPHA-CHLORDENE	601.94	241	056534-02-2
238	CARBOPHENOTHION	601.94	241	000786-19-6
240	DICHLORVOS	601.64	243	000062-73-7
241	CALCIUM ARSENATE	601.45	244	007778-44-1
241	MERCURIC CHLORIDE	601.45	244	007487-94-7
241	SODIUM ARSENITE	601.45	244	007784-46-5
244	FORMALDEHYDE	599.64	247	000050-00-0
245	2-CHLOROPHENOL	599.62	248	000095-57-8
246	PHENANTHRENE	597.68	249	000085-01-8
247	HYDROGEN FLUORIDE	588.03	250	007664-39-3
248	2,4-D ACID	584.47	251	000094-75-7
249	DIBROMOCHLOROMETHANE	580.59	252	000124-48-1
250	DIURON	579.16	253	000330-54-1
251	BUTYLATE	578.43	254	002008-41-5

252	DIMETHYL FORMAMIDE	578.23	255	000068-12-2
253	PYRENE	577.95	256	000129-00-0
254	DICHLOROBENZENE	577.70	211	025321-22-6
255	ETHYL ETHER	572.47	257	000060-29-7
256	DICHLOROETHANE	570.46	258	001300-21-6
257	4-NITROPHENOL	567.79	259	000100-02-7
258	1,3-DICHLOROPROPENE, CIS-	561.82	184	010061-01-5
259	PHOSPHINE	559.74	260	007803-51-2
260	TRICHLOROBENZENE	557.96	261	012002-48-1
261	2,6-DINITROTOLUENE	555.20	262	000606-20-2
262	FLUORIDE ION	549.64	263	016984-48-8
263	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	547.90	264	035822-46-9
264	METHYL PARATHION	545.83	265	000298-00-0
265	PENTAERYTHRITOL TETRANITRATE	545.59	266	000078-11-5
266	1,3-DICHLOROPROPENE, TRANS-	543.37	267	010061-02-6
267	BIS(2-ETHYLHEXYL)ADIPATE	540.20	268	000103-23-1
268	CARBAZOLE	534.52	269	000086-74-8
269	METHYL ISOBUTYL KETONE	533.24	271	000108-10-1
270	1,2-DICHLOROETHENE, CIS-	533.15	270	000156-59-2
271	STYRENE	532.70	272	000100-42-5
272	CARBARYL	530.98	273	000063-25-2
273	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	529.45	274	067562-39-4
274	ACRYLONITRILE	528.28	275	000107-13-1
275	1-METHYLNAPHTHALENE	526.51	NEW	

Substances were assigned the same rank when two (or more) substances received equivalent total point scores.

CAS #= Chemical Abstracts Service Registry Number

This page was updated on 01/10/2008

Health	3
Fire	3
Reactivity	2
Personal Protection	J

Material Safety Data Sheet
Calcium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Calcium

Catalog Codes: SLC2782

CAS#: 7440-70-2

RTECS: EV8040000

TSCA: TSCA 8(b) inventory: Calcium

CI#: Not available.

Synonym:

Chemical Formula: Ca

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

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1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Calcium	7440-70-2	100

Toxicological Data on Ingredients: Calcium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Corrosive to eyes and skin. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to lungs, mucous membranes.
Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical got on the victim's exposed skin, such as the hands : Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Corrosive solid. Flammable solid that, in contact with water, emits flammable gases.
Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:
Keep under inert atmosphere. Keep container dry. Do not breathe dust. Never add water to this product Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes Keep away from incompatibles such as acids, moisture.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 40.08 g/mole

Color: Not available.

pH (1% soln/water): Not available.

Boiling Point: 1484°C (2703.2°F)

Melting Point: 839°C (1542.2°F)

Critical Temperature: Not available.

Specific Gravity: 1.54 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Not available.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances:
Highly reactive with acids.
Reactive with moisture.
The product reacts violently with water to emit flammable but non toxic gases.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available.
LC50: Not available.

Chronic Effects on Humans: The substance is toxic to lungs, mucous membranes.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 4.3: Material that emits flammable gases on contact with water.

Identification: : Calcium : UN1401 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Calcium
Massachusetts RTK: Calcium
TSCA 8(b) inventory: Calcium

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS B-6: Reactive and very flammable material.
CLASS E: Corrosive solid.

DSCL (EEC): R36/38- Irritating to eyes and skin.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 3

Reactivity: 2

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 3

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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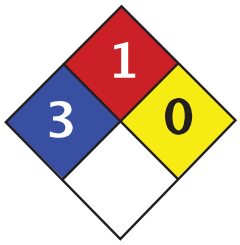
Last Updated: 11/06/2008 12:00 PM



Health	3
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Cadmium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Cadmium

Catalog Codes: SLC3484, SLC5272, SLC2482

CAS#: 7440-43-9

RTECS: EU9800000

TSCA: TSCA 8(b) inventory: Cadmium

CI#: Not applicable.

Synonym:

Chemical Name: Cadmium

Chemical Formula: Cd

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Cadmium	7440-43-9	100

Toxicological Data on Ingredients: Cadmium: ORAL (LD50): Acute: 2330 mg/kg [Rat.]. 890 mg/kg [Mouse]. DUST (LC50): Acute: 50 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant). Severe over-exposure can result in death.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to kidneys, lungs, liver.
Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact: No known effect on eye contact, rinse with water for a few minutes.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 570°C (1058°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Non-flammable in presence of open flames and sparks, of heat, of oxidizing materials, of reducing materials, of combustible materials, of moisture.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Highly toxic or infectious materials should be stored in a separate locked safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.01 (ppm)
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 112.4 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: 765°C (1409°F)

Melting Point: 320.9°C (609.6°F)

Critical Temperature: Not available.

Specific Gravity: 8.64 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity: Reacts violently with potassium.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.
Acute oral toxicity (LD50): 890 mg/kg [Mouse].
Acute toxicity of the dust (LC50): 229.9 mg/m3 4 hour(s) [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP.
The substance is toxic to kidneys, lungs, liver.

Other Toxic Effects on Humans:
Hazardous in case of ingestion, of inhalation.
Slightly hazardous in case of skin contact (irritant, sensitizer).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: An allergen. 0047 Animal: embryotoxic, passes through the placental barrier.

Special Remarks on other Toxic Effects on Humans: May cause allergic reactions, exzema and/or dehydration of the skin.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification:

Identification:

Special Provisions for Transport:

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Cadmium
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Cadmium
Pennsylvania RTK: Cadmium
Massachusetts RTK: Cadmium
TSCA 8(b) inventory: Cadmium
SARA 313 toxic chemical notification and release reporting: Cadmium
CERCLA: Hazardous substances.: Cadmium

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R26- Very toxic by inhalation.
R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Safety glasses.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.
-Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec.
-Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec.
-SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984.
-The Sigma-Aldrich Library of Chemical Safety Data, Edition II.
-Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

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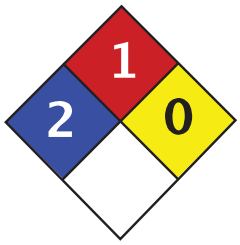
Last Updated: 11/06/2008 12:00 PM



Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Copper MSDS

Section 1: Chemical Product and Company Identification

Product Name: Copper

Catalog Codes: SLC4939, SLC2152, SLC3943, SLC1150, SLC2941, SLC4729, SLC1936, SLC3727, SLC5515

CAS#: 7440-50-8

RTECS: GL5325000

TSCA: TSCA 8(b) inventory: Copper

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: Cu

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

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International Sales: **1-281-441-4400**

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CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Copper	7440-50-8	100

Toxicological Data on Ingredients: Copper LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion. Hazardous in case of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (irritant).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to lungs, mucous membranes.
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation: Not available.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not breathe dust. Avoid contact with eyes Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If you feel unwell, seek medical attention and show the label when possible.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 (mg/m3) from ACGIH [1990]
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 63.54 g/mole

Color: Not available.

pH (1% soln/water): Not applicable.

Boiling Point: 2595°C (4703°F)

Melting Point: 1083°C (1981.4°F)

Critical Temperature: Not available.

Specific Gravity: 8.94 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available.
LC50: Not available.

Chronic Effects on Humans: The substance is toxic to lungs, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion.
Hazardous in case of inhalation.
Slightly hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Human: passes through the placenta, excreted in maternal milk.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Copper
Massachusetts RTK: Copper
TSCA 8(b) inventory: Copper
CERCLA: Hazardous substances.: Copper

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC): R36- Irritating to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator

when ventilation is inadequate.
Splash goggles.

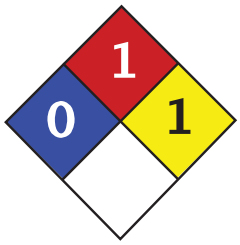
Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 04:58 PM

Last Updated: 11/06/2008 12:00 PM



Health	1
Fire	3
Reactivity	2
Personal Protection	E

Material Safety Data Sheet
Magnesium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Magnesium

Catalog Codes: SLM4408, SLM2263, SLM3637

CAS#: 7439-95-4

RTECS: OM2100000

TSCA: TSCA 8(b) inventory: Magnesium

CI#: Not applicable.

Synonym: Magnesium ribbons, turnings or sticks

Chemical Name: Magnesium

Chemical Formula: Mg

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Magnesium	7439-95-4	100

Toxicological Data on Ingredients: Magnesium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at

least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Highly flammable in presence of open flames and sparks, of heat.
Flammable in presence of acids, of moisture.
Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.
Explosive in presence of acids, of moisture.

Fire Fighting Media and Instructions:
Flammable solid.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:
Magnesium turnings, chips or granules, ribbons, are flammable. They can be easily ignited. They may reignite after fire is extinguished. Produces flammable gases on contact with water and acid. May ignite on contact with water or moist air.
Magnesium fires do not flare up violently unless moisture is present.

Special Remarks on Explosion Hazards: Reacts with acids and water to form hydrogen gas with is highly flammable and eplosive

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Flammable solid.
Stop leak if without risk. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe dust. Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage:
Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Moisture sensitive. Dangerous when wet.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 24.31 g/mole

Color: Silver-white

pH (1% soln/water): Not applicable.

Boiling Point: 1100°C (2012°F)

Melting Point: 651°C (1203.8°F)

Critical Temperature: Not available.

Specific Gravity: 1.74 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Very slightly soluble in hot water.
Insoluble in cold water.
Insoluble in chromium trioxides, and mineral acids, alkalies.
Slightly soluble with decomposition in hot water.
Soluble in concentrated hydrogen fluoride, and ammonium salts.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, incompatible materials, water or moisture, moist air.

Incompatibility with various substances: Reactive with oxidizing agents, acids, moisture.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Violent chemical reaction with oxidizing agents.
Reacts with water to create hydrogen gas and heat. Must be kept dry.
Reacts with acids to form hydrogen gas which is highly flammable and explosive.
Magnesium forms hazardous or explosive mixtures with aluminum and potassium perchlorate; ammonium nitrate; barium nitrate, barium dioxide and zinc; beryllium oxide; boron phosphodiiodide; bromobenzyl trifluoride; cadmium cyanide; cadmium oxide; calcium carbide; carbonates; carbon tetrachloride; chlorine; chlorine trifluoride; chloroform; cobalt cyanide; copper cyanide; copper sulfate(anhydrous), ammonium nitrate, potassium chlorate and water; cupric oxide; cupric sulfate; fluorine; gold cyanide; hydrogen and calcium carbonate; hydrogen iodide; hydrogen peroxide; iodine; lead cyanide; mercuric oxide; mercury cyanide; methyl chloride; molybdenum trioxide; nickel cyanide; nitric acid; nitrogen dioxide; oxygen (liquid); performic acid; phosphates; potassium chlorate; potassium perchlorate; silver nitrate; silver oxide; sodium perchlorate; sodium peroxide; sodium peroxide and carbon dioxide; stannic oxide; sulfates; trichloroethylene; zinc cyanide; zinc oxide.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available.
LC50: Not available.

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: May cause skin irritation by mechanical action. May get mechanical injury or embedding of chips/particles in skin. The particles that are embedded in the wounds may retard healing.
Eyes: May cause eye irritation by mechanical action. Mechanical injury may occur. Particles or chips may embed in eye and retard healing.
Inhalation: Low hazard for ususal industrial handling. It may cause respiratory tract irritation. However, it is unlikely due to physical form. When Magnesium metal is heated during welding or smelting process, Metal Fume Fever may result from inhalation of magnesium fumes. Metal Fume Fever is a flu-like condition consisting of fever, chills, sweating, aches, pains, cough, weakness, headache, nausea, vomiting, and breathing difficulty. Other symptoms may include metallic taste, increased white blood cell count. There is no permanent ill-effect.
Ingestion: Low hazard for usual industrial handling. There are no known reports of serious industrial poisonings with Magnesium. Ingeston of large amounts of chips, turnings or ribbons may cause gastrointestinal tract irritation with nausea, vomiting, and diarrhea. Acute ingestion may also result in Hypermagnesia. Hypermagnesia may cause hypotension, bradycardia, CNS depression, respiratory depression, and impairment of neuromuscular transmission (hyporeflexia, paralysis).

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 4.1: Flammable solid.

Identification: : Magnesium UNNA: 1869 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Magnesium
Rhode Island RTK hazardous substances: Magnesium
Pennsylvania RTK: Magnesium

Massachusetts RTK: Magnesium
Massachusetts spill list: Magnesium
New Jersey: Magnesium
TSCA 8(b) inventory: Magnesium

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-4: Flammable solid.
CLASS B-6: Reactive and very flammable material.

DSCL (EEC):
R11- Highly flammable.
R15- Contact with water liberates extremely flammable gases.
S7/8- Keep container tightly closed and dry.
S43- In case of fire, use dry chemical. Never use water.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 3

Reactivity: 2

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 0

Flammability: 1

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Last Updated: 11/06/2008 12:00 PM

Health	2
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Nickel metal MSDS

Section 1: Chemical Product and Company Identification

Product Name: Nickel metal

Catalog Codes: SLN2296, SLN1342, SLN1954

CAS#: 7440-02-0

RTECS: QR5950000

TSCA: TSCA 8(b) inventory: Nickel metal

CI#: Not applicable.

Synonym: Nickel Metal shot; Nickel metal foil.

Chemical Name: Nickel

Chemical Formula: Ni

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Nickel metal	7440-02-0	100

Toxicological Data on Ingredients: Nickel metal LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant), of ingestion.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer), of ingestion, of inhalation (lung sensitizer).
CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to skin.
The substance may be toxic to kidneys, lungs, liver, upper respiratory tract.
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Material in powder form, capable of creating a dust explosion. This material is flammable in powder form only.

Special Remarks on Explosion Hazards:
Material in powder form, capable of creating a dust explosion.
Mixtures containing Potassium Perchlorate with Nickel & Titanium powders & infusorial earth can explode.
Adding 2 or 3 drops of approximately 90% peroxyformic acid to powdered nickel will result in explosion.
Powdered nickel reacts explosively upon contact with fused ammonium nitrate at temperatures below 200 deg. C.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Keep away from incompatibles such as oxidizing agents, combustible materials, metals, acids.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 (mg/m3) from ACGIH (TLV) [United States] Inhalation Respirable.
TWA: 0.5 (mg/m3) [United Kingdom (UK)]
TWA: 1 (mg/m3) from OSHA (PEL) [United States] InhalationConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid. Lustrous solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 58.71 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: 2730°C (4946°F)

Melting Point: 1455°C (2651°F)

Critical Temperature: Not available.

Specific Gravity: Density: 8.908 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Insoluble in cold water, hot water.
Insoluble in Ammonia.
Soluble in dilute Nitric Acid.
Slightly soluble in Hydrochloric Acid, Sulfuric Acid.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, combustible materials, metals, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with strong acids, selenium, sulfur, wood and other combustibles, nickel nitrate, aluminum, aluminum trichloride, ethylene, p-dioxan, hydrogen, methanol, non-metals, oxidants, sulfur compounds, aniline, hydrogen sulfide, flammable solvents, hydrazine, and metal powders (especially zinc, aluminum, and magnesium), ammonium nitrate, nitryl fluoride, bromine pentafluoride, potassium perchlorate + titanium powder + indusorial earth.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available.
LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP.
Causes damage to the following organs: skin.
May cause damage to the following organs: kidneys, lungs, liver, upper respiratory tract.

Other Toxic Effects on Humans:

Hazardous in case of inhalation.
Slightly hazardous in case of skin contact (irritant, sensitizer), of ingestion.

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose/Conc:
LDL [Rat] - Route: Oral; Dose: 5000 mg/kg
LDL [Guinea Pig] - Route: Oral; Dose: 5000 mg/kg

Special Remarks on Chronic Effects on Humans: May cause cancer based on animal test data

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: Nickel dust and fume can irritate skin.
Eyes: Nickel dust and fume can irritate eyes.
Inhalation: Inhalation of dust or fume may cause respiratory tract irritation with non-productive cough, hoarseness, sore throat, headache, vertigo, weakness, chest pain, followed by delayed effects, including tachypnea, dyspnea, and ARDS. Death due to ARDS has been reported following inhalation of high concentrations of respirable metallic nickel dust. Later effects may include pulmonary edema and fibrosis.
Ingestion: Metallic nickel is generally considered not to be acutely toxic if ingested. Ingestion may cause nausea, vomiting, abdominal , and diarrhea. Nickel may damage the kidneys(proteinuria), and may affect liver function. It may also affect behavior (somnolence), and cardiovascular system (increased cornary artery resistance, decreased myocardial contractility, myocardial damage, regional or general arteriolar or venus dilation).
Chronic Potential Health Effects:
Skin: May cause skin allergy. Nickel and nickel compounds are among the most common sensitizers inducing allergic contact dermatitis.
Inhalation: Chronic inhalation nickel dust or fume can cause chronic hypertrophic rhinitis, sinusitis, nasal polyps, perforation of the nasal septum, chronic pulmonary irritation, fibrosis, pulmonary edema, pulmonary eosinophilia, Pneumoconiosis, allergies (asthma-like allergy), and cancer of the nasal sinus cavities, lungs, and possibly other organs. Future exposures can cause asthma attacks with shortness of breath, wheezing, cough, and/or chest tightness. Chronic inhalation of nickel dust or fume may also affect the liver (impaired liver function tests), and blood (changes in red blood cell count).
Ingestion: Prolonged or repeated ingestion of nickel can be a source chronic urticaria and other signs of allergy. Chronic ingestion of NIckel may also affect respiration and cause pneumoconiosis or fibrosis.
Note: In the general population, sensitization occurs from exposure to nickel-containing coins, jewelry, watches,

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Nickel metal
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Nickel metal
Connecticut hazardous material survey.: Nickel metal
Illinois toxic substances disclosure to employee act: Nickel metal
Illinois chemical safety act: Nickel metal
New York release reporting list: Nickel metal
Rhode Island RTK hazardous substances: Nickel metal
Pennsylvania RTK: Nickel metal
Michigan critical material: Nickel metal
Massachusetts RTK: Nickel metal
Massachusetts spill list: Nickel metal
New Jersey: Nickel metal
New Jersey spill list: Nickel metal
Louisiana spill reporting: Nickel metal
California Director's List of Hazardous Substances: Nickel metal
TSCA 8(b) inventory: Nickel metal

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R40- Possible risks of irreversible effects.
R43- May cause sensitization by skin contact.
S22- Do not breathe dust.
S36- Wear suitable protective clothing.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Last Updated: 11/06/2008 12:00 PM

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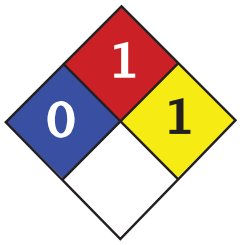

Health	1
Fire	1
Reactivity	1
Personal Protection	E

Material Safety Data Sheet
Zinc Metal MSDS

Section 1: Chemical Product and Company Identification

Product Name: Zinc Metal

Catalog Codes: SLZ1054, SLZ1159, SLZ1267, SLZ1099, SLZ1204

CAS#: 7440-66-6

RTECS: ZG8600000

TSCA: TSCA 8(b) inventory: Zinc Metal

CI#: Not applicable.

Synonym: Zinc Metal Sheets; Zinc Metal Shot; Zinc Metal Strips

Chemical Name: Zinc Metal

Chemical Formula: Zn

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Zinc Metal	7440-66-6	100

Toxicological Data on Ingredients: Zinc Metal LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 480°C (896°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of open flames and sparks, of heat, of oxidizing materials, of acids, of alkalis, of moisture.
Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:
Zinc + NaOH causes ignition.
Oxidation of zinc by potassium proceeds with incandescence.
Residues from zinc dust /acetic acid reduction operations may ignite after long delay if discarded into waste bins with paper.
Incandescent reaction when Zinc and Arsenic or Tellurium, or Selenium are combined.
When hydrazine mononitrate is heated in contact with zinc, a flamming decomposition occurs at temperatures a little above its melting point.
Contact with acids and alkali hydroxides (sodium hydroxide, postasium hydroxide, calcium hydroxide, etc.) results in evolution of hydrogen with sufficient heat of reaction to ignite the hydrogen gas.
Zinc foil ignites if traces of moisture are present.
It is water reactive and produces flammable gases on contact with water. It may ignite on contact with water or

moist air.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Flammable solid that, in contact with water, emits flammable gases.
Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe dust. Keep away from incompatibles such as oxidizing agents, acids, alkalis, moisture.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Keep from any possible contact with water. Do not allow water to get into container because of violent reaction.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid. Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 65.39 g/mole

Color: Bluish-grey

pH (1% soln/water): Not applicable.

Boiling Point: 907°C (1664.6°F)

Melting Point: 419°C (786.2°F)

Critical Temperature: Not available.

Specific Gravity: Not available.

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol, acetone.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials, moisture

Incompatibility with various substances:
Reactive with oxidizing agents, acids, alkalis.
Slightly reactive to reactive with moisture.
The product may react violently with water to emit flammable but non toxic gases.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with acids, halogenated hydrocarbons, NH_4NO_3, barium oxide, $Ba(NO_3)_2$, Cadmium, CS_2, chlorates, Cl_2, CrO_3, F_2, Hydroxylamine, $Pb(N_3)_2$, $MnCl_2$, HNO_3, performic acid, $KClO_3$, KNO_3, N_2O_2, Selenium, $NaClO_3$, Na_2O_2, Sulfur, Te, water, $(NH_4)_2S$, As_2O_3, CS_2, $CaCl_2$, chlorinated rubber, catalytic metals, halocarbons, o-nitroanisole, nitrobenzene, nonmetals, oxidants, paint primer base, pentacarbonoyliron, transition metal halides, seleninyl bromide, HCl, H_2SO_4, (Mg +$Ba(NO_3)_2$ +BaO_2), (ethyl acetoacetate +tribromoneopentyl alcohol.
Contact with Alkali Hydroxides(Sodium Hydroxide, Potassium Hydroxide, Calcium Hydroxide, etc) results in evolution of hydrogen.
Ammonium nitrate + zinc + water causes a violent reaction with evolution of steam and zinc oxide.
May react with water.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:

LD50: Not available.
LC50: Not available.

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: May cause skin irritation. Dermal exposure to zinc may produce leg pains, fatigue, anorexia and weight loss.
Eyes: May cause eye irritation.
Ingestion: May be harmul if swallowed. May cause digestive tract irritation with tightness in throat, nausea, vomiting, diarrhea, loss of appetite, malaise, abdominal pain. fever, and chills. May affect behavior/central nervous system and autonomic nervous system with ataxia, lethargy, staggering gait, mild derrangement in cerebellar function, lightheadness, dizzness, irritability, muscular stiffness, and pain. May also affect blood.
Inhalation: Inhalation of zinc dust or fumes may cause respiratory tract and mucous membrane irritation with cough and chest pain. It can also cause "metal fume fever", a flu-like condition characterized appearance of chills, headached fever, maliase, fatigue, sweating, extreme thirst, aches in the legs and chest, and difficulty in breathing. A sweet taste may also be be present in metal fume fever, as well as a dry throat, aches, nausea, and vomiting, and pale grey cyanosis.
The toxicological properties of this substance have not been fully investisgated.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: Not available.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:

New York release reporting list: Zinc Metal
Rhode Island RTK hazardous substances: Zinc Metal
Pennsylvania RTK: Zinc Metal
Florida: Zinc Metal
Michigan critical material: Zinc Metal
Massachusetts RTK: Zinc Metal
New Jersey: Zinc Metal
California Director's List of Hazardous Substances: Zinc Metal
TSCA 8(b) inventory: Zinc Metal
TSCA 12(b) one time export: Zinc Metal
SARA 313 toxic chemical notification and release reporting: Zinc Metal
CERCLA: Hazardous substances.: Zinc Metal: 1000 lbs. (453.6 kg)

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not Available

DSCL (EEC):
R15- Contact with water liberates
extremely flammable gases.
R17- Spontaneously flammable in air.
S7/8- Keep container tightly closed and dry.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 1

Reactivity: 1

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 0

Flammability: 1

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an
approved/certified respirator or
equivalent.
Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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ATSDR Department of Health and Human Services Agency for Toxic Substances & Disease Registry

ToxFAQs™: Chemical Agent Briefing Sheets (CABS)

Lead

January 2006

PDF Version

What is lead?

Lead is a heavy, bluish-gray metal that has a low melting point. It occurs naturally in the Earth' s crust, but it is not a particularly abundant element. It is rarely found naturally as a metal, but rather in its divalent (2+) oxidative state in ore deposits widely distributed throughout the world. The most im portant lead containing ores are galena (PbS), anglesite ($PbSO_4$), and cerussite ($PbCO_3$). Natural lead is a mixture of four stable isotopes: ^{208}Pb (51%–53%), ^{206}Pb (23.5%–27%), ^{207}Pb (20.5%–23%), and ^{204}Pb (1.35%–1.5%).

What are the forms of lead?

- Metallic lead
- Inorganic lead and lead compounds (or lead salts)
- Organic lead (containing carbon)

What are the common uses of lead?

The largest use for lead is in storage batteries in cars and other vehicles. Lead may be used as a pure metal, alloyed with other metals, or as chemical compounds.

Lead used by industry comes from mined ores ("primary") or from recycled scrap metal or batteries ("secondary"). However, most lead today is obtained from recovery of recycled scrap, mostly lead-a cid batteries.

Human activities, such as lead mining and smelting operations and manufacturing and use of lead products (*e.g.*, leaded gasoline, lead-based paint), have resulted in the contamination of many industrial and residential areas with lead.

Form	Uses
Metallic lead	Certain uses of lead, such as leaded gasoline, lead-based paints for domestic use, lead-based solder in food cans and water pipes, lead sinkers, and ammunition, have been reduced or banned to minimize lead's harmful effects on people and animals.
Lead and lead compounds (or lead salts), such as • **lead acetate** • **lead chloride** • **lead nitrate** • **lead oxide** • **lead phosphate** • **lead acetate**	• **Cosmetics and hair dye** - Some hair dyes and some non-Western cosmetics, such as kohl and surma, contain lead. • **Fishing equipment** - Most fishing weights and sinkers are made from lead. • **Folk remedies** - Many non-Western folk remedies used to treat diarrhea or other ailments may contain substantial amounts of lead. Examples of these include alarcon, ghasard, alkohl, greta, azarcon,

• **lead sulfate** • **lead sulfide**	liga, bali goli, pay-loo-ah, coral, and rueda. • **Glazing** - Applied to some ceramicware can contain lead. • **Lead based paint** - Although the sale of residential lead-based paint was banned in the United States in 1978, it remains a major source of lead exposure for young children residing in older houses. • **Lead batteries** - Production of lead-acid batteries is the major use of lead. • **Lead-based solder** - Has been banned for use in water distribution systems, but many buildings and homes contain lead pipes or lead-based solder. Lead-based solder also is used for electrical circuitry applications. • **Lead-shot** and **ammunition** - It is the second highest production use of lead. • Other uses of lead include the production of lead alloys, soldering materials, shielding for x-ray machines, and manufacturing of corrosion- and acid-resistant materials used in the building industry.
Organic • **tetraethyl lead** • **tetramethyl lead**	The use of lead in gasoline was phased out in the 1980s, and has been banned since January 1, 1996. The use of lead in gasoline has contributed to its dispersion throughout the environment. During the combustion of gasoline containing these alkyllead compounds, significant amounts of inorganic lead can be released to the surrounding areas. **Current Uses** • Gasoline for off-road vehicles, farm equipment, and airplanes **Past Uses** • Gasoline additives (to increase octane rating)

What are the routes of exposure for lead?

People are most likely to be exposed to lead by consuming contaminated food and drinking water. Exposure can also occur by inadvertently ingesting contaminated soil, dust, or lead-based paint.

Form	Routes of Exposure
Metallic lead **Lead and lead compounds (or lead salts), such as** • **lead acetate** • **lead chloride** • **lead nitrate** • **lead oxide** • **lead phosphate** • **lead subacetate** • **lead sulfate** • **lead sulfide**	• Ingestion is the primary source of exposure to the general population. • Lead paint is a major source of environmental exposure for children who ingest flaking paint, paint chips, and weathered powdered paint (mostly from deteriorated housing units in urban areas). Lead paint can also contribute to soil/dust lead which can be inadvertently ingested via hand-to-mouth activity of young children. • Lead can leach into drinking water from lead-based solder used in water pipes. • Lead can leach into foods or liquids stored in ceramic containers made with lead glazing. • Engaging in hobbies such as casting ammunition, making fishing weights, and stained glass can result in exposure to lead. • Exposure by inhalation can result during activities such as soldering with lead solder or sanding or sandblasting lead-based paint.
Organic • **tetraethyl lead** • **tetramethyl lead**	• Inhalation • Dermal studies in animals have shown that organic lead is well absorbed through the skin

Who are the populations most at risk and how are they usually exposed?

People living near hazardous waste sites, lead smelters or refineries, battery recycling or crushi ng centers, or other industrial lead sources may be exposed to lead and chemicals that contain lead. Workers in occupations that have sources of lead exposure (*e.g.*, plumbers, miners, mechanics, and lead smelter or refinery workers).

Certain hobbies, folk remedies, home activities, and car repairs (*e.g.*, radiator repair) can contribute to lead exposure. Smoking cigarettes or breathing second-hand smoke increases exposure because tobacco smoke contains small amounts of lead.

Pregnant women, the developing fetuses, and young children are particularly vulnerable to the effe cts of lead. Young children are more likely to play in dirt and to place their hands and other objects in their

mouths, thereby increasing the opportunity for exposure via ingestion of lead-contaminated soil an d dust.

What are the possible toxic effects of lead?

The most sensitive targets for lead toxicity are the developing nervous system, the hematological and cardiovascular systems, and the kidney. However, because of lead's many modes of action in biologi cal systems, lead could potentially affect any system or organs in the body. The effects are the same whether it is breathed or swallowed.

Blood Lead Concentrations Corresponding to Adverse Health Effects

Life Stage	Effect	Blood lead (µg/dL)
Children	Depressed ALAD* activity	<5
	Neurodevelopmental effects	<10
	Sexual maturation	<10
	Depressed vitamin D	>15
	Elevated EP**	>15
	Depressed NCV***	>30
	Depressed hemoglobin	>40
	Colic	>60
Adults	Depressed GFR****	<10
	Elevated blood pressure	<10
	Elevated EP (females)	>20
	Enzymuria/proteinuria	>30
	Peripheral neuropathy	>40
	Neurobehavioral effects	>40
	Altered thyroid hormone	>40
	Reduced fertility	>40
	Depressed hemoglobin	>50
Elderly adults	Depressed ALAD*	<5
	Neurobehavioral effects	>4

*aminolevulinic acid dehydratase (ALAD)

**erythrocyte porphyrin (EP)

***nerve conduction velocity (NCV)

****glomerular filtration rate (GFR)

Source: ATSDR Toxicological Profile for Lead (Draft for Public Comment), 2005.

How can I reduce the risk of exposure to lead?

- Do not allow children to chew or mouth surfaces that may have been painted with lead-based paint (homes built before 1978).
- If you have a water lead problem, the U.S. Environmental Protection Agency (EPA) recommends that you flush your cold water pipes if they have not been used in over 6 hours by running water until it is cold (5 seconds to 2 minutes) before drinking or cooking with it.
- Avoid some types of paints and pigments that contain lead and are used as make-up or hair coloring; keep these kinds of products away from children.
- Hire a professional contractor, who is required to follow certain health safety requirements for remediation or renovation involving lead-based paint, (www.epa.gov/lead/pubs/leadinfo.htm#remodeling).
- Wash children's hands and faces often to remove lead dusts and soil, and regularly clean the house of dust and tracked in soil.

What are the safety guidelines for lead exposure?

Air

- National Institute for Occupational Safety and Health (NIOSH)

  Recommended exposure limit (REL) time-weighted average (TWA) - 0.05 mg/m^3
  Immediately dangerous to life or health (IDLH) - 100 mg/m^3

- Occupational Safety and Health Administration (OSHA)

  Air - workplace 50 $\mu g/m^3$
  Action level - 40 µg/100 g of whole blood

- The American Conference of Governmental Industrial Hygienists (ACGIH)

Threshold limit values (TLV)/(TWA) - 0.05 mg/m^3
TLV/TWA guideline for lead arsenate - 150 µg/m^3
TLV/TWA guideline for other forms of lead - 50 µg lead/m^3

- U.S. Environmental Protection Agency (EPA)

  National Primary and Secondary Ambient Air Quality Standards - 1.5 µg/m^3

- World Health Organization (WHO)

  Air quality guidelines -- 0.5 µg/m^3

Water

- EPA

  Maximum contaminant level (MCL) - action level 0.015 mg/L
  Action level for public supplies - 15 µg/L

- WHO

  Drinking Water Quality Guidelines - 0.01 mg/L

Blood

- Centers for Disease Control and Prevention (CDC)

  Level of concern for children - 10 µg/dL

- OSHA

  Cause for written notification and medical exam - 40 µg/dL
  Cause for medical removal from exposure - 50 µg/dL

- ACGIH

  Advisory; biological exposure index - 30 µg/dL

Food

- Food and Drug Administration (FDA)

  Bottled drinking water - 0.005 mg/L

Other

- ACGIH

  Biological exposure indices (lead in blood) - 30 µg/100 mL

- Consumer Product Safety Commission

  Paint - 600 ppm

- FDA

  Ceramicware (µg/mL leaching solution) - 0.5-3.0 µg/mL

µg/m^3: micrograms per cubic meter
µg/dL: micrograms per deciliter
µg/L: micrograms per liter
g: gram
mg/L: milligrams per liter
mL: milliliter
ppm: parts per million

What are the most important or common mediating factors?

Factors that determine the severity of the health effects from lead exposure include

- Dose
- Age of the person exposed
  - the developing nervous system is the most sensitive system to the effects of lead
  - the efficiency of lead absorption from the gastrointestinal tract is greater in children than in adults
- Life stages of women (childbirth, lactating, menopause)
- Occupational exposures
- Duration of exposure
- Health and lifestyle of the person exposed
- Nutritional status of the person exposed
  - a diet adequate in calcium and iron may decrease lead absorption

The toxic effects of lead exposure may be worse in individuals with inherited genetic diseases or gene polymorphisms such as thalassemia, individuals with glucose-6-phosphate dehydrogenase (G6PD) deficiency, and carriers of certain gene polymorphic forms (*e.g.*, ALAD and vitamin D receptor). Research continues about this topic.

Is there a test to see if my child or I have been exposed to lead?

Blood	• The screening test of choice is blood lead levels. • Blood tests are commonly used to screen children for lead poisoning. • Analysis of lead in whole blood is the most common and accurate method of assessing lead exposure. • Exposure to lead also can be evaluated by measuring erythrocyte protoporphyrin (EP) in blood samples. EP is a part of red blood cells known to increase when the amount of lead in the blood is high. However, the EP level is not sensitive enough to identify children with elevated blood lead levels below about 25 micrograms per deciliter (µg/dL).
Bone and Teeth	• X-ray fluorescence techniques have been used to determine lead concentration in bones and teeth. It is not widely available and is used mostly in research. • Lead partitions to bone over a lifetime of exposure; therefore, bone lead measurements may be a better indicator of cumulative exposure than blood lead.
Urine	• Measurements of urinary lead levels have been used to assess lead exposure. • The measurement of lead excreted in urine following chelation with calcium disodium EDTA (EDTA provocation) has been used to detect elevated body burden of lead in adults and children.
Hair and Nails	• These are not reliable for testing due to errors external contamination. They are relatively poor predictors of blood lead, particularly at low concentrations.

Future Research Needs

To close current gaps in the scientific database on the health effects of lead, a long–term resear ch program is needed that might include the following:

- Further short-term studies or studies in vitro designed to clarify mechanisms of action for the various toxicities might be useful.
- Studies identifying exposures during different developmental periods can help identify critical periods of vulnerability for immunocompetence, development of sex organs, or neurobehavioral parameters.
- Chronic-duration exposure studies in animals would expand information on the toxicity of lead. Special studies that examine biochemical and morphological effects of lead may provide new information on mechanisms of action of lead, particularly for the effects of greatest concern such as neurobehavioral changes in children.
- Development of new and more sensitive tests of specific neuropsychological functions.
- Further investigation of links between lead and amyotrophic lateral sclerosis, essential tremor, schizophrenia, and Parkinson's disease.
- Epidemiological studies designed in a manner that permits more rigorous assessments of effect modification.
- Studies about the long-term consequences of lead-related neurobehavioral deficits detected in infants and children and the manifestation of chronic neurobehavioral problems in adolescence and adulthood.
- Further characterization of bone lead concentration as a biomarker of exposure for various effect end points (*e.g.*, blood pressure and renal effects).
- Studies of the potential prevalence of elevated bone lead stores in women of reproductive age and the associated risk that this poses to fetal development by mobilization of maternal bone stores during pregnancy.
- Further clarification of the role of some genetic polymorphisms.
- Evaluation of cohorts from prospective studies into adulthood for potential late-appearing effects including cancer.

For more information

- Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profile for Lead

  http://www.atsdr.cdc.gov/toxprofiles/tp13.html

- ATSDR ToxFAQs™ for Lead

  http://www.atsdr.cdc.gov/tfacts13.html

- ATSDR Case Studies in Environmental Medicine Lead Toxicity

  http://www.atsdr.cdc.gov/csem/lead/

- ATSDR Interaction Profile for Chemical Mixtures for Arsenic, Cadmium, Chromium, and Lead

  http://www.atsdr.cdc.gov/interactionprofiles/ip04.html

- ATSDR Interaction Profile for Chemical Mixtures for Lead, Manganese, Zinc, and Copper

  http://www.atsdr.cdc.gov/interactionprofiles/ip06.html

- ATSDR Interaction Profile for Chemical Mixtures for Chlorpyrifos, Lead, Mercury, and Methylmercury

  http://www.atsdr.cdc.gov/interactionprofiles/ip11.html

- Centers for Disease Control and Prevention Lead Web Page

  http://www.cdc.gov/lead/

- U.S. Environmental Protection Agency Lead Web Page

  http://www.epa.gov/lead/

- U.S. Department of Labor, Occupational Safety & Health Administration

  http://www.osha.gov/SLTC/lead/

For more information, contact:

Agency for Toxic Substances and Disease Registry
Division of Toxicology and Environmental Medicine
1600 Clifton Road NE, Mailstop F-32
Atlanta, GA 30333
Phone: 1-800-CDC-INFO (800-232-4636)
TTY 888-232-6348

FAX: (770)-488-4178
Email: CDCINFO@cdc.gov

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Mercury

Mercury is a naturally occurring metal found in air, water, and soil. It exists in several forms, including elemental (or metallic) mercury, inorganic mercury compounds, and organic mercury compounds:

- **Elemental mercury** is liquid at room temperature and is used in thermometers, fluorescent light bulbs, some electrical switches, and some industrial processes.
- **Inorganic mercury** compounds are formed when mercury combines with other elements to form salts, which are usually powders or crystals. Inorganic mercury compounds are found naturally in the environment. Some forms of inorganic mercury have been used in antiseptic creams, ointments, and preservatives.
- **Organic mercury** compounds are formed when mercury combines with carbon. Microscopic organisms can produce organic mercury compounds (methylmercury) in contaminated water and soil, which can accumulate in the food chain. Other special types of organomercurials have been used as medical preservatives and medicines.

How People Are Exposed to Mercury

- Eating fish or shellfish that is contaminated with methylmercury, which is the main source of general human exposures to mercury;
- Breathing air contaminated with elemental mercury vapors (e.g., in workplaces such as dental offices and industries that use mercury or in locations where a mercury spill or release has occurred);
- Having dental fillings that contain mercury; and
- Practicing cultural or religious rituals that use mercury.

How Mercury Affects People's Health

- Short-term exposure to extremely high levels of elemental mercury vapors can result in lung damage, nausea, diarrhea, increases in blood pressure or heart rate, skin rashes, eye irritation, and injury to the nervous system.
- Prolonged exposure to lower levels of elemental mercury can permanently damage the brain and kidneys.
- The developing brain of a fetus can be injured if the mother is exposed to methylmercury.

Levels of Mercury in U.S. Population

Scientists tested levels of mercury in the blood of 16,780 participants who took part in CDC's national study known as the National Health and Nutrition Examination Survey (NHANES). These findings are based on total blood mercury levels in the U.S. general

population for persons aged 1 year and older who participated in NHANES during 2003-2006, as well as trends in the total mercury of children aged 1–5 and females aged 16–49 during 1999–2006.

- In the total population during 2003–2006, the total blood mercury levels for non–Hispanic blacks and non–Hispanic whites were higher than those for Mexican Americans.
- Across the age groups in the total population during 2003-2006, total blood mercury levels increased with age, peaked at the fifth or sixth decade, depending on race/ethnicity, and then declined.
- In the most recent survey period of 2005–2006, the 95th percentile levels for total blood mercury in children aged 1-5 years and females aged 16-49 years were 1.43 µg/L and 4.48 µg/L, respectively. The 95th percentile means that 95 percent of the U.S. population's exposure is below this estimated level. Conversely, only 5 percent of the population will have values at this level or higher.
- Over the four survey periods from 1999-2006, blood mercury levels increased slightly for non–Hispanic white children and decreased slightly for non–Hispanic black and Mexican American children. Female children had slightly higher blood mercury levels than male children.

For More Information

- Agency for Toxic Substances and Disease Registry
  Detailed information about mercury and public health is available at
  http://www.atsdr.cdc.gov/alerts/970626.html and
  http://www.atsdr.cdc.gov/cabs/mercury/index.html
- CDC Emergency Preparedness and Response
  Case definitions of mercury, toxicology FAQs, and toxicological profile at
  http://emergency.cdc.gov/agent/mercury/

May 2009

Department of Health and Human Services
Agency for Toxic Substances & Disease Registry

ToxFAQs™

ToxFAQs™
for
Arsenic
(*Arsénico*)
August 2007

PDF Version, 92 KB

CAS#: 7440-38-2

This fact sheet answers the most frequently asked health questions (FAQs) about arsenic. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

Highlights

Exposure to higher than average levels of arsenic occur mostly in the workplace, near hazardous waste sites, or in areas with high natural levels. At high levels, inorganic arsenic can cause death. Exposure to lower levels for a long time can cause a discoloration of the skin and the appearance of small corns or warts. Arsenic has been found in at least 1,149 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is arsenic?

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds.

Inorganic arsenic compounds are mainly used to preserve wood. Copper chromated arsenate (CCA) is used to make "pressure-treated" lumber. CCA is no longer used in the U.S. for residential uses; it is still used in industrial applications. Organic arsenic compounds are used as pesticides, primarily on cotton fields and orchards.

What happens to arsenic when it enters the environment?

- Arsenic occurs naturally in soil and minerals and may enter the air, water, and land from wind-blown dust and may get into water from runoff and leaching.
- Arsenic cannot be destroyed in the environment. It can only change its form.
- Rain and snow remove arsenic dust particles from the air.
- Many common arsenic compounds can dissolve in water. Most of the arsenic in water will ultimately end up in soil or sediment.
- Fish and shellfish can accumulate arsenic; most of this arsenic is in an organic form called arsenobetaine that is much less harmful.

How might I be exposed to arsenic?

- Ingesting small amounts present in your food and water or breathing air containing arsenic.
- Breathing sawdust or burning smoke from wood treated with arsenic.
- Living in areas with unusually high natural levels of arsenic in rock.
- Working in a job that involves arsenic production or use, such as copper or lead smelting, wood treating, or pesticide application.

How can arsenic affect my health?

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs.

Ingesting very high levels of arsenic can result in death. Exposure to lower levels can cause naus ea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of “pins an d needles” in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of th e skin and the appearance of small “corns” or “warts” on the palms, soles, and torso.

Skin contact with inorganic arsenic may cause redness and swelling.

Almost nothing is known regarding health effects of organic arsenic compounds in humans. Studies i n animals show that some simple organic arsenic compounds are less toxic than inorganic forms. Ingestion of methyl and dimethyl compounds can cause diarrhea and damage to the kidneys.

How likely is arsenic to cause cancer?

Several studies have shown that ingestion of inorganic arsenic can increase the risk of skin cance r and cancer in the liver, bladder, and lungs. Inhalation of inorganic arsenic can cause increased risk of lung cancer. The Department of Health and Human Services (DHHS) and the EPA have determined that inorganic arsenic is a known human carcinogen. The International Agency for R esearch on Cancer (IARC) has determined that inorganic arsenic is carcinogenic to humans.

How does arsenic affect children?

There is some evidence that long-term exposure to arsenic in children may result in lower IQ score s. There is also some evidence that exposure to arsenic in the womb and early childhood may increase mortality in young adults.

There is some evidence that inhaled or ingested arsenic can injure pregnant women or their unborn babies, although the studies are not definitive. Studies in animals show that large doses of arsenic that cause illness in pregnant fem ales, can also cause low birth weight, fetal malformations, and even fetal death. Arsenic can cross the placenta and has been found in fetal ti ssues. Arsenic is found at low levels in breast milk.

How can families reduce their risk for exposure to arsenic?

- If you use arsenic-treated wood in home projects, you should wear dust masks, gloves, and protecti ve clothing to decrease exposure to sawdust.
- If you live in an area with high levels of arsenic in water or soil, you should use cleaner source s of water and limit contact with soil.
- If you work in a job that may expose you to arsenic, be aware that you may carry arsenic home on y our clothing, skin, hair, or tools. Be sure to shower and change clothes before going home.

Is there a medical test to show whether I've been exposed to arsenic?

There are tests available to measure arsenic in your blood, urine, hair, and fingernails. The urin e test is the most reliable test for arsenic exposure within the last few days. Tests on hair and fingernails can measure exposure to high levels of ars enic over the past 6-12 months. These tests can determine if you have been exposed to above-average levels of arsenic. They cannot predict whether the arsenic levels in your body will affect your health.

Has the federal government made recommendations to protect human health?

The EPA has set limits on the amount of arsenic that industrial sources can release to the environ ment and has restricted or cancelled many of the uses of arsenic in pesticides. EPA has set a limit of 0.01 parts per million (ppm) for arsenic in drinking water.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit (PEL) of 10 micrograms of arsenic per cubic meter of workplace air (10 $\mu g/m^3$) for 8 hour shifts and 40 hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Arsenic *(Update)*. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact:

Agency for Toxic Substances and Disease Registry
Division of Toxicology and Environmental Medicine
1600 Clifton Road NE, Mailstop F-62
Atlanta, GA 30333
Phone: 1-800-CDC-INFO • 888-232-6348 (TTY)
FAX: 770-488-4178
Email: cdcinfo@cdc.gov

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state heal th or environmental quality department if you have any more questions or concerns.

This page was updated on 10/05/2007

SAFETY DATA SHEET

Creation Date 06-Feb-2012 **Revision Date** 29-Mar-2024 **Revision Number** 5

1. Identification

Product Name **Perfluorooctanoic acid**

Cat No. : **L08862**

CAS No 335-67-1
Synonyms No information available

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 by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute oral toxicity	Category 4
Acute Inhalation Toxicity - Dusts and Mists	Category 4
Serious Eye Damage/Eye Irritation	Category 1
Carcinogenicity	Category 2
Reproductive Toxicity	Category 1B
Effects on or via lactation	
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Liver.	

Label Elements

Signal Word
Danger

Hazard Statements
Causes serious eye damage
Suspected of causing cancer
May damage the unborn child
May cause harm to breast-fed children
Causes damage to organs through prolonged or repeated exposure
Harmful if swallowed or if inhaled

Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Do not breathe dust/fume/gas/mist/vapors/spray
Avoid contact during pregnancy/while nursing
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Use only outdoors or in a well-ventilated area
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Eyes
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
Ingestion
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth
Storage
Store locked up
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)

WARNING. Cancer and Reproductive Harm - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Octanoic acid, pentadecafluoro-	335-67-1	>95

4. First-aid measures

General Advice If symptoms persist, call a physician.

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 plenty of water for at least 15 minutes. If skin irritation persists,

call a physician.

Inhalation Remove to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur.

Ingestion Clean mouth with water and drink afterwards plenty of water. Get medical attention if symptoms occur.

Most important symptoms and effects None reasonably foreseeable. Causes severe eye damage. Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Water spray. Carbon dioxide (CO_2). Dry chemical. Chemical foam.

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature No information available
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
Thermal decomposition can lead to release of irritating gases and vapors. In the event of fire and/or explosion do not breathe fumes.

Hazardous Combustion Products
Carbon monoxide (CO). Carbon dioxide (CO_2). Gaseous hydrogen fluoride (HF). 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.

NFPA

Health	Flammability	Instability	Physical hazards
3	1	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment as required. Ensure adequate ventilation. Avoid dust formation.

Environmental Precautions Should not be released into the environment.

Methods for Containment and Clean Up Sweep up and shovel into suitable containers for disposal. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling Do not get in eyes, on skin, or on clothing. Wear personal protective equipment/face protection. Ensure adequate ventilation. Avoid ingestion and inhalation. Avoid dust formation.

Storage. Corrosives area. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep in properly labeled containers. Incompatible Materials. Bases. Strong acids. Reducing Agent.

8. Exposure controls / personal protection

Exposure Guidelines This product does not contain any hazardous materials with occupational exposure limitsestablished by the region specific regulatory bodies.

Engineering Measures Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Tight sealing safety goggles. Face protection shield.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

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.

Recommended Filter type: Particulates filter conforming to EN 143.

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 or clothing. Remove and wash contaminated clothing and gloves, including the inside, before re-use. Wear suitable gloves and eye/face protection.

9. Physical and chemical properties

Physical State	Solid
Appearance	Off-white
Odor	pungent
Odor Threshold	No information available
pH	2.6 1g/l aq.sol., 20°C
Melting Point/Range	53 - 60 °C / 127.4 - 140 °F
Boiling Point/Range	189 - 192 °C / 372.2 - 377.6 °F @ 760 mmHg
Flash Point	No information available
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	Not applicable
Specific Gravity	No information available
Solubility	Soluble
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	> 300°C
Viscosity	Not applicable
Molecular Formula	C8 H F15 O2
Molecular Weight	414.07

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Exposure to air or moisture over prolonged periods.

Incompatible Materials Bases, Strong acids, Reducing Agent

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2), Gaseous hydrogen fluoride (HF), Thermal decomposition can lead to release of irritating gases and vapors

Hazardous Polymerization No information available.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Octanoic acid, pentadecafluoro-	LD50 200 - 2000 mg/kg (Rat)	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 No information available

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
Octanoic acid, pentadecafluoro-	335-67-1	Group 2B	Not listed	Not listed	X	Not listed

IARC (International Agency for Research on Cancer)

IARC (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans

Mutagenic Effects No information available

Reproductive Effects Experiments have shown reproductive toxicity effects on laboratory animals.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure Liver

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system.

Persistence and Degradability Soluble in 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.

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	UN3261
Proper Shipping Name	Corrosive solid, acidic, organic, n.o.s.
Technical Name	Octanoic acid, pentadecafluoro-
Hazard Class	8
Packing Group	III

TDG

UN-No	UN3261
Proper Shipping Name	Corrosive solid, acidic, organic, n.o.s.
Hazard Class	8
Packing Group	III

IATA

UN-No	UN3261
Proper Shipping Name	Corrosive solid, acidic, organic, n.o.s.
Hazard Class	8
Packing Group	III

IMDG/IMO

UN-No	UN3261
Proper Shipping Name	Corrosive solid, acidic, organic, n.o.s.
Hazard Class	8
Packing Group	III

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Octanoic acid, pentadecafluoro-	335-67-1	X	ACTIVE	S;SP

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed
SP - Indicates a substance that is identified in a proposed SNUR

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

Component	CAS No	**TSCA 12(b)** - Notices of Export
Octanoic acid, pentadecafluoro-	335-67-1	Section 5

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
Octanoic acid, pentadecafluoro-	335-67-1	-	-	206-397-9	X	X	X	X	X	KE-27883

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 contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

Component	CAS No	Weight %	SARA 313 - Threshold Values %	SARA 313 - Reporting threasholds
Octanoic acid, pentadecafluoro-	335-67-1	>95	0.1 %	-

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 contains the following Proposition 65 chemicals.

Component	CAS No	California Prop. 65	Prop 65 NSRL	Category
Octanoic acid, pentadecafluoro-	335-67-1	Carcinogen Developmental	-	Carcinogen Developmental

U.S. State Right-to-Know Regulations Not applicable

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
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

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)
Octanoic acid, pentadecafluoro-	335-67-1	-	Use restricted. See item 75. (see link for restriction details) Use restricted. See item 30. (see link for restriction details)	SVHC Candidate list - Toxic for reproduction (Article 57 c) SVHC Candidate list - PBT (Article 57 d)

After the sunset date the use of this substance requires either an authorization or can only be used for exempted uses, e.g. use in scientific research and development which includes routine analytics or use as intermediate.

REACH links
https://echa.europa.eu/authorisation-list
https://echa.europa.eu/candidate-list-table

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)
Octanoic acid, pentadecafluoro-	335-67-1	Not applicable	Annex I - Substance subject to prohibitions Annex IV : 1 mg/kg (Waste Management - Conc. Limit) Stockholm Convention - Persistent Organic Pollutant	Not applicable	Not applicable

Contains component(s) that meet a 'definition' of per & poly fluoroalkyl substance (PFAS)?
See table for values

Component	OECD PFAS	US (EPA) PFAS	EU (ECHA) PFAS	UK (HSE) PFAS	Chemsec PFAS (Sin List)
Octanoic acid, pentadecafluoro- (CAS #: 335-67-1)	Listed	Listed	Listed	Listed	Listed

PFAS Legend
Listed = Meets the PFAS definition of the named authority

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)
Octanoic acid, pentadecafluoro-	335-67-1	Not applicable	Not applicable	X	Not applicable

16. Other information

Prepared By Health, Safety and Environmental Department
Email: chem.techinfo@thermofisher.com

www.thermofisher.com

Creation Date	06-Feb-2012
Revision Date	29-Mar-2024
Print Date	29-Mar-2024
Revision Summary	New emergency telephone response service provider.

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 G
SSDS AND SVE SYSTEM O&M MANUAL

Introduction

ATANE Engineers, Architects and Land Surveyors D.P.C. is pleased to provide this Operations and Maintenance (O&M) Manual for the sub-slab depressurization system (SSDS) and soil vapor extraction system (SVE) installed at 32-01 57th Street, in Queens, (Tax Block 1159, Lot 1) New York (hereinafter referred to as the "Site"). A general site figure shows the location of the property occupied by the Tibetan Community Center of New Jersey and New York. This O&M Manual is intended to inform the Owner, building operators and/or owners of the original design intent of the SSDS, and the recommended operation, maintenance, and monitoring requirements of the SSDS and SVE.

Site Background and Previous Vapor Investigations

Since remaining contamination exists at the site, Institutional Controls (ICs) and Engineering Controls (ECs) are required to protect human health and the environment. As part of the Engineer Controls implemented, the SSDS and SVE were selected in accordance with the New York State Department of Environmental Conservation (NYSDEC) Order of Consent Number R2-20170321-111.

Both systems were started with 100% applied suction from the fan in order to maximize the air flow drawn. Systems parameters including airflow and organic vapor concentrations at the effluents were monitored following start-up. Vapor concentrations were measured with the PID at the effluent. System monitoring was conducted as per Interim Remedial Measure (IRM) requirements. The pressure gauges were configured to read between 0 and 2" inches of water column of vacuum pressure to verify vacuum operation of the system.

Sub-Slab Depressurization System

In order to implement immediate remedial measures to reduce potential exposure to chlorinated solvent vapors on and off-site, an active SSDS was installed via four (4) pit type sub slab depressurization points. The SSDS consists of underground laterals tied into aboveground electric radon-type fans, and to exhaust vents along the roof-lines of the building on the Site. Each system is designed to operate continuously and is operated through use of a simple on/off switch located on or near the fan.

The SSDS is coupled to two RadonAway ventilation fans located on the roof of the building. SSDS Pits 1-3 is connected via a ceiling manifold system to one (1) RadonAway fan and SSDS Pit 4 is connected via a direct roof connection from this SSDS pit location. The locations of the piping outlets to the roof was coordinated with the Architect to avoid visual conflicts and to minimize bends, or other flow reducing impedances.

Soil Vapor Extraction (SVE) System

As part of the immediate remedial measures to reduce potential exposure to chlorinated solvent vapors in the adjacent residential property, one SVE pit was installed at the site boundary directly adjacent to the residential property using a geoprobe.

The SVE pits are manifolded together in the sub-slab of the parking lot, run to the southeast side of the building up to the roof, and coupled with a Gast R6130Q-50 Regenerative Blower located on the roof of the building. As with the sub-slab depressurization system (SSDS) components, the locations of the piping outlets to the roof were coordinated with the Architect to avoid visual conflicts and to minimize bends, or other flow reducing impedances. All roof venting locations are 10 feet away from any exhaust or air intake vents.

SSDS and SVE Objectives and Targets

- The purpose of the SSDS is to create a pressure differential across the floor slab basement in order to mitigate the risk of exposure for the occupants of the building.
  The active SSD system will not be discontinued unless prior written approval is granted by the NYSDEC and the NYSDOH. In the event that monitoring data indicates that the SSD system may no longer be required, a proposal to discontinue the SSD system will be submitted by the remedial party to the NYSDEC and NYSDOH.

- The purpose of the soil vapor extraction (SVE) well is employed to recover vapors transferred into the unsaturated soils. Vapor extraction is typically used in combination with air sparging to recover and to prevent vapor phase transport off-site.
  The SVE system will not be discontinued unless prior written approval is granted by the NYSDEC. In the event that monitoring data indicates that the SVE system may no longer be required, a proposal to discontinue the system will be submitted by the remedial party. Conditions that may warrant discontinuing the SVE system include contaminant concentrations soil that: (1) reach levels that are consistently below 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 soil vapor levels collected from monitoring pits located throughout the site. Systems will remain in place and operational until permission to discontinue their use is granted in writing by the NYSDEC.

SSDS Description

In order to implement immediate remedial measures to reduce potential exposure to chlorinated solvent vapors on and off-site, an active SSDS was installed via four (4) pit type sub slab depressurization points. The SSDS is coupled to two RadonAway ventilation fans located on the roof of the building. SSDS Pits 1-3 is connected via a ceiling manifold system to one (1) RadonAway fan and SSDS Pit 4 is connected via a direct roof connection from this SSDS pit location. The locations of the piping outlets to the roof was coordinated with the Architect to avoid visual conflicts and to minimize bends, or other flow reducing impedances.

The system was started with 100% applied suction from the fan in order to maximize the air flow drawn from indoor space. System parameters including airflow and organic vapor concentrations at the effluents were monitored following start-up. Vapor concentrations were measured with the PID at the effluent. System monitoring was conducted as per IRM requirements. The pressure gauges were configured to read between 0 and 2" inches of water column of vacuum pressure to verify vacuum operation of the system.

SVE Description

Rotron EN606 Regenerative Blower with 3HP 3PH XP 230/460V Motor with Outlet Silencer KO Tank with Integral Air Filter and Magnehelic Gauge, Vacuum and Temp Gauges on Inlet, Dilution Air Valve with Inlet Silencer on Inlet, 6" Cleanout Flange, XP Dwyer High Level Float Switch, Clear Tubing Sight Glass, Vacuum Relief Valve, Manual Ball Valve Drain XP On/Off Starter Box Wired 208V 3PH with Reset Push Button. XP High Level Float Switch Will Shut Down Blower.

SSDS Operation, Maintenance and Monitoring

A visual inspection of the complete system will be conducted by the Tibetan Community during an annual monitoring event. SSDS components to be monitored include, but are not limited to, the radon-type fan, manometer, alarm, and general system piping.

Sub-Slab Depressurization System (SSDS)

Monitoring of the Sub Slab depressurization (SSD) System will be performed annually on a routine basis, similar to the SVE System. Modification to the frequency or sampling requirements will require approval from the NYSDEC. 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 SSD system has been reported or an emergency occurs that is deemed likely to affect the operation of the system. The SSDS is considered an immediate but interim remedial measure for the Site. The SSD system will be operated and maintained in accordance to Operation Maintenance and Monitoring (OM&M) as prescribed below:

- The systems proper operation will be continuously monitored by the site ownership and also by the building occupants.
- Routine maintenance of the system will be required if any part if the system has failed or functioning improperly and/or the air flow is not maintained.

The system will be inspected, and its performance certified annually via a Certification Letter Report. This inspection will verify the proper functioning of system fan and the evaluation of individual vapor concentrations that exist from each system utilizing a PID.
The certification letter report will include, at a minimum:

- Date of inspections;
- Personnel conducting inspections;
- Description of the inspection activities performed;

- ❖ Any observations, conclusions, or recommendations;
- ❖ Copy of any inspection forms;
- ❖ Certification of the performance of Engineering Controls and Institutional Controls, as discussed below.
- ❖ If changes are needed to the system or controls;

If compliance with the system operations requirements have been maintained;

Soil Extract Vapor System

If the system is not operating correctly, it will be evident by the fact that the manometer will be leveled out at zero, and/or the fan will simply not be running. Below is a list of potential solutions:

- The manometer that measures fan operation has a small tube that runs off of the top and into the pipe itself. This is how it takes readings. If the tube falls out for any reason the manometer will read as if the fan were not running. Reinsert or replace tubing if missing.
- Check your breaker panel to see if the circuit breaker for the SVE system circuit has tripped.
- If the fan is plugged into a wall outlet, make sure that it is not unplugged. If the fan is installed outside, there is a water-tight electrical box with an on/off switch on it located next to the fan. Some of these can be accidently flipped off. Make sure that the switch is in the "on" position.
- When the system has been exposed to sub-zero temperatures for several days, the exhaust may freeze and stop working as a result. There is a sensor in the fan that senses when the fan is about to overheat, and it shuts itself off. The blower fan may actually continue running despite the manometer being at zero. If this is occurring, the fan will restart and clear on its own, usually once the temperatures are consistently above 20 degrees Fahrenheit. Turning the fan off will actually make it take longer for the system to thaw.

Troubleshooting

If any deficiencies are found must be communicated to the New York State Department of Environmental Conservation (NYSDEC). This section describe general procedures to follow in the event of reasonably foreseeable observations during the monitoring program or maintenance inspections.

Sub-Slab Depressuring System

Equipment readings are not within their typical range, any equipment is observed to be malfunctioning, or the system is not performing within specifications, maintenance and repair is to be initiated immediately, and the SSDS system restarted.

For Operating and Maintenance

- Verify all connections are tight and leak-free. Insure the RP Series Fan and all ducting is secure and vibration-free.
- Verify system vacuum pressure with manometer. Insure vacuum pressure is within normal operating range and less than the maximum recommended operating pressure. (Based on sea-level operation, at higher altitudes reduce by about 4% per 1000 Feet.) (Further reduce Maximum Operating Pressure by 10% for High Temperature environments) See Product Specifications. If this is exceeded, increase the number of suction points.
- Verify Radon levels by testing to EPA protocol

Several warnings for General Ventilating Use Only:

- Do Not Use to Exhaust Hazardous, Corrosive or Explosive Materials, Gases or Vapors. See Vapor Intrusion Application Note #AN001 for important information on VI applications. RadonAway.com/vapor-intrusion
- WARNING! NOTE: Fan is suitable for use with solid state speed controls however use of speed controls is not generally recommended. 3. WARNING! Check voltage at the fan to insure it corresponds with nameplate. 4. WARNING! Normal operation of this device may affect the combustion airflow needed for safe operation of fuel burning equipment. Check for possible backdraft conditions on all combustion devices after installation. 5. NOTICE! There are no user serviceable parts located inside the fan unit. Do NOT attempt to open. Return unit to the factory for service. 6. WARNING! Do not leave fan unit installed on system piping without electrical power for more than 48 hours. Fan failure could result from this non-operational storage. 7. WARNING! TO REDUCE THE RISK OF FIRE, ELECTRIC SHOCK, OR INJURY TO PERSONS, OBSERVE THE FOLLOWING: a) Use this unit only in the manner intended by the manufacturer. If you have questions, contact the manufacturer. b) Before servicing or cleaning unit, switch power off at service panel and lock the service disconnecting means to prevent power from being switched on accidentally. When the service disconnecting means cannot be locked, securely fasten a prominent warning device, such as a tag, to the service panel. c) Installation work and electrical wiring must be done by qualified person(s) in accordance with all applicable codes and standards, including fire rated construction. d) Sufficient air is needed for proper combustion and exhausting of gases through the flue (chimney) of fuel burning equipment to prevent back drafting. Follow the heating equipment manufacturers guideline and safety standards such as those published by the National Fire Protection Association, and the American Society for Heating, Refrigeration and Air Conditioning Engineers (ASHRAE), and the local code authorities. e) When cutting or drilling into a wall or ceiling, do not damage electrical wiring and other hidden utilities. f) Ducted fans must always be vented to outdoors. g) If this unit is to be installed over a tub or shower, it must be marked as appropriate for the application and be connected to a GFCI (Ground Fault Circuit Interrupter) - protected branch circuit.

Soil Vapor Extraction (SVE) System

Manufacturer's warning indicates to assure the power supply is disconnected and locked out before attempting to do any maintenance on the unit. It is critical that the unit be locked out from starting during maintenance as severe injury or death could result from exposure to high voltage or rotating parts.
For maintenance the follow steps must be follow:

- Allow the blower to cool to a surface temperature of less than 100 F before attempting maintenance. Prolonged exposure to temperatures above 120F can cause severe burns.
- Do not attempt to check the filter cartridge during operation of the blower. Only check the cartridge after
- disconnecting the power from the blower and locking out the power to prevent an unexpected start.
- Clean the blower surfaces periodically to avoid buildup of dust or other debris. Buildup of debris can cause overheating and premature failure of the blower. If an inlet filter is being use, ensure that it remains clean during operation by examining the filter cartridge for debris build up. Replace dirty or clogged filter cartridges.
- On pressure units, periodically clean the inlet mesh screen to avoid loss of capacity. If an external inlet filter is used, the filter element should be cleaned monthly or as frequently as required by local conditions. Excessive pressure drop will develop from use of clogged or dirty filters. This

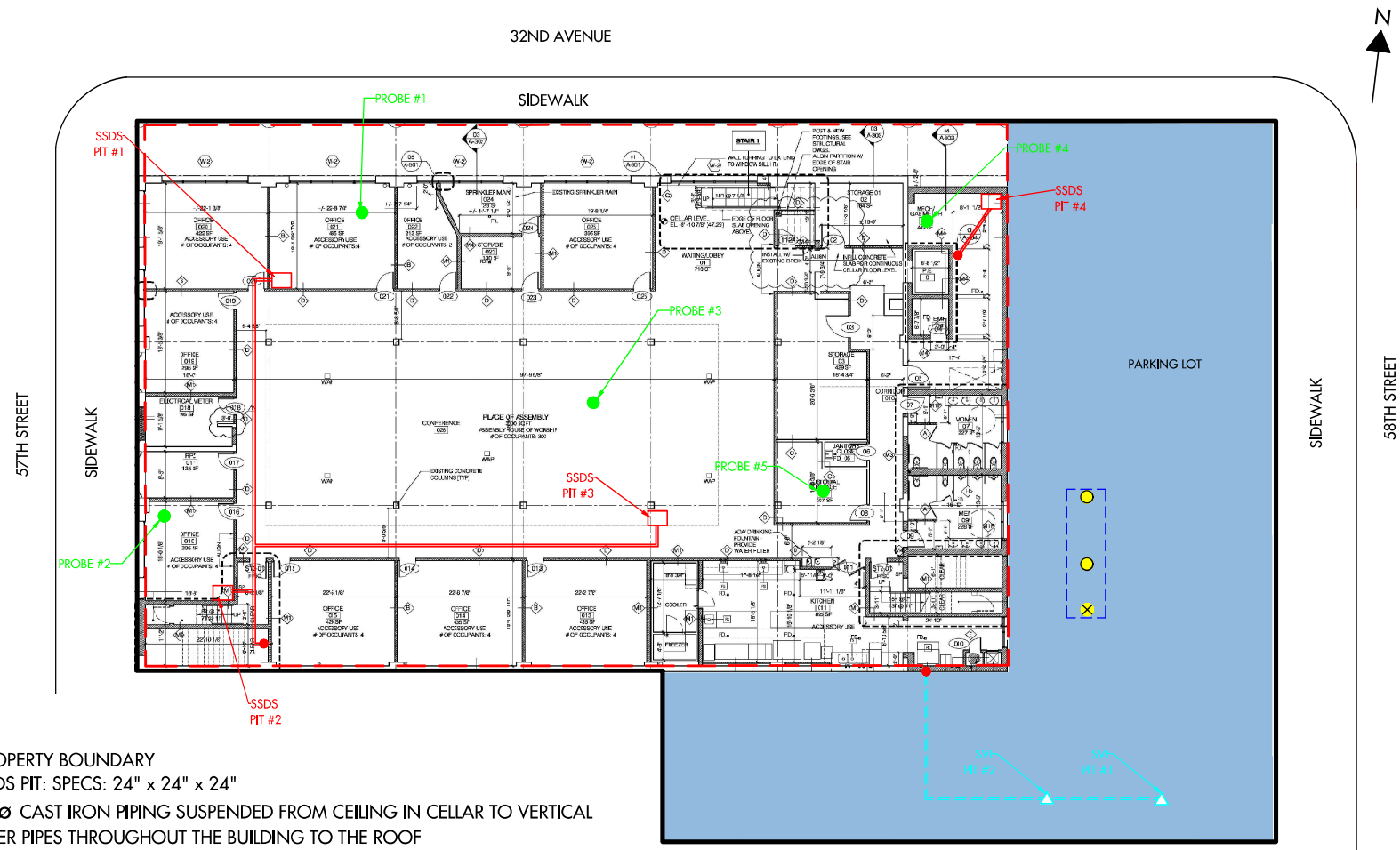
pressure drop will degrade blower performance and increase operating temperatures, leading possibly to premature pump failure.

- To replace the filter, remove the wing nut and cover. Remove the element and either clean with compressed air or replace. Reassemble in reverse order.
- For vacuum applications, the optional in-line vacuum filter must be cleaned regularly, depending on local conditions. Cleaning can be achieved by blowing out with compressed air. If cleaning is not possible, replace the cartridge.

Access the cartridge by unhooking the relevant clips and removing the cover

Drawings

Drawing 1. As-built Drawing



LEGEND:

- PROPERTY BOUNDARY
- SSDS PIT: SPECS: 24" x 24" x 24"
- 4" Ø CAST IRON PIPING SUSPENDED FROM CEILING IN CELLAR TO VERTICAL RISER PIPES THROUGHOUT THE BUILDING TO THE ROOF
- RISER TO ROOF
- VACUUM MONITORING PROBE
- TRENCH MANHOLE COVER OF DRYWELL
- MANHOLE COVER
- APPROXIMATE FOOTPRINT OF INSTALLED DRYWELL AND STORM WATER RETENTION SYSTEM
- SVE WELL - UNCONFIRMED AS-BUILD*
- UNDERGROUND SVE PIPING - UNCONFIRMED AS-BUILD*

*AS-BUILD DESIGN COULD NOT BE CONFIRMED DUE TO THE LACK OF DOCUMENTATION OF INSTALLATION PER PROPOSED SVE DESIGN

- 3" ASPHALT PAVEMENT (TYPICAL AT PARKING LOTS)
- 8" BASEMENT SLAB AS CONFIRMED BY HYDROTECH DURING THE INSTALLATION OF VACUUM MONITORING PROBE #5

0 30

APPROXIMATE SCALE IN FEET

DATE	DESCRIPTION	CHK

SEAL & SIGNATURE

HYDROTECH ENVIRONMENTAL ENGINEERING AND GEOLOGY, DPC

231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY. 10001

TEL: (631) 462-5866

BASE DRAWING PREPARED BY

NANDINEE PHOOKAN ARCHITECTS PC

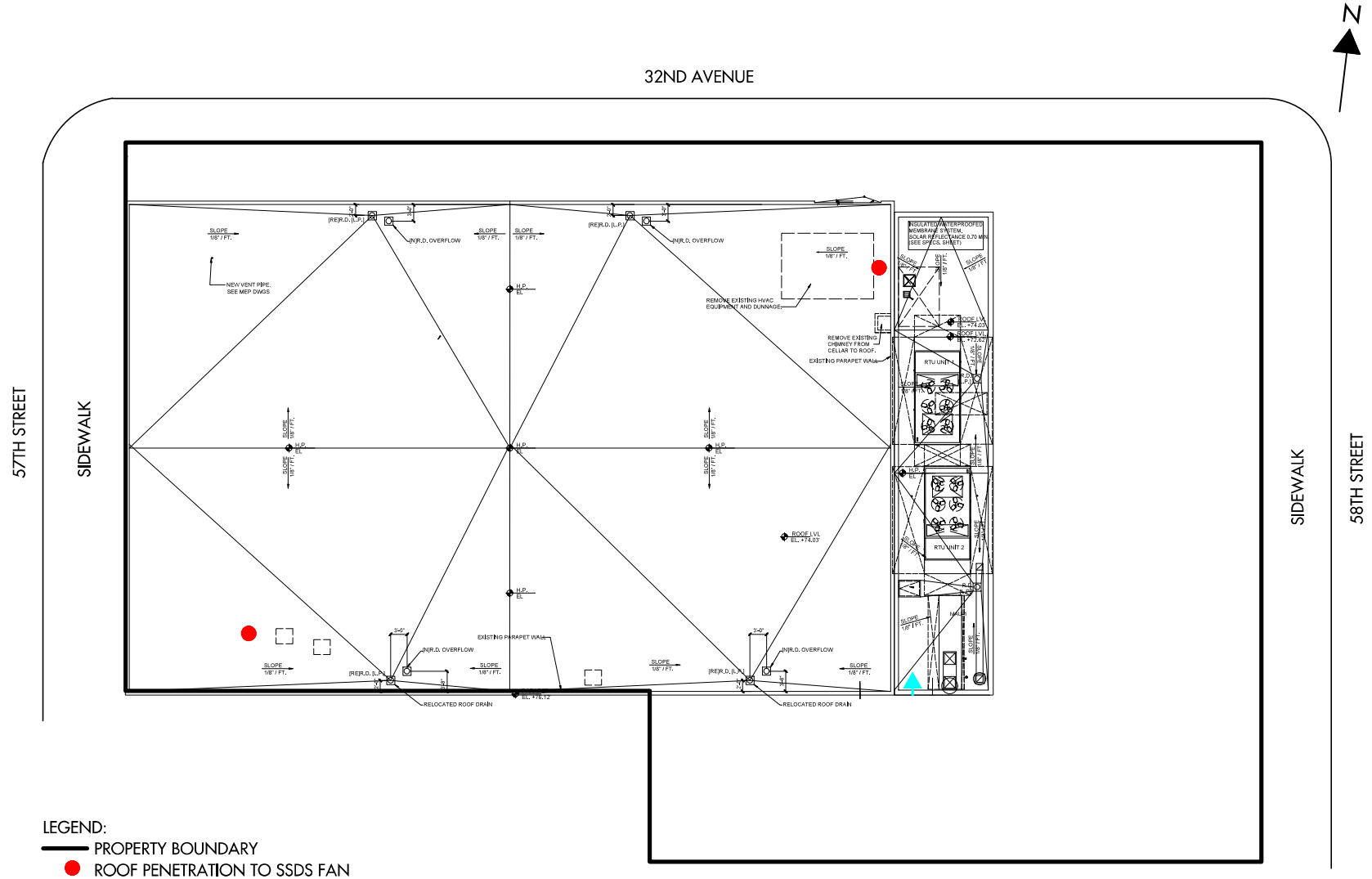
PROJECT NAME AND ADDRESS

32-01 57TH STREET, QUEENS, NY

PROJECT FIGURE

AS-BUILD DRAWINGS OF COVER SYSTEM, SSDS AND SVE SYSTEM - CELLAR AND GROUND LEVEL PLAN VIEW

PROJECT NO. 240047	DATE 04/24/25
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS NOTED	APPROVED BY P.M.



LEGEND:

- PROPERTY BOUNDARY
- ROOF PENETRATION TO SSDS FAN
- SVE FAN ABOVE ROOF PARAPET

DATE	DESCRIPTION	CHK

SEAL & SIGNATURE

HYDROTECH ENVIRONMENTAL ENGINEERING AND GEOLOGY, DPC

231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY. 10001

TEL: (631) 462-5866

BASE DRAWING PREPARED BY

NANDINEE PHOOKAN ARCHITECTS PC

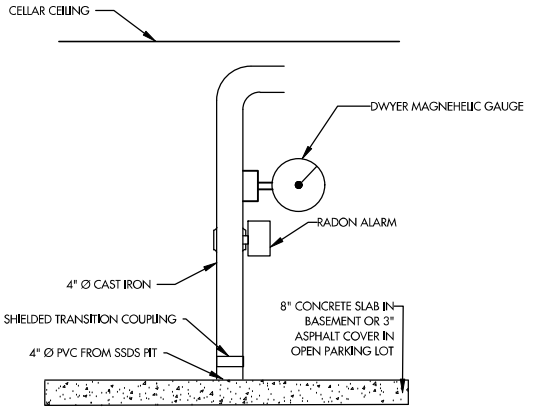
PROJECT NAME AND ADDRESS

32-01 57TH STREET, QUEENS, NY

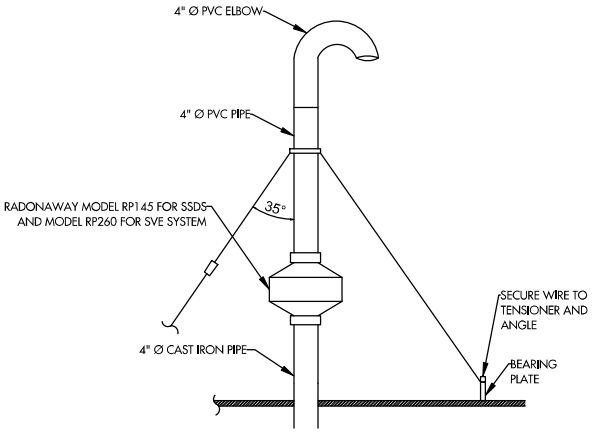
PROJECT FIGURE

AS-BUILD DRAWINGS OF COVER SYSTEM, SSDS AND SVE SYSTEM - ROOF VIEW

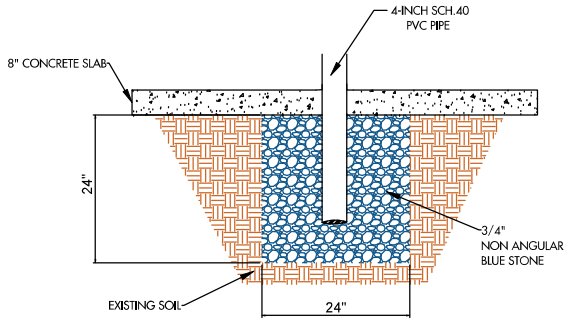
PROJECT NO. 250001	DATE 04/28/25
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS NOTED	APPROVED BY P.M.



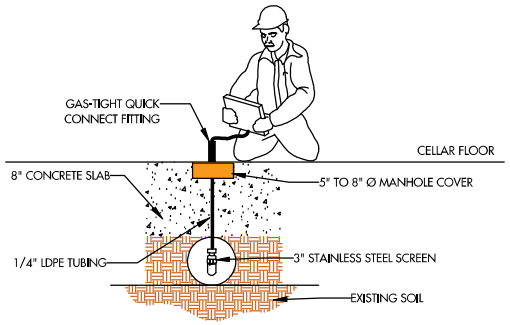
SSDS VENT RISER AT CELLAR/SVE RISER AT GRADE LEVEL IN PARKING LOT



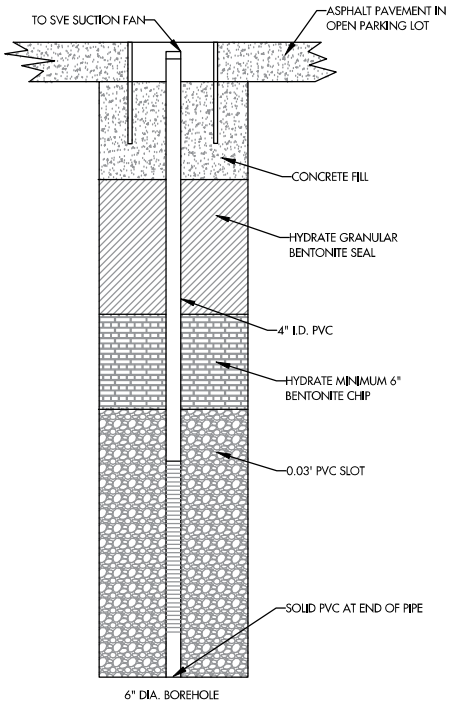
SSDS/SVE VENT RISER AT ROOF FOR SSDS OR ROOF PARAPET FOR SVE SYSTEM



SSDS PITS



SSDS PRESSURE MONITORING POINT



SVE WELL ID	SCREENED INTERVAL	WELL SCREEN DIA.
SVE-1	10' - 15'	0.03'
SVE-2	10' - 15'	0.03'

SOIL VAPOR EXTRACTION WELL (SVE WELL DESIGN DETAILS ADOPTED FROM IRM WP) AS-BUILD DESIGN COULD NOT BE CONFIRMED DUE TO THE LACK OF DOCUMENTATION OF INSTALLATION PER PROPOSED SVE DESIGN

DATE	DESCRIPTION	CHK

SEAL & SIGNATURE

HYDROTECH ENVIRONMENTAL ENGINEERING AND GEOLOGY, DPC

231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY. 10001

TEL: (631) 462-5866

BASE DRAWING PREPARED BY

PROJECT NAME AND ADDRESS

32-01 57TH STREET, QUEENS, NY

PROJECT FIGURE

AS-BUILD DRAWUNGS OF COVER SYSTEM, SSDS AND SVE SYSTEM-SECTIONS VIEW

PROJECT NO.	DATE
240047	04/24/25
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS NOTED	APPROVED BY P.M.

DRAWING NOTES

General Notes:

1. The work depicted on these drawings was performed by an experienced contractor who has working knowledge of applicable code standards and industry accepted standard good practice. Not every condition or element is or can be explicitly shown on these drawings.
2. The contractor conferred with and sought the approval of the engineer and/or Architect of Record for the final locations of all venting system components.
3. The contractor provides an as-built drawing of the installed venting system upon completion.
4. SSDS and SVE system are installed in compliance with New York City Mechanical Code, Chapter 5 Section MC-512 Subslab exhaust systems.
5. SSDS and SVE system riser piping runs are marked "Soil Vapor Venting System - Do Not Tamper with or Disturb". The labels can be read easily within three (3) feet.
6. All piping is supported according to all applicable codes.
7. Provided 120V AC 20 AMP electrical service with a dedicated circuit breaker to within five (5) feet of the location of the venting fan for roof installation options.
8. Vacuum Monitoring Points - A small diameter ($\frac{1}{4}$") pilot hole was drilled through the existing concrete floor slab into the gravel base layer. A manometer was used to measure the pressure beneath the slab at the pilot hole location. Permanent manhole covers were installed at each test location. A negative pressure reading will indicate the influence of the SSDS system at each point location and confirmed communication from the SSDS to the probe location.
9. Each SSDS and SVE system riser piping is fitted with a visible and audible vacuum monitoring/Alarm (model $\frac{28001}{2}$) with electronic light and audio indicating loss of system vacuum or malfunctioning and a visible Dwyer Magnehelic dial type vacuum gauge (model 2100).

Pipe Notes:

1. Hubless Cast Iron pipe and fittings are manufactured from gray cast iron and shall conform to ASTM A 888 and CISPI Standard 301. The Charlotte Pipe and Foundry Company hubless Cast Iron Soil Pipe shall be specified, or approved equivalent. All piping to be 4" inches diameter unless otherwise noted.
2. All pipe and fittings are marked with the collective trademark of the Cast Iron Soil Pipe Institute ® and listed by NSF® International.
3. Hubless Couplings shall conform to CISPI Standard 310 and be certified by NSF® International.
4. Heavy Duty couplings conform to ASTM C 1540 and are used when indicated. Gaskets shall conform to ASTM C 564.
5. The cast iron riserwas installed vertically to the exterior of the building to the roof and terminate a minimum of one (1) foot above the roof line and at least ten (10) feet from HVAC RTU air intakes, doors, windows, or other openings into the occupied space of the building or adjacent buildings.

Suction Fan Notes:

1. SSDS Suction Fan specified as RadonAway RP 145, or engineer approved equivalent. One (1) suction fan installed for SSDS pits #1-3 and one (1) suction fan is to be installed for SSDS pit #4 as identified in the contract drawings. SVE Suction Fan specified as RadonAway RP 145, or engineer approved equivalent. One (1) suction fan is to be installed for SVE pits #1 and #2.
2. Electrical connection provided per Radon Away Specifications.
3. Selected contractor conformed to all installation instructions as provided per the included RadonAway installation instructions.
4. Fan mounted to roof or roof ledger using RadonAway Fan Mounting Bracket, SKU 25007.

DATE	DESCRIPTION	CHK

SEAL & SIGNATURE

HYDROTECH ENVIRONMENTAL ENGINEERING AND GEOLOGY, DPC

231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY. 10001

TEL: (631) 462-5866

BASE DRAWING PREPARED BY

PROJECT NAME AND ADDRESS

32-01 57TH STREET, QUEENS, NY

PROJECT FIGURE

AS-BUILD DRAWINGS OF COVER SYSTEM, SSDS AND SVE SYSTEM- GENERAL NOTES

PROJECT NO.	DATE
240047	05/13/25
DRAWN BY: A.S.	REVIEWED BY: P.M.
SCALE (11X17): AS NOTED	APPROVED BY: P.M.

RadonAway®

The World's Leading
Radon Fan Manufacturer



RP Series

Installation & Operating Instructions

RadonAway
3 Saber Way | Ward Hill, MA 01835
www.radonaway.com

P/N IN020-REV R 08/15

RadonAway Ward Hill, MA.

Series Fan Installation & Operating Instructions

Please Read and Save These Instructions.

DO NOT CONNECT POWER SUPPLY UNTIL FAN IS COMPLETELY INSTALLED. MAKE SURE ELECTRICAL SERVICE TO FAN IS LOCKED IN "OFF" POSITION. DISCONNECT POWER BEFORE SERVICING FAN.

1. **WARNING!** WARNING! For General Ventilating Use Only. Do Not Use to Exhaust Hazardous, Corrosive or Explosive Materials, Gases or Vapors. See Vapor Intrusion Application Note #AN001 for important information on VI applications. RadonAway.com/vapor-intrusion
2. **WARNING!** NOTE: Fan is suitable for use with solid state speed controls however use of speed controls is not generally recommended.
3. **WARNING!** Check voltage at the fan to insure it corresponds with nameplate.
4. **WARNING!** Normal operation of this device may affect the combustion airflow needed for safe operation of fuel burning equipment. Check for possible backdraft conditions on all combustion devices after installation.
5. **NOTICE!** There are no user serviceable parts located inside the fan unit. **Do NOT attempt to open.** Return unit to the factory for service.
6. **WARNING!** Do not leave fan unit installed on system piping without electrical power for more than 48 hours. Fan failure could result from this non-operational storage.
7. **WARNING!** TO REDUCE THE RISK OF FIRE, ELECTRIC SHOCK, OR INJURY TO PERSONS, OBSERVE THE FOLLOWING:

   a) Use this unit only in the manner intended by the manufacturer. If you have questions, contact the manufacturer.

   b) Before servicing or cleaning unit, switch power off at service panel and lock the service disconnecting means to prevent power from being switched on accidentally. When the service disconnecting means cannot be locked, securely fasten a prominent warning device, such as a tag, to the service panel.

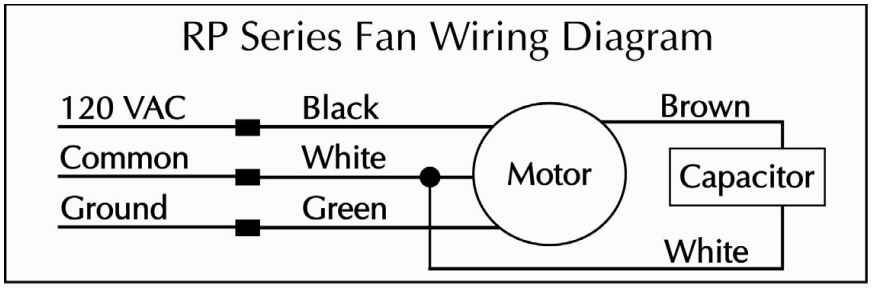
   c) Installation work and electrical wiring must be done by qualified person(s) in accordance with all applicable codes and standards, including fire rated construction.

   d) Sufficient air is needed for proper combustion and exhausting of gases through the flue (chimney) of fuel burning equipment to prevent back drafting. Follow the heating equipment manufacturers guideline and safety standards such as those published by the National Fire Protection Association, and the American Society for Heating, Refrigeration and Air Conditioning Engineers (ASHRAE), and the local code authorities.

   e) When cutting or drilling into a wall or ceiling, do not damage electrical wiring and other hidden utilities.

   f) Ducted fans must always be vented to outdoors.

   g) If this unit is to be installed over a tub or shower, it must be marked as appropriate for the application and be connected to a GFCI (Ground Fault Circuit Interrupter) - protected branch circuit.



RP Series

RP140	**p/n 23029-1**
RP145	**p/n 23030-1**
RP260	**p/n 23032-1**
RP265	**p/n 23033-1**
RP380	**p/n 28208**

1.0 SYSTEM DESIGN CONSIDERATIONS

1.1. INTRODUCTION

The RP Series Radon Fans are intended for use by trained, professional, certified/licensed Radon mitigators. The purpose of this instruction is to provide additional guidance for the most effective use of an RP Series Fan. This instruction should be considered as a supplement to EPA/radon industry standard practices, state and local building codes and state regulations. In the event of a conflict, those codes, practices and regulations take precedence over this instruction.

1.2. FAN SEALING

The RP Series Fans are factory sealed, no additional caulk or other materials are required to inhibit air leakage.

1.3. ENVIRONMENTALS

The RP Series Fans are designed to perform year-round in all but the harshest climates without additional concern for temperature or weather. For installations in an area of severe cold weather, please contact RadonAway for assistance. When not in operation, the fan should be stored in an area where the temperature is never less than 32 degrees F. or more than 100 degrees F.

1.4. ACOUSTICS

The RP Series Fan, when installed properly, operates with little or no noticeable noise to the building occupants. The velocity of the outgoing air should be considered in the overall system design. In some cases the "rushing" sound of the outlet air may be disturbing. In these instances, the use of a RadonAway Exhaust Muffler is recommended.

(To ensure quiet operation of ENERGY STAR qualified in-line and remote fans, each fan shall be installed using sound attenuation techniques appropriate for the installation. For bathroom and general ventilation applications, at least 8 feet of insulated flexible duct shall be installed between the exhaust or supply grille(s) and the fan). RP Series fans are not suitable for kitchen range hood remote ventilation applications.

1.5. GROUND WATER

In the event that a temporary high water table results in water at or above slab level, water may be drawn into the riser pipes thus blocking air flow to the RP Series Fan. The lack of cooling air may result in the fan cycling on and off as the internal temperature rises above the thermal cutoff and falls upon shutoff. Should this condition arise, it is recommended that the fan be turned off until the water recedes allowing for return to normal operation.

1.6. SLAB COVERAGE

The RP Series Fan can provide coverage up to 2000+ sq. ft. per slab penetration. This will primarily depend on the sub-slab material in any particular installation. In general, the tighter the material, the smaller the area covered per penetration. Appropriate selection of the RP Series Fan best suited for the sub-slab material can improve the slab coverage. The RP140/145/155 are best suited for general purpose use. The RP260 can be used where additional airflow is required and the RP265/380 is best suited for large slab, high airflow applications. Additional suction points can be added as required. It is recommended that a small pit (5 to 10 gallons in size) be created below the slab at each suction hole.

1.7. CONDENSATION & DRAINAGE

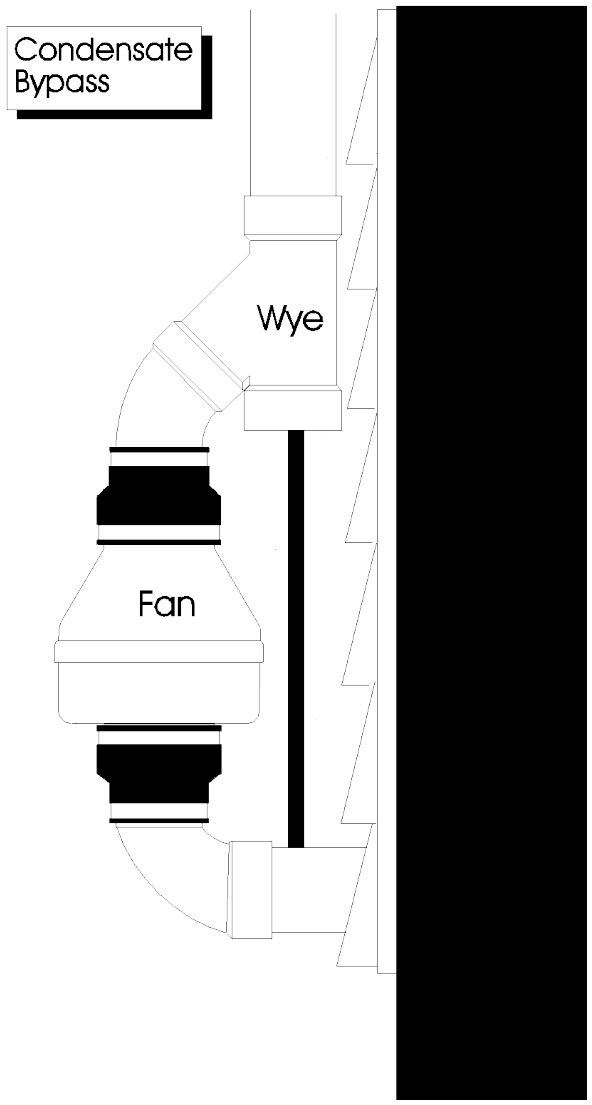
Condensation is formed in the piping of a mitigation system when the air in the piping is chilled below its dew point. This can occur at points where the system piping goes through unheated space such as an attic, garage or outside. The system design must provide a means for water to drain back to a slab hole to remove the condensation. The RP Series Fan **MUST** be mounted vertically plumb and level, with the outlet pointing up for proper drainage through the fan. Avoid mounting the fan in any orientation that will allow water to accumulate inside the fan housing. The RP Series Fans are **NOT** suitable for underground burial.

For RP Series Fan piping, the following table provides the minimum recommended pipe diameter and pitch under several system conditions.

Pipe Dia.	Minimum Rise per Ft of Run*				
	@25 CFM	@50 CFM	@100 CFM	@200 CFM	@300 CFM
6"	-	3/16	1/4	3/8	3/4
4"	1/8	1/4	3/8	2 3/8	-
3"	1/4	3/8	1 1/2	-	-

*Typical RP1xx/2xx Series Fan operational flow rate is 25 - 90 CFM 0n 3" and 4" pipe. (For more precision, determine flow rate by measuring Static Pressure, in WC, and correlate pressure to flow in the performance chart in the addendum.)

Under some circumstances in an outdoor installation a condensate bypass should be installed in the outlet ducting as shown. This may be particularly true in cold climate installations which require long lengths of outlet ducting or where the outlet ducting is likely to produce large amounts of condensation because of high soil moisture or outlet duct material. Schedule 20 piping and other thin-walled plastic ducting and Aluminum downspout will normally produce much more condensation than Schedule 40 piping. Schedule 40 piping is preferred for radon mitigation, all joints should fully sealed using the appropriate pipe cement on socket type fittings or flexible coupling firmly attached via worm drive screw clamps. Sealing ducting or pipe with duct tape is not acceptable on radon mitigation installations. No pipe penetrations are permitted, other than the condensation bypass. Silicon caulk is permitted for sealing purposes.



The bypass is constructed with a 45 degree Wye fitting at the bottom of the outlet stack. The bottom of the Wye is capped and fitted with a tube that connects to the inlet piping or other drain. The condensation produced in the outlet stack is collected in the Wye fitting and drained through the bypass tube. The bypass tubing may be insulated to prevent freezing.

1.8. SYSTEM MONITOR & LABEL

A System Monitor, such as a manometer (P/N 50017) or audible alarm (P/N 28001-2) is required to notify the occupants of a fan system malfunction. A System Label (provided with Manometer P/N 50017) with instructions for contacting the installing contractor for service and also identifying the necessity for regular radon tests to be conducted by the building occupants, must be conspicuously placed where the occupants frequent and can see the label.

1.9. VENTILATION

If used as a ventilation Fan any type of ducting is acceptable, however, flexible nonmetallic ducting is recommended for easy installation and quieter operation. Insulated flexible ducting is highly recommended in cold climates to prevent the warm bathroom air from forming condensation in the ducting where it is exposed to colder attic air. The outlet of the fan should always be ducted to the outside. Avoid venting the outlet of the fan directly into an attic area. The excess moisture from the bathroom can cause damage to building structure and any items stored in the attic. Multiple venting points may be connected together using a "T" or "Y" fitting. Ideally Duct should be arranged such that equal duct lengths are used between intake and "T" or "Y" fitting, this will result in equal flow rates in each intake branch. If adjustable intake grilles are used on multi-intake systems then the opening on each grill should be equal in order to minimize noise and resistance. Straight smooth runs of rigid metal ducting will present the least resistance and maximize system performance. The Equivalent Length of Rigid Metal Ducting resulting in .2" WC pressure loss for each Fan Model is provided in the specification section of these Instructions. Flexible ducting, if used, must always be as close to being fully extended as possible. Formed rigid metal duct elbows will present the least resistance and maximize system performance, recommended bend radius of elbow is at least 1.5 x duct diameter.

RP Series fans are not suitable for kitchen range hood remote ventilation applications. For quietest performance, the fan should be mounted further away from the inlet duct, near the outside vent. A minimum distance of 8 feet is recommended between the fan or T/Y of a multi-intake system and intake grille(s).

Backdraft dampers allow airflow in only one direction preventing cold/hot drafts from entering the vented area and minimize possible condensation and icing within the system while the fan is not operating. Backdraft dampers are highly recommended at each intake grille for bathroom ventilation in all cold climate installations. Installation instructions are included with Spruce backdraft dampers.

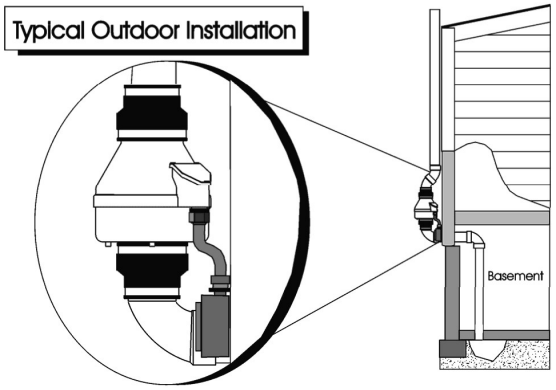
The ducting from this fan to the outside of the building has a strong effect on the airflow, noise and energy use of the fan. Use the shortest, straightest duct routing possible for best performance, and avoid installing the fan with smaller ducts than recommended. Insulation around the ducts can reduce energy loss and inhibit mold growth. Fans installed with existing ducts may not achieve their rated airflow.

1.10. ELECTRICAL WIRING

The RP Series Fans operate on standard 120V 60 Hz. AC. All wiring must be performed in accordance with the National Fire Protection Association's (NFPA)"National Electrical Code, Standard #70"-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician. Outdoor installations require the use of a U.L. listed watertight conduit. Ensure that all exterior electrical boxes are outdoor rated and properly sealed to prevent water penetration into the box. A means, such as a weep hole, is recommended to drain the box.

1.11. SPEED CONTROLS

The RP Series Fans are rated for use with electronic speed controls, however, they are generally not recommended. If used, the recommended speed control is Pass & Seymour Solid State Speed Control Cat. No. 94601-I.

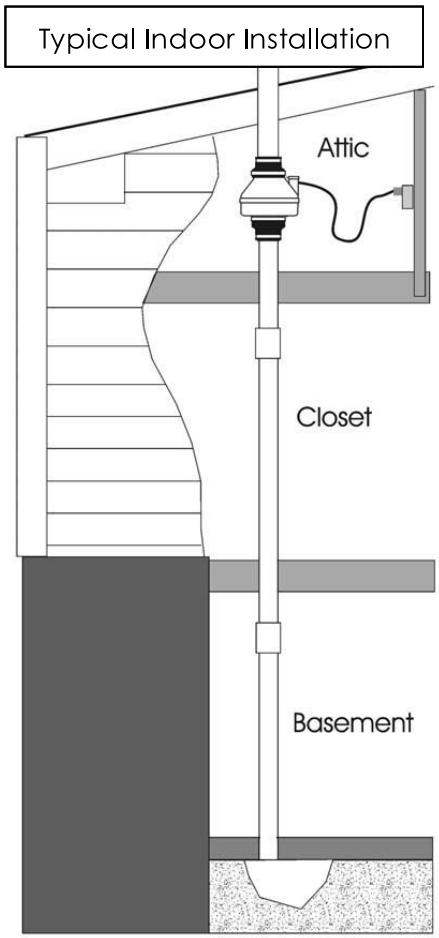


2.0 INSTALLATION

The RP Series Fan can be mounted indoors or outdoors. (It is suggested that EPA recommendations be followed in choosing the fan location.) The RP Series Fan may be mounted directly on the system piping or fastened to a supporting structure by means of optional mounting bracket

2.1 MOUNTING

Mount the RP Series Fan vertically with outlet up. Insure the unit is plumb and level. When mounting directly on the system piping assure that the fan does not contact any building surface to avoid vibration noise.



2.2 MOUNTING BRACKET (optional)

The RP Series Fan may be optionally secured with the RadonAway P/N 25007 (25033 for RP385) mounting bracket. Foam or rubber grommets may also be used between the bracket and mounting surface for vibration isolation.

2.3 SYSTEM PIPING

Complete piping run, using flexible couplings as means of disconnect for servicing the unit and vibration isolation. Used as a Radon Fan the fan is typically outside of the building thermal boundary, and is venting to the outside, installation of insulation around the fan is not required. If used as a ventilation fan insulation may be installed around the fan and duct work, insulation should be sized appropriately for the duct size used and secured with duct tape.

2.4 ELECTRICAL CONNECTION

Connect wiring with wire nuts provided, observing proper connections (See Section 1.10). Note that the fan is not intended for connection to rigid metal conduit.

Fan Wire	Connection
Green	Ground
Black	AC Hot
White	AC Common

2.5 VENT MUFFLER (optional)

Install the muffler assembly in the selected location in the outlet ducting. Solvent weld all connections. The muffler is normally installed at the end of the vent pipe.

2.6 OPERATION CHECKS & ANNUAL SYSTEM MAINTENANCE

_____**Verify** all connections are tight and **leak-free**.

_____**Insure** the RP Series Fan and all ducting is secure and vibration-free.

_____**Verify** system vacuum pressure with manometer. **Insure** vacuum pressure is within normal operating range and **less than** the maximum recommended operating pressure.

(Based on sea-level operation, at higher altitudes reduce by about 4% per 1000 Feet.)
(Further reduce Maximum Operating Pressure by 10% for High Temperature environments)
See Product Specifications. If this is exceeded, increase the number of suction points.

_____**Verify Radon levels by testing to EPA protocol.**

RP SERIES PRODUCT SPECIFICATIONS

The following chart shows fan performance for the RP Series Fan:

Typical CFM Vs Static Pressure "WC									
	0"	.25"	.5"	.75"	1.0"	1.25"	1.5"	1.75"	2.0"
RP140	135	103	70	14	-	-	-	-	-
RP145	166	146	126	104	82	61	41	21	3
RP260	272	220	176	138	103	57	13	-	-
RP265	334	291	247	210	176	142	116	87	52
RP380*	497	401	353	281	220	176	130	80	38

* Tested with 6" inlet and discharge pipe.

Power Consumption 120 VAC, 60Hz 1.5 Amp Maximum		Maximum Recommended Operating Pressure* (Sea Level Operation)**	
RP140	17 - 21 watts	RP140	0.8" W.C.
RP145	41 - 72 watts	RP145	1.7" W.C.
RP260	52 - 72 watts	RP260	1.5" W.C.
RP265	91 - 129 watts	RP265	2.2" W.C.
RP380	95 - 152 watts	RP380	2.0" W.C.

**Reduce by 10% for High Temperature Operation*
***Reduce by 4% per 1000 feet of altitude*

	Size	Weight	Inlet/Outlet	L.2
RP140	8.5H" x 9.7" Dia.	5.5 lbs.	4.5" OD (4.0" PVC Sched 40 size compatible)	25
RP145	8.5H" x 9.7" Dia.	5.5 lbs.	4.5" OD (4.0" PVC Sched 40 size compatible)	15
RP260	8.6H" x 11.75" Dia.	5.5 lbs.	6.0" OD	48
RP265	8.6H" x 11.75" Dia.	6.5 lbs.	6.0" OD	30
RP380	10.53H" x 13.41" Dia.	11.5 lbs.	8.0" OD	57

L.2 = Estimated Equivalent Length of Rigid Metal Ducting resulting in .2in WC pressure loss for Duct Size listed. Longer Equivalent Lengths can be accommodated at Flows Lower than that at .2in WC pressure loss (see CFM Vs Static Pressure "WC Table).

Recommended ducting: 3" or 4" RP1xx/2xx, 6" RP380, Schedule 20/40 PVC Pipe

Mounting: If used for Ventilation use 4", 6" or 8" Rigid or Flexible Ducting

Mount on the duct pipe or with optional mounting bracket.

Storage temperature range: 32 - 100 degrees F.

Normal operating temperature range: -20 - 120 degrees F.

Maximum inlet air temperature: 80 degrees F.

Continuous Duty

Class F Insulation [RP140 Class B]

Class B Insulation

Thermally Protected

3000 RPM

Rated for Indoor or Outdoor Use

LISTED
Electric Fan

Intertek
77728

Conforms to
UL STD. 507

Certified to
CAN/CSA STD.
C22.2 No.113

ENERGY STAR
RP140 Only

TESTED/CERTIFIED
2100
Home Ventilating Institute

IMPORTANT INSTRUCTIONS TO INSTALLER

Inspect the GP/XP/XR/RP/SF Series Fan for shipping damage within 15 days of receipt. Notify **RadonAway® of any damages immediately**. RadonAway® is not responsible for damages incurred during shipping. However, for your benefit, RadonAway® does insure shipments.

There are no user serviceable parts inside the fan. **Do not attempt to open.** Return unit to factory for service.

Install the GP/XP/XR/RP/SF Series Fan in accordance with all EPA standard practices, and state and local building codes and state regulations.

Provide a copy of this instruction or comparable radon system and testing information to the building occupants after completing system installation.

WARRANTY

RadonAway® warrants that the GPX01/XP/XR/RP/SF Series Fan (the "Fan") will be free from defects in materials and workmanship for a period of 90 days from the date of purchase (the "Warranty Term").

RadonAway® will replace any Fan which fails due to defects in materials or workmanship during the Warranty Term. The Fan must be returned (at Owner's cost) to the RadonAway® factory. Any Fan returned to the factory will be discarded unless the Owner provides specific instructions along with the Fan when it is returned regardless of whether or not the Fan is actually replaced under this warranty. Proof of purchase must be supplied upon request for service under this Warranty.

This Warranty is contingent on installation of the Fan in accordance with the instructions provided. This Warranty does not apply where any repairs or alterations have been made or attempted by others, or if the unit has been abused or misused. Warranty does not cover damage in shipment unless the damage is due to the negligence of RadonAway®.

5 YEAR EXTENDED WARRANTY WITH PROFESSIONAL INSTALLATION.

RadonAway® will extend the Warranty Term of the fan to five (5) years from date of purchase or sixty-three (63) months from the date of manufacture, whichever is sooner, if the Fan is installed in a professionally designed and professionally installed active soil depressurization system or installed as a replacement fan in a professionally designed and professionally installed active soil depressurization system by a qualified installer. Proof of purchase and/or proof of professional installation may be required for service under this warranty. Outside the Continental United States and Canada the extended Warranty Term is limited to one (1) year from the date of manufacture.

RadonAway® is not responsible for installation, removal or delivery costs associated with this Warranty.

LIMITATION OF WARRANTY

EXCEPT AS STATED ABOVE, THE GPx01/XP/XR/RP SERIES FANS ARE PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

IN NO EVENT SHALL RADONAWAY BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR RELATING TO, THE FAN OR THE PERFORMANCE THEREOF. RADONAWAY'S AGGREGATE LIABILITY HEREUNDER SHALL NOT IN ANY EVENT EXCEED THE AMOUNT OF THE PURCHASE PRICE OF SAID PRODUCT. THE SOLE AND EXCLUSIVE REMEDY UNDER THIS WARRANTY SHALL BE THE REPAIR OR REPLACEMENT OF THE PRODUCT, TO THE EXTENT THE SAME DOES NOT MEET WITH RADONAWAY'S WARRANTY AS PROVIDED ABOVE.

For service under this Warranty, contact RadonAway for a Return Material Authorization (RMA) number and shipping information. No returns can be accepted without an RMA. If factory return is required, the customer assumes all shipping costs, including insurance, to and from factory.

RadonAway® 3 Saber Way
Ward Hill, MA 01835 USA TEL (978) 521-3703
FAX (978) 521-3964
Email to: Returns@RadonAway.com

Record the following information for your records:

Serial No._____
Purchase Date_____

DWYER

15 Max psi, 2% Accuracy, NPT Thread Air Filter Kit

1/8 Inch Thread, 100 Inch Water Column, 140°F Max

MSC# 00497362

Mfr# 2100

Specifications

Type	Air Filter Kit
Maximum Pressure (psi)	15.00
Accuracy (Percentage)	2; 2%
Connection Type	FNPT

Gender	Female
Dial Size	101.6 mm; 4 in
Connection Size	0.13 in
Connection Location	Side; Back

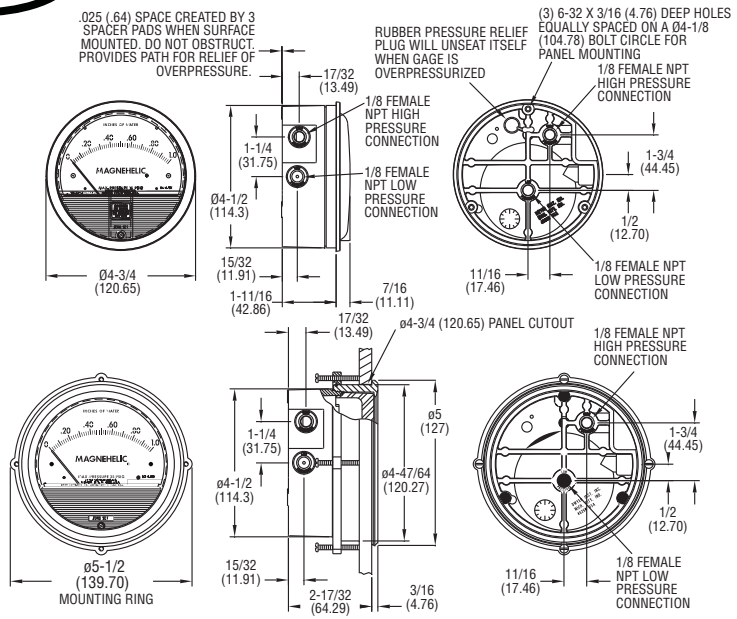
Show More

MSC Part #	00497362
Mfr Part #	2100
Big Book Page #	4442

The Dwyer 15 Max psi, 2% Accuracy, NPT Thread Air Filter Kit - 1/8 Inch Thread, 100 Inch Water Column, 140°F Max can be found within the Differential Pressure Gauges & Switches category. As part of MSC Industrial Supply's Measuring & Inspecting offering, this item can be found using MSC part number 00497362.

Bulletin A-27

Magnehelic® Differential Pressure Gage



**The blowout plug is not used on models above 180 inches of water pressure, medium or high pressure models, or on gages which require an elastomer other than silicone for the diaphragm.*

STANDARD GAGE ACCESSORIES: Two 1/8˝ NPT plugs for duplicate pressure taps, two 1/8˝ pipe thread to rubber tubing adapters and three flush mounting adapters with screws.

MP AND HP GAGE ACCESSORIES: Mounting ring and snap ring retainer substituted for 3 adaptors, 1/4" compression fittings replace 1/8" pipe thread to rubber tubing adaptors.

OVERPRESSURE PROTECTION: Standard Magnehelic® Differential Pressure Gages are rated for a maximum pressure of 15 psig and should not be used where that limit could be exceeded. Models employ a rubber plug on the rear which functions as a relief valve by unseating and venting the gage interior when over pressure reaches approximately 25 psig (excludes MP and HP models). To provide a free path for pressure relief, there are four spacer pads which maintain .023˝ clearance when gage is surface mounted. Do not obstruct the gap created by these pads.

SPECIFICATIONS

Service: Air and non-combustible, compatible gases. (Natural Gas option available.)
Wetted Materials: Consult factory.
Housing: Die cast aluminum case and bezel, with acrylic cover. (MP model has polycarbonate cover).
Accuracy: ±2% of full scale (±3% on - 0, -100 Pa, -125 Pa, 10MM and ±4% on -00, - 00N, -60 Pa, -6MM ranges), throughout range at 70°F (21.1°C).
Pressure Limits: -20˝ Hg to 15 psig.† (-0.677 bar to 1.034 bar); MP option: 35 psig (2.41 bar), HP option: 80 psig (5.52 bar).
Overpressure: Relief plug opens at approximately 25 psig (1.72 bar), standard gages only. The blowout plug is not used on models above 180 inches of water pressure, medium or high pressure models, or on gages which require an elastomer other than silicone for the diaphragm.
Temperature Limits: 20 to 140°F (-6.67 to 60°C). *Low temperature models available as special option.
Size: 4˝ (101.6 mm) diameter dial face.
Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.
Process Connections: 1/8˝ female NPT duplicate high and low pressure taps - one pair side and one pair back.
Weight: 1 lb 2 oz (510 g), MP & HP 2 lb 2 oz (963 g).
Agency Approvals: RoHS.

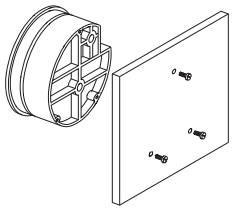
†For applications with high cycle rate within gage total pressure rating, next higher rating is recommended. See Medium and High pressure options.

Note: May be used with hydrogen when ordering Buna-N diaphragm. Pressure must be less than 35 psi.

INSTALLATION

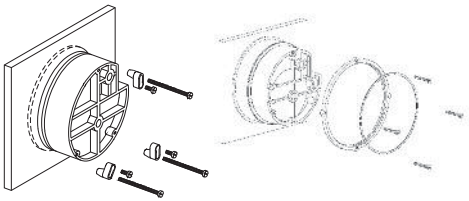
Select a location free from excessive vibration and where the ambient temperature will not exceed 140°F (60°C). Also, avoid direct sunlight which accelerates discoloration of the clear plastic cover. Sensing lines may be run any necessary distance. Long tubing lengths will not affect accuracy but will increase response time slightly. Do not restrict lines. If pulsating pressures or vibration cause excessive pointer oscillation, consult the factory for ways to provide additional damping.
All standard Magnehelic® Differential Pressure Gages are calibrated with the diaphragm vertical and should be used in that position for maximum accuracy. If gages are to be used in other than vertical position, this should be specified on the order. Many higher range gages will perform within tolerance in other positions with only rezeroing. Low range models of 0.5" w.c. plus 0.25" w.c. and metric equivalents must be used in the vertical position only.

SURFACE MOUNTING



Locate mounting holes, 120° apart on a 4-1/8" dia. circle. Use No. 6-32 machine screws of appropriate length.

FLUSH MOUNTING



Provide a 4-9/16" dia. (116 mm) opening in panel. Provide a 4-3/4" dia. (120 mm) opening for MP and HP models. Insert gage and secure in place with No. 6-32 machine screws of appropriate length, with adapters, firmly secured in place.

PIPE MOUNTING

To mount gage on 1-1/4" - 2" pipe, order optional A-610 pipe mounting kit.

TO ZERO GAGE AFTER INSTALLATION

Set the indicating pointer exactly on the zero mark, using the external zero adjust screw on the cover at the bottom. Note that the zero check or adjustment can only be made with the high and low pressure taps both open to atmosphere.

OPERATION

Positive Pressure: Connect tubing from source of pressure to either of the two high pressure ports. Plug the port not used. Vent one or both low pressure ports to atmosphere.
Negative Pressure: Connect tubing from source of vacuum or negative pressure to either of the two low pressure ports. Plug the port not used. Vent one or both high pressure ports to atmosphere.
Differential Pressure: Connect tubing from the greater of two pressure sources to either high pressure port and the lower to either low pressure port. Plug both unused ports.
When one side of the gage is vented in dirty, dusty atmosphere, we suggest an A-331 Filter Vent Plug be installed in the open port to keep inside of gage clean.

A. For portable use of temporary installation use 1/8" pipe thread to rubber tubing adapter and connect to source of pressure with flexible rubber or vinyl tubing.
B. For permanent installation, 1/4" O.D., or larger, copper or aluminum tubing is recommended.

MAINTENANCE

No lubrication or periodic servicing is required. Keep case exterior and cover clean. Occasionally disconnect pressure lines to vent both sides of gage to atmosphere and re-zero. Optional vent valves should be used in permanent installations. The Series 2000 is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.

WARNING

Attempted field repair may void your warranty. Recalibration or repair by the user is not recommended.

TROUBLE SHOOTING TIPS

Gage won't indicate or is sluggish.

1. Duplicate pressure port not plugged.
2. Diaphragm ruptured due to overpressure.
3. Fittings or sensing lines blocked, pinched, or leaking.
4. Cover loose or "O"ring damaged, missing.
5. Pressure sensor, (static tips, Pitot tube, etc.) improperly located.
6. Ambient temperature too low. For operation below 20°F (-7°C), order gage with low temperature, (LT) option.

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P.O. BOX 373 • MICHIGAN CITY, INDIANA 46360 U.S.A.
Phone: 219/879-8000 Fax: 219/872-9057
www.dwyer-inst.com e-mail: info@dwyer-inst.com

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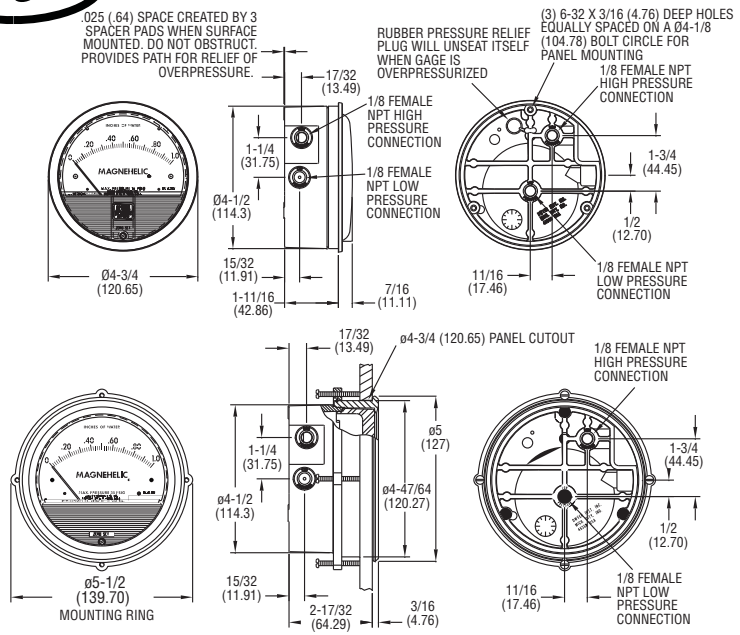
Magnehelic® Differential Pressure Gage
INSTRUCCIONES Y LISTA DE PARTES



(El tapón de goma no es usado en los modelos sobre 180 pulgadas de presión de agua, modelos de presión media o alta, o en instrumentos que requieren un elastizado en cualquier otro material que no sea silicona para el diafragma.)

Accesorios: Tapones 1/8" NPT para las conexiones duplicadas, dos adaptadores de rosca 1/8" NPT a tubo de goma; y tres adaptadores para montaje al ras y tornillos.

Accesorios para Los Modelos MP y HP: El anillo de montaje y el retensor del anillo de presión son substituidos por 3 adaptadores, accesorios de compresión de 1/4" remplazan a los adaptadores de rosca 1/8" a tubo de goma.

Protección Para Sobrepresión: Los Manómetros Diferenciales Magnehelic Estándar están clasificados para una presión máxima de 15 psi y no se deberían de usar donde el límite puede excederse. Los modelos emplean un tapón de goma en el trasero que funciona como una válvula de alivio desmontándose y ventilando el interior del instrumento cuando la sobrepresión alcanza aproximadamente 25 psig. (Los modelos MP y HP son excluidos) Para proveer un camino libre para el alivio de presión, el instrumento viene con rodilleras que mantienen un espacio de .023" cuando el instrumento es montado en superficie. No bloque el espacio creado por estas rodilleras.

† Para aplicaciones con alto ciclo de velocidad dentro de la clasificación de presión total del instrumento, la próxima clasificación mas alta es recomendada. Vea las opciones de media y alta presión.

El instrumento puede ser usado con hidrogeno cuando se ordena con diafragma de Buna-N. La presion tiene que ser menos de 35 psi.

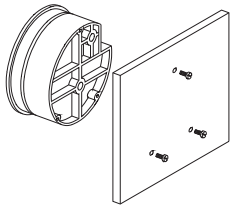
ESPECIFICACIONES

Servicio: aire y gases no combustibles, gases compatibles. (ópcion disponible para uso con gas natural).
Materiales Mojados: Consulte con la fábrica.
Carcasa: Caja y anillo de retención de aluminio fundido a presión con tapadera de acrílico. (El modelo MP tiene la tapadera de policarbonato.)
Exactitud: ±2% de fondo de escala a 21 °C
Mod. 2000-0 ±3%; Mod. 2000-00 ±4%
Límite de Presión: -20 Hg. a 15 psig. † (-0.677 bar a 1,034 bar); opción MP: 35 psig (2.41 bar), opción HP: 80 psig (5.52 bar).
Sobrepresión: El tapón de alivio se abre aproximadamente a los 25 psig, modelos estandard únicamente. El tapón de goma no es usado en los modelos sobre 180 pulgadas de presión de agua, modelos de presión media o alta, o en instrumentos que requieren un elastizado en cualquier otro material que no sea silicio para el diafragma.
Límite de Temperatura: -6.67 a 60ºC. * Modelos de baja temperatura disponibles como opción especial.
Dimensiones: diám. 120,65 mm x 55,6 prof.
Orientación de Montaje: El diafragma debe ser usado solo en posición vertical. Consulte con la fábrica para otras orientaciones de posición.
Conexiones: 1/8" NPT para alta y baja presión, duplicadas (atrás, a los lados).
Peso: 510 g, MP y HP 963 g.
Aprobación de la agencia: RoHS.

Instalacion

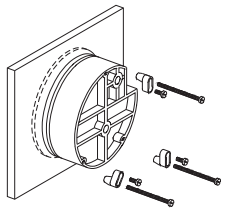
Seleccione un lugar libe de exceso de vibraciones, y donde la temperatura ambiente no supere los 60°C. Evite luz solar directa, para evitar decoloración de la cubierta plástica. Las conexiones de proceso pueden tener cualquier longitud sin afectar la exactitud, pero pueden extender el tiempo de respuesta del instrumento. Si hay pulsación de presión o vibración, consulte a fábrica sobre medios de amortiguación.
Los MAGNEHELIC han sido calibrados con el diafragma vertical, y deben ser usados en esas condiciones. Para otras posiciones, se debe especificar en la orden de provisión. Los de rango elevado pueden ser usados en diversas posiciones, pero se debe reajustar el cero. Los modelos de la serie 2000-00 y equivalentes métricos deben ser usados solo verticalmente.

Montaje en Superficie



Perfore tres orificios separados 120° sobre una circunferencia de 105 mm de diám. y sostenga el instrumento con tres tornillos 6-32 de long. apropiada.

Montaje alineado



Perfore un circulo de 115 mm de diám. en el panel, y sostenga el instrumento mediante los.

Montaje Sobre Pipa

Para montar el instrumento sobre pipas de 32 a 50 mm de diám., ordene el adaptador opcional A-610.

Puesta a Cero Después de Instalar

Deje las conexiones de presión abiertas a atmósfera y ajuste a cero desde tornillo del panel frontal.

Operacion

Presión Positiva: Conecte la tubería desde la fuente de presión a cualquiera de las dos conexiones de alta presión (HIGH), bloqueando la no usada; Las conexiones de baja (LOW) presión pueden dejarse uno o los dos abiertos a la atmósfera.
Presión Negativa: Repita el procedimiento anterior, conectado en este caso las conexiones de baja presión (LOW). Deje las otras conexiones abiertas.
Presión diferencial: Conecte el tubo correspondiente a la presión más positiva al cualquiera de los conectores de alta presión (HIGH) bloqueando el no usado, y la más baja presión o presión negativa (vacío) al conector de baja presión (LOW). Puede usarse cualquier conector de cada par, dejando siempre uno bloqueado. Si se deja una conexión abierta a la atmósfera, se recomienda el uso de un filtro tipo A-331 en el lugar correspondiente para mantener limpio el interior del instrumento. Para uso portable, o instalación temporaria, uso adapta dores para rosca de tubo de 1/89 a tubo flexible, y conecte a proceso mediante una tubería de goma, o equivalente. Para instalación permanente, se recomienda el uso de tubo de cobre o aluminio de por lo menos 1/4" de diám. exterior.

No se requiere mantenimiento específico alguno, ni lubricación. Periódicamente, desconecte el instrumento, ventee la presión acumulada, y reajuste el cero. Para instalaciones permanentes, se debe usar un juego de válvulas de montaje permanente para el venteo.
El instrumento de Serie 2000 no puede ser re parado en el campo y debería de ser regresado si reparos son necesarios (Reparos en el campo no deben de ser intentados y pueden cancelar la garantía.). Asegurarse de incluir una descripción breve del problema más cualquier notas pertinentes a la aplicación para devolución de productos antes de enviar el instrumento.

Cuidado! : La recalibración en campo puede invalidar la garantía. No se recomienda la recalibracion por parte del usuario. En caso necesario envie el instrumento con transporte pago a:

Localización De Fallas

• *El instrumento no indica, o es lento en reacción.*
1. Conexión duplicada abierta.
2. Diafragma roto por sobrepresión.
3. Tubería de conexión perforada, con pérdidas o pinchazos.
4. Anillo de retención flojo, u "O " ring dañado.
5. Conexión a proceso indebida o inadecuada.
6. Temperatura muy baja. Para este caso ordene tipos LT (baja temperatura).

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Phone: 219/879-8000 Fax: 219/872-9057
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Checkpoint IIA Mitigation System Alarm

Item # 28001-2

Description - Audible alarm; green and red LED lights; factory preset to activate at .25" WC vacuum pressure; low voltage

RadonAway is a B2B business only. You must be an approved RadonAway customer to purchase products through this website. If you are an existing RadonAway customer and need a website login, click here. If you are a professional and would like to become a RadonAway customer, click here.

Technical Specifications:

Additional Checkpoint Alarm Information:

- Downloadable Checkpoint Alarm Installation Instructions (PDF format)

INSTALLATION & OPERATING INSTRUCTIONS
Instruction P/N IN015 Rev E
FOR *CHECKPOINT IIa*™ P/N 28001-2 & 28001-3
RADON SYSTEM ALARM

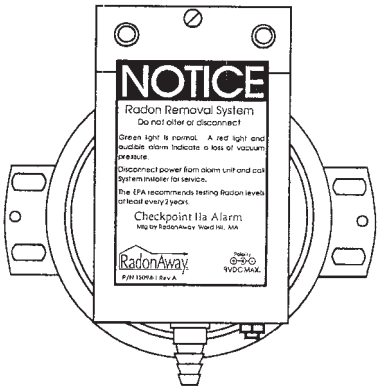
INSTALLATION INSTRUCTIONS
(WALL MOUNTING)

Select a suitable wall location near a vertical section of the suction pipe. The unit should be mounted about four or five feet above the floor and as close to the suction pipe as possible. Keep in mind that with the plug-in transformer provided, the unit must also be within six feet of a 120V receptacle. **NOTE: The Checkpoint IIa is calibrated for vertical mounting, horizontal mounting will affect switchpoint calibration.**

Drill two ¼" holes 4" apart horizontally where the unit is to be mounted.

Install the two ¼" wall anchors provided.

Hang the CHECKPOINT IIa from the two mouting holes located on the mounting bracket. Tighten the mounting screws so the unit fits snugly and securely against the wall.



Drill a 5/16" hole into the side of the vent pipe about 6" higher than the top of the unit.

Insert the vinyl tubing provided about 1" inside the suction pipe.

Cut a suitable length of vinyl tubing and attach it to the pressure switch connector on the CHECKPOINT IIa.

CALIBRATION AND OPERATION.

The CHECKPOINT IIa units are calibrated and sealed at the factory to alarm when the vacuum pressure falls below the factory setting and should not normally require field calibration. Factory Settings are:
28001-2 -.25" WC Vacuum
28001-3 -.10" WC Vacuum

To Verify Operation:

With the exhaust fan off or the pressure tubing disconnected and the CHECKPOINT IIa plugged in, both the red indicator light and the audible alarm should be on.

Turn the fan system on or connect the pressure tubing to the fan piping. The red light and the audible alarm should go off. The green light should come on.

Now turn the fan off. The red light and audible alarm should come on in about two or three seconds and the green light should go out.

WARRANTY INFORMATION

Subject to applicable consumer protection legislation, RadonAway warrants that the CHECKPOINT IIa will be free from defective material and workmanship for a period of (1) year from the date of purchase. Warranty is contingent on installation in accordance with the instructions provided. This warranty does not apply where repairs or alterations have been made or attempted by others; or the unit has been abused or misused. Warranty does not include damage in shipment unless the damage is due to the negligence of RadonAway. All other warranties, expressed or written, are not valid. To make a claim under these limited warranties, you must return the defective item to RadonAway with a copy of the purchase receipt. RadonAway is not responsible for installation or removal cost associated with this warranty. In no case is RadonAway liable beyond the repair or replacement of the defective product FOB RadonAway.

THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. THERE IS NO WARRANTY OF MERCHANTIBILITY. ALL OTHER WARRANTIES, EXPRESSED OR WRITTEN, ARE NOT VALID.

For service under these warranties, contact RadonAway for a Return Material Authorization (RMA) number and shipping information. **No returns can be accepted without an RMA.** If factory return is required, the customer assumes all shipping costs to and from factory.

Manufactured by:
RadonAway
Ward Hill, MA
(978)-521-3703

APPENDIX H
SITE MANAGEMENT FORMS

Monthly Inspection Checklist
Active Sub Slab Depressurization (SSD) System

32-01 57th STREET, QUEENS, NEW YORK

NYSDEC BCP Site # 241197

This system protects public safety and must be operating properly to ensure the safety of occupants of the building. If you identify any problems with this system, contact HydroTech Environmental Engineering and Geology DPC at 631-462-5866

Checklist for SSDS Observations

Question	No	Yes	Directions	Comments
Is the SSDS pressure gauges at SSDS Pit 1 to SSSDS Pit 4 operational?			If "**No**," add comment and contact HydroTech	
Does the system pressure gauges at SSDS Pit 1 to SSSDS Pit 4 indicate proper vacuum?			If "**No**," add comment and contact HydroTech	
What is the vacuum gauges readings at SSDS Pit 1 to SSSDS Pit 4?			If readings are -1≤ - ≤ **-1.9 Inch H2O (Inch WC)**, Ok. If **≥-1 Inch H2O (Inch WC)**, then comment and contact HydroTech	
Are the system alarms at SSDS Pit 1 to SSSDS Pit 4 operational?			If "**No**," add comment and contact HydroTech	
Are clamps in system piping properly fastened and seals near the blower intact and properly sealed?			If "**No**," add comment and contact HydroTech	
Are there any holes, cracks, or other physical deficiencies in SSDS piping?			If "**Yes**," add comment and contact HydroTech	
Are there any blockages in SSDS piping?			If "**Yes**," add comment and contact HydroTech	
Are vacuum monitoring points Probe #1 to Probe #5 intact ?			If "**No**," add comment and contact HydroTech	

Checklist for SVE System Observations

Question	No	Yes	Directions	Comments
Is the SVE system pressure gauge operational?			If "**No**," add comment and contact HydroTech	
Does the SVE system pressure gauge indicate proper vacuum?			If "**No**," add comment and contact HydroTech	
What is the vacuum gauge reading?			If reading is ≤ **-5 Inch H2O (Inch WC)**, Ok. If ≥**-5 Inch H2O (Inch WC)**, then comment and contact HydroTech	
Is the SVE system alarm operational?			If "**No**," add comment and contact HydroTech	
Are clamps in system piping properly fastened and seals near the blower intact and properly sealed?			If "**No**," add comment and contact HydroTech	
Are there any holes, cracks, or other physical deficiencies in SVE system piping?			If "**Yes**," add comment and contact HydroTech	
Are there any blockages in SVE system piping?			If "**Yes**," add comment and contact HydroTech	

This form must be signed, kept on file at the building location and be available on inspection.

Name of Building Maintenance Personnel Performing Inspection: _____

Signature of Building Maintenance Personnel Performing Inspection: _____

Date of Inspection: _____

Inspector name and title	Site Address	Date
	32-01 57th Street, Queens, NY	
Remedy Description of Cover Systems		
1. Review of the current remedy		
Identify the current remedy:		
□ Cover System	□ SSDS	□ SVE System
2. Review of the current remedy goals		
What schedule has been established for inspection of Cover System		Annually
What schedule has been established for monitoring of SSDS ?		Annually
What schedule has been established for monitoring of SVE System?		Annually
B. Summary of Remedy Performance Assessment		
1. Evaluate remedy effectiveness:		
Based on information collected since the last O&M review, do SSDS monitoring data indicate that the system is failing or could eventually fail to meet remedy goals?		□ Yes □ No
Since the last O&M review, have SSDS monitoring data exhibited trends indicative of a new or renewed release?		□ Yes □ No
Since the last O&M review, have changes in landuse been suggested and or implemented that have the potential to reduce the protectiveness of the SSDS remedy?		□ Yes □ No
Since the last O&M review, have contaminants been identified in new locations or at higher concentrations where they pose or have the potential to pose unacceptable risks to receptors?		□ Yes □ No
If you answered yes to any of the above questions, did the information suggest the need for immediate action or is the condition being monitored to evaluate the need for future action? Use this space to comment. What actions, if any, have been taken and/or are planned in response to the new information?		□ Immediate Action □ Monitor for future □ N/A
Based on your answers to the above questions, is there reason to evaluate the need for a contingent remedy at this time? If yes, use this space to comment.		□ Yes □ No
SSDS		
PID at effluent		PPM
Vacuum guage		Inch H20
Vacuum Reading at vacuum monitoring points	Probe #1	Inch H20
	Probe #2	Inch H20
	Probe #3	Inch H20
	Probe #4	Inch H20
	Probe #5	Inch H20
Fans Condition		□ Function □ Damage

Aralms Condition	□ Function □ Damage
Was the SSDS operating upon arrival? If "No," explain below why the system was not running, efforts taken to restart the SSDS and if the system was operational when leaving. If successful in making the SSDS operational, complete the remainder of the checklist.	□ Yes □ No
Were all sub-slab vacuum readings less than of equal to - 0.01 inches of water? If "Yes," the SSDS is deemed still effective and the vacuum readings taken during this inspection are now the new baseline readings. If "No," system must be adjusted/amended and the SSDS re-commissioned. Discuss adjustments and amendments below:	□ Yes □ No
Sve System	
PID at effluent	PPM
Vacuum guage	Inch H20
Fan Condition	□ Function □ Damage
Aralm Condition	□ Function □ Damage
Was the SVE System operating upon arrival? If "No," explain below why the system was not running, efforts taken to restart the system and if the system was operational when leaving. If successful in making the SVE system operational, complete the remainder of the checklist.	□ Yes □ No
Cover System	
Did you observe breaking or cracks in the slab cover	□ Yes □ No
If yes describe the level of alteration needed for repairs and remedies?	

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		
O&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, shipping of laboratory samples, and the removal of waste.

	Current Reporting Period (miles)	**Total to Date (miles)**
Standby Engineer/Contractor		
Laboratory Courier/Delivery Service		
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		
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:
Other:

CERTIFICATION BY CONTRACTOR
I, _____ (**Name**) do hereby certify that I am _____ (**Title**) of the Company/Corporation herein referenced and contractor for the work described in the foregoing application for payment. According to my knowledge and belief, all items and amounts shown on the face of this application for payment are correct, all work has been performed and/or materials supplied, the foregoing is a true and correct statement of the contract account up to and including that last day of the period covered by this application. _____ **Date** **Contractor**

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

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:

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

Revised April 2023

APPENDIX I
QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN

TIBETAN COMMUNITY OF NEW YORK & NEW JERSEY

32-01 57th STREET
QUEENS, NEW YORK

NYSDEC Site Number: 241197

Table of Contents

Figures

1. Proposed Locations of On-Site Ambient Air Samples

Tables

1. Sampling & Analytical Method Requirements – Ambient Air Samples

Attachments

A. Resumes of Key Personnel involved in this Project
B. Sample Chain of Custody Form
C. Conventional Laboratory QA/QC

1.0 Introduction

This Quality Assurance Project Plan (QAPP) has been prepared for the air samples to be collected in accordance with Site Management Plan (SMP) developed for the property occupied by the Tibetan Community of New York and New Jersey and located at 32-01 57th Street, in Queens, (Tax Block 1159, Lot 1) New York (hereinafter referred to as the "Site"). The intent of the QAPP is to ensure that proper procedures for samples custody are performed and data review, validation and verification requirements are complete.

All related portions of the fieldwork will be performed, at a minimum, in accordance with acceptable industry standards. These acceptable industry standards include, but are not limited to, the ASTM Standard Guide for Phase II Environmental Site Assessments (E 1903-97), the New York State Department of Environmental Conservation (NYSDEC) DER-10, Technical Guidance for Site Investigation and Remediation, May 2010, 6 NYCRR Subpart 360, New York State Department of Health (NYSDOH) Guidance for evaluating Soil Vapor Intrusion in the State of NY (October 2006).

2.0 Project Objective and Scope of Work

The objective of the investigations as set forth in the SMP is to perform the following tasks:

- On-site indoor air assessment in order to evaluate the effectiveness of the sub-slab depressurization system (SSDS) installed beneath the cellar slab of the building at the Site.

3.0 Sampling Procedures and Data Quality Usability Objectives

3.1 Ambient Air Sampling

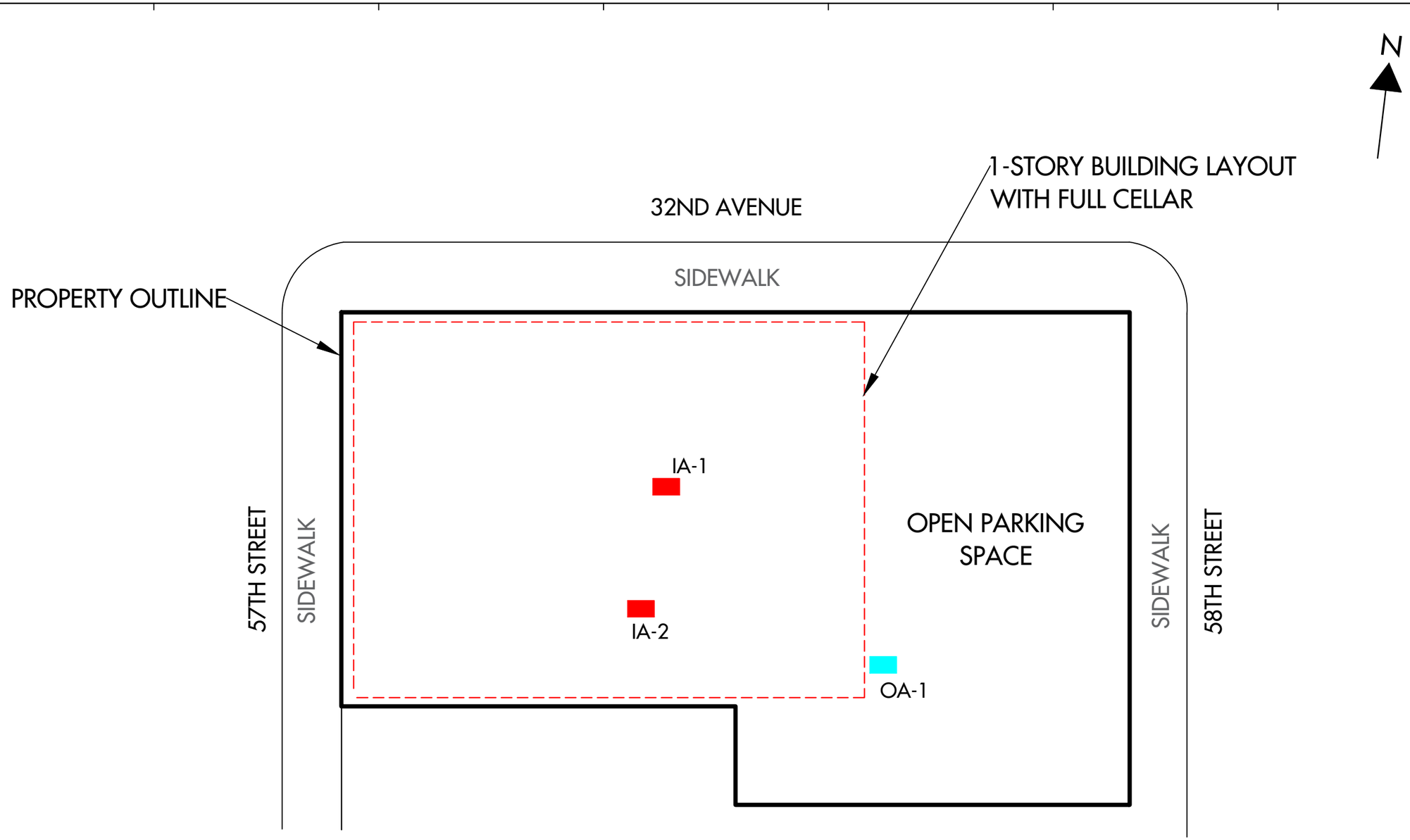
In the event on-site indoor air assessment shall be performed at the Site to further evaluate the effectiveness of the SSDS, two indoor air samples IA-1 and IA-2 and one background outdoor air sample OA-1 will be collected at their previous locations; i.e., IA-1 inside the cellar and IA-2 inside the main hall of the building. **Figure 1** provides a map of proposed locations of on-site ambient air samples. This sampling will be performed in accordance with October 2006 NYSDOH Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York. All samples will be collected utilizing 6 liter pre-cleaned, passivated, and evacuated whole air Summa Canister. Each air sampling canister will be connected to a flow control valve set to collect the 6-L sample over a period of 6 hours at a rate of less than 0.2 liter per minute. Sampling shall be performed for the duration of 8 hours. The samples will be transmitted under proper chain of custody procedures to a NYSDOH ELAP- certified laboratory for analysis. **Table 1** provides the samples volumes, test methods, reporting limits and holding times for the ambient air samples.

3.2 General QA/QC Considerations

The ambient air samples will be managed as per the following protocols:

- HydroTech PM (Paul I. Matli) and HydroTech QAO (Ruijie Xu) shall perform field audits to verify compliance with the SMP and identify corrective measures where problems are identified. A resume for Paul I. Matli and Ruijie Xu are included in **Attachment A.**
- Samples will be labeled and logged in a monitor notebook and Chain of Custody upon collection including sampler name, sampling identification, date and time of sample collection and sampling depth, sampling methods and devices.
- In the field, samples will be the responsibility of, and will stay with, the HydroTech PM (Paul I. Matli) and/or QAO (Ruijie Xu).
- Once samples have been collected, they are returned to HydroTech office and logged in for temporary storage under a proper Chain of Custody. **Attachment B** provides a sample chain of custody form.
- HydroTech staff will be then responsible for transporting samples to State-certified (ELAP) laboratory for analysis under a proper Chain of Custody.
- Laboratory personnel will record the date and time of samples arrival at the lab and ensure that all holding times for each matrix and analysis will be met.
- After samples are analyzed, laboratory information is added to the label.
- The Sample Chain of Custody form will be used to record all transport and storage information.

- Samples analytical data report will undergo QA/QC performed by a laboratory QA officer who checks each data sheet for precision, missing or illegible information, errors in calculation and values outside of the expected range. A minimum of five percent of the total of a given type of sample shall be devoted to internal QC checks. These checks are designed to ensure accuracy in the sampling procedure and the analytical methods and include blanks, duplicates, matrix spikes reference standards and performance evaluation samples. **Attachment C** provides a conventional lab QA/QC procedures associated with soil samples and analysis.
- The Laboratory data packages for ambient air samples will conform to the Analytical Services Protocols (ASP) Category B Deliverables in accordance to NYSDEC DER-10 Appendix 2B.
- To ensure that data quality objectives are met, HydroTech QAO will assess data precision, accuracy, degree of representation, comparability and completeness of samples and data. This is primarily accomplished in the evaluation of data together with field notes and sampling logs.
- All deficiencies identified by HydroTech PM during the performance of field audits or evaluation of the data will be immediately reported to NYSDEC. In addition to identifying deficiencies, the HydroTech PM is responsible for recommending corrective actions.
- The analytical data for ambient air samples generated from this project will be provided in an electronic format in accordance with NYSDECs DER-10 Section 1.15. Specifically, the final reports shall be in an electronic format that complies with the NYSDEC's Electronic Document Standards (EDS).
- A Category B deliverable is required for ambient air samples and a Data Usability Summary Report (DUSR) will be prepared. The DUSR will include all data and answer the following questions:
    1. Is the data package complete as defined under the requirements for the most current DEC ASP Category B or USEPA CLP data deliverables?
    2. Have all holding times been met?
    3. Do all the QC data; blanks, instrument tunings, calibration standards, calibration verifications, surrogate recoveries, spike recoveries, replicate analyses, laboratory controls and sample data fall within the protocol required limits and specifications?
    4. Have all of the data been generated using established and agreed upon analytical protocols?
    5. Does an evaluation of the raw data confirm the results provided in the data summary sheets and quality control verification forms?
    6. Have the correct data qualifiers been used and are they consistent with the most current DEC ASP?



LEGEND:

- OUTDOOR AIR SAMPLE (OA-)
- ON-SITE INDOOR AIR SAMPLES (IA-)
  - IA-1 CELLAR
  - IA-2 MAIN HALL ON FIRST FLOOR

0 — 50

APPROXIMATE SCALE IN FEET

DATE	DESCRIPTION	CHK

SEAL & SIGNATURE

HYDROTECH ENVIRONMENTAL ENGINEERING AND GEOLOGY, DPC

231 WEST 29TH STREET, SUITE 1104, NEW YORK, NY. 10001

TEL: (631) 462-5866

BASE DRAWING PREPARED BY

PROJECT NAME AND ADDRESS

32-01 57TH STREET, QUEENS, NY

PROJECT FIGURE

FIGURE 1: PROPOSED LOCATIONS OF ON-SITE AMBIENT AIR SAMPLES

PROJECT NO.	DATE
240047	05/14/25
DRAWN BY A.S.	REVIEWED BY P.M.
SCALE (11X17) AS NOTED	APPROVED BY P.M.

7. Have any quality control (QC) exceedances been specifically noted in the DUSR and have the corresponding QC summary sheets from the data package been attached to the DUSR?

- All validated data will be reviewed by Amine Dahmani, an independent QAO of the laboratory who is responsible of generating a data usability analysis. This analysis shall consist of (1) an assessment to determine if the data quality objectives were met; (2) evaluation of matrix effects to assess the performance of the analytical method with respect to sample matrix, and determine whether the data have been biased high or low due to matrix effects. A Data Usability Summary Report (DUSR) will be prepared and provided in an electronic format in accordance to NYSDEC DER-10 Appendix 2B and in compliance with the NYSDEC's Electronic Document Standards (EDS). A resume for Amine Dahmani is included in **Attachment A.**
- Field investigation will be performed under the full oversight of Tarek Z. Khouri, a NYS registered professional engineer. A resume for Tarek Z. Khouri is included in **Attachment A**.

Table 1: Sampling & Analytical Method Requirements –Ambient Air Samples

Vapor/Air Matrix Sample ID(1)	Parameters	Minimum Sample Volume	Sample Container	Sample Preservation	Analytical Method	Lab Reporting Limit	Technical Holding Time
On-Site (IA-1, IA-2, OA-1) & Duplicate Sample)	VOCS	6 L	Summa® Canister	NA	TO + 15	Compound Specific (1-20 µg/m^3)	30 days

(1)….Analytical Services Protocols (ASP) Deliverables Package Category B.

ATTACHMENTS

ATTACHMENT A

RESUMES OF KEY PERSONNEL INVOLVED IN THIS PROJECT

TAREK Z. KHOURI, P.E. *Principal Environmental Engineer*

Education
M.S. Environmental Engineering, University of Central Florida

B.S. Chemistry, University of Central Florida

Professional Registration
Professional Engineer (P.E.)
Connecticut # 0031583
D.C. # 908711
Maryland # 49155
Massachusetts # 52601
New Jersey # 24GE04697200
New York # 086611
Pennsylvania # PE084919
Rhode Island # 12059
Texas # 125442
Virginia # 0402056415

Certifications
OSHA: 40 Hour HAZWOPER; 8 Hour Supervisor Management; 10 Hour Construction Safety

USACE Construction Quality Management

Affiliations
Transportation & Infrastructure Committee, NY Building Congress (NYBC), NY, USA

Environmental and Energy Committee, American Society of Engineering Companies (ACEC) NY, USA

Chairman (2013), Solid Waste Committee, Qatar Green Building Council (QGBC) Qatar

Legislative Committee (2008-2010), National Brownfield Association (NBA), NY, USA

Environmental Council (2008-2010), The Business Council of NY State (BCNY), NY, USA

Summary of Experience
Mr. Khouri has more than 20 years of experience in the real estate development, construction and engineering industries.

He has been a trusted partner, providing environmental consulting services to public and private sector clients including developers, real estate owners, investors, facility managers and city, state and federal agencies and municipalities.

Mr. Khouri has participated and managed the remediation and reuse of contaminated properties for over 20 years. He has performed, directed, and overseen environmental investigations and remedial actions at petroleum and chlorinated solvent spill sites, fuel farms, refineries, former manufactured gas, landfills, and a variety of residential, commercial and industrial settings.

Mr. Khouri integrates environmental risk management with land use planning and sustainable development to meet the needs and objectives of diverse clients and stakeholders for residential, commercial, and industrial real estate, in urban and rural environment. Mr. Khouri utilizes his technical expertise as well as his leadership and management skills to direct and oversee teams of professionals for the successful completion of these complex projects.

Relevant Experience
- **Principal Environmental Engineer –** Hydro Tech Environmental Engineering and Geology, DPC (2017-Present)
- **Senior Vice President** – HAKS (2015-2017)
- **Vice President** – Langan Engineering and Environmental Services, USA. (2013-2015)
- **Managing Director** – Averda Environmental Services, Qatar. (2011-2013)
- **Managing Director** – Clean Planet International, USA, Africa and Middle East. (2010-2011)
- **Associate** – Langan Engineering and Environmental Services, USA and Middle East. (2004-2010)
- **Senior Project Manager** – URS Corporation, USA and Middle East. (1998-2004)
- **Senior Scientist** – Solidere, Lebanon. (1996-1998)
- **Environmental Engineer** – University of Central Florida, USA. (1994-1996)

- **Environmental Impact Assessments, Phase I ESAs, and Phase II ESIs - Clients: Developers, Property Managers, Environmental Attorneys, Architects, Banks, and Insurance Firms** - Conducted 100s of environmental assessments for various entities specializing in urban renewal: Mixed use, residential, commercial, retail, warehouses, manufacturing facilities, gas stations and vacant lands. I also designed and executed subsurface investigations for soil, groundwater, and soil gas.

- **Remedial Investigation, Remedial Design and Associated Remediation Projects - Clients: Developers, Property Managers, Environmental Attorneys, Architects, Banks, Insurance Firms -** Managed myriads of environmental investigations and remedial actions at petroleum and chlorinated solvent spill sites, former manufactured gas and a variety of other commercial and industrial settings. Constituents of concern have included LNAPLs and DNAPLs, petroleum hydrocarbons, chlorinated solvents, soil vapor, coal tar, creosote, PCBs, and metals. Managed and participated in historical research, sample collection and data evaluation, synthesis of information to determine site-specific cleanup levels, remedial technology evaluation, design of treatment systems, site cleanup, installation and operation of treatment systems, optimizing systems, and performance monitoring.

- **LIRR/MTA East Side Access Project, New York, NY - Client: MTA** - The project involves the construction of new metro tunnels system in densely developed areas of midtown Manhattan, new tunnels system construction beneath active Amtrak, Metro North and NYCTA facilities, construction of new terminals, ventilation facilities, off street entrances, and yards development. In addition to establishing the guidelines of the project specific environmental management system, I provided direct and extensive public and community relations outreach, educational and awareness programs, as well technical support for the design engineering and construction teams, inspectors, and environmental sub consultants, so that construction of the project proceeds in compliance with environmental commitments, be conducted under budget and on time, while maintaining the utmost quality. Another key component of the project success was the direct and constant coordination between the environmental department and the multiple agencies and operators/owners of the project, such as USEPA, NYSDEC, NYSDOH, NYCDOT, NYCDEP, NYCDOB, MTA, LIRR, NYCTA, Amtrak, and Metro North. Construction Cost: $8.4 Billion

- **Hudson Yards, Proposed New York Jets Stadium, New York, NY – Client: NY Jets -** Served as the environmental project manager for the due diligence, investigation, and preliminary design phases of the proposed Jets Stadium. The work included subsurface investigation for soil, groundwater, and soil gas, and required close interaction with multiple entities including the MTA, LIRR, NYCTA, NYCDOS, NYSDEC, and Amtrak. Construction Cost: $1.4 Billion

- **Columbia University Manhattanville Expansion Project, New York, NY – Client: Columbia University -** Columbia University new campus will be built within a 17-acre area and will be comprised of academic and research facilities, housing, as well as commercial retail stores and open space areas. As the senior environmental project manager, I oversaw all environmental engineering related activities, including site assessment prior to the development, pre-construction support for demolition, recycling, soil and groundwater management, air quality controls, and LEED certification support. Construction Cost: $2+ Billion

- **Potable Water System Testing for Lead, New York, NY – Client: NYCSCA** - Directly managed the emergency work for the sampling, testing, evaluation and reporting of lead in the potable water of approximately 300 public schools in New York City. HAKS was one of the main consultants working for NYCSCA to implement a potable water system testing protocol which included coordination with school facilities, field work encompassing flushing and sampling, laboratory testing, analyzing, and reporting sample results. The project was conducted on a tight 24/7 timetable. The project was completed successfully under the direct supervision and daily coordination with the NYCSCA, with limited to no disturbance to schools' schedule and extracurricular activities, on time and on budget.

- **City University of New York, Tank Rehabilitation, Remediation and Closure Program, New York, NY – Client: DASNY -** Served as the project manager for the technical assessment, remediation design, and oversight of the Underground Storage Tank (UST) facilities at seven City

University campuses. Tanks sizes ranged from 550 Gal to 50,000 Gal. The work included design drawings and construction documents for the tanks and dispensing systems for vapor recovery, fire suppression, electronic monitoring/sensing, pumping/delivery, storage tank details, site restoration, subsurface investigation, and spill remediation. Construction Cost: $5 Million

- **Active Fuel Oil Terminal, Brooklyn, NY – Client: Bayside Fuel Oil Depot Corporation -** Managed the remedial investigation in connection with petroleum releases at an active fuel oil terminal located on Gravesend Bay. Developed and executed a strategy to manage client's liability relating to light non-aqueous phase liquid (LNAPL). Negotiated an alternative remedial action which benefitted the adjacent property and NYSDEC while eliminating client from liabilities at the adjacent property. Investigated and evaluated storm water infrastructure, and included an updated storm water management plan, as part of a sustainable groundwater remedy. Fees: $1.1 Million

- **54 Rutledge St, Insitu Bio-Remediation, Brooklyn, NY – Client: Fortis Property Group -** Managed the implementation of a remedial action for major petroleum and gasoline spills. The remedial action consisted of a multi-phased approach to site cleanup, which included excavation and removal of contaminated soil and groundwater, removal of underground storage tanks, injection of chemical oxidation compounds into the groundwater table, installation of permanent remedial injection and monitoring points, installation of a soil vapor mitigation system, and delineation of off-site contamination. Fees: $1.0 Million

- **Circuitron Corporation Superfund Site, Ground Water Treatment System, East Farmingdale, NY – Client: USACE** - Served as the Project Engineer and the Health and Safety Officer providing technical direction for on-site staff, guidance in hazardous waste/material management, and performing technical review of reports and contract deliverables. Coordinated with USEPA and USACE for the day-to-day operations and quality control matters. Fees: $1.6 Million

- **Constructability Review – Justice Sonia Sotomayor Houses, Bronx, NY – Client: NYCHA -** Constructability Review for the upgrading/rehabilitation of the Justice Sonia Sotomayor Houses in the Bronx for the New York City Housing Authority (NYCHA). The scope of work includes such repairs as Local Law 11 Brick Facade repair/waterproofing for areas of significant disrepair (including brick masonry, window sills/lintels, and brick parapet replacement with metal railing); roof replacement (asbestos abatement, 4-ply insulated roofing, roof drains); interior repairs/sheet rock/painting to apartments with water damage, new window installation at all locations; replacement of the water tanks, pumps, and repairs to the water tank structures in particular buildings; repairs to the property's main loop and improvements to entrances, lobbies and security. Construction Cost: $102 Millions

- **LCP Chemicals Inc. Superfund Site, Linden, NJ – Client: LCP Chemicals Inc. -** Served as the Project Manager and the Health and Safety Officer for the interim removal action program for mercury clean up and removal, petroleum contaminated soil excavation, storage tanks and steel structure demolition. The job also included a drum landfill investigation, done in level B PPE. Awarded the 74th Annual Governor's Occupational Safety & Health Award Citation of Merit of the State of New Jersey in 2002. Fees: $1.1 Million

- **FAA Technical Center, PCB Soil Remediation at Area 20A Superfund Site, Atlantic City, NJ – Client: USACE -** Served as a Laboratory Manager for the PCB contaminated soils removal project at FAA Technical Center. Responsibilities included the development of sampling and analysis plans, establishment of project data quality objectives, evaluation and selection of laboratories for testing programs, data quality assessment, and reports preparation. Fees: $3.2 Million

- **FAA Technical Center, Area D Jet Fuel Farm Superfund Site, Atlantic City, NJ – Client: USACE** - Served as the Quality Control Manager, supervising laboratory prequalification, fieldwork, and laboratory analysis. Evaluated and optimized the operation of the groundwater treatment system, CEM, and SVE bioremediation system, and prepared quarterly reports deliverables to the USEPA and the USACE. Also performed quality assurance audit and review for the pre-excavation sampling results performed by FAA subcontractors, using field test kits for PCB and TPH. Fees: $2.1 Million

- **US Federal Government, Anthrax Investigation, New Jersey and New York – Client: USPS** - Mr. Khouri was part of a team that was contracted by the Federal Government and the United States Postal Services (USPS) to perform Anthrax sampling and investigation throughout dozens of USPS facilities in the Northeast.

International Representative Projects

- **Global Infrastructure Project, Harare, Zimbabwe** – Provided owner representation services for conducting due diligence and feasibility studies for multibillion dollars infrastructure development projects. Projects are BOT and included a 120,000-bbd oil refinery, 300 Km oil pipeline, 20,000 unit's housing project, resorts, telecommunication improvement, and assessing mining concessions. Construction Cost: $7.2 Billion

- **OQYANA World First, Dubai, UAE** – Provided geotechnical and waterfront/marine engineering evaluations of the island's perimeter seawalls and ground improvement schemes, as well as seismic slope stability analysis at the edge of the islands. The proposed design effort and creative approach led to enormous budget and schedule savings for the client. Construction Cost: $1+ Billion

- **Normandy Landfill Treatment Project, Beirut, Lebanon** - Managed the remediation program of a 60 acres' landfill reclamation project. Additionally, I corresponded with management, owners, developers, and government representatives, and my involvement with the project from the design stage throughout the full remediation led to the project ultimate success with regard to the remediation design and schedule and budget compliance. Construction Cost: $65 Million

- **Beach Restoration, Al Athaiba Beach (Muscat, Oman) and Saint Germain sur Ay Beach (La Manche, France) -** Provided environmental engineering and site civil support for erosion control and restoration of the beach. Fees: $500,000

Publications

- Reductive Dehalogenation of Tetrachloroethylene by Soil Sulfate Reducing Microbes Under Various Electron Donor Conditions (2000).

- The Effect of Organic Substrates on Enhanced Biological Phosphorus Removal in Continuous Culture and Batch Experiments (1998).

- Comparison of Enhanced Biological Phosphorus Removal Populations under Ten Different Environmental Conditions (1998).

- Observations From Steady State and Batch Experiments Concerning the Effect on Enhanced Biological Phosphorus Removal of Volatile Fatty Acids and Glucose (1997).

- Single Stage Anaerobic and Aerobic Sequencing Biotransformation and Mineralization of Tetrachloroethylene (PCE) for the Remediation of Contaminated Soils and Groundwater (1996).

HydroTech Environmental
ENGINEERING AND GEOLOGY, DPC

Paul I. Matli, Ph.D., P.G.
VICE PRESIDENT

Ph.D., Environmental Sciences, Tokyo University of Agriculture and Technology, Japan, 2002

M.S., Environmental Sciences, International Center for Advanced Mediterranean Agronomic Studies, Greece, 1997

B.S. Agriculture Engineering, Saint Joseph University, Lebanon, 1994

Accredited US Educational Equivalence of Ph.D., M.S. and B.S. by Globe Language Services, Inc.

OSHA Certifications/Training

40-Hr HAZWOPER
8-Hr HAZWOPER Refresher
30-Hr Construction Safety and Health
10-Hr Construction Industry

Professional Licenses

New York State Professional Geologist (License # 000186)

Affiliations

Member of the American Institute of Professional Geologists since 2015 (Membership # 2784)

Summary of Experience

Mr. Matli has over sixteen (16) years' of experience in environmental engineering and geology with established records of project portfolio management of remedial investigations, design and oversight of remedial cleanup and remedial closures at inactive hazardous waste disposal sites, Brownfield Cleanup Program (BCP) sites, Voluntary Cleanup Program (VCP) sites, Little-E designation sites, petroleum spill sites, former landfills and Superfund sites. Mr. Matli's extensive experience involves the preparation of Environmental Assessment Statements (EAS), Phase I Environmental Site Assessment (ESA) reports, Phase II Remedial Investigations Reports/Site Characterization Reports (RIR), Pilot and Feasibility Studies, Remedial Action Work Plans (RAWP), Construction Completion Reports (CCR), Site Management Plans (SMP) , Remedial Action Reports (RAR) and Final Engineering Reports (FER) for commercial and residential development complexes, auto related workshops, dry cleaners, manufacturing and industrial blocks. Mr. Matli has been in charge of providing technical guidance of all aspects of fieldwork including geophysical and sub-surface drilling activities for installing soil probes, monitoring wells, soil/sub-slab vapor implants, media monitoring and sampling, petroleum bulk storage tanks assessments as well as designing and installing vapor barriers, Sub-Slab Depressurization Systems (SSDS) and Soil Vapor Extraction (SVE) systems.

Relevant Experience

Brownfield Cleanup Program Remediation Of DNAPL Via *In-Situ* Chemical Oxidation/Bioremedial Agents And Active Vapor Mitigation Systems, Vleigh Place, Flushing, NY - Client: United Properties Corp. & VP Capital Holdings, LLC – As an Environmental Project Manager for this site, I was involved in the initial soil and groundwater assessments to investigate environmental impacts associated with the presence of an on-site drycleaner. These investigations confirmed on-site discharges of chlorinated solvents impacting thirteen storefronts located on-site. The former owner expressed interest in the New York State Department of Environmental Conservation (NYSDEC) BCP and I worked with this owner to apply to the program as a Participant. I then prepared and coordinated all necessary documents for the transition of this site into the BCP. Under BCP, I performed additional subsurface delineation of soil and groundwater impact as well as the extent of vapor intrusion impacts on-site and off-site. Besides a I conducted receptor survey that confirmed the presence of a significant threat to the health of 13 commercial tenant located on-site and occupant of two adjacent residential complexes. Immediate remedial activities were required on-site and off-site. As environmental engineer I was involved the design and installation of interim vapor mitigation systems inside the 13 on-

site tenant spaces prior to their destruction by a fire in 2016. I was then involved in the design and installation of an interim Soil Vapor Extraction (SVE) system to prevent the migration of chlorinated vapor into adjacent residential buildings. Under the directions of an NYS Licensed Professional Engineer (PE), I had the direct responsibility of preparing and implementing a NYSDEC-approved RAWP. RAWP activities consisted of a site-wide soil excavation, multiple rounds of in-situ groundwater treatment by chemical oxidation brand name PersulfOx and a bioremedial agent brand name 3_D Microemulsion Factory Elumlsified (3DME) followed by several rounds of post-groundwater remediation sampling events. A total of 48,830 cubic yards of non-hazardous fill material and a total of 1,080 cubic yards of former concrete foundations were also removed during site excavation for future redevelopment. In addition, monitoring of soil vapor intrusion has also been performed off-site in surrounding sidewalks and adjacent buildings including a daycare facility. The Site remediation was completed by achieving the Unrestricted Soil Cleanup Objectives for the soil cleanup and the Track 4 Cleanup Goal for the Site. Using an innovative and affordable remedial design, I was able to stay within budget, prepare an SMP and an FER and help my client receive the tangible tax credits by completing the BCP milestones and receive a NYSDEC-issued Certificate of Completion (COC) within two years of NYSDEC RAWP approval. The site is currently under a post-remediation Site Management Plan, which includes a groundwater sampling program, SVE monitoring program, an SSDS installation and monitoring at adjacent property (2014 - Ongoing).

Brownfield Cleanup Program Remediation Of Historic Railroad Freight Yard And Manufacturing Site, East 135th Street, Bronx NY – Client Deegan 125th Realty LLC – Project Site involved the redevelopment of a 1.112-acre site into two 25-story mixed residential and commercial use towers with full basements and parking/driveways over of two unexcavated public utility easements. With the active involvement of HydroTech, the Site was initially enrolled for remediation under the NYC Mayor's Office of Environmental Remediation (OER) VCP program. With its location in the En-Zone along with the presence of soil impacts from historic uses, I identified this Site as an opportunity for the NYSDEC BCP and I worked with the developer to apply to the program as a volunteer. Once the site was accepted into the BCP program, I performed a Focused Site Characterization and prepared a NYS Licensed PE – certified RAWP with a Track 1 Cleanup Goal. During remedial excavation into the interim unsaturated soil, residual soil contamination could not be removed over 63.6% of the Site perimeter and as such, Track 1 Cleanup Goal was achieved over 0.0405 acres and Track 4 cleanup was achieved over 0.707 acres. As the project manager and project geologist, I provided all necessary support during Site remediation including but not limited to obtaining a Quality and Quantity Dewatering Permit from NYCDEP, perform soil waste characterization and coordinate approvals by soil disposal facilities of 36,048 tons of non-hazardous soil disposed of this project, and also coordinate regulatory approvals of 7,680 tons of required backfill material imported to the site. At the completion of the remedial development, I prepared and submitted to NYSDEC an SMP and a NYS Licensed PE – certified FER. NYSDEC-issued a COC within 30 months of NYSDEC RAWP approval. The site is currently under the post-remediation site management inspection and reporting of a composite cover (2015 – Present).

Management Of Cleanup Of Hazardous Materials At A Former Rubber And Adhesives Factory, 9th Street, Long Island City, NY – Client 9th Street LIC – This project site was historically used for adhesives manufacturing for approximately 62 years and a site environmental characterization identified the presence of hazardous chemical waste beneath the property. After thirteen years of no response by former ownership to address site remediation pursuant to a NYSDEC consent order, a new ownership became involved as a respondent to the Consent order and has requested HydroTech to expedite a design for a site cleanup that should be completed within less than 3 months during the layout of a new building foundations. As a Project Manager, I prepared a NYS licensed PE-certified Interim Remedial

Measures Work Plan (IRM WP), which underwent within less than 3 months four revisions due to evolving site information related to underlying bedrock and perched water. The IRM WP included specific soil cleanup methods and selected remedies dictated by NYSDEC that included a design for an SVE system and subsequently a SSDS. IRM activities completed during a first phase included a further delineation of hazardous contamination in soil across the site, groundwater sampling for emerging contaminants and volatile organic compounds, soil waste characterization, acquisition of a dozen Contained-in Determination letters from NYSDEC for non-hazardous waste, proper disposal of 1,123.24 tons of hazardous soil and 5,362.54 of non-hazardous soil, disposal of 45,371 gallons of non -hazardous liquid from dewatering and truck wash/decontamination pad, closure and removal of 9 underground storage tanks (USTs) listed in the Petroleum Bulk Storage (PBS) database and Chemical Bulk Storage database. My project oversight included monitoring day-to-day construction operations by directing a field crew consisting of a geologist, a community air monitoring technician and a technician for odor suppression. The second phase of IRM activities were upgraded consistent with site development. These activities were detailed in an NYSDEC-approved IRM WP Addendum and will resume upon completion of building construction (2019 – Present).

Remedial Development And Spill Closure At A Gasoline Station, 11th Avenue, New York, NY – Client: Sam Ruv Operating Corp. – This project involved remedial redevelopment activities at a former gasoline filling station and an auto repair facility into a 10-story commercial building. My duties as a Qualified Environmental Professional (QEP) included the performance of a remedial investigation addressing a Little E-Designation for hazardous materials. The investigation was conducted per a NYCOER Remedial Investigation Work Plan. In-situ petroleum releases identified during this investigation lead to the opening of an NYSDEC petroleum spill case. I prepared a Remedial Action Work Plan which included a design for a waterproofing vapor barrier under the directions of a NYS Licensed PE and oversaw the implementation of remedial activities in coordination with OER as part of a Voluntary Clean-Up Program (VCP) and under the authority of NYSDEC as part of spill remediation. During site remediation, non-hazardous petroleum contaminated soil/fill was excavated and removed from the property pursuant to a soil Waste characterization exercise, which I conducted, beforehand. In addition, gasoline and diesel underground storage tanks were properly closed and removed from the properly in compliance with applicable laws and regulations. As part of site development, the vapor barrier system that consisted of a waterproofing membrane was installed beneath the hydrostatic slab across the footprint of the building. At the completion site remediation, a decision for a No Further Action was issued by NYSDEC for the spill incident and achieved a Track 1 Cleanup Goal was achieved under which condition, the Little E-Designation for hazardous materials was removed to the Satisfaction of the NYCOER (2015 - 2018).

Integrated Remedial Options For Mixed Use Site Redevelopment And Management, Canal Street, New York, NY – Client: CBCS Hudson Equities, LLC – As an Environmental Project Manager for this Site, I assisted a NYS Licensed PE during the preparation of RAWPs addressing the remediation of an NYSDEC petroleum spill case in accordance to NYSDEC requirements and also a Little E-designation for hazardous materials in accordance with NYCOER guidance and approvals. I designed, coordinated and directed the performance of remedial activities during site development into a 10-stroy hotel. The scope of these activities consisted of the performance of a soil waste characterization, *in-situ* groundwater treatment by Chemical Oxidation brand name RegenOx™ and bioremedial agent identified as Oxygen Releasing Compounds Advanced (ORCA), the proper closure and removal of a waste oil and gasoline USTs, soil waste characterization, excavation of impact fill material and petroleum impacted soil to below the depth of soil groundwater interface and disposal of non-hazardous regulated waste, collection and analysis of post-excavation endpoint sample, application of Oxygen Releasing Compound Advanced (ORCA) pellets at bottom of excavation, the installation of an active SSDS and a waterproofing vapor barrier and the institution of a groundwater monitoring and sampling program leading to the final closure of NYSDEC spill case. Performed annual inspection of installed engineering controls consisting of

vapor barrier, SSDS and concrete slab to monitor their environmental function for the protection of the health of building occupants pursuant to an OER-approved Site Management Plan (SMP) (2010 - Ongoing).

Petroleum Spill Remediation And Soil Vapor Mitigation At A Former Gasoline Station, Cropsey Avenue, Brooklyn, NY – Client: Avo Construction – The project site is a former gasoline station and auto repair facility associated with an NYSDEC gasoline-related spill case. This site was then redeveloped into seven 3-story residential buildings. As a project geologist I managed the entire remediation of residual gasoline constituents in soil and groundwater beneath the new vacant building and the mitigation of gasoline vapors detected in the basement and first floor at this development. The mitigation of gasoline vapors were undertaken following a regulatory order issued by the New York State Department of Health (NYSDOH) through the NYSDEC and the New York City Department of Health (NYCDOH) preventing this site from being occupied before taking the necessary measures to render it protective to human health. I designed and installed individual active SSDS in each of the seven 3-story vacant residential buildings following a quantitative pre-mitigation diagnostic testing exercise, which I performed pursuant to NYSDEC and NYSDOH approvals. The seven SSDSs were adequately designed to eliminate the potential vapor intrusion pathway between the vapor source (soil and groundwater) and the receptor (indoor air within the building interior). Upon verifying the SSDS successfully prevented the sub-slab gasoline vapors from impacting the indoor air, the NYSDEC in consultation with NYSDOH and NYCDOH authorized the occupation of the seven new developments at this site. The remediation of gasoline constituents in soil and groundwater was then performed following a complete delineation of contamination on-site and off-site. This remediation involved three rounds of off-site groundwater treatment by RegenOx™ and also ORCA. Upon reducing the levels of contaminants to levels satisfactory to NYSDDEC, a decision for a No Further Action was issued by NYSDEC for the spill incident (2010 - 2017).

Site Cleanup For Affordable Residential Redevelopment, Third Avenue, Bronx, NY – Client : Strategic Development & Construction Group – This project consisted of a remedial development of a new 7-story low income/supportive housing residential building with a full cellar located on the west side of Third Avenue in the Morrisania Section of the Bronx that is mostly a low income residential neighborhood. The new building is owned and operated by Services for the UnderServed (SUS), a non-profit agency that provides housing and support services for formerly homeless and other qualified residents. As an Environmental Project Manager for this Site I had to complete several project milestones leading to the finishing of this remedial development. These project milestones included the preparation of an Environmental Assessment Statement (EAS) and Environmental Assessment (EA) to obtain funding from the U.S. Department of Housing and Urban Development's (HUD) HOME Investment Partnership Program (HOME) funding through HPD's Supportive Housing Loan Program. My duties also involved fulfilling the remedial requirements of a Little E-designation for hazardous materials in accordance with City Environmental Quality Review (CEQR) requirements and a NYCOER-approved RAWP pursuant to the NYC VCP. The implementation of RAWP during building construction lead to the identification of hazardous levels of lead in 60 percent of the site soil/fill material through soil waste characterization investigation and several delineation investigations. The project disposed of 2,474.4 tons of hazardous lead contaminated soil. The remedial goal of a Track 1 cleanup was achieved following site cleanup. I was the recipient for the 2016 Big Apple Brownfield Award for Supportive/ Affordable Housing issued for this project by the New York City Brownfield Partnership (2013 - 2015).

Landfill Remedial Monitoring, Paerdegat Basin Natural Area Park, Brooklyn, NY – Client : New York City Department of Environmental Protection (NYCDEP) – This project is an artificially created basin out of Bedford Creek, a freshwater tributary to Jamaica Bay. The basin was impacted by conveying street runoff directly from stormwater and combined sewer overflows from highly urbanized neighborhood and also by dredging conducted during the early twentieth century and historic fill in the South Natural Park Area. Approximately, 177 acres of Paerdegat Basin shoreline and submerged land were restored to

parkland including a Natural Area Park and Ecology Park. In order to correct the degraded water quality conditions in Paerdegat Basin, groundwater sampling was performed to evaluate whether the designated contaminants identified by prior investigations within the urban fill material of the South Natural Park Area have potentially impacted the groundwater after the construction of the Natural Area Park and Ecology Park. As an Environmental Geologist for this site, I performed groundwater sampling per Investigation Work Plans, which I prepared and were approved by NYSDEC and NYCDEP. Groundwater investigations were performed once at pre-construction and several time at post-construction at the Natural Area Park and Ecology Park. These groundwater investigations involved the installation and development of monitoring wells, the sampling of monitoring wells per USEPA low flow samling methods and the sampling of surface water during periods of low tides and high tides with specially designated Quality Assurance Project Plans. I documented the findings of these investigations in groundwater investigation reports to the satisfaction of NYCDEP and NYSDEC (2014 - 2016)

Industrial Air Quality Assessment For Office Conversion Into A Daycare Facility, 40th Avenue, Queens, NY - Client: Peachy Enterprise, LLC - This project addressed the CEQR Technical Manual – Chapter 17 provisions for hazardous materials associated with suspect on-site and off-site historic uses and also an air quality impact assessment in anticipation of the conversion of an office space to a day care center within an existing office building located in M1-3 manufacturing zone under a special permit from the New York City Board of Standards and Appeals (BSA). As an Environmental Project Manager for this site, I performed a Hazardous materials investigation in accordance to NYCDEP-approved investigation work plan, which I prepared. I also prepared a NYCDEP-approved RAP, which was certified by a NYS Licensed PE. I also prepared an air quality impact assessment to the satisfaction of NYCDEP and this assessment involved a boiler screen analysis per CEQR guidance as well as a basic screening of industrial mobile and stationary sources using EPA's AERSCREEN screening dispersion models and detailed analysis using EPA's AERMODE dispersion model. Findings of air emissions provided by these models were compared to NYSDEC's Guidelines for the Evaluation and Control of Ambient Air Contaminants under 6 NYCRR Part 212 Process Operations DAR-1 Annual Guideline Concentrations (AGC) and Short-Term Guideline Concentrations (SGC) Tables Guidance documents. Upon verification that air pollutant concentrations are below the impact criteria, NYCDEP issued a sign-off on the submitted air quality impact assessment documents and back-up materials and issued a notice to proceed for the establishment of the day care facility (2013 - 2014).

HydroTech Environmental
ENGINEERING AND GEOLOGY, DPC

RUIJIE XU
PROJECT MANAGER

Education

M.S., Environmental Science,
New York University,
Polytechnic Engineering School,
New York, NY, 2014

B.S., Biological Science,
Wuhan University,
College of Life Science, Wuhan,
Hubei, China, 2012

Certifications/Training

OSHA: 40 Hour HAZWOPER
OSHA 10 Hour Construction Safety and Health
OSHA 30 Hour for Construction Industry

Summary of Experience

Ms. Xu provides various types of environmental services for private clients. These services include conducting Phase I/II ESAs, remedial investigation, oversight of the implementation of remedial actions and post-remediation monitoring and sampling. Ms. Xu is also working on multiple NYC E-Designation sites and NYS Spill sites under the oversight of lead agencies such as NYSDEC, NYSDEP and NYCOER. The major responsibilities include guiding the client through the environmental petition process, facilitating the client to obtain related environmental approvals/permits, reporting to responsible agencies and ensure the compliance with regulatory requirements.

Relevant Experience

Remediation and Site Management at a Mixed-Use Development Site, Bronx, NY – Client: 2026 Westchester Realty – Project involved the redevelopment of a 1.16-acre site into a 7-story mixed residential, commercial and community building with a partial basement and adjoining ground level parking. The new development also provided 134 affordable rental units. Remediation and construction were completed in 2016 with the active involvement of HydroTech. The site is currently under the post-remediation site management. As the environmental engineer, I'm responsible for the annual inspection of the ECs and reporting to OER. (2018 – Present)

Mixed-Use Redevelopment Site, New York, NY – Client: 150 Wooster LLC – The site was developed into a 6-story mixed residential and commercial building with a full basement and enrolled in the New York City Voluntary Cleanup Program (VCP) due to the presence of E-Designation for Hazardous Materials. In the pre-development investigation, the site was assigned with a spill due to presence of petroleum impacted soil. In addition, lead was detected in soil exceeding the EPA hazardous level. Based upon communication with NYCOER, excavation and implementation of engineering controls (ECs) including vapor barrier and active Sub-Slab Depressurization System (SSDS) were required. As the environmental engineer of the site, I performed soil characterization and lead delineation, provided oversight over remedial activities including soil excavation, tank removal and installation of ECs. I'm currently involved in the post-remediation site management such as annual inspection of ECs and petition for spill closure. (2016 – Present)

Mixed-Use Redevelopment Site, New York, NY – Client: West 30th Street LLC – The project involved redevelopment of a 0.40-acre property located in the Hudson Yard under supervision of NYCOER. The new mixed-use building with full basement will be luxury rental with 25% of affordable units.

As the environmental engineer on the project, I performed remedial investigation including Phase I/II ESA, designed the ECs (vapor barrier system) and conducted waste characterization and delineation. I'm currently involved in the construction oversight over remediation activities such as soil disposal and EC installation. (2018 – Present)

LNAPL Remediation and Monitoring, Bronx, NY – Client: HB Bronx Realty, LLC – Project involved providing engineering support services related in accordance with Site Management Plan supervised by NYSDEC at a commercial parking facility. As environmental engineer on the project, I am currently involved in the periodical sampling and monitoring of the groundwater, LNAPL removal, inspection of engineering controls and reporting to NYSDEC for evaluation of the performance of the remedial system and petition for spill closure. (2018 – Present)

Multiple Affordable Residential Redevelopment, Bronx, NY – Client: SKF Development LLC – The project consists of redevelopment of multiple properties into affordable residential buildings located within the NYS Environmental Zones (En-Zones), which are anticipated to be enrolled in the Brownfield Cleanup Program (BCP). As the environmental engineer, I am currently involved in preparing BCP application for each site and will be responsible for future remedial investigation, remedial design and construction and remediation oversight once the BCP agreement is signed. (2019 – present)

Mixed-Use Development Site, Brooklyn, NY – Client: 540 Fulton Associates LLC – Project involved developing a 15,000-SF lot in Downtown Brooklyn into a 43-story mixed residential and commercial use high rise with full basement. I, as the environmental consultant, performed waste characterization and provided remediation oversight throughout the sub-grade construction. In addition, I also conducted required sampling and prepared the application and renewal package for a NYCDEP Dewatering Permit for discharging approximately 200,000 gallons of groundwater into the combined sewer. (2017 – 2019)

Spill Remediation and Closure at a Commercial Redevelopment Site, Manhattan, NY – Client: New York City Ambulatory – The project included vertical expansion of an existing 2-story theater into a 3-story building for plastic surgery. Soil with petroleum odor were encountered during the excavation for the new sub-cellar. HydroTech was then involved to delineate the extend of the impacted soil and reported the findings to NYSDEC as a spill. Air monitoring along with dust control and odor suppression were conducted throughout the excavation and removal of approx. 1,200 tons of soil and a vapor barrier system were installed under the supervision of HydroTech. As the environmental engineer, I performed the soil waste characterization/delineation and remediation oversight during soil excavation and vapor barrier installation and reported to NYSDEC to acquire spill closure. (2016 – 2018)

Remediation at a Mixed-Use Development Site, New York, NY – Client: Downtown RE Holdings LLC – Project involved the redevelopment of a 0.2-acre site into a 12-story mixed residential and commercial building with a full cellar and a sub-cellar. During the remedial investigation and soil characterization, hazardous lead was detected in soil underneath the Site from multiple locations and depths. HydroTech collected over 100 samples to delineate the vertical and horizontal extend of hazardous lead to help the client save the cost on soil disposal. As the environmental engineer, I conducted the soil sampling for lead delineation and communicated with soil brokers and disposal facilities for soil disposal approval. (2015 – 2016)

Technical Review and Construction Oversight at Multiple Development Sites – Served at New York City Office of Environmental Remediation and provided technical review of cleanup projects and projects documentation for development sites across the five boroughs. Attended meetings with consultants, contractors and developing team and performed site visit during the construction to supervise the implementation of required remedial actions. (2014 – 2015)

M. Amine Dahmani, Ph.D.
Senior Project Manager- SESI Consulting Engineers
Principal- AMXconsult,LLC
Adjunct Professor- UCONN Civil & Environmental Engineering

EDUCATION

1986 - Ph.D. Petroleum Engineering with a Minor in Civil Engineering, Louisiana State University
1983 - M.S. Petroleum Engineering, Louisiana State University
1981 - B.S. Petroleum Engineering, Louisiana State University

EXPERIENCE

2025- on - Principal, AMXconsult, LLC
2017 - on – Adjunct Faculty, Civil & Environmental Engineering Department (CEE), University of Connecticut (UCONN)
October 2016- on - Senior Project Manager, SESI Consulting Engineers, Pine Brook, NJ
August 2015- October 2016 - Senior Project Manager, Remediation Technology Group, Langan Engineering, NJ
June 2008- August 2015 – Section Team Leader, Head of Research and Development and Forensics, Spectrum Analytical, Inc. Agawam, MA
June 2005- June 2008 - Section Team Leader, Research and Development, Spectrum Analytical, Inc. Agawam, MA
1990-May 2005 – Project Manager, Environmental Research Institute (now Center of Environmental Science and Engineering, CESE), University of Connecticut, Storrs, CT

Dr. Dahmani obtained a Ph.D. in Petroleum Engineering from LSU in 1986. After working in the oil industry for four years, he joined the Environmental Research Institute (now CESE) at the University of Connecticut (UCONN) in 1990 to work on environmental assessment, testing and remediation research and development. The institute had state-of-the-art laboratories that provided a full range of services in the development of analytical methods and in analytical testing (organics, metals, nutrients) to support research by faculty members as well as government and industry. Dr. Dahmani joined Spectrum Analytical (now Eurofins) in Massachusetts in 2005 to head the R&D and petroleum forensics teams. Spectrum Analytical provided a full range of analytical testing services for the private and government sectors. He joined Langan Engineering in 2015 as a Senior Manager in the Remediation Technology group before joining SESI as a Senior Project Manager in 2016. Dr. Dahmani currently develops remedial designs, conducts data quality assessments and data usability evaluations (DQA/DUE) for SESI NJ and CT projects, reviews Data Usability Summary Reports (DUSRs) for NY projects and conducts petroleum forensic evaluations. Dr. Dahmani is also an Adjunct Professor at the UCONN Civil & Environmental Engineering department and conducts treatability studies in the Geoenvironmental Laboratory at UCONN.

ATTACHMENT B

SAMPLE CHAIN OF CUSTODY FORM

York Analytical Laboratories, Inc.
120 Research Drive Stratford, CT 06615
132-02 89th Ave Queens, NY 11418
clientservices@yorklab.com
www.yorklab.com

Field Chain-of-Custody Record - AIR

YORK Project No.

NOTE: YORK's Standard Terms & Conditions are listed on the back side of this document.
This document serves as your written authorization for YORK to proceed with the analyses requested below. Your signature binds you to YORK's Standard Terms & Conditions.

YOUR Information	Report To:	Invoice To:
Company:	Company:	Company:
Address:	Address:	Address:
Phone.:	Phone.:	Phone.:
Contact:	Contact:	Contact:
E-mail:	E-mail:	E-mail:

YOUR Project Number

YOUR Project Name

YOUR PO#:

Turn-Around Time

RUSH - Next Day	
RUSH - Two Day	
RUSH - Three Day	
RUSH - Four Day	
Standard (5-7 Day)	

Please print clearly and legibly. All information must be complete. Samples will not be logged in and the turn-around-time clock will not begin until any questions by YORK are resolved.

Samples Collected by: (print your name above and sign below)

Air Matrix Codes

- AI - Indoor Ambient Air
- AO - Outdoor Amb. Air
- AE - Vapor Extraction Well/ Process Gas/Effluent
- AS - Soil Vapor/Sub-Slab

Samples From

New York	
New Jersey	
Connecticut	
Pennsylvania	
Other	

Report / EDD Type (circle selections)

Summary Report	CT RCP	Standard Excel EDD
QA Report	CT RCP DQA/DUE	EQuIS (Standard)
NY ASP A Package	NJDEP Reduced Deliv.	NYSDEC EQuIS
NY ASP B Package	NJDKQP	NJDEP SRP HazSite
Other:		

YORK Reg. Comp.

Compared to the following Regulation(s): (please fill in)

Certified Canisters: Batch ___ Individual ___

Please enter the following REQUIRED Field Data

Reporting Units: ug/m^3 ___ ppbv ___ ppmv ___

Sample Identification	Date/Time Sampled	Air Matrix	Canister Vacuum Before Sampling (in Hg)	Canister Vacuum After Sampling (in Hg)	Canister ID	Flow Cont. ID	Analysis Requested

Comments:

Detection Limits Required

≤ 1 ug/m^3 _____ NYSDEC V1 Limits _____
Routine Survey _____ Other _____

Sampling Media

6 Liter Canister	
Tedlar Bag	

Samples Relinquished by / Company	Date/Time	Samples Received by / Company	Date/Time	Samples Relinquished by / Company	Date/Time
Samples Received by / Company	**Date/Time**	**Samples Relinquished by / Company**	**Date/Time**	**Samples Received by / Company**	**Date/Time**
Samples Relinquished by / Company	**Date/Time**	**Samples Received by / Company**	**Date/Time**	**Samples Received in LAB by**	**Date/Time**

ATTACHMENT C
CONVENTIONAL LABORATORY QA/QC

QUALITY SYSTEMS MANUAL

FOR ENVIRONMENTAL ANALYTICAL SERVICES

Revision 3.2
Effective Date: 09/12/2022

York Analytical Laboratories, Inc.
120 Research Drive
Stratford, CT 06615

York Analytical Laboratories, Inc. (II)
132-02 89th Avenue Suite 217
Richmond Hill, NY 11418

203-325-1371
www.yorklab.com

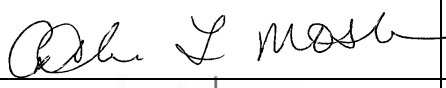
Name	Title	Signature	Date
Cassie Mosher	Laboratory Manager-CT		09/12/2022
Krys Trafalski	Laboratory Manager, QA Officer-NY		09/12/2022
Sarah Widomski	QA Officer-CT		09/12/2022

TABLE OF CONTENTS QUALITY SYSTEMS MANUAL

PREFACE TO THE QUALITY SYSTEMS MANUAL

Purpose

The purpose of this document is to provide implementation guidance on the establishment and management of quality systems for York Analytical Laboratories, Inc. and is based on The National Environmental Laboratory Accreditation Institute (TNI) Quality System requirements,

Background

To be accredited by various States and certain other programs under the auspices of TNI and ISO the following are relevant:

1. The National Environmental Laboratory Accreditation Conference (TNI). Accredited laboratories shall have a comprehensive quality system in place, the requirements for which are outlined in The NELAC Institute (TNI) 2016 Volume 1: Management and Technical Requirements for Laboratories Performing Environmental Analysis (EL-V1-2016). This manual was written with guidance primarily from Volume 1: Modules 2, 3, 4, 5, and 7.

   Additional information may be found at:

- http://www.nelac-institute.org/

2. ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories is for use by laboratories in developing their management system for quality, administrative and technical operations. Laboratory customers, regulatory authorities and accreditation bodies may also use it in confirming or recognizing the competence of laboratories.

   Additional information may be found at:
   - http://www.iso.org/iso/home.html

Project Specific Requirements

Project-specific requirements or regulations may supersede requirements contained in this manual. The laboratory bears the responsibility for meeting all **State requirements**. Nothing in this document relieves the laboratory from complying with contract requirements, or with **Federal, State, and/or local regulations**.

Results and Benefits

- **Standardization of Processes** – Because this manual provides the laboratory with a comprehensive set of requirements that meet the needs of many clients, as well as the NELAP, the laboratory may use it to create a standardized quality system. Ultimately, this standardization saves laboratory resources by establishing one set of consistent requirements for all environmental work. Primarily, the laboratory bears the responsibility for meeting all State requirements as outlined in their respective certification programs.
- **Deterrence of Improper, Unethical, or Illegal Actions** – Improper, unethical, or illegal activities committed by only a few laboratories have implications throughout the industry, with negative impacts on all laboratories. This manual establishes a minimum threshold program for all laboratories to use to deter and detect improper, unethical, or illegal actions.
- **Foundations for the Future** – A standardized approach to quality systems, shared by laboratories and The NELAC Institute, paves the way for the standardization of other processes. For example, this manual might serve as a platform for a standardized strategy for Performance Based Measurement System (PBMS) implementation.

Document Format

This YORK Quality Systems Manual (QSM) is designed to implement the TNI 2016 (EL-V1-2016) standards along with the ISO/IEC 17025:2005 standards.

The section numbering has been changed from that of these standards as the manual is meant to be a stand-alone document. Therefore the numbering in this document is not consistent with the numbering in the above-mentioned standards; however, all required elements are covered, herein.

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ACROYNM LIST

°C: Degrees Celsius
ANSI/ASQC: American National Standards Institute / American Society for Quality Control
ASTM: American Society for Testing and Materials
CAS: Chemical Abstract Service
CCV: Continuing calibration verification
CFR: Code of Federal Regulations
COC: Chain of Custody
CV: Coefficient of Variation
DO: Dissolved Oxygen
DOC: Demonstration of Capability **DQOs:** Data Quality Objectives
EPA: Environmental Protection Agency
g/L: Grams per Liter
GC/MS: Gas Chromatography / Mass Spectrometry
ICP-MS: Inductively Coupled Plasma / Mass Spectrometer
ICV: Initial Calibration Verification
ID: Identifier

IDOC: Initial Demonstration of Capability
ISO/IEC: International Standards Organization / International Electrotechnical Commission
LCS: Laboratory Control Sample
LCSD: Laboratory Control Sample Duplicate
LOD: Limit of Detection
LOQ: Limit of Quantitation
MDL: Method Detection Limit **ME:** Marginal Exceedance **mg/kg:** Milligrams per Kilogram **MS:** Matrix Spike
MSD: Matrix Spike Duplicate
NELAC: National Environmental Laboratory Accreditation Conference **NELAP:** National Environmental Laboratory Accreditation Program **NIST:** National Institute of Standards and Technology
OSHA: Occupational Safety and Health Administration **PBMS:** Performance Based Measurement System
PC: Personal Computer
PCBs: Polychlorinated Biphenyls
PT: Proficiency Testing
QA: Quality Assurance
QAPP: Quality Assurance Project Plan
QSM: Quality Systems Manual
QC: Quality Control
RL: Reporting Limit
RPD: Relative Percent Difference **RSD:** Relative Standard Deviation **SD:** Serial Dilutions
SOP: Standard Operating Procedure
TNI: The NELAC Institute **TSS:** Total Suspended Solids **UV:** Ultraviolet
VOC: Volatile Organic Compound

QUALITY SYSTEMS

Quality Systems include all quality assurance (QA) policies and quality control (QC) procedures that are delineated in a Quality Systems Manual (QSM) and followed to ensure and document the quality of the analytical data. York Analytical Laboratories, Inc. (YORK), accredited under the National Environmental Laboratory Accreditation Program (NELAP), assures implementation of all QA policies and the applicable QC procedures specified in this Manual. The QA policies, which establish essential QC procedures, are applicable to all areas of YORK, regardless of size and complexity.

The intent of this document is to provide sufficient detail about quality management requirements so that all accrediting authorities evaluate laboratories consistently and uniformly.

The NELAC Institute (TNI) is committed to the use of Performance Based Measurement Systems (PBMS) in environmental testing and provides the foundation for PBMS implementation in these standards. While this standard may not currently satisfy all the anticipated needs of PBMS, NELAC will address future needs within the context of State statutory and regulatory requirements and the finalized EPA implementation plans for PBMS.

Chapter 5 is organized according to the structure of ISO/IEC 17025, 2005. Where necessary specific areas within this Chapter deemed may contain more information than specified by ISO/IEC 17025.

All items identified in this QSM shall be available for on-site inspection or data audit.

1.0 SCOPE

a) This QSM sets the general requirements that YORK must successfully demonstrate to be recognized as competent to perform specific environmental analyses.

b) This QSM includes additional requirements and information for assessing competence or for determining compliance by the organization or accrediting authority that grants approval.

If more stringent standards or requirements are included in a mandated test method or by regulation, the laboratory demonstrates that such requirements are met. If it is not clear which requirements are more stringent, the standard from the method or regulation is to be followed.

c) YORK uses this QSM in the development and implementation of its quality systems. Accreditation authorities use this NELAC based standard to assess the competence of environmental laboratories.

2.0 REFERENCES

See Appendix A.

3.0 DEFINITIONS

The relevant definitions from ISO/IEC Guide 2, ANSI/ASQC E-4, 1994, the EPA "Glossary of Quality Assurance Terms and Acronyms," and the *International vocabulary of basic and general terms in metrology (VIM*) are applicable. The most relevant is quoted in Appendix A, Glossary, of Chapter 1 of NELAC, together with further definitions applicable for the purposes of this Standard.

4.0 ORGANIZATION AND MANAGEMENT

4.1 Legal Definition of Laboratory

YORK is legally definable as evidenced by its business license, and current Certifications by the States of Connecticut and New York Depts. of Heath Environmental Laboratory Accreditation Program (ELAP) certifications and the NJDEP and PADEP ELAP certifications. York is organized and operates in such a way that its facilities meet the requirements of the NELAC/TNI Standard. Refer to the presentations of the Organization and QA responsibility as shown in Figures 1 and 2, respectively. Current Certifications are detailed as follows: State of Connecticut Department of Health (CTDOH) Certification no. PH-0723 and PH-0721, New York State Department of Health (NYSDOH) Certifications no. 10854 and 12058 State of New Jersey Dept. of Environmental Protection (NJDEP) Certification nos. CT-005 and NY-037 and State of Pennsylvania DEP Registration No. 68-04440. York's EPA registration ID is CT-005.

4.2 Organization

York Analytical Laboratories Inc.:

a) Has a managerial staff with the authority and resources necessary to discharge their duties;

b) Has processes to ensure that its personnel are free from any commercial, financial and other undue pressure that adversely affect the quality of their work;

c) Is organized in such a way that confidence in its independence of judgment and integrity is maintained at all times;

d) Specifies and documents the responsibility, authority, and interrelationship of all personnel who manage, perform or verify work affecting the quality of calibrations and tests;

Such documentation includes:

1) A clear description of the lines of responsibility in the laboratory, and is proportioned such that adequate supervision is ensured, and

2) Job descriptions for all positions.

e) Provides supervision by persons familiar with the calibration or test methods and procedures, the objective of the calibration or test, and the assessment of the results.

The ratio of supervisory to non-supervisory personnel ensures adequate supervision and adherence to laboratory procedures and accepted techniques.

f) Has technical directors who have overall responsibility for the technical operations of YORK facilities.

The technical director certifies that personnel who perform the tests for which the laboratory is accredited have the appropriate educational and/or technical background. Such certification is documented.

The technical director meets the requirements specified in the Accreditation Process. (See NELAC Section 4.1.1.1.)

g) Has a Quality Assurance Officer (QAO) who has responsibility for the quality system and its implementation.

The quality assurance officer has direct access to the technical director and to the highest level of management at which decisions are made regarding laboratory policy or resources.

The quality assurance officer (and/or designees):

1) Serves as the focal point for QA/QC activities, and is responsible for the oversight and/or review of quality control data;
2) Has functions independent from laboratory operations for which she/he has quality assurance oversight;
3) Is able to evaluate data objectively and perform assessments without outside (e.g., managerial) influence;
4) Has documented training and/or experience in QA/QC procedures and is knowledgeable in the quality system, as defined under NELAC;
5) Has a general knowledge of the analytical test methods for which data review is performed;
6) Arranges for and conducts internal audits as per YORK QSM section 5.3 annually; and
7) Notifies YORK management of deficiencies in the quality system and monitors corrective action.

h) Nominates, by way of the “Alternates List,” deputies in case of absence of the Technical Director and/or the Quality Assurance Director;

i) YORK makes every effort to ensure the protection of its clients' information as confidential and proprietary.

ii) YORK is sensitive to the fact that much of the analytical work performed for clientele may be subject to litigation processes. YORK, therefore, holds all information in strict confidence with laboratory release only to the client.
iii) Information released to entities other than the client is performed only upon written request from the client.
iv) Due to the investigative nature of most site assessments, analytical information may become available to regulatory agencies or other evaluating entities during site assessment of the laboratory for the specific purpose of attaining laboratory certifications, accreditations, or evaluation of laboratory qualification for future work. During these occurrences, the laboratory will make every effort to maintain the confidence of client specific information.

j) For purposes of qualifying for and maintaining accreditation, participates in a proficiency test program as outlined in Chapter 2 of NELAC. Results of YORK’s performance in rounds of proficiency testing are available by request.

4.3 Scope of Management System

The management system covers activities in the laboratory's permanent facilities at 120 Research Drive, Stratford, CT 06615 and 132-02 89th Avenue Richmond Hill. NY 11418. The fields of activities include:

Analysis of environmental samples (water, wastewater, soil, sludge, and air) for Federal and State regulated contaminants in support of private clients.

The laboratory's scope of tests is listed in the specific Certifications and encompasses volatile organics, semi-volatile organics, pesticides, herbicides, PCBs, metals, and various general chemistryparameters.

Methods under which York Analytical Laboratories, Inc. performs its accredited testing include:

EPA 120.1
EPA 1311
EPA 1312
EPA 1664
EPA 180.1, Rev. 2.0
EPA 200.7, Rev. 4.4
EPA 200.8, Rev. 5.4
EPA 245.1, Rev. 3.0
EPA 245.2
EPA 300.0, Rev. 2.1
EPA 3005A
EPA 3010A
EPA 3015A
EPA 3050B
EPA 3060A
EPA 3510C
EPA 3545A
EPA 3546
EPA 3550C
EPA 3580A
EPA 420.1
EPA 5030C
EPA 5035A-H
EPA 5035A-L
EPA 524.2
EPA 6010C
EPA 6010D
EPA 6020A
EPA 6020B
EPA 608.3
EPA 624.1
EPA 625.1
EPA 7196A
EPA 7470A
EPA 7471B
EPA 7473
EPA 8011
EPA 8015D
EPA 8081B
EPA 8082A
EPA 8151A
EPA 8260C
EPA 8260D

EPA 8270D
EPA 8270D SIM
EPA 8270E
EPA 8270E SIM
EPA 9010C
EPA 9014
EPA 9023
EPA 9045D
EPA 9095B
SM 19, 21-23 4500-P E
SM 2120B-2011
SM 21-23 2120B
SM 21-23 2320B
SM 21-23 2540C
SM 2320B-2011
SM 2540 B-2011
SM 2540 C-2011
SM 2540 D-2011
SM 2540 F-2011
SM 3500-Cr B-2011
SM 4500-CN B-2011 and C-2011
SM 4500-CN E-2011
SM 4500-N Org B-2011 or C-2011
SM 4500-N Org D-2011
SM 4500-NH3 D-2011 or E-2011
SM 4500-P B(5)-2011
SM 4500-P E-2011
SM 4500-S2 F-2011
SM 5210B-2011
SM 5220D-2011
SM 5310C-2011
SM 6640B-2006

Methods under which York Analytical Laboratories, Inc. (II) performs its accredited testing include:

EPA 8260C
EPA 8260D
EPA 5030C
EPA 5035A-I
EPA 5035A-H
EPA TO-15
EPA 537
EPA 537.1

5.1 QUALITY SYSTEM – ESTABLISHMENT, AUDITS, ESSENTIAL QUALITY CONTROLS, AND DATA VERIFICATION

5.2 Establishment

YORK establishes and maintains quality systems based on the required elements contained in this Manual and appropriate to the type, range and volume of environmental testing activities it undertakes.

a) The elements of this quality system are documented in this quality manual.

b) The quality documentation is available for use by all laboratory personnel.

c) The laboratory defines and documents its policies and objectives for, and its commitment to accepted laboratory practices and quality of testing services.

d) The laboratory management ensures that these policies and objectives are documented in the quality manual and are communicated to, understood and implemented by all laboratory personnel concerned.

i. All staff members are given access to a controlled copy of the Quality Systems Manual (QSM) for review at the commencement of employment. However, the individual Standard Operating Procedures are the training documents that have precedence. The QSM is provided as a general overview.

ii. A controlled copy of the quality manual is also available in each department.

e) The quality manual is maintained current under the responsibility of the quality assurance department. This manual is reviewed on an annual basis or more frequently, and revised as necessary.

5.3 Quality Systems Manual (QSM) Elements

This Quality Systems Manual (QSM) and related quality documentation state YORK's policies and operational procedures established in order to meet the requirements of this Standard.

This manual lists on the title page: a document title; the laboratory's full name and address; the name, address, and telephone number of individuals responsible for the laboratory and the effective date of the version.

This quality manual and related quality documentation also contains:

a) A quality ***policy statement***, including objectives and commitments, by top management;

i. York Analytical Laboratories, Inc. (YORK) is committed to providing quality environmental analytical services. To ensure the production of scientifically sound, legally defensible data of known and documented quality, an extensive Quality Assurance program has been developed and implemented. This document, YORK's Quality Systems Manual for Environmental Analytical Services, presents an overview of the essential elements of our Quality Assurance program. YORK has modeled this systems manual after EPA guidelines as outlined in "Guidance for Quality Assurance Project Plans (EPA QA/G-5)", Office of Monitoring Systems and Quality Assurance, Office of Research and Development, U.S. EPA, EPA/240-R-02/009 December 2002.

ii. YORK's QA Program is monitored at the Corporate, Divisional, and Group levels, and relies on clearly defined objectives, well-documented procedures, a comprehensive quality assurance/quality control system, and management support for its effectiveness.

iii. This QA Program Systems Manual is designed to control and monitor the quality of data generated at YORK. The essential elements described herein are geared toward generating data that is in compliance with federal regulatory requirements specified under the Clean Water Act, the Safe Drinking Water Act, the Resource Conservation and Recovery Act, the Comprehensive Environmental Response, Compensation, and Liability Act, Clean Air Act and applicable amendments, and state and equivalents. Although the quality control requirements of these various programs are not completely consistent, each of the programs base data quality judgments on the following three types of information, the operational elements of each being described elsewhere in this manual.

⇨ Data which indicates the overall qualifications of the laboratory to perform environmental analyses;
⇨ Data which measures the laboratory's daily performance using a specific method; and
⇨ Data which measures the effect of a specific matrix on the performance of a method.

iv. It is important to note that the QA guidelines presented herein will always apply unless adherence to specific Quality Assurance Project Plans (QAPPs) or client and/or regulatory agency specific requirements are directed. In these cases, the elements contained within specified direction or documentation shall supersede that contained in this document.

v. This manual is a living document subject to periodic modifications to comply with regulatory changes and technological advancements. All previous versions of this document are obsolete. Users are

urged to contact YORK to verify the current revision of this document.

b) The organization and management structure of the laboratory, its place in any parent organization and relevant organizational charts;

See Figures 1 and 2- Organizational Charts.

The relationship between management, technical operations, support services and the quality system;

c) Procedures to ensure that all records required under the NELAP are retained, as well as procedures for control and maintenance of documentation through a document control system which ensures that all standard operating procedures, manuals, or documents clearly indicate the time period during which the procedure or document was in force;

i. Ensuring a quality work product in the environmental laboratory not only requires adherence to the quality issues discussed in the previous sections, but also requires the ability to effectively archive, restore, and protect the records that are generated.

ii. Procedures are in place to ensure that all records are retained. In addition, a documentation control system is employed to clearly indicate the time period during which a standard operating procedure, manual, or document was in force. These procedures are outlined in the laboratory standard operating procedure SOP-T002.

iii. All laboratory logbooks, instrument response printouts, completed analytical reports, chain-of-custodies, and laboratory support documentation are stored for a minimum of five years. Project specific data are stored in sequentially numbered project files and include copies of the applicable laboratory logbooks, instrument response printouts, completed analytical reports, chain-of-custodies, and any other pertinent supporting documentation.

iv. When complete, the project specific data are high speed optically scanned and transformed into digital CD media. Additional copies of these records are created at the time of scanning and are stored off-site for protection of the data. These records are stored for a minimum of five years.

v. Access to all systems is limited by use of log-in and password protection and is maintained by York's IT Manager.

vi. There are four forms of electronic data that are generated in the laboratory. Refer to Table 1 – Data Archiving Schedule below for a synopsis of general data archiving schedules.

vii. All electronic records are stored for a minimum of five years.

TABLE 1 – DATA ARCHIVING SCHEDULE

LIMS Database	
Backup frequency:	Hourly
Backup media:	Virtual Machine/Hard Disk
Backup software:	MS SQL Server Backup
Onsite copy:	Redundancy by using mirrored hard drive
Offsite copy:	Hourly to Cloud
Instrument Data	
Backup frequency:	Real time back-up to VM then Daily
Backup media:	Hard Disk-File server-VM
Backup software:	Win Backup
Backup versions kept:	All versions-changes only archived
Offsite copy:	One to Cloud/Daily

d) Job Descriptions, Roles and Responsibilities

In order for the Quality Assurance Program to function properly, all members of the staff must clearly understand and meet their individual responsibilities as they relate to their job function and the quality program as a whole.

The responsibility for quality lies with every employee at YORK. As such, all employees have access to the Quality Assurance Manual and are responsible for knowing the content of this manual and upholding the standards therein. Each employee is expected to conduct themselves in accordance with the procedures in this manual and the laboratory's SOPs.

The following descriptions define the primary roles and their relationship to the Quality Assurance Program. Members of the key staff include the following:

- Management (e.g., President, CTO, Managers);
- Technical managers (e.g., Technical Directors, Group Leaders);
- Quality Assurance Officer and Data Quality Managers;
- Support systems and administrative managers (e.g., IT manager, Facilities manager, project managers, client services); and
- Other staff

In these positions, members of the key staff are responsible for assuring compliance with the National Environmental Laboratory Accreditation Program (NELAP), California Environmental Laboratory Accreditation Program (ELAP), State and Federal Agencies, and ISO 17025:2005 Standard requirements. In these roles, key personnel may set or enforce quality policies, monitor compliance, initiate corrective actions, interface with laboratory, client, and regulatory personnel, and provide general program oversight.

President and Vice President/Chief Scientific Officer:

YORK's Top Management which represents YORK to the various York facilities and Client entities.

- ⇨ Ensures that YORK's financial and production performance meets assigned metrics.
- ⇨ Determines need for capital and employee resources and allocates as appropriate.
- ⇨ Serves as the legal representative for YORK.
- ⇨ Responsible for yearly budget and overruns.
- ⇨ Point persons for major new initiatives
- ⇨ Manages Laboratory Managers, Technical Directors, QAO and support personnel

Laboratory Technical Directors:

YORK's Laboratory Technical Directors are the final authorities on all issues dealing with data quality and have the authority to require that procedures be amended or discontinued, or analytical results voided or repeated. They also have the authority to recommend suspension or termination of employees on the grounds of non-compliance with QA/QC procedures. In addition, Technical Directors:

- ⇨ Ensure that YORK remains current with all regulations which affect operations and disseminate all such changes in regulatory requirements to the QA Officer, and Group Leaders;
- ⇨ The Laboratory Manager may also act in the Technical Director capacity if the Technical Director is absent for a period of time exceeding 15 consecutive calendar days, providing they meet the qualifications of the Technical Director to temporarily perform this function. If the absence exceeds 35 consecutive calendar days, the primary accrediting authority will be notified in writing;
- ⇨ Ensure that all analysts and supervisors have the appropriate education and training to properly carry out the duties assigned to them and ensures that this training has been documented;
- ⇨ Ensures that personnel are free from any commercial, financial and other undue pressures which might adversely affect the quality of their work;
- ⇨ Oversees the development and implementation of the QA Program which assures that all data generated will be scientifically sound, legally defensible, and of known quality;
- ⇨ In conjunction with the QA Officer, conduct annual reviews of the QA Program;
- ⇨ Oversees the implementation of new and revised QA procedures to improve data quality;

- ⇨ Ensures that appropriate corrective actions are taken to address analyses Identified as requiring such actions by internal and external performance or procedural audits. Procedures that do not meet the standards set forth in the QAM or laboratory SOPs may be temporarily suspended by the Laboratory Manager and Technical Director;
- ⇨ Reviews and approves all SOPs prior to their implementation and ensures all approved SOPs are implemented and adhered to;
- ⇨ Assists the QA Officer with all laboratory accreditation efforts as necessary

Laboratory Managers:

The Laboratory Managers direct log-in and the analytical production sections of the laboratories. They report directly to the Vice President/Chief Scientific Officer and assist in determining the most efficient instrument utilization. More specifically, they:

- ⇨ Evaluate the level of internal/external non-conformances for all departments;
- ⇨ Continuously evaluate production capacity and improves capacity utilization;
- ⇨ Continuously evaluate turnaround time and addresses any problems that may hinder meeting the required and committed turnaround time from the various departments;
- ⇨ Develop and improve the training of all analysts in cooperation with the Vice President/Chief Scientific Officer, Laboratory Directors, QA Officers and Group Leaders, and in compliance with regulatory requirements;
- ⇨ Ensure that scheduled instrument maintenance is completed;
- ⇨ Are responsible for efficient utilization of supplies;
- ⇨ Constantly monitor and modify the processing of samples through the departments; and
- ⇨ Maintain sufficient personnel, equipment and supplies to achieve production goals.

The Laboratory Managers report to the Vice President/Chief Scientific Officer and are responsible for all laboratory, client, and project technical issues. More specifically, they:

- ⇨ For major projects and/or clients, act as a technical resource for the client and the laboratory in matters of method selection or QC criteria.
- ⇨ Company-wide, maintain all training-related documentation in a single secure location. Develops training guides and other training documentation as needed;
- ⇨ Interface directly with Project Management staff in response to questions pre-release or from the client post-release. Determine root cause and interface with QA Officer to prevent recurrences;
- ⇨ Interface directly with clients, or other client representatives in matters related to technical data quality requests, when required
- ⇨ Provide support to Business Development through the review of QAPPs, and work plans. Provide comment and alternative solutions if unable to meet specific requirements;
- ⇨ Support QA and Operations with SOP revisions, where needed;
- ⇨ Perform full QA reviews and/or data validation where required;
- ⇨ Provide technical solutions to QA with regard to laboratory procedures, data quality issues, possible solutions, and appropriate corrective actions;
- ⇨ Provide technical opinions and support to Operations with regard to current procedures or new method development;
- ⇨ Interface with QA staff as necessary to ensure continuous improvement in all areas of YORK's operations.
- ⇨ Provide LIMS input; and

Quality Assurance Officers:

The Quality Assurance Officer (QAO) has full authority through the Vice President/Chief Scientific Officer in all matters relating to quality assurance and quality control systems. The QAO can make recommendations to the Vice President/Chief Scientific Officer and/or Laboratory Managers/Directors regarding the suspension analytical activities or the suspension or termination of employees on the grounds of non-compliance with QA/QC systems or procedures. An alternate QA Officer is always assigned. In the absence of the primary designate, the alternate will act in the QAO's capacity with the full authority of the position as allowed by YORK governing documents. In addition, the QAO performs the following:

- ⇨ Oversight and monitoring of and compliance with YORK's QA program;

- ⇨ Ensuring continuous improvement in all aspects of YORK's QA program such as:
  - o accreditations/certifications;
  - o analytical method management;
  - o internal and external audits;
  - o documentation;
  - o training;
  - o proficiency evaluation studies;
- ⇨ Ensuring YORK's QA program remains up-to-date consistent with current regulatory requirements and YORK's QA policies;
- ⇨ Supervision and direction of all QA staff; and
- ⇨ Provide assistance to responses for data validation inquiries
- ⇨ Serving as a resource for QA matters;
- ⇨ Provide support and oversight to QA staff with regard to external audit responses. Provide input on and define appropriate corrective actions for the laboratory. Document corrective action responses, and monitor the required audit response time frames, as needed.
- ⇨ Oversees in-house training on quality assurance and control.
- ⇨ Provides Ethics training to all relevant personnel

- ⇨ Maintains and updates the QAM on an annual basis;
- ⇨ Implements YORK's QA Program;
- ⇨ Monitors the QA Program within the laboratory to ensure complete compliance with its objectives, QC procedures, holding times, and compliance with client or project specific data quality objectives;
- ⇨ Distributes performance evaluation (PE) samples on a routine basis to ensure the production of data that meets the objectives of its QA Program;
- ⇨ Maintains all SOPs used at YORK;
- ⇨ Maintains records and archives of all PE results, audit comments, and customer inquiries concerning the QA program;
- ⇨ Performs statistical analyses of QC data and establish controls that accurately reflect the performance of the laboratory;
- ⇨ Conducts periodic performance and system audits to ensure compliance with the elements of YORK's QA Program;
- ⇨ Prescribes and monitors corrective action;
- ⇨ Serves as in-house client representative on all project inquiries involving data quality issues;
- ⇨ Coordinates data review process to ensure that thorough reviews are conducted on all project files;
- ⇨ Develops revisions to existing SOPs;
- ⇨ Reports the status of in-house QA/QC to the Vice President/Chief Scientific Officer;
- ⇨ Maintains records and archives of all QA/QC data including but not limited to method detection limit (MDL) studies, IDOCs, DOCs and completed log books; and
- ⇨ Conducts and/or otherwise ensures that an adequate level of QA/QC training is conducted within the laboratory

Director of Project Management/Client Services:

The Director of Project Management reports to the President and serves as the interface between the laboratory's technical departments and the laboratory's clients. The staff consists of the Project Management team, and satellite office/remote personnel. With the overall goal of total client satisfaction, the functions of this position are outlined below:

- ⇨ Technical training and growth of the Project Management team;
- ⇨ Business liaison for the Project Management team;
- ⇨ Human resource management of the Project Management team;
- ⇨ Responsible for the review and negotiation of client contracts and terms and conditions;
- ⇨ Responsible for establishing standard and custom fee schedules for the laboratory;
- ⇨ Responsible for preparation of proposals and quotes for clients and client prospects;
- ⇨ Accountable for response to client inquiries concerning sample status;
- ⇨ Responsible for assistance to clients regarding the resolution of problems concerning Chains-of-Custody;

- ⇨ Ensuring that client specifications, when known, are met by communicating project and quality assurance requirements to the laboratory;
- ⇨ Notifying the department managers of incoming projects and sample delivery schedules;
- ⇨ Accountable to clients for communicating sample progress in with agreed-upon due dates;
- ⇨ Responsible for discussing with client any project-related problems, resolving service issues, and coordinating technical details with the laboratory staff;
- ⇨ Responsible for staff familiarization with specific quotes, sample log-in review, and final report completeness; and
- ⇨ Ensure that all non-conformance conditions are reported to the QA Officer, Lab Manager, and/or Laboratory Director via the Corrective Action process.

Group Leaders:

The Group Leaders report directly to the Lab Managers. They have the authority to accept or reject data based on pre-defined QC criteria. In addition, with the approval of the QA Officer, the Group Leaders may accept data that falls outside of normal QC limits if, in his or her professional judgment, there are technical justifications for the acceptance of such data. The circumstances must be well documented and any need for corrective action identified must be defined and initiated. The authority of the Group Leaders in QC related matters results directly from the QA Officer. The Group Leaders also:

- ⇨ Monitoring the validity of the analyses performed and data generated in the laboratory. This activity begins with insuring data quality, analyzing internal and external non-conformances to identify root cause issues and implementing the resulting corrective and preventive actions, facilitating the data review process and providing technical and troubleshooting expertise on routine and unusual or complex problems;
- ⇨ Providing training and development programs to applicable laboratory staff as new hires and, subsequently, on a scheduled basis; and
- ⇨ Coordinates audit responses with Laboratory Managers and QA Officer.
- ⇨ Actively support the implementation of YORK's QA Program;
- ⇨ Ensure that their employees are in full compliance with YORK's QA Program;
- ⇨ Maintain accurate SOPs (by reviewing and implementing updates) and enforce routine compliance with SOPs;
- ⇨ Conduct technical training of new staff and when modifications are made to existing procedures;
- ⇨ Maintain a work environment which emphasizes the importance of data quality;
- ⇨ Ensure all logbooks are current, reviewed and properly labeled or archived;
- ⇨ Ensure that all non-conformance conditions are reported to the QA Officer, Lab Manager, and/or Technical Director via Corrective Action reports;
- ⇨ Provide guidance to analysts in resolving problems encountered daily during sample prep/analysis in conjunction with the Technical Director, Lab Manager, and/or QAO . Each is responsible for 100% of the data review and documentation, nonconformance issues, and the timely and accurate completion of performance evaluation samples and MDLs, for his/her department;
- ⇨ Encourage the development of analysts to become cross-trained in various methods and/or operate multiple instruments efficiently while performing maintenance and using appropriate documentation techniques;
- ⇨ Ensure that preventive maintenance is performed on instrumentation as detailed in the QA Manual or SOPs. He or she is responsible for developing and implementing a system for preventive maintenance, troubleshooting, and repairing or arranging for repair of instruments;
- ⇨ Provide written responses to external and internal audit issues; and
- ⇨ Provide support to all levels of YORK Management.

Sample Control Group:

The Sample Control Group reports to the Laboratory Manager. The responsibilities are outlined below:

- ⇨ Conduct the receipt, handling, labeling and proper storage of samples in compliance with laboratory procedures and policies;
- ⇨ Oversee the training of Sample Control Technicians regarding the above items;
- ⇨ Direct the logging of incoming samples into the Element LIMS and ensure the verification of data entry from login;
- ⇨ Acts as a liaison between Project Managers and Analytical departments in respect to handling rush

orders and resolving inconsistencies and problems with chain-of-custody forms, and routing of subcontracted analyses; and

- ⇨ Oversees the handling of samples in accordance with the Waste Disposal SOP
- ⇨ Supervise the recording of the transfer of samples from refrigerated conditions to ambient conditions;
- ⇨ Coordinate the collection of waste throughout the laboratory that will be disposed of through "Lab Packs";
- ⇨ Coordinate and supervise Hazardous Waste Technician(s);
- ⇨ Dispose of solid waste to an assigned locations;
- ⇨ Supervise the disposal of soils into appropriate drums;.
- ⇨ Prepare and discharge treated wastewater to the sewer system;
- ⇨ Maintain Uniform Hazardous Waste Manifest files;
- ⇨ Prepare weekly sample disposal schedules;
- ⇨ Coordinate and schedule waste pick-up;
- ⇨ Check all waste containers for appropriate labels; and
- ⇨ Maintain safe housekeeping and practices.

Laboratory Analysts

Laboratory analysts are responsible for conducting analysis and performing all tasks assigned to them by the group leader or supervisor. The responsibilities of the analysts are listed below:

- ⇨ Perform analyses by adhering to analytical and quality control protocols prescribed by current SOPs, this QA Manual, the Data Integrity Policy, and project-specific QA plans honestly, accurately, timely, safely, and in the most cost-effective manner.
- ⇨ Document standard and sample preparation, instrument calibration and maintenance, data calculations, sample matrix effects, and any observed non-conformance on work sheets, bench sheets, preparation logbook, and/or a Non-Conformance report;
- ⇨ Report all non-conformance situations, instrument problems, matrix problems and QC failures, which might affect the reliability of the data, to the Group Leader and/or the QA Officer;
- ⇨ Perform 100% review of the data generated prior to entering and submitting for secondary level review; and
- ⇨ Work cohesively as a team in their department to achieve the goals of accurate results, optimum turnaround time, cost effectiveness, cleanliness, complete documentation, and personal knowledge of environmental analysis.

Project Managers/Client Services:

The Project Managers report to the Director of Project Management and/or Business Development Director. These personnel in turn report directly to the President. Typical responsibilities include:

- ⇨ Serving as the laboratories' primary point of contact for assigned clients;
- ⇨ Working with laboratory chemists to resolve questions on data;
- ⇨ Scheduling of courier deliveries and pick-ups;
- ⇨ Tracking the progress of all laboratory production efforts;
- ⇨ Advising clients of any scheduling conflicts, possible delays, or other problems which may arise;
- ⇨ Resolving any questions or issues that clients may have with regard to our services, especially our reports;

- ⇨ Preparation or directing preparation of bottle kits for use by clients in their sampling efforts;
- ⇨ Reviewing of reports/EDDs (Electronic Data Deliverables) as necessary prior to release;
- ⇨ Invoice review prior to release to client;
- ⇨ Serving as back-up contact person for other Project Managers in the event of his/her absence;
- ⇨ Coordination of all subcontracting efforts for projects assigned;
- ⇨ Preparation and implementation of program QAPPs (Quality Assurance Project Plans), if needed;

Health and Safety Manager:

The Health and Safety Manager (EHS) reports to the Laboratory Manager and ensures that systems are maintained for the safe operation of the laboratory. The EHS Manager is responsible for:

- ⇨ Conducting ongoing, necessary safety training and conducting new employee safety orientations;
- ⇨ Assisting in developing and maintaining the Chemical Hygiene/Safety Manual;
- ⇨ Oversees the inspection and maintenance of general safety equipment – fire extinguishers, safety showers, eyewash fountains, etc. and ensure prompt repairs as needed; and
- ⇨ Completes accident reports, follows up on root causes and defines corrective actions.

Education and Experience

YORK makes every effort to hire analytical staff that possess a college degree (AS, BA, BS) in an applied science with some chemistry in the curriculum. Exceptions are made based upon experience and an individual's ability to learn as there are many in the industry that are more than competent, experts perhaps, who have not earned a college degree.

Selection of qualified individuals for employment begins with documentation of minimum education, training, and experience prerequisites needed to perform the prescribed task. Experience and specialized training may be accepted in lieu of a college degree (basic lab skills such as using a balance, aseptic or quantitation techniques, etc. are also considered).

Included in Table 1.0 below are the basic job titles and personnel responsibilities for anyone who manages, performs or verifies work affecting the quality of the laboratory's environmental sample testing. Minimum education and training requirements are summarized as well.

When an analyst does not meet these minimum requirements, they can perform a task under the direct supervision of a qualified analyst, peer reviewer or Group Leader, and are considered an analyst in training. The person supervising an analyst in training is directly accountable for the quality of the analytical data and must review and approve data and associated corrective actions.

Table 1.0 Minimum Education/Experience requirements for each York position

Position	General Duties	Minimum Education Requirements	Minimum Experience Requirements
Sr. Scientist/Technical Director/Chief Tech. Officer	Responsible for technical aspects of the laboratory operations and related SOPs, training and troubleshooting. Provide Client technical support	B.S. in Chemistry	Ten years hands-on lab experience with GC, GCMS, ICP, AAS, IC and wet chem procedures for the analysis of environmental samples. A minimum of two year front line supervisory experience
Laboratory Manager	Responsible for Lab operations, including all lab disciplines.	B.S. in one of the physical sciences or A.S. plus 10 years' experience	Two years hands-on laboratory experience at the bench and management levels. Familiarity with licensing requirements.
QA/QC Officer	Responsible for overseeing the QA aspects of data. Also provides for review of data packages and internal audits/training.	B.S. in one of the physical sciences or A.S. plus 10 years' experience	Four years hands-on lab experience demonstrated familiarity with QA principles and practices in analytical laboratory.
Data Quality Manager	Responsible for second level review of Lab data for all disciplines	B.S. in one of the physical sciences or A.S. plus 5 years' experience	5 years' experience in lab operations with all major disciplines including intimate knowledge of lab instrumentation and related software. Familiar with data review and data validation guidelines.
Group Leader GC/MS	Responsible for all technical efforts of the GC/MS labs.	B.S. in one of the physical sciences	Four years hands-on GC and/or GC/MS experience with environmental methods. Capable of troubleshooting instrumentation, and interpretation of GCMS data. Also experienced in data package preparation and review.
GC/MS Analyst	Responsible for GC/MS sample/data analysis, reduction and reporting.	B.S. in one of the physical sciences	One year of experience in operating and maintaining GC/MS systems, one year interpreting MS data or one

			external MS interpretation course.
GC/MS Operator	Responsible for operating subsampling systems and GC/MS systems.	A.S. or B. in a science discipline	Six months experience in operating GC/MS systems. Internal training and certification require.
GC Analyst	Responsible for analysis of samples for Pesticides, PCBs, herbicides and special analytes by GC techniques.	A.S. or B.S. in a science discipline	Five years of hands-on experience with analysis using capillary GC with flame ionization electron capture, flame photometric and thermal conductivity detectors. Also, experience interpreting GC data for pesticide, PCBs, herbicides and other environmental contaminants.
Group Leader Metals	Responsible for all sample preparation and analysis for metals.	B.S. in a science discipline	Five years of hands-on experience with ICP, GFAAS and CVAA. Minimum of three years of experience with environmental sample prep and analysis for all metals including mercury.
Metals Technician	Responsible for sample preparation for metals analysis, including Hg.	High school diploma	Six months experience in laboratory procedures
Group Leader-Wet Chemistry	Responsible for all wet chemistry analyses, Ion Chromatography and TCLP extractions/preparation.	B.S. in a science discipline or A.S.	Two years of hands-on environmental laboratory experience with Wet Chem procedures , Ion Chromatography and TCLP extractions
Lab Technician-Wet Chemistry	Responsible for wet chem analyses and TCLP extractions	A.S. or B.S. in a science discipline	Six months hands-on experience with Wet chem procedures and TLP extractions. In lieu of educational requirement, a High school diploma with one year experience in wet chem procedures is acceptable.
Ion Chromatography Analyst	Responsible for all anion and cation analysts by IC.	B.S. in a science discipline	Six months hands-on experience with IC procedures, including data interpretation, review and reporting.
Group Leader-Organic Extractions	Responsible for all organic extractions for BNAs, Pest/PCB, Herbicides and other target compounds	A.S. or B.S. in a science discipline	Two years of experience of environmental sample for target organics compounds. In lieu of the education requirement, a high school diploma and four years of experience in education including one year of supervisory experience will suffice.
Extractions Technician	Responsible for extraction/concentration of environmental samples for BNAs, PCB/Pests, and herbicides	A.S. or B.S. in a science discipline	Six months of experience in extraction/concentration techniques. In lieu of a degree, a high school diploma and one year of experience in laboratory procedures will suffice.
Sample Manager	Reportable for all sample receipts, chain-of-custody, and log-in.	A.S. or B.S. in a science discipline	Three years of experience in an environmental laboratory or A.M.B. + one year experience
Sample Custodian	Assist Sample Manager with log-in duties and sample disposal	High School Diploma	One year of general laboratory experience or environmental industry experience.
System Manager	Responsible for the management of all computing systems including hardware, software, documentation, archive procedures and LIMS management.	B.S. in IT discipline	Three years of experience in hardware troubleshooting, system design/build, software installation and maintenance.
Client Services Managers/Project Mgrs.	Responsible for all client interface from both technical and scheduling perspective	B.S. in a science discipline	Five years laboratory analysis experience and/or three years of sales experience in environmental business.

e) Identification of the laboratory's approved signatories; at a minimum, the title page of the quality manual has the signed and dated concurrence (with appropriate titles) of all responsible parties including the QA Manager, Operations, QA, Technical, Laboratory and Operations Directors.

f) The laboratory's procedures for achieving traceability of measurements;

g) A list of all test methods under which the laboratory performs its accredited testing may be found in the Index of Standard Operating Procedures, a separate document.

h) Mechanisms for ensuring that the laboratory reviews all new work to ensure that it has the appropriate facilities and resources before commencing such work;

i) Reference to the calibration and/or verification test procedures used;

Calibration procedures and verification of acceptability for each set of required calibrations are defined in Section 13 (Calibration) and Section 12 (Quality Control) of each standard operating procedure.

j) Procedures for handling samples received;

The generation of quality analytical data begins with the collection of the sample and, therefore, the integrity of the sample collection process is of importance to YORK. Samples must be collected in such a way that foreign material is not introduced into the samples and that analytes of interest do not escape from the samples or degrade prior to their analysis. To ensure sample integrity and representativeness, the following items must be considered:

- ⇨ Samples must be collected in appropriate containers. In general, glass containers are used for organic analytes except for PFAS (HDPE or PP) and polyethylene for inorganic/metal analytes;
- ⇨ Only new sample containers which are certified and documented clean by the vendor in shall be provided by YORK for sample collection;
- ⇨ Certain extremely hazardous samples or samples that have the potential to become extremely hazardous will not be accepted. These include (but are not limited to)

    1. Radioactive samples that significantly exceed background levels
    2. Biohazardous samples (medical wastes, body fluids, etc.)
    3. Explosive samples in pure form (gunpowder, ammunition, flares, etc.)
    4. Neurological or other toxic agents (Sarin, Anthrax, Ricin, etc.)
    5. Drum samples which are concentrated acids, organic solvents or know oxidizers
    6. Unknowns with no historical information on character of the material

YORK's chain-of-custody document is used to forward samples from the client to the laboratory. As the basic elements of most all chain-of-custody (COC) documents are similar, clientele may choose to use their own chain-of-custody document to forward samples to YORK, however York prefers use of its COC.

Any discrepancies in the COC must be documented on the Sample Receipt Form and resolved prior to analysis of samples.

Upon receipt by YORK, samples proceed through an orderly processing sequence designed to ensure continuous integrity of both the sample and its documentation from sample receipt through its analysis and beyond.

All coolers that are received by the Sample Control Group undergo a preliminary examination in accordance with the Sample Receipt checklist in Element. Specifically, each sample is carefully examined for label identification, proper container (type and volume), chemical preservation when applicable, container condition, and chain-of-custody documentation consistency with sample labels. Discrepancies are noted in Element on both the Sample Receipt Form and, if possible, discussed with the client by Project Management. If this is not possible, the discrepancies are communicated to the client for resolution prior to the completion of the log-in process. The temperature of the cooler is measured and, with other observations, are recorded on the COC and in Element (temperature).

During the log-in process each sample is assigned a unique laboratory identification number through a computerized Laboratory Information Management System (LIMS), which stores all essential project information. YORK maintains multiple security levels of access into LIMS to prevent unauthorized tampering/release of sample and project information.

Once all analyses for a sample have been completed and the sample container is returned to its designated location where, it shall remain in refrigerated storage for a period not less than 14 days following sample receipt unless the client requests return/forwarding of the sample. Following the 14-day refrigerated storage period, the samples are placed into ambient storage for another period not less than 16 days after which the samples are bulked into drums for later disposal. Samples are retained for 30 days in total unless other arrangements pre-empt this.

k) Reference to the major equipment and reference measurement standards used as well as the facilities and services used by the laboratory in conducting tests;

A list of major equipment is kept up-to-date on the List of Major Assets, reference Appendix G. This, as well as a list of reference measurement standards and their certificates of calibration, is maintained by the QA Officer or the respective departments. In general, all calibrations and references should be traceable to NIST

l) Reference to procedures for calibration, verification and maintenance of equipment; Laboratory SOPs are available to staff for calibration, verification and maintenance of equipment. In general,

m) Reference to verification practices which may include inter-laboratory comparisons, proficiency testing programs, use of reference materials and internal quality control schemes;

Instrument calibration is required to ensure that the analytical system is operating correctly and functioning at the proper sensitivity such that required reporting limits can be met. Each instrument is calibrated with standard solutions appropriate to the type of instrument and the linear range established for the analytical method. The manufacturer's guidelines, the analytical method, and/or the requirements of special contracts determine the frequency of calibration and the concentration of calibration standards, whichever is most applicable. The following are very general guidelines and are not meant to be all-inclusive. Detailed calibration procedures are specified in the SOP for each method performed.

Gas Chromatography/Mass Spectroscopy (GC/MS): Each day prior to analysis of samples, all GC/MS instruments are tuned with 4-bromofluorobenzene (BFB) for VOCs and decafluorotriphenylphosphine (DFTPP) for SVOCs in accordance with the tuning criteria specified in the applicable methods. Samples are not analyzed until the method-specific tuning requirements have been met. These have been eliminated in newer versions SW846 methods of 8260D and 8270E. Tuning is only required upon performance of an initial calibration.

After the tuning criteria are met, the instrument is then calibrated for all target analytes and an initial multipoint calibration curve established. The calibration curve is then validated by the analysis of a second source standard, referred to as the initial calibration verification (ICV). Alternatively, the previous calibration curve may be used if validated by a continuing calibration verification (CCV) standard. All target analytes are represented in the calibration. For the initial calibration to be deemed acceptable, 80% of the target compounds must show average Response factor RSDs <20% or for regressions >0.990 and must be re-evaluated and meet the acceptance criteria, at a minimum, every twelve (12) hours thereafter.

Liquid Chromatography/Mass Spectrometry/Mass Spectrometry (LC/MSMS). These systems are used for determination of target PFAS species in Potable water, non-potable water and soil matrices. Systems are tuned according to manufacturer specifications and challenged each day by running CCV standards at various method or SOP dictated levels. For initial calibration the instrument is then calibrated for all target analytes and an initial multipoint calibration curve established. The calibration curve is then validated by the analysis of a second source standard, referred to as the initial calibration verification (ICV). Alternatively, the previous calibration curve may be used if validated by a continuing calibration verification (CCV) standards. All target analytes are represented in the calibration. For the initial calibration to be deemed acceptable, all target compounds must show average Response factor RSDs

<30% or for regressions >0.995 and must be re-evaluated and meet the acceptance criteria, at a minimum, every 10 sample injections and at the end of an analytical sequence.

Non-GC/MS Chromatography: The field of chromatography involves a variety of instrumentation and detectors. While calibration standards and control criteria vary depending upon the type of system and analytical methodology required for a specific analysis, the general principles of calibration apply uniformly. Each chromatographic system is calibrated prior to sample analysis. An initial multipoint calibration curve is generated using all target analytes. All target analytes must meet the acceptance criteria for the calibration to be deemed acceptable. The calibration curve is then validated by the analysis of a second source standard, referred to as the initial calibration verification (ICV). The continued validity of the initial multipoint calibration is verified every 12 hours using continuing calibration verification (CCV) standard containing all target analytes. If the CCV fails to meet the acceptance criteria, the system is re-calibrated and all samples analyzed since the last acceptable CCV must be re-analyzed.

Inductively Coupled Plasma Emission Spectroscopy: Initial calibration consists of a calibration blank (CB) plus one calibration standard. The calibration is verified by the re-analysis of the standard and initial calibration verification (ICV) standard. If the standard and the ICV fail to meet the acceptance criteria, the initial calibration is considered invalid and is re-performed.

Continuing calibration verification (CCV) consists of a mid-concentration standard plus a calibration blank (CB) analyzed every 10 samples and at the end of the sequence. If the CCV and/or CB fail to meet the acceptance criteria, the instrument must be re-calibrated and all samples analyzed since the previous acceptable CCV and/or CB must be re-analyzed.

ICP/MS Spectroscopy: Each day prior to the analysis of samples, all ICP/MS instruments undergo mass calibration and resolution checks prior to initial calibration. Initial calibration consists of a calibration blank (CB) and at least three calibration standards. The calibration is verified by the re-analysis of the standard and initial calibration verification (ICV) standards. If the standard and the ICV fail to meet the acceptance criteria, the initial calibration is considered invalid and is re-performed.

Continuing calibration verification (CCV) consists of a mid-concentration standard plus a calibration blank (CB) analyzed every 10 samples and at the end of the sequence. If the CCV and/or CB fail to meet the acceptance criteria, the instrument must be re-calibrated and all samples analyzed since the previous acceptable CCV and/or CB must be re-analyzed.

Cold Vapor Atomic Absorption Spectroscopy: Initial calibration consists of a calibration blank plus a series of at least 5 standards. The calibration curve is then validated by the analysis of a second source standard, referred to as the initial calibration verification (ICV). Continuing calibration verification (CCV) consists of midpoint calibration standard plus a continuing calibration blank (CCB) analyzed every 10 samples and at the end of the sequence. If the CCV and/or CCB fail to meet the acceptance criteria, the instrument must be re-calibrated and all samples analyzed since the previous acceptable CCV and/or CCB must be re-analyzed. If the calibration blanks contain target analyte concentrations exceeding the acceptance limits, the cause must be determined and corrected.

General Inorganic Analyses: General inorganic (non-metal) analyses involve a variety of instrumental and wet chemistry techniques. While calibration procedures vary depending on the type of instrumentation and methodology, the general principles of calibration apply universally. Each system or method is initially calibrated using standards prior to analyses being conducted with continual verification that the calibration remains acceptable throughout analytical processing. If continuing calibration verification fails to meet the acceptance criteria, the instrument must be re-calibrated and all samples analyzed since the previous acceptable CCV must be re-analyzed.

PERIODIC CALIBRATION

Periodic calibration shall be performed for instrumentation such as balances, thermometers, ovens, and furnaces that are required in analytical methods, but which are not routinely calibrated as part of the analytical procedure. Documentation of calibration is kept for each instrumentation item.

Calibration requirements are determined within the York laboratory depending upon the instrumentation used and its operating function. Following are brief example discussions for the calibration of balances and thermometers with examples of calibration data sheets to serve as a guideline for the preparation of laboratory- specific procedures.

Balances (Example Procedure)

All balances are verified by using weights traceable to the National Bureau of Standards (NIST) on use. Calibration weights shall be Class S or better and shall be recertified as required. If balances are calibrated by an external agency, verification of their weights shall be provided.

Calibration of balances shall be over the range in which they are most commonly used. The weighs used for calibration of each balance shall be 0.5g, 2.0g, 10.0g, 20.0g, and 100g. Acceptance for balances which are direct reading to 0.01 gram shall be ± 0.01g, to 0.0001g shall be ± 0.007g, and to 0.00001g shall be ± 0.0007g.

Thermometers (Example Procedure)

Certified, or reference, thermometers shall be maintained for use in calibrating working thermometers including other temperature measurement devices such as thermocouples, probes and infrared temperature sensors. Reference thermometers shall be provided with NIST traceability for initial calibration and shall be recertified every year with instrumentation directly traceable to the NIST. Working thermometers shall be compared with reference thermometers every 12 months. In addition, working thermometers shall be visually inspected by laboratory personnel prior to use.

Calibration temperatures and acceptance criteria shall be based upon the working range of the thermometer and the accuracy required for its use.

n) Procedures to be followed for feedback and corrective action whenever testing discrepancies are detected, or departures from documented policies and procedures occur;

o) The laboratory management arrangements for permitting exceptions and departures from documented policies and procedures or from standard specifications;

YORK's SOPs are in substantial conformity with their corresponding published method references. Departure from approved SOPs shall be approved if necessary or appropriate due to the nature or composition of the sample or otherwise based on the reasonable judgment of YORK's Laboratory Manager, Technical Director, or QA Officer.

Departures shall be made on a case-by-case basis consistent with recognized standards of the industry. In no case shall significant departures be approved without written communication between Client Services and the affected client.

p) Procedures for dealing with complaints;

Procedures for dealing with complaints may be found in the SOP, Handling of Inquiries and Complaints.

q) Procedures for protecting confidentiality and proprietary rights;

YORK is sensitive to the fact that some of the analytical work performed for clients may be subject to litigation. YORK, therefore, holds all information in strict confidence with laboratory release only to the client or designee. Information released to entities other than the client is performed only upon written (facsimile or e-mail) request from the client.

Due to the investigative nature of most site assessments, analytical information may become available to

regulatory agencies or other evaluating entities during site assessment of the laboratory for the specific purpose of attaining laboratory certifications, accreditations, or evaluation of laboratory qualification for future work. During these occurrences, the laboratory will make its best effort to maintain the confidence of client specific information.

r) Procedures for audits;

YORK participates in a wide variety of system and performance audits conducted by various state agencies, as well as through its major clients. These audits are conducted to verify that analytical data produced conforms to industry standards on a routine basis.

A System Audit is a qualitative evaluation of the measurement systems utilized at YORK, specifically, that YORK has, in place, the necessary facilities, staff, procedures, equipment, and instrumentation to generate acceptable data. This type of audit typically involves an on-site inspection of the laboratory facility, operations, and interview of personnel by the auditing agency.

A Performance Audit verifies the ability of YORK to correctly identify and quantitate compounds in blind check samples. This type of audit normally is conducted by the auditing agency through laboratory participation in round robin Performance Evaluation (PE) programs. Examples of current PE program involvement include those offered by commercial suppliers like ERA (WS/WP/SOIL and DMR-QA), or other inter-laboratory studies not required for certification but done to ensure laboratory performance, as well as programs administered by major clients.

Outliers in required PE samples will be investigated and corrective actions documented using the Corrective/Preventive Action Record.

Should the result of any audit detect a significant error, which has been identified to adversely affect released data, the situation shall be thoroughly investigated. Corrective measures shall be enacted to include system re-evaluation, the determined effect on released data and client notification, as necessary. Client notification should occur as soon as practical or within 72 hours of discovery. These measures shall be documented using the Corrective/Preventive Action Record.

s) Processes/procedures for establishing that personnel are adequately experienced in the duties they are expected to carry out and are receiving any needed training;

Quality control begins prior to sample(s) receipt at the laboratory. The selection of well qualified personnel, based upon education and/or experience is the first step in successful laboratory management. A thorough screening of job applicants and selection of the best candidate to fulfill a well-defined need is as important an aspect of a successful QA/QC program as a careful review of analytical data.

Employee training and approval procedures used at YORK are detailed in the SOP on Employee Training, and includes but is not limited to the following:

- ⇨ A thorough understanding of the applicable regulatory method and YORK SOP;
- ⇨ A review of YORK's QA Program Manual and thorough understanding of the specifics contained therein that are directly related to the analysis to be performed;
- ⇨ Instruction by the applicable Group Leader or Tech. Director on all aspects of the analytical procedure;
- ⇨ Performance of analyses under supervision of experienced laboratory personnel, which shall include analysis of blind QC check samples, when deemed appropriate;
- ⇨ Participation in in-house seminars on analytical methodologies and procedures;
- ⇨ Participation in job related seminars outside of the laboratory; and

t) Ethics policy statement developed by the laboratory and processes/procedures for educating and training personnel in their ethical and legal responsibilities including the potential punishments and penalties for improper, unethical, or illegal actions;

A vital part of YORK's analytical laboratory services is their Laboratory Ethics Training Program. An effective program starts with an Ethics Policy Statement that is supported by all staff, and is reinforced

with initial and ongoing ethics training.

"It shall be the policy of YORK to conduct all business with integrity and in an ethical manner. It is a basic and expected responsibility of each staff member and manager to hold to the highest ethical standard of professional conduct in the performance of all duties."

A proactive ethics training program is the most effective means of deterring and detecting improper, unethical, or illegal actions in the laboratory. There are six facets to the program: (1) clearly define improper, unethical, and illegal actions; (2) outline elements of prevention and detection programs for

improper, unethical, or illegal actions; and (3) identify examples of inappropriate (i.e., potentially fraudulent) laboratory practices; (4) Annual Ethics and Data Integrity Training to be documented and maintained in the personnel file of each employee., (5) Documented training on new revisions of the Quality Systems Manual (QSM) and for new employees as needed. (6) Signed Ethics and Data Integrity Agreement (to be completed for new employees and annually thereafter).

Definition of Improper, Unethical, and Illegal Actions

Improper actions are defined as deviations from contract-specified or method-specified York analytical practices and may be intentional or unintentional.

Unethical or illegal actions are defined as the deliberate falsification of analytical or quality assurance results, where failed method or contractual requirements are made to appear acceptable.

Prevention of laboratory improper, unethical, or illegal actions begins with a zero-tolerance philosophy established by management. Improper, unethical, or illegal actions are detected through the implementation of oversight protocols.

Prevention and Detection Program for Improper, Unethical, or Illegal Actions

YORK management has implemented a variety of proactive measures to promote prevention and detection of improper, unethical, or illegal activities. The following components constitute the basic program:

- ⇨ Data Integrity Standard Operating Procedure
- ⇨ Data Integrity Documentation Procedures
- ⇨ An Ethics and Data Integrity Agreement that is read and signed by all personnel;
- ⇨ Initial and annual ethics training;
- ⇨ Internal audits;
- ⇨ Analyst documentation on certain types of manual integration changes to data;
- ⇨ Active use of electronic audit functions when they are available in the instrument software; and
- ⇨ A "no-fault" policy that encourages laboratory personnel to come forward and report fraudulent activities directly to the QA Officer.

A proactive, "beyond the basics" approach to the prevention of improper, unethical, or illegal actions are a necessary part of laboratory management. As such, in addition to the requirements above, YORK has a designated ombudsman (Data Quality Manager) to whom laboratory personnel can report improper, unethical, or illegal practices, or provide routine communication of training, lectures, and changes in policy intended to reduce improper, unethical, or illegal actions.

Examples of Improper, Unethical, or Illegal Practices

Documentation that clearly shows how all analytical values were obtained are maintained by YORK and supplied to the data user as needed. To avoid miscommunication, YORK clearly documents all errors, mistakes, and basis for manual integrations within the project file and case narrative as applicable. Notification is also made to the appropriate supervisor so that appropriate corrective actions can be initiated. Gross deviations from specified procedures are investigated for potential improper, unethical, or illegal actions, and findings of fraud are fully investigated by senior management. Examples of improper, unethical, or illegal practices are identified below:

- ⇨ Improper use of manual integrations to meet calibration or method QC criteria (for example, peak shaving or peak enhancement are considered improper, unethical, or illegal actions if performed

solely to meet QC requirements);
- ⇨ Intentional misrepresentation of the date or time of analysis (for example, intentionally resetting a computer system's or instrument's date and/or time to make it appear that a time/date requirement was met);
- ⇨ Falsification of results to meet method requirements;
- ⇨ Reporting of results without analyses to support (i.e., dry-labbing);
- ⇨ Selective exclusion of data to meet QC criteria (for example, initial calibration points dropped without technical or statistical justification);
- ⇨ Misrepresentation of laboratory performance by presenting calibration data or QC limits within data reports that are not linked to the data set reported, or QC control limits presented within QAPP that are not indicative of historical laboratory performance or used for batch control;
- ⇨ Notation of matrix inference as basis for exceeding acceptance limits (typically without implementing corrective actions) in interference-free matrices (for example, method blanks or laboratory control samples);
- ⇨ Unwarranted manipulation of computer software (for example, improper background subtraction to meet ion abundance criteria for GC/MS tuning, chromatographic baseline manipulations);
- ⇨ Misrepresentation of QC samples (for example, adding surrogates after sample extraction, omitting sample preparation steps for QC samples, over- or under-spiking); and
- ⇨ Reporting of results from the analysis of one sample for those of another.

v) Reference to procedures for reporting analytical results;

Standard operating procedures pertaining to the reporting of results are available to all laboratory personnel and are included in the specific SOP for each procedure.

All analytical data generated within YORK is thoroughly checked for accuracy and completeness. The data validation process consists of data generation, reduction, and two levels of review as described below.

The analyst generating the analytical data has the primary responsibility for its correctness and completeness. All data is generated and reduced following protocols specified in the appropriate SOPs. Each analyst reviews the quality of his or her work based upon an established set of guidelines specified in the SOPs or as detailed by project requirements. The analyst reviews the data to ensure that:

- ⇨ Holding times have not been exceeded;
- ⇨ Sample preparation information is correct and complete;
- ⇨ Analysis information is correct and complete;
- ⇨ The appropriate procedures were employed;
- ⇨ Analytical results are correct and complete;
- ⇨ All associated QC is within established control limits and, if not, out-of-control forms are completed thoroughly explaining the cause and corrective action taken;
- ⇨ Any special sample preparation and analytical requirements have been met; and
- ⇨ Documentation is complete, i.e., all anomalies in the preparation and analysis have been documented; out-of-control forms, if required, are complete, etc.

This initial review step, performed by the analyst, is designated as primary review. The Data Quality Manager then conducts an independent check equivalent to that of the primary review and are designed to ensure that:

- ⇨ Calibration data is scientifically sound, appropriate to the method, and completely documented;
- ⇨ QC data is within established guidelines or reported with appropriate clarification/qualification;
- ⇨ Qualitative identification of sample components is correct;
- ⇨ Quantitative results are correct;
- ⇨ Documentation is complete and any anomalies properly addressed and documented;
- ⇨ The data is ready for incorporation into the final report package; and
- ⇨ The data package is complete and ready for release.

A significant component of the secondary review is the documentation of any errors that have been identified and corrected during the review process. YORK believes that the data package that is submitted for a secondary review should be free from errors. Errors that are discovered are documented and formally transmitted to the appropriate Group Leader. The cause of the errors is then addressed by

additional training or clarification of procedures (SOP revisions) to ensure that similar errors do not recur and high quality data will be generated.

These procedures are done electronically. Once set to Reviewed in Element LIMS, this constitutes approval for data release and generation of analytical report.

During both of the QC review processes, 100% of the raw data associated with the entire project is available to the reviewer.

Following draft report generation, the report is reviewed by the Project Manager to ensure that the data set and quality control data are complete and meet the specific requirements of the project. When available, the data are also evaluated against historical site information. Once all requested analytical work has been verified as complete, a final report is generated and electronically signed by the Laboratory Manager.

Following approval for release, the Quality Assurance Manager or other qualified personnel may review 10% of the project files back to the raw data as an additional check, if a situation so warrants.

A variety of reporting formats, from Portable Document File (PDF), normal reports to computerized data tables (Execl and special EDDs) to complex reports discussing regulatory issues are available. In general, YORK reports contain the following information.

Analytical Data

Analytical data is reported by sample identification (both client and laboratory) and test. Pertinent information including date(s) sampled, received, prepared, and analyzed; any required data qualifiers are included on each results page. The reporting limit for each method analyte is also listed. Additional data may include Method Detection Limits (MDLs) and any dilution factors used.

QC Data

A QC Summary is provided with each QA Summary report when requested. Unless otherwise specified in a QAPP or requested by the client, QC Summaries include results for method blanks, blank spikes, site-specific matrix spikes, matrix spike duplicates, and surrogate spikes. The effective control limits for the reported QC values are also provided on the QC Summary as well as explanations for any QC outliers. Case Narratives may be included as appropriate.

As required for the project, data reports from “results only” through “full ASP-B like” will be generated and provided. Numerous custom EDD formats are also provided as needed including EquIS, NYSDEC EquIS, Giskey and numerous other formats.

Methodology

References for the preparative and analytical methodology employed is included on all preliminary or final analytical reports.

Signatory

Final reports are ready for release to the client following review and approval by the Laboratory Manager, as evidenced by his/her signature on the final report.

Preliminary Data

Upon client request, preliminary data shall be released prior to completion of a full QC review. Preliminary data is subject to change pending QC review and, therefore, shall be clearly marked as “DRAFT”. This qualification is provided as notification to the client that the data review process has not been completed yet and that the data is subject to possible modification resulting therefrom.

Revised Data

Analytical reports that have been revised for any reason from the original sent report shall be noted as being revised with a report note, case narrative or indication as to the reason for the revision.

Formatting

At a minimum, an analytical report shall consist of the Report Cover Page, Analytical Results, Footnotes/Comments Page, and COC. Paginated reports shall be employed for all reports. All reports are bookmarked for ease of navigation. York offers approximately forty different reporting formats from a simple report (Results only) to a complex validation ready deliverable, along with various Electronic Data Deliverables (EDDs). All data are posted to our website for client access through our DataPort access portal.

Figure 1. Company Organizational Chart

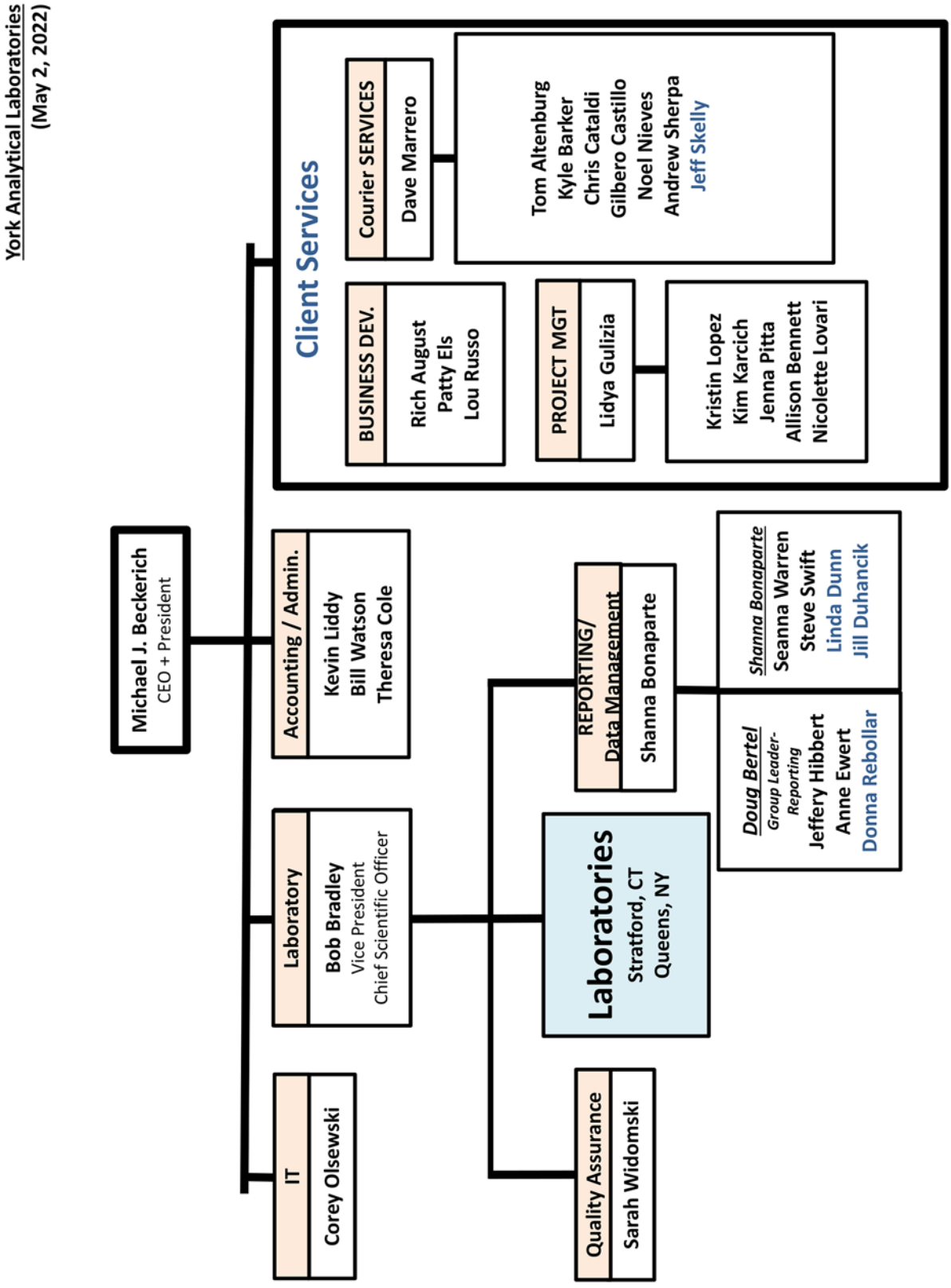
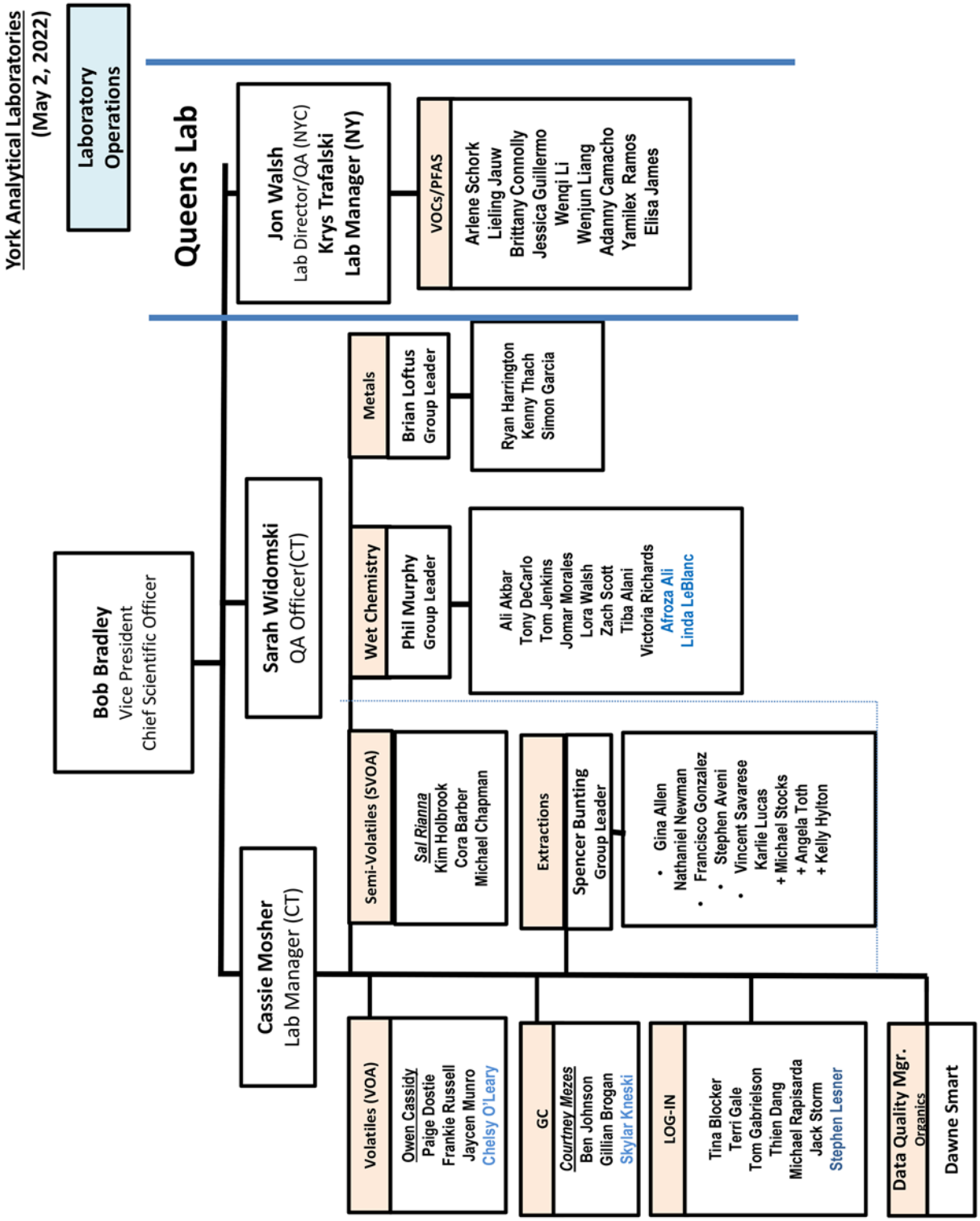


Figure 2. Laboratory Functional Organizational Chart



5.4 Audits

5.4.1 Internal Audits

The laboratory arranges comprehensive annual internal audits to verify that its operations continue to comply with the requirements of the laboratory's quality system. The Quality Assurance Officer or designee plans and organizes audits as required by a predetermined schedule and requested by management. The internal audits also serve the purpose of ensuring that SOPs meet the requirements of the reference methods and their updates. During health crises, such as pandemics or other similar disease outbreaks, Internal Audits may be suspended until such time as management deems the threat to health is no longer an issue. As a substitute, a desk internal audit may be done to accomplish these tasks,

The QAO or other qualified personnel, independent of the activity to be audited, will carry out such audits following the procedures in the SOP, Internal Audit Procedures.

Personnel do not audit their own activities except when it can be demonstrated that an effective audit will be carried out.

Where the audit findings cast doubt on the correctness or validity of the laboratory's calibrations or test results, the laboratory takes immediate corrective actions and where deemed relevant notifies, in writing, any client whose work was involved.

i. List of available qualified personnel for internal audits include:
   - QA Officer
   - Lab Manager or Technical Director
   - QA Assistant
   - Group Leader (For departments other than their own)
   - Any Senior Chemist (With training in proper internal auditing procedures) not working in the area to be audited

ii. The minimum qualifications for an internal auditor shall be:
   - Education: A Bachelors (BS) Degree in an applied science with 12-16 semester hours in chemistry.
   - Experience: Two years' experience in an instrumental analytical technique for environmental analysis of representative environmental samples. Training to the most current revision of the SOP on Internal Audits.
   - Any outside audit findings will also be included in the Internal Audits.

5.4.2 Management Review

YORK management conducts an annual review of its quality system and its testing and calibration activities to ensure its continuing suitability and effectiveness and to introduce any necessary changes or improvements in the quality system and laboratory operations.

This review takes account of reports from managerial and supervisory personnel, the outcome of recent internal audits, assessments by external bodies, the results of inter-laboratory comparisons or proficiency tests, any changes in the volume and type of work undertaken, feedback from clients, senior lab personnel, corrective actions, and other relevant factors.

The laboratory shall have a procedure for review by management, and maintain records of review findings and actions.

5.4.3 Audit Review

All audit and review findings and any corrective actions that arise from them are documented. The laboratory

management ensures that these actions are discharged within the agreed time frame (typically 30 days) as indicated in the quality manual and/or SOPs. Specific Audit checklists are employed for each discipline/method.

5.4.4 Performance Audits

In addition to periodic audits, the laboratory ensures the quality of results provided to clients by implementing checks to monitor the quality of the laboratory's analytical activities. Examples of such checks are:

a) Internal quality control procedures using statistical techniques (see Section 5.4 below);-Control charts

b) Participation in proficiency testing or other inter-laboratory comparisons;

c) Use of certified reference materials and/or in-house quality control using secondary reference materials as specified in YORK QSM Section 5.4;

d) Replicate testing using the same or different test methods;

g) Re-testing of retained samples;

h) Correlation of results for different but related analysis of a sample (for example, total phosphorus should be greater than or equal to ortho-phosphate);

i) In-depth data integrity assessments.

5.4.5 Corrective / Preventive Actions

a) In addition to providing acceptance criteria and specific protocols for corrective/preventive actions in, the laboratory implements general procedures to be followed to determine when departures from documented policies, procedures and quality control have occurred. These procedures include but are not limited to the following:

    1) Identify the individual(s) responsible for assessing each QC data type;

    2) Identify the individual(s) responsible for initiating and/or recommending corrective/preventive actions;

    3) Define how the analyst shall treat a data set if the associated QC measurements are unacceptable;

    4) Specify how out-of-control situations and subsequent corrective actions are to be documented; and

    5) Specify procedures for management (including the QA officer) to review corrective/preventive action reports.

b) To the extent possible, sample results are reported only if all quality control measures are acceptable. If a quality control measure is found to be out of control, and the data are to be reported, all samples associated with the failed quality control measure are reported with the appropriate data qualifier(s).

5.4 Essential Quality Control Procedures

These general quality control principles apply, where applicable, to all testing at YORK. The manner in which each is implemented is dependent on the types of tests performed by the laboratory and is further described in specific SOPs for each test. The standards for any given test type assure that the applicable principles are addressed:

a) All laboratories have detailed written protocols in place to monitor the following quality controls:

    1) Positive and negative controls (blanks, spikes, reference materials, etc.) to monitor tests;

2) Tests to define the variability and/or repeatability of the laboratory results such as replicates;

3) Measures to assure the accuracy of the test method including calibration and/or continuing calibrations, use of certified reference materials, proficiency test samples, or other measures;

4) Measures to evaluate test method capability, such as detection limits and quantitation limits or range of applicability such as linearity;

5) Selection of appropriate formulae to reduce raw data to final results such as regression analysis, comparison to internal/external standard calculations, and statistical analyses;

6) Selection and use of reagents and standards of appropriate quality as define din the SOPs;

7) Measures to assure the selectivity of the test for its intended purpose; and

8) Measures to assure constant and consistent test conditions (both instrumental and environmental) where required by the test method, such as temperature, humidity, or specific instrument conditions.

b) All quality control measures are assessed and evaluated on an on-going basis, and quality control acceptance criteria are used to determine the usability of the data.

c) The laboratory has procedures for the development of acceptance/rejection criteria where no method or regulatory criteria exist.

d) The quality control protocols specified in the method manual (YORK QSM Section 10.1.2) is followed. YORK ensures that the essential standards outlined in NELAC 5, Appendix D, or mandated methods or regulations (whichever are more stringent) are incorporated into the SOP/method manuals. When it is not apparent which is more stringent the QC in the mandated method or regulations is to be followed.

The essential quality control measures for testing are found in Appendix D.

6.1 PERSONNEL

6.2 General Requirements for Laboratory Staff

YORK's testing departments have a sufficient level of personnel with the necessary education, training, technical knowledge and experience to perform the assigned functions.

All personnel are responsible for complying with all quality assurance/quality control requirements that pertain to their organizational/technical function. Each technical staff member must have a combination of experience and education to adequately demonstrate a specific knowledge of their particular function and a general knowledge of laboratory operations, test methods, quality assurance/quality control procedures and records management.

6.3 Laboratory Management Responsibilities

In addition to YORK QSM Section 4.2.d, the laboratory management:

a) Defines the minimum level of qualification, experience and skills necessary for all positions in the laboratory. In addition to education and/or experience, basic laboratory skills such as using a balance and quantitative techniques, are considered.

b) Ensures that all technical laboratory staff members demonstrate capability in the activities for which they are responsible. Such demonstration is documented (See Appendix C). Note: In departments with specialized "work cells" (a well-defined group of analysts that together perform the method analysis), the group as a unit meets the above criteria and this demonstration is fully documented.

c) Ensures that the training of each member of the technical staff is kept up-to-date (on-going) by the following:

1) Keeping evidence on file that demonstrates that each employee has read, understood, and is using the latest version of the laboratory's in-house quality documentation that relates to his/her job responsibilities.

2) Documenting training courses or workshops on specific equipment, analytical techniques, or laboratory procedures.

3) Documenting employee attendance at training courses on ethical and legal responsibilities including the potential punishments and penalties for improper, unethical or illegal actions. Keeping on file evidence that demonstrates that each employee has read, acknowledges, and understands their personal ethical and legal responsibilities including the potential punishments and penalties for improper, unethical or illegal actions.

4) Maintains up-to-date analyst training records that contain a certification that technical personnel have read, understood and agreed to perform the most recent version of the test method (the approved method or SOP as defined by the laboratory document control system, YORK QSM Section 5.2.d) and documentation of continued proficiency by at least one of the following once per year:

i. Acceptable performance of a blind sample (single blind to the analyst);

ii. Another demonstration of capability;

iii. Successful analysis of a blind performance sample on a similar test method using the same technology (e.g., GC/MS volatiles by purge and trap for Methods 524.2, 624, or 5035/8260) would only require documentation for one of the test methods;

iv. At least four consecutive laboratory control samples with acceptable levels of precision and accuracy;

v. If subsections i-iv cannot be performed, analysis of authentic samples with results statistically indistinguishable from those obtained by another trained analyst.

d) Documents all analytical and operational activities of the laboratory;

e) Supervises all personnel employed by the laboratory with the exception of the QA Officer;

f) Ensures that all sample acceptance criteria (YORK QSM Section 11.0) are verified and that samples are logged into the sample tracking system and properly labeled and stored.

g) Documents the quality of all data reported by the laboratory.

h) In conjunction with the QA Officer, develops a proactive program for the prevention and detection of improper, unethical, or illegal actions. Components of this program could include: internal proficiency testing (single and double blind); post-analysis electronic audits; effective reward program to improve employee vigilance and co-monitoring; and separate SOPs identifying appropriate and inappropriate laboratory and instrument manipulation practices.

6.2.1 Ownership Transfer / Out of Business

a) In the event that the laboratory transfers ownership or goes out of business, YORK will ensure that the records are maintained or transferred according to client instruction.

b) Upon ownership transfer, record retention requirements shall be addressed in the ownership transfer agreement and the responsibility for maintaining archives will be clearly established. In cases of bankruptcy, appropriate regulatory and state legal requirements concerning laboratory records will be followed.

c) In the event that the laboratory goes out of business, all records will revert to the control of the client

or regulatory agency, as applicable. As much notice as possible will be given to clients and the accrediting bodies who have worked with the laboratory during the previous 5 years of such action.

6.3 Personnel Records

Records on the relevant qualifications, training, skills and experience of the technical personnel are maintained by the laboratory, including records on demonstrated proficiency for each laboratory test method, such as the criteria outlined in YORK QSM Section 10.5 for analysis.

7.1 PHYSICAL FACILITIES – ACCOMMODATION AND ENVIRONMENT

7.2 Environment

a) Laboratory accommodations, test areas, energy sources, lighting, heating and ventilation are such that they facilitate proper performance of tests.

b) The environment in which these activities are undertaken does not invalidate the results or adversely affect the required accuracy of the measurements. Particular care shall be taken when such activities are undertaken at sites other than the permanent laboratory premises.

c) The laboratory shall provide for the effective monitoring, control and recording of environmental conditions as appropriate. Such environmental conditions may include dust, electromagnetic interference, humidity, main voltage, temperature, and sound and vibration levels.

d) In instances where monitoring or control of any of the above-mentioned items is specified in a test method or by regulation, the laboratory meets and documents adherence to the laboratory facility requirements.

7.3 Work Areas

a) There is effective separation between neighboring areas when the activities therein are incompatible including volatile organic chemicals handling areas.

b) Access to and use of all areas affecting the quality of these activities are defined and controlled.

c) Adequate measures are taken to ensure good housekeeping in the laboratory and to ensure that any contamination does not adversely affect data quality.

d) Workspaces are available to ensure an unencumbered work area. Work areas include:

1) Access and entryways to the laboratory;

2) Sample receipt areas;

3) Sample storage areas;

4) Chemical and waste storage areas; and

5) Data handling and storage areas.

8.0 EQUIPMENT AND REFERENCE MATERIALS

a) YORK is furnished with all items of equipment (including reference materials) required for the correct performance of tests for which accreditation is maintained. Note that YORK does not use equipment outside its permanent control.

b) All equipment is properly maintained, inspected, and cleaned. Maintenance procedures are documented.

c) Any equipment item that has been subjected to overloading or mishandling, or that gives suspect results,

or has been shown by verification or otherwise to be defective, is taken out of service, clearly identified and wherever possible stored at a specified place until it has been repaired and shown by calibration, verification or test to perform satisfactorily. The laboratory shall examine the effect of this defect on previous calibrations or tests.

d) When appropriate, each item of equipment, including reference materials, is labeled, marked, or otherwise identified to indicate its calibration status.

e) Records are maintained of each major item of equipment and all reference materials significant to the tests performed. These records include documentation on all routine and non-routine maintenance activities in assigned log books and reference material verifications.

The records include:

1) The name of the item of equipment;
2) The manufacturer's name, type identification, and serial number or other unique identification;
3) Date received and date placed in service (if available);
4) Current location, where appropriate;
5) If available, condition when received (e.g., new, used, reconditioned);
6) Copy of the manufacturer's instructions, where available;
7) Dates and results of calibrations and/or verifications and date of the next calibration and/or verification;
8) Details of maintenance carried out to date and planned for the future; and
9) History of any damage, malfunction, modification or repair.

9.1 MEASUREMENT TRACEABILITY AND CALIBRATION

9.2 General Requirements

All measuring operations and testing equipment having an effect on the accuracy or validity of tests are calibrated and/or verified before being put into service and on a continuing basis. The laboratory has an established program for the calibration and verification of its measuring and test equipment. This includes balances, thermometers and control standards.

9.3 Traceability of Calibration

a) The overall program of calibration and/or verification and validation of equipment is designed and operated so as to ensure that measurements made by the laboratory are traceable to national standards of measurement.

b) Calibration certificates indicate the traceability to national standards of measurement and provide the measurement results and associated uncertainty of measurement and/or a statement of compliance with an identified metrological specification. The laboratory maintains records of all such certification in the QA office.

c) Where traceability to national standards of measurement is not applicable, the laboratory provides satisfactory evidence of correlation of results, for example, by participation in a suitable program of inter-laboratory comparisons, proficiency testing, or independent analysis.

9.4 Reference Standards

a) Reference standards of measurement held by the laboratory (such as Class S or equivalent weights, or NIST-traceable thermometers) are used for calibration only and for no other purpose, unless it can be demonstrated that their performance as reference standards has not been invalidated. A body that can provide traceability calibrates reference standards of measurement. Where possible, this traceability is to a national standard of measurement.

b) There is a program of calibration and verification for reference standards.

i. Two weeks prior to their date of calibration expiration, individual thermometers are removed from

service and replaced by newly calibrated units from the supplier.

ii. YORK keeps two sets of Class S weights on hand for use in the laboratory. One set is used for daily calibration checks, and the second set is kept for back up use should the first set be damaged, lost or otherwise compromised. The second set of weights is also place in service when the daily use set is shipped off site for recalibration.

iii. Analytical balances are serviced and calibrated on a routine, annual schedule by an outside vendor.

c) Where relevant, reference standards and measuring and testing equipment are subjected to in-service checks between calibrations and verifications. Reference materials are traceable. Where possible, traceability is to national or international standards of measurement, or to national or international standard reference materials.

d) NIST-Traceable Weights and Thermometers

i. Reference standards of measurement shall be used for the purposes of calibration only. NIST traceable thermometers and NIST-traceable weights shall not be used for routine testing. If NIST traceable reference sources are used for routine testing they shall not be used for calibration purposes unless it can be shown that their performance as reference standards would not be invalidated.

ii. For NIST-traceable weights and thermometers, YORK requires that all calibrations be conducted by a calibration laboratory accredited by ACLASS, A2LA or other recognized accrediting body.

a. The calibration laboratory must hold proper accreditation for the services rendered. Prior to use, QA verifies that the selected vendor holds the appropriate scope of accreditation for the services required.

b. The calibration certificate or report supplied by the calibration laboratory must contain a traceability statement, the conditions under which the calibrations were made, a compliance statement with an identified metrological specification and the pertinent clauses when applicable, and a clearly identified record of the quantities and functional test results before and after re-calibration.

c. The certificate and scope of accreditation is kept on file at the laboratory and is reviewed yearly.

iii. If significant amendments are made to a calibration certificate, it must have its own unique report identifier and must reference the one it is replacing. The piece of equipment must be identified in the amended report using its unique serial number or other laboratory defined identifier. The amended report is maintained with the original calibration report.

iv. Laboratory balances are recalibrated annually by an external, certified vendor that is certified to ISO 17025 / ISO 9001 standards for calibration. Prior to use, QA verifies that the selected vendor holds the appropriate scope of accreditation for the services required. This service is documented on each balance with a signed and dated certification sticker.

v. NIST mercury thermometers are sent out for recalibration every five years, or are replaced. All working mercury thermometers are calibrated annually against a NIST-traceable reference thermometer. All digital temperature measuring devices (min/max thermometers, IR guns) are calibrated quarterly. Equipment that does not meet acceptance criteria is removed from service and repaired or replaced. Calibration reports are maintained by the QA Officer.

vi. Balance calibrations and temperature readings of ovens, refrigerators, and incubators are checked on each day of use. Min/Max thermometers are used for refrigerators and freezers to continually monitor temperature performance.

e) Traceable Reference Standards and Materials

i. Reference standards and materials are traceable to certified reference materials, where available. Commercially prepared standard materials are purchased from vendors accredited by A2LA, NVLAP (National Voluntary Lab Accreditation Program) or other recognized vendor, and come with a Certificate of Analysis that documents the purity of the standard and expiration date, if assigned. If a standard cannot be purchased from a vendor that supplies a Certificate of Analysis, the purity of the standard is documented by analysis against a known reference.

ii. Analytical reagents must be at a minimum the purity required by or stated in the test method. Commercial materials that are purchased for the preparation of calibration, verification or spiking solutions, are usually accompanied by an assay certificate or the purity is noted on the label. If the purity is ≥96%, the weight provided by the vendor may be used without correction. If the purity is <96%, a correction will be made to solution concentrations prepared from that material.

iii. The receipt of all reference standards and materials, including received date and expiration date, is documented by the laboratory at the time of receipt, in chemical receiving logbooks. All documentation received with the reference standard or material (Certificate of Analysis or Purity Certificates) is retained by the laboratory. To prevent contamination and/or deterioration in quality, all standards and materials are handled and stored according to the method or manufacturer's requirements.

iv. Preparation of standard or reference materials are documented in SOPs and in Element LIMS by department. These records show the traceability to the purchased standards or materials, and include the method of preparation, date of preparation, expiration date, and preparer's initials, at a minimum.

v. All standards, reference, primary and working, whether purchased from a commercial vendor or prepared by the laboratory, must be checked regularly to ensure that the variability of the standard from the 'true' value does not exceed method requirements. Calibration standards are checked by comparison with a standard from a second source, usually another manufacturer and vendor. In cases where a second manufacturer is not available, a different lot, with vendor certification, may be used as a second source.

vi. Quality control (QC) criteria for primary and second source standards are defined in laboratory SOPs and/or in Element LIMS. In most cases, the analysis of an Initial Calibration Verification (ICV) is used as the second source verification of a primary calibration source.

9.5 Calibration

Calibration requirements are divided into two parts: (1) requirements for analytical support equipment, and (2) requirements for instrument calibration. In addition, the requirements for instrument calibration are divided into initial calibration and second source or initial calibration verification, and continuing calibration verification.

9.5.1 Support Equipment

These standards apply to all devices that may not be the actual test instrument, but are necessary to support laboratory operations. These include but are not limited to: balances, ovens, refrigerators, freezers, incubators, water baths, thermometers, and volumetric dispensing devices (such as Eppendorf®, or automatic dilutor/dispensing devices) if quantitative results are dependent on their accuracy, as in standard preparation and dispensing or dilution into a specified volume.

a) All support equipment is maintained in proper working order. The records of all repair and maintenance activities, including service calls is kept.

b) All support equipment is calibrated or verified at least annually, using NIST traceable references when available, over the entire range of use. The results of such calibration are within the specifications required of the application for which this equipment is used or:

1) The item is removed from service until repaired; or

2) The laboratory maintains records of established correction factors to correct all measurements.

c) Raw data records are retained to document equipment performance.

d) Prior to use on each working day, balances, ovens, refrigerators, freezers, and water baths are checked in the expected use range, with NIST traceable calibrated references. The acceptability for use or continued use is according to the needs of the analysis or application for which the equipment is being used.

e) Mechanical volumetric dispensing devices including burettes (except Class A glassware) are checked for accuracy on at least a quarterly use basis. Glass microliter syringes are to be considered Class A glassware, and come with a certificate from the manufacturer attesting to established accuracy or the accuracy is initially demonstrated and documented by the laboratory.

9.5.2 Instrument Calibration

This manual specifies the essential elements that define the procedures and documentation for initial instrument calibration and continuing instrument calibration verification to ensure that the data are of known quality and be appropriate for a given regulation. This manual does not specify detailed procedural steps ("how to") for calibration, but establishes the essential elements for selection of the appropriate technique(s). This approach allows flexibility and permits the employment of a wide variety of analytical procedures and statistical approaches currently applicable for calibration. If more stringent standards or requirements are included in a mandated test method or by regulation, the laboratory demonstrates that such requirements are met. If it is not apparent which standard is more stringent, then the requirements of the regulation or mandated test method are to be followed.

Note: In the following sections, initial instrument calibration is directly used for quantitation and continuing instrument calibration verification is used to confirm the continued validity of the initial calibration, unless otherwise stipulated by the analytical method.

9.5.2.1 Initial Instrument Calibrations

The following items are essential elements of initial instrument calibration:

a) The details of the initial instrument calibration procedures including calculations, integrations, acceptance criteria and associated statistics are included or referenced in the test method SOP. When initial instrument calibration procedures are referenced in the test method, the referenced material is retained by the laboratory and is available for review.

b) Sufficient raw data records are retained to permit reconstruction of the initial instrument calibration, e.g., calibration date, test method, instrument, analysis date, each analyte name, analyst's initials or signature; concentration and response, calibration curve or response factor; or unique equation or coefficient used to reduce instrument responses to concentration.

c) Sample results are quantitated from the initial instrument calibration and may not be quantitated from any continuing instrument calibration verification unless specifically stated in a mandated test method.

d) All initial instrument calibrations are verified with a standard obtained from a second manufacturer or lot. Traceability shall be to a national standard, when available.

e) Criteria for the acceptance of an initial instrument calibration is established, e.g., correlation coefficient or relative percent difference. The criteria used are appropriate to the calibration technique employed.

f) Results of samples not bracketed by initial calibration standards (within calibration range) are reported as having less certainty, e.g., defined qualifiers or flags or explained in the case narrative. As determined by the method, the lowest calibration standard is at or above the method detection limit and at or below the reporting limit.

g) If the initial instrument calibration results are outside established acceptance criteria, corrective actions are performed. Data associated with an unacceptable initial instrument calibration is not reported.

h) Calibration standards include concentrations at or below the regulatory limits/Action levels where technologically feasible.

i) If a reference or mandated method does not specify the number of calibration standards, the minimum number is two for ICP metals and a minimum of 5 for all other calibrations. The laboratory's standard operating procedure defines the number of points for establishing the initial instrument calibration.

9.5.2.2 Continuing Instrument Calibration Verification

When an initial instrument calibration is not performed on the day of analysis, the validity of the initial calibration is verified prior to sample analyses by analyzing continuing calibration verification standards with each analytical batch. The following items are essential elements of continuing calibration verification:

a) The details of the continuing calibration procedure, calculations and associated statistics are included or referenced in the test method SOP.

b) A continuing calibration verification standard (s) must be analyzed at the beginning and end of each analytical batch, and where required by method or project, at a specific frequency, every 10 or 20 samples or 12 hours, within the batch.

c) Sufficient raw data electronic records must be retained to permit reconstruction of the continuing calibration verification, e.g., test method, instrument, analysis date, each analyte name, concentration and response, calibration curve or response factor, or unique equations or coefficients used to convert instrument responses into concentrations. Continuing calibration verification records must explicitly connect the continuing calibration verification data to the initial calibration.

d) Criteria for the acceptance of a continuing calibration verification must be established, e.g., relative percent difference or Percent Drift.

e) If the continuing calibration verification results obtained are outside established acceptance criteria, corrective actions must be performed. If routine corrective action procedures fail to produce a second (consecutive and immediate) calibration verification within acceptance criteria, then the laboratory shall demonstrate performance after corrective action with two consecutive successful calibration verifications, or a new instrument calibration must be performed. If the laboratory has not demonstrated acceptable performance, sample analyses shall not occur until a new initial calibration curve is established and verified.

As an exception, sample data associated with an unacceptable continuing calibration verification may be reported as qualified data under the following specific conditions:

i. When the acceptance criteria for the continuing calibration verification are exceeded high, i.e., high bias and there are associated samples that are non-detects, then those non-detects may be reported. Otherwise the samples affected by the unacceptable calibration verification are reanalyzed after a new calibration curve has been established, evaluated and accepted.

ii. When the acceptance criteria for the continuing calibration verification are exceeded low, i.e., low bias, those sample results may be reported if they exceed a maximum regulatory limit/action level. Otherwise the samples affected by the unacceptable verification are reanalyzed after a new calibration curve has been established, evaluated and accepted.

10.1 TEST METHODS AND STANDARD OPERATING PROCEDURES

10.2 Methods Documentation

a) The laboratory has documented instructions on the use and operation of all relevant equipment, on the handling and preparation of samples and for calibration and/or testing, where the absence of such instructions could jeopardize the calibrations or tests.

b) All instructions, standards, manuals, and reference data relevant to the work of the laboratory are maintained up-to-date and be readily available to the staff.

10.2.1 Standard Operating Procedures (SOPs) Administrative

YORK maintains standard operating procedures that accurately reflect all phases of current laboratory activities such as instrument operation, assessing data integrity, corrective actions, handling customer complaints, reporting of test results, etc.

a) These documents, for example, may be equipment manuals provided by the manufacturer or internally written documents.

b) The test methods may be copies of published methods as long as any changes or selected options in the methods are documented and included in the SOP (See 10.1.2.)

c) Copies of all SOPs are accessible to all personnel.

d) The SOPs are organized.

e) Each SOP clearly indicates the effective date of the document, the revision number and the signatures of the approving authorities.

10.2.2 Standard Operating Procedures (SOPs) Analytical

a) The laboratory has and maintains SOPs for each accredited analyte or test method.

b) This SOP may consist of copies of published or referenced test methods or standard operating procedures that have been written by the laboratory. In cases where modifications to the published method have been made by the laboratory or where the referenced test method is ambiguous or provides insufficient detail, these changes or clarifications are clearly described. Each test method includes or references where applicable:

1) Identification of the test method;
2) Applicable matrix or matrices;
3) Detection limit;
4) Scope and application, including components to be analyzed;
5) Summary of the test method;
6) Definitions;
7) Interferences;
8) Safety;
9) Equipment and supplies;
10) Reagents and standards;
11) Sample collection, preservation, shipment, and storage;
12) Quality control;
13) Calibration and standardization;
14) Procedure;
15) Calculations;
16) Method performance;
17) Pollution prevention;
18) Data assessment and acceptance criteria for quality control measures;
19) Corrective actions for out-of-control data;
20) Contingencies for handling out-of-control or unacceptable data;
21) Waste management;
22) References; and
23) Any tables, diagrams, flowcharts, and validation data.
24) Modifications
25) Revision History

10.3 Exceptionally Permitting Departures from Documented Policies / Procedures

a) If it is necessary to depart from a documented procedure or policy due to circumstances outside of YORK's control or due to conditions encountered while preparing or analyzing a sample, the following will be documented.

   1) The nature of the exception
   2) How the data or procedure may be impacted
   3) Any Corrective Action that may be needed.
   4) Any approval from a client that may be required.
   5) Approval by management to report or proceed with the exception.
   6) A Case Narrative with the Final Report explaining the exception.

10.4 Test Methods

The laboratory uses appropriate test methods and procedures for all tests and related activities within its responsibility (including, as applicable, sample collection, sample handling, transport and storage, sample preparation and sample analysis). The method and procedures shall be consistent with the accuracy required, and with any standard specifications relevant to the calibrations or tests concerned.

a) When the use of specific test methods for a sample analysis is mandated or requested, only those methods are used.

b) Where test methods are employed that are not required, as in the Performance Based Measurement System approach, the methods are fully documented and validated (see YORKQSM Section 10.1.2 and Appendix C), and are available to the client and other recipients of the relevant reports.

10.5 Test Method Assessment

The laboratory will periodically conduct a Test Method Assessment on the analytical methods in use. These assessments are typically done during annual internal audit activities. The purpose is to evaluate the compliance between bench performance of the method versus the current YORK Standard Operating Procedure versus the promulgated or published method. Discrepancies will need to be addressed and resolved. Note that some methods are totally prescriptive while others may contain prescriptive aspects, and still others are performance based. In many cases, modifications to the published method may be required due to circumstances outside the laboratories' control.

10.6 Demonstration of Capability

a) Prior to acceptance and initiation of any test method, satisfactory demonstration of method capability is required. This demonstration does not test the performance of the method in real world samples, but in the applicable and available clean matrix (sample of a matrix is which no target analytes or interferences are present at concentrations that impact the results of a specific test method), e.g., water, solids and air. In addition, for analytes that do not lend themselves to spiking, the demonstration of capability may be performed using quality control samples.

b) Continuing demonstration of method performance, per the quality control requirements is required annually as DOCs.

c) In all cases, the appropriate forms, such as the Certification Statement, is completed and retained by the laboratory to be made available upon request. The laboratory retains all associated supporting data necessary to reproduce the analytical results summarized in the Certification Statement.

d) Demonstration of capability is completed each time there is a significant change in instrument type, personnel, or test method.

e) In departments with specialized "work cell(s)" (a group consisting of analysts with specifically defined tasks that together perform the test method), the group as a unit must meet the above criteria and this demonstration of capability is fully documented.

f) When a work cell is employed, and the members of the cell change, the new employee(s) must work with an experienced analyst in that area of the work cell where they are employed. This new work cell must demonstrate acceptable performance through acceptable continuing performance checks such as laboratory control samples). Such performance is documented and the four preparation batches following the change in personnel must not result in the failure of any batch acceptance criteria, e.g., method blank and laboratory control sample, or the demonstration of capability must be repeated. In addition, if the entire work cell is changed or replaced, the new work cell must perform the demonstration of capability.

g) Performance of the work cell is linked to the training records of the individual members of the work cell (See YORK QSM Section 6.2).

10.7 Sample Aliquots

Where sampling (as in obtaining sample aliquots from a submitted sample) is carried out as part of the test method, the laboratory shall use documented procedures and appropriate techniques to obtain representative subsamples.

10.8 Data Verification

Calculations and data transfers are subject to appropriate checks.

a) The laboratory has Standard Operating Procedures that ensure that the reported data are free from transcription and calculation errors.

b) The laboratory has Standard Operating Procedures that ensure that all quality control measures are reviewed and evaluated before data are reported. Refer to internal Quality Control Checks, Project Management and Analytical Report Review

c) The laboratory has Standard Operating Procedures that address manual calculations including manual integrations. Refer to appropriate SOPs.

10.9 Documentation and Labeling of Standards and Reagents

Documented procedures exist for the purchase, receipt and storage of consumable materials used for the technical operations of the laboratory. Most records are electronically documented in Element LIMS while others may be logbook entries with references.

a) The laboratory retains records for all standards, reagents and media including the manufacturer/vendor, the manufacturer's Certificate of Analysis or purity (if supplied), the date of receipt, recommended storage conditions, and an expiration date after which the material is not used, unless the laboratory verifies its suitability for testing use.

b) Original containers (such as those provided by the manufacturer or vendor) are labeled with an expiration date.

c) Records are maintained on reagent and standard preparation. These records indicate traceability to purchased stocks or neat compounds, reference to the method of preparation, date of preparation, expiration date and preparer's initials.

d) All containers of prepared reagents and standards bear a unique identifier and expiration date and are linked to the documentation requirements in YORKQSM Section 10.8.c above.

10.10 Computers and Electronic Data Related Requirements

Where computers, automated equipment, or microprocessors are used for the capture, processing, manipulation, recording, reporting, storage or retrieval of test data, YORK ensures that:

a) All requirements of the NELAC Standard (i.e., Chapter 5 of NELAC) are met;

b) Computer software is tested and documented to be adequate for use, e.g., internal audits, personnel training, focus point of QA and QC;

c) Procedures are established and implemented for protecting the integrity of data. Such procedures include, but are not limited to, integrity of data entry or capture, data storage, data transmission and data processing;

d) Computer and automated equipment are maintained to ensure proper functioning and provided with the environmental and operating conditions necessary to maintain the integrity of calibration and test data; and,

e) It establishes and implements appropriate procedures for the maintenance of security of data including the prevention of unauthorized access to, and the unauthorized amendment of, computer records.

11.1 SAMPLE HANDLING, SAMPLE ACCEPTANCE POLICY AND SAMPLE RECEIPT

While YORK does not have control of field sampling activities, the following are essential to ensure the validity of the laboratory's data.

11.2 Sample Tracking

a) The laboratory has a documented system for uniquely identifying the items to be tested, to ensure that there can be no confusion regarding the identity of such items at any time. This system includes identification for all samples, subsamples and subsequent extracts and/or digestates. The laboratory assigns a unique identification (ID) code to each sample container received in the laboratory. (The use of container shape, size, or other physical characteristic, such as amber glass, or purple top, is not an acceptable means of identifying the sample.)

b) This laboratory code is maintained as an unequivocal link with the unique field ID code assigned each container.

c) The laboratory ID code is placed on the sample container as a durable label.

d) The laboratory ID code is entered into the laboratory records (see YORKQSM Section 11.3.d) and is the link that associates the sample with related laboratory activities such as sample preparation or calibration.

e) In cases where the sample collector and analyst is the same individual or the laboratory pre-assigns numbers to sample containers, the laboratory ID code may be the same as the field ID code.

11.3 Sample Acceptance Policy

The laboratory has a written sample acceptance policy that clearly outlines the circumstances under which samples are accepted or rejected. Data from any samples that do not meet the following criteria are flagged in an unambiguous manner, and the nature of the variation is clearly defined. The sample acceptance policy is available to sample collection personnel and includes, but is not limited to, the following areas of concern:

a) Proper, full, and complete documentation, that includes sample identification, the location, date and time of collection, collector's name, preservation type, sample type and any special remarks concerning the sample;
b) Proper sample labeling that includes a unique identification and a labeling system for the samples with requirements concerning the durability of the labels (water resistant) and the use of indelible ink;
c) Use of appropriate sample containers;
d) Adherence to specified holding times;
e) Adequate sample volume. Sufficient sample volume must be available to perform the necessary tests; and,
f) Procedures to be used when samples show signs of damage, contamination or inadequate preservation.
g) Samples are NOT accepted if classified as extremely hazardous, such as drum waste or neat chemicals.

11.3.1 Sample Acceptance Policy (Posted)

This sample acceptance policy outlines the circumstances in which received samples are accepted or rejected by York Analytical Laboratories, Inc. (YORK). If any of the below criteria are not met, it may delay YORK's processing of samples, possibly compromising "short" holding time analyses. Where received samples do not meet these criteria, YORK will contact the client.

If immediate client contact cannot be made, and hold times are not an issue, samples will be appropriately stored until the situation is clarified with the client. If a delay in sample processing will result in missed holding times, and YORK deems there is sufficient information provided on the Chain-of-Custody (COC), the lab will proceed with sample log-in and processing; however, YORK will not assume any liability for samples processed under these circumstances.

Data from samples that do not meet the sample acceptance criteria are flagged and/or addressed in a case narrative, with the nature of the deviation clearly defined. Samples must have written authorization to proceed if not in compliance with this guidance.

1. Complete COC with the following information:

   Unique sample identification, date and time of collection, sample matrix, analysis requested, sampler's name, preservation type (if applicable), client name and address, any additional comments, signature of relinquishing party and date and time that samples were relinquished.

2. Sample temperature upon receipt of >0°C to 6°C, as applicable to the method.

   In the event that samples are collected on the same day that they are received by the laboratory, they are deemed acceptable if they are received on ice and the cooling process has begun.

3. Sample containers and preservatives must be appropriate for the test and method being requested on the COC.

4. Sample labels must include a unique identification written with indelible ink on water resistant labels that correspond with the COC.

5. Adequate sample volume must be provided for the analyses requested on the COC, and containers for volatile analyses must be free of headspace. This includes Tedlar bags and Summa canisters.

6. Sufficient holding time available to perform the analyses requested:

   Samples shall be received at the laboratory within 48 hours of sampling, or with at least 1/2 of the holding time left for the analysis, whichever is less. YORK always makes a best effort to ensure that holding times are not exceeded under these circumstances. In the event that a preparation or analysis is performed outside of the associated holding time, the client will be notified and the data will be qualified in the report.

7. Coolers and samples must be received in good condition, with no obvious signs of damage or tampering.

8. Please note, mixed waste, or samples classified as extremely hazardous are **NOT** accepted.

If you require additional information or clarification, please do not hesitate to contact YORK, or your Project Manager at (203) 325-1371.

11.4 Sample Receipt Protocols

a) Upon receipt, the condition of the sample, including any abnormalities or departures from standard condition as prescribed in the relevant test method, is recorded. All items specified in YORKQSM Section 11.2 above are checked.

   1) All samples that require cold temperature preservation are considered acceptable if the arrival temperature is within 2°C of the required temperature or the method-specified range. For samples with a specified temperature of 4°C, samples with a temperature ranging from just above the freezing

temperature of water to 6°C shall be acceptable. Samples that are hand delivered to the laboratory immediately after collection may not meet these criteria. In these cases, the samples shall be considered acceptable if there is evidence that the chilling process has begun, such as arrival on ice.

2) The laboratory shall implement procedures for checking chemical preservation using readily available techniques, such as pH or free chlorine, prior to or during sample preparation or analysis.

Certain measurements, such a pH, are performed and recorded just prior to analysis.

Field filtration for dissolved metals may also be required. If there is no documentation of field filtration on the Chain of Custody when required, the Project Manager is notified and the client asked. If samples are not field filtered, they are sent to the lab for filtration within 24 or 48 hours depending on the analysis.

b) The results of all checks are recorded on Sample Receipt and, as needed, in the Corrective Action field on the login in LIMS.

c) When there is any doubt as to the item's suitability for testing, when the sample does not conform to the description provided, and when the test required is not fully specified, the laboratory makes every attempt to consult the client for further instruction before proceeding. The laboratory establishes whether the sample has received all necessary preparation, or whether sample preparation has yet to be performed. If the sample does not meet the sample receipt acceptance criteria listed in this standard, the laboratory:

1) Retains correspondence and/or records of conversations concerning the final disposition of rejected samples; or

2) Fully documents any decision to commence with the analysis of samples not meeting acceptance criteria.

i. The condition of these samples is, at a minimum, noted on the chain of custody record or transmittal form, and laboratory receipt documents.

ii. The analysis data is/are appropriately "qualified" on the final report.

d) The laboratory utilizes a permanent chronological electronic database to document receipt of all sample containers.

1) This sample receipt log records the following:

i. Client/Project Name;

ii. Date and time of laboratory receipt;

iii. Unique laboratory ID code (see YORKQSM Section 11.1); and

iv. Signature or initials of the person making the entries.

2) During the login process, the following information is linked to the log record or included as a part of the log. If such information is recorded/documented elsewhere, that document becomes part of the laboratory's permanent records, easily retrievable upon request, and readily available to individuals who will process the sample. Note: The placement of the laboratory ID number on the sample container is not considered a permanent record.

i. The field ID code that identifies each container is linked to the laboratory ID code in the sample receipt log.
ii. The date and time of sample collection is linked to the sample container and to the date and time of receipt in the laboratory.
iii. The requested analyses (including applicable approved test method numbers) are linked to the laboratory ID code.
iv. Any comments resulting from inspection for sample rejection are linked to the laboratory ID code.

e) All documentation (i.e., memos or transmittal forms) that are conveyed to the laboratory by the sample submitter is retained.

f) A complete chain of custody record form is maintained.

11.5 Storage Conditions

The laboratory has documented procedures and appropriate facilities to avoid deterioration, contamination, and damage to the sample during storage, handling, preparation, and testing; any relevant instructions provided with the item are followed. Where items must be stored or conditioned under specific environmental conditions, these conditions are maintained, monitored, and recorded.

a) Samples are stored according to the conditions specified by preservation protocols:

   1) Samples that require thermal preservation are stored under refrigeration at +/-2° of the specified preservation temperature unless method-specific requirement pre-empt this, such as volatile soil samples using Terracore (frozen). For samples with a specified storage temperature of 4°C, storage at a temperature above the freezing point of water to 6°C is acceptable.

   2) Samples are stored away from all standards, reagents, food, and other potentially contaminating sources. Samples are stored in such a manner to prevent cross contamination. Samples for analysis of volatile organics are stored in separate storage refrigerators/freezers to reduce vross contamination potential.

b) Sample fractions, extracts, leachates, and other sample preparation products are stored according to YORKQSM Section 11.4.a above or according to specifications in the test method.

c) When a sample or portion of a sample needs to be held secure (for example, for reasons of record, safety or value, or to enable check calibrations or tests to be performed later), the laboratory has storage and security arrangements that protect the condition and integrity of the secured items or portions concerned.

11.6 Sample Disposal

The laboratory has standard operating procedures for the disposal of samples, digestates, leachates and extracts or other sample preparation products.

12.1 RECORDS

The laboratory maintains a record system to suit its particular circumstances and comply with any applicable regulations. The system produces unequivocal, accurate records that document all laboratory activities. The laboratory retains all original observations, calculations and derived data, calibration records and a copy of the test report for a minimum of five years and for lead and copper in potable water, 12 years.

There are two levels of sample handling: 1) sample tracking and 2) legal chain of custody protocols that are used for evidentiary or legal purposes. All essential requirements for sample tracking (e.g., chain of custody form) are outlined in YORKQSM Sections 12.1, 12.2 and 12.3. YORK details the Legal/Evidentiary and Chain of Custody procedures in the appropriate SOPs.

12.2 Record Keeping System and Design

The YORK record keeping system allows historical reconstruction of all laboratory activities that produced the analytical data. The history of the sample is readily understood through the documentation. This includes inter-laboratory transfers of samples and/or extracts.

a) The records include the identity of personnel involved in sampling, sample receipt, preparation, and calibration or testing.

b) All information relating to the laboratory facilities equipment, analytical test methods, and related laboratory activities, such as sample receipt, sample preparation, or data verification, are documented.

c) The record keeping system facilitates the retrieval of all working files and archived records for inspection and verification purposes, e.g., set format for naming electronic files.

d) All changes to records are signed or initialed by responsible staff. The reason for the signature or initials is clearly indicated in the records such as “sampled by,” “prepared by,” or “reviewed by.”

e) All generated data, except those that are generated by automated data collection systems, are recorded directly, promptly, and legibly in permanent ink.

f) Entries in records are not to be obliterated by methods such as erasures, overwritten files or markings. All corrections to record-keeping errors are made by one line marked through the error. The individual making the correction signs (or initials) and dates the correction. These criteria also apply to electronically maintained records.

g) Refer to 10.9 for Computer and Electronic Data.

12.3 Records Management and Storage

a) All records (including those pertaining to calibration and test equipment), certificates and reports are safely stored, and held secure and in confidence to the client. NELAP-related records are available to the accrediting authority.

b) All records, including those specified in YORKQSM Section 12.3, are retained for a minimum of five years from generation of the last entry in the records. The laboratory maintains all information necessary for the historical reconstruction of data. Records stored only on electronic media are supported by the hardware and software necessary for their retrieval. For potable water lead and copper data are retained for 10 years.

c) Records that are stored or generated by computers or personal computers have hard copy or write-protected backup copies.

d) The laboratory has an established record management system for control of laboratory notebooks, instrument logbooks, standards logbooks, and records for data reduction, validation storage and reporting.

e) Access to archived information is documented with an access log. These records are protected against fire, theft, loss, environmental deterioration, vermin, and in the case of electronic records, electronic or magnetic sources.

f) The laboratory has a plan to ensure that the records are maintained or transferred according to the clients’ instructions (see 4.1.8.e of NELAC) in the event of Laboratory Transfer of Ownership, Going out of Business or Bankruptcy. In all cases, appropriate regulatory and state legal requirements concerning laboratory records will be followed.

12.4 Laboratory Sample Tracking

12.4.1 Sample Handling

A record of all procedures to which a sample is subjected while in YORK’s possession is maintained. These include but are not limited to all records pertaining to:

a) Sample preservation, including appropriateness of sample container and compliance with holding time requirement;
b) Sample identification, receipt, acceptance or rejection, and log-in;
c) Sample storage and tracking, including shipping receipts, sample transmittal forms (chain of custody form); and
d) Documentation procedures for the receipt and retention of test items, including all provisions necessary to

protect the integrity of samples.

12.4.2 Laboratory Support Activities

In addition to documenting all the above-mentioned activities, the following is retained:

a) All original raw data, whether hard copy or electronic, for calibrations, samples and quality control measures, including analysts work sheets and data output records (chromatograms, strip charts, and other instrument response readout records);

b) A written description or reference to the specific test method used, which includes a description of the specific computational steps used to translate parametric observations into a reportable analytical value;

c) Copies of final reports;

d) Archived standard operating procedures;

e) Correspondence relating to laboratory activities for a specific project;

f) All corrective/preventive action reports, audits and audit responses;

g) Proficiency test results and raw data; and,

h) Results of data review, verification, and cross-checking procedures.

12.4.3 Analytical Records

The essential information associated with analyses, such as strip charts, tabular printouts, computer data files, analytical notebooks, and run logs, include:

a) Laboratory sample ID code;

b) Date of analysis and time of analysis if the method-specified holding time is 72 hours or less, or when time critical steps are included in the analysis, e.g., extractions, and incubations;

c) Instrument identification and instrument operating conditions/parameters (or reference to such data);

d) Analysis type;

e) All manual calculations e.g., manual integrations;

f) Analyst's or operator's initials/signature;

g) Sample preparation including cleanup, separation protocols, incubation periods, ID codes, volumes, weights, instrument printouts, meter readings, calculations, reagents;

h) Sample analysis;

i) Standard and reagent origin, receipt, preparation, and use;

j) Calibration criteria, frequency and acceptance criteria;

k) Data and statistical calculations, review, confirmation, interpretation, assessment and reporting conventions;

l) Quality control protocols and assessment;

m) Electronic data security, software documentation and verification, software and hardware audits, backups, and records of any changes to automated data entries; and,

n) Method performance criteria including expected quality control requirements.

12.4.4 Administrative Records

The following are maintained:

a) Personnel qualifications, experience and training records;

b) Ethics Statements;

c) Records of demonstration of capability for each analyst; and

d) A log of names, initials and signatures for all individuals who are responsible for signing or initialing any laboratory record.

13.0 LABORATORY REPORT FORMAT AND CONTENTS

The results of each test, or series of tests carried out by the laboratory must be reported accurately, clearly, unambiguously and objectively. The results normally reported in a test report and include all the information necessary for the interpretation of the test results and all information required by the method used. Some regulatory reporting requirements or formats, such as monthly operating reports may not require all items listed below, however, YORK will provide all the required information to their client for use in preparing such regulatory reports.

a) Except as discussed in 13.b, each report to an outside client includes at least the following information (those prefaced with “where relevant” are not mandatory):

1) A title, e.g., "Technical Report”;

2) Name and address of laboratory, and location where the test was carried out if different from the address of the laboratory and phone number with name of contact person for questions;

3) Unique identification of the certificate or report (such as Work order no.) and of each page, and the total number of pages;

This requirement may be presented in several ways:

i. The total number of pages may be listed on the first page of the report as long as the subsequent pages are identified by the unique report identification and consecutive numbers, or

ii. Each page is identified with the unique report identification, the pages are identified as a number of the total report pages (example: 3 of 10, or 1 of 20).

Other methods of identifying the pages in the report may be acceptable as long as it is clear to the reader that discrete pages are associated with a specific report, and that the report contains a specified number of pages.

4) Name and address of client, where appropriate and project name if applicable;

5) Description and unambiguous identification of the tested sample including the client identification code;

6) Identification of test results derived from any sample that did not meet NELAC sample acceptance requirements such as improper container, holding time, or temperature;

7) Date of receipt of sample, date and time of sample collection, date(s) of performance test, and time of sample preparation and/or analysis if the required holding time for either activity is less than or equal to 72 hours;

8) Identification of the test method used, or unambiguous description of any nonstandard method used;

9) If the laboratory collected the sample, reference to sampling procedure;

10) Any deviations from (such as failed quality control), additions to or exclusions from the test method (such as environmental conditions), and any nonstandard conditions that may have affected the quality of results, and including the use and definitions of data qualifiers.

11) Measurements, examinations and derived results, supported by tables, graphs, sketches, and photographs as appropriate, and any failures identified; identify whether data are calculated on a dry weight or wet weight basis; identify the reporting units such as µg/l or mg/kg;

12) When required, a statement of the estimated uncertainty of the test results;

13) A signature and title, or an equivalent electronic identification of the person(s) accepting responsibility for the content of the report (however produced), and date of issue;

14) At the YORK's discretion, a statement to the effect that the results relate only to the items tested or to the sample as received by the laboratory;

15) At the YORK's discretion, a statement that the certificate or report shall not be reproduced except in full, without the written approval of the laboratory;

16) Clear identification of all test data provided by outside sources, such as subcontracted laboratories, clients, etc.; and

17) Clear identification of numerical results with values outside of quantitation limits.

b) Where the certificate or report contains results of tests performed by subcontractors, these results are clearly identified by subcontractor name or applicable accreditation number and the entirety of the subcontract report is included with the final YORK report.

c) After issuance of the report, the laboratory report remains unchanged. Material amendments to a calibration certificate, test report or test certificate after issue may be made only in the form of a further document, or data transfer, including the statement "Revision No. . . . [or as otherwise identified]" with explanation, or equivalent form of wording. Such amendments meet all the relevant requirements of the NELAC Standard.

d) YORK notifies clients promptly, in writing, of any event such as the identification of defective measuring or test equipment that casts doubt on the validity of results given in any calibration certificate, test report or test certificate or amendment to a report or certificate.

e) The laboratory will, where clients require transmission of test results by telephone, telex, facsimile or other electronic means, follow documented procedures that ensure that the requirements of this Standard are met and that confidentiality is preserved.

f) YORK will certify that all its NELAC-certified test results reported meet all requirements of NELAC or provide reasons and/or justification if they do not.

14.0 SUBCONTRACTING ANALYTICAL SAMPLES

When YORK subcontracts work whether because of unforeseen circumstances (e.g. workload, need for further expertise or temporary incapacity) or on a continuing basis (e.g. through client direction, contractual arrangement or permanent subcontracting), this work shall be placed with a laboratory accredited under NELAP, or other appropriate certification, for the tests to be performed or with a laboratory that meets applicable statutory and requirements for performing the tests and submitting the results of tests performed. All subcontracted work shall be referenced and so noted in the final YORK analytical report.

Subcontract laboratories will provide or make available, current copies of the following documents prior to YORK submitting samples. This information will be updated annually or on an as needed basis.

a) Laboratory accreditations / certifications

b) Upon request, any Proficiency Testing (PT) or Performance Evaluation (PE) results relevant to the subcontracted samples.

c) Insurance Certificates

d) Quality Assurance Manual

e) Subcontract laboratories will also submit statements affirming that YORK will be notified if any of the following occur.

- There is a change or loss in accreditation for the applicable analysis.
- Most recent PT or PE study results for the applicable analysis are unacceptable *AND* are not able to be addressed via Corrective Action.
- There is a need to subcontract YORK project samples. Prior YORK approval is required in writing for subcontracting samples.

f) The client project requirements will be used to evaluate the subcontract laboratories and to determine their acceptability. Approval by either: the QA Manager, Laboratory Manager or Client Services Director (or designee) is required.

g) A master list of approved laboratories will be created and distributed to Sample Control and all Project Managers. All subcontracting must utilize a laboratory from this list.

The procedure for subcontracting samples will follow these guidelines:

a) YORK will advise its client via written, facsimile or e-mail notification of its intention to subcontract any portion of the testing to another party in cases when unforeseen circumstances occur. YORK shall gain approval by the client in writing, facsimile or via e-mail response.

b) YORK may subcontract samples on a continuing basis without written, facsimile or e-mail notification under the following (but not limited to) cases:

- Standing Client direction or instruction
- Contractual specification or requirement
- Project historical precedent

c) A separate Chain of Custody will be created specifically for the subcontracted sample(s). This (or a copy) will be included with the full and complete subcontract report in the final YORK analytical report.

d) YORK shall retain records demonstrating that the above requirements have been met.

15.0 OUTSIDE SUPPORT SERVICES AND SUPPLIES

YORK does not procure outside services and supplies, other than those referred to in this Manual.

Service providers and vendors are evaluated in accordance with ISO/IEC 17025:2005 or ISO 9001 guidelines prior to use by YORK with detailed vendors listed in each SOP.

16.0 INQUIRIES AND COMPLAINTS

York's SOP addresses the policies and procedures for the resolution of inquiries and complaints received from clients or other parties about the laboratory's activities. Where an inquiry or complaint, or any other

circumstance, raises doubt concerning the laboratory's compliance with the laboratory's policies or procedures, or with the requirements of this manual or otherwise concerning the quality of the laboratory's calibrations or tests, the laboratory shall ensure that those areas of activity and responsibility involved are promptly audited in accordance with NELAC Section 5.3.1. Records of the complaint and subsequent actions are maintained and are available for audits.

17.0 REVIEW OF WORK REQUESTS, CONTRACTS AND TENDERS

YORK has established procedures for the review of work requests contracts and tenders. Projects, proposals and contracts are reviewed for adequately defined requirements and the ability of YORK to meet those requirements. A thorough review of all technical and quality control requirements contained in these requests is performed to ensure a project's success. The appropriateness of requested methods, and the lab's capability to perform them must be established. A review of the laboratory's capability to analyze non-routine analytes is also part of this review process. Additionally, alternate test methods that are capable of meeting the clients' requirements may be proposed by the lab.

All projects, proposals and contracts are reviewed for the client's requirements in terms of compound lists, test methodology requested, detection and reporting levels, and quality control limits. During the review process, the laboratory determines whether it has the necessary physical, personnel and information resources to meet the project requirements, and if the personnel have the expertise needed to perform the required testing. Each proposal is also checked for its impact on the overall capacity of the laboratory. The proposed turnaround time will be checked for feasibility. Electronic or hard copy deliverable requirements are evaluated against the laboratory's ability to produce such documentation.

This review process ensures that the laboratory's test methods are suitable to achieve regulatory and/or client requirements and that the laboratory holds the appropriate certifications to perform the work. In the event that the use of a subcontract laboratory is needed, also confirming that they meet all project requirements and maintain the appropriate certifications for the proposed subcontract analyses. If the laboratory cannot provide all services and therefore intends to use the services of a subcontract laboratory, this will be documented and discussed with the client prior to project or contract approval.

Following the review process, the laboratory (Client Services) informs the client of the results of the review and notes any potential conflict, lack of accreditation, or inability of the lab to complete the work satisfactorily. Any discrepancy between the client's requirements and the capability of the laboratory to meet those requirements is resolved in writing before acceptance of the project or contract. It is necessary that the project requirements or contract be acceptable to both the client and the laboratory prior to the start of the work. The review process is repeated when there are amendments to the original contract by the client.

All contracts, Quality Assurance Project Plans (QAPPs), contract amendments, and documented communications become part of the project record.

Review Personnel

Depending upon the scope of a project or contract, one or more key persons may review and accept work on behalf of the laboratory. For routine projects, a review by the Project Manager (PM) is considered adequate. The PM confirms that the laboratory has the necessary certifications, that it can meet the clients' data quality, reporting and turn-around time requirements.

For new, complex or large projects, the proposed project proposal or contract is given to the Business Development Director and/or Client Services Director for an initial review that encompasses all facets of the operation. The scope of work is then distributed to the following personnel, as needed based on scope of contract, to evaluate all of the project related requirements:

- Vice President/Chief Scientific Officer
- Laboratory Manager
- Technical Director(s)
- Quality Assurance Officer

- Group Leaders
- Project Manager(s)

Appropriate records are maintained for every contract or work request. Copies of the agreed-upon contract will be distributed to key personnel as needed and the signed copies maintained by the Business Development Director and/or Laboratory Manager(s).

Project Kick-off and Status Meetings

For routine project work, project managers ensure that specific technical and QC requirements are effectively evaluated and communicated to laboratory personnel through the use of the LIMS system: special requirements/Comments section in the appropriate work order field. These comments then appear on the lab staff worklists for implementation.

Prior to work on a new or complex project, project managers or key personnel will hold meetings via Zoom with operations personnel to discuss schedules and any unique aspects of the project. Items discussed include the project technical profile, turnaround times, holding times, methods, analyte lists, reporting limits, deliverables, sample hazards, and any other special requirements.

Project requirements are given to the laboratory staff during project kick-off meetings or the daily status meetings. Information disseminated during these meetings provides direction to the laboratory staff in order to maximize production, maintain high quality and ensure client satisfaction.

During the project, changes to the scope of work may occur due to client, sampling or regulatory reasons. If these changes impact the laboratory's role in the project (use of a non-standard method or modification of a method to comply with revised requirements) then the changes need to be discussed with and agreed upon with the client prior to continuing with the work. These changes must be documented prior to implementation and communicated to the laboratory staff via email, zoom meeting or via the Laboratory Manager.

And at all times, records of all pertinent discussions with a client relating to the project or contract are documented and maintained as a part of the project record using the "Other Documents" in the work Order LIMS field.

18.0 MANAGEMENT REVIEW, MANAGEMENT OF CHANGE AND CONTINUOUS IMPROVEMENT

Management Review

A comprehensive Management Review of the entire YORK Quality System will be conducted by the Laboratory Managers on an annual basis, no later than the end of the first quarter for the previous year's review. All major stakeholders will be given an opportunity to provide comment or input for the review. These will include:

- Vice President/Chief Scientific Officer
- Client Services Director
- Lab Managers
- Technical Directors
- Senior Project Managers
- Other Operational / Project Management personnel as appropriate.
- Clients

The purpose and goal of the Management Review will identify areas of improvement, areas requiring more resources or oversight, opportunities for continuous improvement and follow up on previous recommendations.

The final completed review is part of the NELAP laboratory documentation requirements and may be submitted to YORK authorized auditing agencies or clients upon request.

18.1 Management of Change

Whenever a change is made in a controlled environment (not just production) the laboratory is put at risk. However, one needs to constantly make changes to keep pace with business / regulatory requirements. The challenge to the laboratory is to minimize the risk and impact of that change.

An organization must have an operating process in place for which an evaluation has been conducted, and that allows proper lead times and approvals to ensure that the laboratory is unaffected when changes are made. But to successfully implement a change, one also needs to have a comprehensive understanding of the infrastructure that supports the services to determine the overall impact.

The Management of Change process will track and implement the following types of changes:

a) Permanent Change: – A change that is considered long term and durable. Any change which is not categorized as a Temporary Change.
b) Temporary Change: – A change which has a defined lifetime and which will be removed before a defined date (usually no more than six months).
c) Emergency Change: – An emergency change path that allows the change to be implemented and commissioned immediately in order to address an immediate safety, operational, health, environmental, or product quality situations.

The functional categories that will be managed include:
a) Laboratory Facility Acquisition
b) Laboratory Instrument Acquisition
c) Analytical Method Development and Validation
d) Laboratory Operations Process Change
e) Department Relocation
f) Activation of Analytical Method
g) Information Technology (Major Initiatives)
h) New Accreditation or Certification

18.2 Continuous Improvement

In order for YORK to be proactive and a leader in the industry, the entire YORK Quality system is designed to ensure the production of scientifically sound, legally defensible data of known and proven quality. The addition of the Management Review and Management of Change processes enhances YORK's ability to foster continuous improvement.

Continuous improvement is an ongoing effort to improve data integrity, services or processes. These efforts can seek "incremental" improvement over time or "breakthrough" improvement all at once. All staff at YORK participates in continuous improvement, from the Vice President/Chief Scientific Officer down to the beginning technician, as well as external stakeholders when applicable.

The following procedures / inputs have direct involvement in the continuous improvement process:
a) External Audits (Regulatory and Client Based)
b) Internal Audits
c) Corrective / Preventive Actions
d) Statistical Quality Control (SQC) Monitoring
e) Proficiency Testing Performance
f) Client Feedback – Complaints and Commendations
g) Management Review
h) Management of Change

The Management of Change process will guide and document the major improvements. The Corrective / Preventive Action procedure will enable and record the more incremental changes.
The principal elements are commitment to quality, focused effort, involvement of all employees, willingness to change, and communication.

NELAC APPENDICES

APPENDIX A - REFERENCES

NELAC Standards, Chapters 1-6., Effective July 01, 2016

40 CFR Part 136, Appendix A, paragraphs 8.1.1 and 8.2.

American Association for Laboratory Accreditation April 1996. General Requirements for Accreditation.

"American National Standards Speficiationn and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs (ANSI/ASQC E-4)," 1994.

EPA 2185 - Good Automated Laboratory Practices, 1995 available at www.epa.gov/docs/etsdwe1/irm_galp/

EPA/600/3-89/013 Ecological Assessment of Hazardous Waste Sites, Office of Research and Development, Washington, DC, 1991.

EPA/503/8-91/001 Evaluation of Dredged Material Proposed for Ocean Disposal – Testing Manual. Office of Water, Washington, DC, 1991.

EPA/600/4-90/031 Manual for Evaluation of Laboratories Performing Aquatic Toxicity Tests, Office of Research and Development, Washington, DC, 1991.

EPA/600/3-88/029 Protocol for Short-term Toxicity Screening of Hazardous Wastes, Office of Research and Development, Washington, DC, 1991.

EPA/600/4-90/027F Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, 4th Ed., Office of Research and Development, Washington, DC, 1993.

EPA/823/B-98/004 Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – Inland Testing Manual. Office of Water, Washington, DC, 1994.

"Glossary of Quality Assurance Terms and Acronyms," Quality Assurance Division, Office of Research and Development, USEPA.

"Guidance on the Evaluation of Safe Drinking Water Act Compliance Monitoring Results from Performance Based Methods," September 30, 1994, Second draft.

ISO/IEC 17025: 2005. General requirements for the competence of calibration and testing laboratories. "

Manual for the Certification of Laboratories Analyzing Drinking Water, Revision 4, EPA 815-B-97-001.

Performance Based Measurement System, EPA EMMC Method Panel, PBMS Workgroup, 1996.

APPENDIX B - GLOSSARY

The following definitions are used in the text of Quality Systems. In writing this document, the following hierarchy of definition references was used: ISO 8402, ANSI/ASQC E-4, EPA's Quality Assurance Division Glossary of Terms, and finally definitions developed by NELAC. The source of each definition, unless otherwise identified, is the Quality Systems Committee.

Acceptance Criteria: Specified limits placed on characteristics of an item, process, or service defined in requirement documents. (ASQC)

Accreditation: The process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory. In the context of the National Environmental Laboratory Accreditation Program (NELAP), this process is a voluntary one. (NELAC)

Accrediting Authority: The Territorial, State, or Federal agency having responsibility and accountability for environmental laboratory accreditation and which grants accreditation. (NELAC) [1.5.2.3]

Accuracy: The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator. (QAMS)

Analysis Duplicate: The second measurement of the target analyte(s) performed on a single sample or sample preparation.

Analyst: The designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality. (NELAC)

Analytical Reagent (AR) Grade: Designation for the high purity of certain chemical reagents and solvents given by the American Chemical Society. (Quality Systems)

Assessment: The evaluation process used to measure or establish the performance, effectiveness, and conformance of an organization and/or its systems to defined criteria (to the standards and requirements of NELAC). (NELAC)

Audit: A systematic evaluation to determine the conformance to quantitative and qualitative spYorkfications of some operational function or activity. (EPA-QAD)

Batch: Environmental samples, which are prepared and/or analyzed together with the same process and personnel using the same lot(s) of reagents. A **preparation batch** is composed of one to 20 environmental samples of the same NELAC-defined matrix, meeting the above-mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An **analytical batch** is composed of prepared environmental samples (extracts, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various environmental matrices and can exceed 20 samples. (NELAC Quality Systems Committee)

Blank: A sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results. (ASQC)

Blind Sample: A sub-sample for analysis with a composition known to the submitter. The analyst/ laboratory may know the identity of the sample but not its composition. It is used to test the analyst's or laboratory's proficiency in the execution of the measurement process. (NELAC)

Calibration: To determine, by measurement or comparison with a standard, the correct value of each scale reading on a meter or other device. The levels of the applied calibration standard should bracket the range of planned or expected sample measurements. (NELAC)

Calibration Curve: The graphical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response. (NELAC)

Calibration Method: A defined technical procedure for performing a calibration. (NELAC)

Calibration Standard: A substance or reference material used to calibrate an instrument. (QAMS)

Certified Reference Material (CRM): A reference material one or more of whose property values are certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation which is issued by a certifying body. (ISO Guide 30 - 2.2)

Chain of Custody Form: A record that documents the possession of the samples from the time of collection to receipt in the laboratory. This record generally includes: the number and types of containers; the mode of collection; collector; time of collection; preservation; and requested analyses. (NELAC)

Compromised Samples: Those samples which are improperly sampled, insufficiently documented (chain of custody and other sample records and/or labels), improperly preserved, collected in improper containers, or exceeding holding times when delivered to a laboratory. Under normal conditions compromised samples are not analyzed. If emergency situations require analysis, the results must be appropriately qualified. (NELAC)

Confirmation: Verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to:

- Second column confirmation;
- Alternate wavelength;
- Derivatization;
- Mass spectral interpretation;
- Alternative detectors; or
- Additional cleanup procedures. (NELAC)

Conformance: An affirmative indication or judgment that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements. (ANSI/ ASQC E4-1994)

Corrective Action: The action taken to eliminate the causes of an existing nonconformity, defect or other undesirable situation in order to prevent recurrence. (ISO 8402)

Data Audit: A qualitative and quantitative evaluation of the documentation and procedures associated with environmental measurements to verify that the resulting data are of acceptable quality (i.e., that they meet spYorkfied acceptance criteria). (NELAC)

Data Reduction: The process of transforming raw data by arithmetic or statistical calculations, standard curves, concentration factors, etc., and collation into a more useable form. (EPA-QAD)

Deficiency: An unauthorized deviation from acceptable procedures or practices, or a defect in an item. (ASQC)

Demonstration of Capability: A procedure to establish the ability of the analyst to generate acceptable accuracy. (NELAC)

Desorption Efficiency: The mass of target analyte recovered from sampling media, usually a sorbent tube, divided by the mass of target analyte spiked on to the sampling media expressed as a percentage. Sample target analyte masses are usually adjusted for the desorption efficiency. (NELAC)

Detection Limit: The lowest concentration or amount of the target analyte that can be identified, measured, and reported with confidence that the analyte concentration is not a false positive value. See Method Detection Limit. (NELAC)

Document Control: The act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly and controlled to ensure use of the correct version at the location where the prescribed activity is performed. (ASQC)

Duplicate Analyses: The analyses or measurements of the variable of interest performed identically on two subsamples of the same sample. The results from duplicate analyses are used to evaluate analytical or measurement precision but not the precision of sampling, preservation or storage internal to the laboratory. (EPA- QAD)

Holding Times (Maximum Allowable Holding Times): The maximum times that samples may be held prior to analysis and still be considered valid or not compromised. (40 CFR Part 136)

Inspection: An activity such as measuring, examining, testing, or gauging one or more characteristics of an entity and comparing the results with specified requirements in order to establish whether conformance is achieved for each characteristic. (ANSI/ ASQC E4-1994)

Internal Standard: A known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical method. (NELAC)

Instrument Blank: A clean sample (e.g., distilled water) processed through the instrumental steps of the measurement process; used to determine instrument contamination. (EPA-QAD)

Laboratory: A body that calibrates and/or tests. (ISO 25)

Laboratory Control Sample (however named, such as laboratory fortified blank, spiked blank, or QC check sample): A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is generally used to establish intra-laboratory or analyst-spYorkfic prYorksion and bias or to assess the performance of all or a portion of the measurement system. (NELAC)

Laboratory Duplicate: Aliquots of a sample taken from the same container under laboratory conditions and processed and analyzed independently. (NELAC)

Limit of Detection (LOD): Limit of Detection (LOD): The smallest concentration of a substance that must be present in a sample in order to be detected at the DL with 99% confidence. At the LOD, the false negative rate (Type II error) is 1%. (NELAC)

Limit of Quantitation (LOQ): The smallest concentration that produces a quantitative result with known and recorded precision and bias. (NELAC)

Manager (however named): The individual designated as being responsible for the overall operation, all personnel, and the physical plant of the environmental laboratory. A supervisor may report to the manager. In some cases, the supervisor and the manager may be the same individual. (NELAC)

Matrix: The component or substrate that contains the analyte of interest. For purposes of batch and QC requirement determinations, the following matrix distinctions shall be used:

- Aqueous: Any aqueous sample excluded from the definition of Drinking Water matrix or Saline/Estuarine source. Includes surface water, groundwater, effluents, and TCLP or other extracts.
- Drinking Water: Any aqueous sample that has been designated a potable or potential potable water source.
- Non-aqueous Liquid: Any organic liquid with <15% settleable solids.
- Solids: Includes soils, sediments, sludges and other matrices with >15% settleable solids.
- Chemical Waste: A product or by-product of an industrial process that results in a matrix not previously defined.
- Air: Whole gas or vapor samples including those contained in flexible or rigid wall containers.

Matrix Spike (spiked sample or fortified sample): A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.

Matrix Spike Duplicate (spiked sample or fortified sample duplicate): A second replicate matrix spike prepared in the laboratory and analyzed to obtain a measure of the precsion of the recovery for each analyte.

May: Denotes permitted action, but not required action. (NELAC)

Method Blank: A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses. (NELAC)

Method Detection Limit: The minimum concentration of a substance (an analyte) that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. (40 CFR Part 136 Appendix B)

Must: Denotes a requirement that must be met.

National Accreditation Database: The publicly accessible database listing the accreditation status of all laboratories participating in NELAP. (NELAC)

National Environmental Laboratory Accreditation Conference (NELAC): A voluntary organization of State and Federal environmental officials and interest groups purposed primarily to establish mutually acceptable standards for accrediting environmental laboratories. A subset of NELAP. (NELAC)

National Environmental Laboratory Accreditation Program (NELAP): The overall National Environmental Laboratory Accreditation Program of which NELAC is a part. (NELAC)

Negative Control: Measures taken to ensure that a test, its components, or the environment do not cause undesired effects, or produce incorrect test results. (NELAC)

Objective Evidence: Any documented statement of fact, other information, or record, either quantitative or qualitative, pertaining to the quality of an item or activity, based on observations, measures, or tests that can be verified. (ASQC)

Performance Audit: The routine comparison of independently obtained qualitative and quantitative measurement system data with routinely obtained data in order to evaluate the proficiency of an analyst or laboratory. (NELAC)

Performance Based Measurement System (PBMS): A set of processes wherein the data quality needs, mandates or limitations of a program or project are spYorkfied and serve as criteria for selecting appropriate test methods to meet those needs in a cost-effective manner. (NELAC)

Positive Control: Measures taken to ensure that a test and/or its components are working properly and producing correct or expected results from positive test subjects. (NELAC)

Precision: The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms. (NELAC)

Preservation: Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical and/or biological integrity of the sample. (NELAC)

Proficiency Testing: A means of evaluating a laboratory's performance under controlled conditions relative to a given set of criteria through analysis of unknown samples provided by an external source. (NELAC) [2.1]

Proficiency Testing Program: The aggregate of providing rigorously controlled and standardized environmental samples to a laboratory for analysis, reporting of results, statistical evaluation of the results and the collective demographics and results summary of all participating laboratories. (NELAC)

Proficiency Test Sample (PT): A sample, the composition of which is unknown to the analyst and is provided to test whether the analyst/laboratory can produce analytical results within acceptance criteria. (QAMS)

Protocol: A detailed written procedure for field and/or laboratory operation (e.g., sampling, and analysis) which must be strictly followed. (EPA- QAD)

Pure Reagent Water: Shall be water (defined by national or international standard) in which no target analytes or interferences are detected as required by the analytical method. (NELAC)

Quality Assurance: An integrated system of activities involving planning, quality control, quality assessment, reporting and quality improvement to ensure that a product or service meets defined standards of quality with a stated level of confidence. (QAMS)

Quality Assurance (Project) Plan (QAPP): A formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved. (EPA-QAD)

Quality Control: The overall system of technical activities whose purpose is to measure and control the quality of a product or service so that it meets the needs of users. (QAMS)

Quality Control Sample: An uncontaminated sample matrix with known amounts of analytes from a source independent from the calibration standards. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. (EPA-QAD)

Quality Manual: A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users. (NELAC)

Quality System: A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC. (ANSI/ ASQC E-41994)

Quantitation Limits: Levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported at a spYorkfic degree of confidence. (NELAC)

Range: The difference between the minimum and the maximum of a set of values. (EPA-QAD)

Raw Data: Any original factual information from a measurement activity or study recorded in a laboratory notebook, worksheets, records, memoranda, notes, or exact copies thereof that are necessary for the reconstruction and evaluation of the report of the activity or study. Raw data may include computer printouts and recorded data from automated instruments. If exact copies of raw data have been prepared.

Reagent Blank (method reagent blank): A sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps. (QAMS)

Record Retention: The systematic collection, indexing and storing of documented information under secure conditions. (EPA-QAD)

Reference Material: A material or substance one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials. (ISO Guide 30- 2.1)

Reference Method: A method of known and documented accuracy and prYorksion issued by an organization recognized as competent to do so. (NELAC)

Reference Standard: A standard, generally of the highest metrological quality available at a given location, from which measurements made at that location are derived. (VIM-6.08)

Reference Toxicant: The toxicant used in performing toxicity tests to indicate the sensitivity of a test organism and to demonstrate the laboratory's ability to perform the test correctly and obtain consistent results (see Chapter 5, Appendix D, Section 2.1.f). (NELAC)

Replicate Analyses: The measurements of the variable of interest performed identically on two or more sub-samples of the same sample within a short time interval. (NELAC)

Requirement: Denotes a mandatory specification; often designated by the term "shall". (NELAC)

Sampling Media: Material used to collect and concentrate the target analytes(s) during air sampling such as solid sorbents, filters, or impinger solutions.

Selectivity: (Analytical chemistry) The capability of a test method or instrument to respond to a target substance or constituent in the presence of non-target substances. (EPA-QAD)

Sensitivity: The capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. (NELAC)

Shall: Denotes a requirement that is mandatory whenever the criterion for conformance with the specification requires that there be no deviation. This does not prohibit the use of alternative approaches or methods for implementing the specification so long as the requirement is fulfilled. (ANSI)

Should: Denotes a guideline or recommendation whenever noncompliance with the specification is permissible. (ANSI)

Spike: A known mass of target analyte added to a blank sample or sub-sample; used to determine recovery efficiency or for other quality control purposes. (NELAC)

Standard: The document describing the elements of laboratory accreditation that has been developed and established within the consensus principles of NELAC and meets the approval requirements of NELAC procedures and policies. (ASQC)

Standard Operating Procedure (SOP): A written document which details the method of an operation, analysis or action whose techniques and procedures are thoroughly prescribed and which is accepted as the method for performing certain routine or repetitive tasks. (QAMS)

Standardized Reference Material (SRM): A certified reference material produced by the U.S. National Institute of Standards and Technology or other equivalent organization and characterized for absolute content, independent of analytical method. (EPA-QAD)

Supervisor (however named): The individual(s) designated as being responsible for a particular area or category of scientific analysis. This responsibility includes direct day-to-day supervision of technical

employees, supply and instrument adequacy and upkeep, quality assurance/quality control duties and ascertaining that technical employees have the required balance of education, training and experience to perform the required analyses. (NELAC)

Surrogate: A substance with properties that mimic the analyte of interest. It is unlikely to be found in environment samples and is added to them for quality control purposes. (QAMS)

Systems Audit (also Technical Systems Audit): A thorough, systematic, qualitative on-site assessment of the facilities, equipment, personnel, training, procedures, record keeping, data validation, data management, and reporting aspects of a total measurement system. (EPA-QAD)

Technical Director: Individual(s) who has overall responsibility for the technical operation of the environmental testing laboratory. (NELAC)

Test: A technical operation that consists of the determination of one or more characteristics or performance of a given product, material, equipment, organism, physical phenomenon, process or service according to a specified procedure. The result of a test is normally recorded in a document sometimes called a test report or a test certificate. (ISO/IEC Guide 2-12.1, amended)

Test Method: An adoption of a scientific technique for a specified measurement problem, as documented in a laboratory SOP. (NELAC)

Testing Laboratory: Laboratory that performs tests. (ISO/ IEC Guide 2 - 12.4)

Test Sensitivity/Power: The minimum significant difference (MSD) between the control and test concentration that is statistically significant. It is dependent on the number of replicates per concentration, the selected significance level, and the type of statistical analysis (see Chapter 5, Appendix D, Section 2.4.a). (NELAC)

Traceability: The property of a result of a measurement whereby it can be related to appropriate standards, generally international or national standards, through an unbroken chain of comparisons. (VIM - 6.12)

Validation: The process of substantiating specified performance criteria. (EPA- QAD)

Verification: Confirmation by examination and provision of evidence that spYorkfied requirements have been met. (NELAC)

NOTE: In connection with the management of measuring equipment, verification provides a means for checking that the deviations between values indicated by a measuring instrument and corresponding known values of a measured quantity are consistently smaller than the maximum allowable error defined in a standard, regulation or specification peculiar to the management of the measuring equipment.

The result of verification leads to a decision either to restore in service, to perform adjustment, to repair, to downgrade, or to declare obsolete. In all cases, it is required that a written trace of the verification performed shall be kept on the measuring instrument's individual record.

Work Cell: A well-defined group of analysts that together perform the method analysis. The members of the group and their specific functions within the work cell must be fully documented. (NELAC)

Sources:

- American Society for Quality Control (ASQC), Definitions of Environmental Quality Assurance Terms, 1996
- American National Standards Institute (ANSI), Style Manual for Preparation of Proposed American National Standards, Eighth Edition, March 1991
- International Standards Organization (ISO) Guides 2, 30, 8402
- International Vocabulary of Basic and General Terms in Metrology (VIM): 1984. Issued by BIPM, IEC, ISO
- National Institute of Standards and Technology (NIST)
- 40 CFR Part 31

APPENDIX C - DEMONSTRATION OF CAPABILITY

C.1 PROCEDURE FOR DEMONSTRATION OF CAPABILITY

A demonstration of capability (DOC) must be made prior to using any test method, and at any time there is a change in instrument type, personnel or test method. (See NELAC 10.2.1.)

Note: Where tests are performed by specialized "work cells" (a well-defined group of analysts that together perform the method analysis), the work cell as a unit meets the above criteria and this demonstration is fully documented.

In general, this demonstration does not test the performance of the method in real world samples, but in the applicable and available clean matrix (a sample of a matrix in which no target analytes or interferences are present at concentrations that impact the results of a specific test method), e.g., water, solids and air. However, before any results are reported using this method, actual sample spike results may be used to meet this standard, i.e., at least four consecutive matrix spikes within the last twelve months. In addition, for analytes that do not lend themselves to spiking, e.g., TSS, the demonstration of capability may be performed using quality control samples.

All demonstrations shall be documented through the use of the form in this appendix.

The following steps, which are adapted from the EPA test methods published in 40 CFR Part 136, Appendix A, are performed if required by mandatory test method or regulation. Note: For analytes for which spiking is not an option and for which quality control samples are not readily available, the 40 CFR approach is one way to perform this demonstration. The laboratory documents that other approaches to DOC are adequate, and this is documented in the laboratory's Quality Manual.

a) A quality control sample is obtained from an outside source. If not available, the QC sample may be prepared by the laboratory using stock standards that are prepared independently from those used in instrument calibration.

b) The analyte(s) is diluted in a volume of clean matrix sufficient to prepare four aliquots at the concentration specified, or if unspecified, to a concentration approximately 10 times the method-stated or laboratory-calculated method detection limit.

c) At least four aliquots are prepared and analyzed according to the test method either concurrently or over a period of days.

d) Using all of the results, the mean recovery ($\overline{X}$) is calculated in the appropriate reporting units (such as µg/L) and the relative standard deviations of the population sample (n-1) (in the same units) for each parameter of interest. When it is not possible to determine mean and relative standard deviations, such as for presence/absence and logarithmic values, the laboratory will assess performance against established and documented criteria.

e) Compare the information from (d) above to the corresponding acceptance criteria for precision and accuracy in the test method (if applicable) or in laboratory-generated acceptance criteria (if there are no established mandatory criteria). If all parameters meet the acceptance criteria, the analysis of actual samples may begin. If any one of the parameters do not meet the acceptance criteria, the performance is unacceptable for that parameter.

f) When one or more of the tested parameters fail at least one of the acceptance criteria, the analyst must proceed according to 1) or 2) below.

1) Locate and correct the source of the problem and repeat the test for all parameters of interest beginning with c) above.

2) Beginning with c) above, repeat the test for all parameters that failed to meet criteria. Repeated failure, however, will confirm a general problem with the measurement system. If this occurs, locate and correct the source of the problem and repeat the test for all compounds of interest beginning with c).

C.2 CERTIFICATION STATEMENT

The following certification statement shall be used to document the completion of each demonstration of capability. A copy of the certification statement shall be retained in the personnel records of each affected employee (see YORKQSM Section 6.3 and 12.3.4.b.).

Demonstration of Capability
Certification Statement

Date: Page of ___
Laboratory Name:
Laboratory Address:
Analyst(s) Name(s):

Matrix: _____
Examples: laboratory pure water, soil, air, solid)

Method number, SOP#, Rev #, and Analyte, or Class of Analytes or Measured Parameters:
_____ (examples: barium by 200.7, trace metals by 6010, benzene by 8021, etc.)

We, the undersigned, CERTIFY that:

1. The analysts identified above, using the cited test method(s), which is in use at this facility for the analyses of samples under the National Environmental Laboratory Accreditation Program, have met the Demonstration of Capability.

2. The test method(s) was performed by the analyst(s) identified on this certification.

3. A copy of the test method(s) and the laboratory-specific SOPs are available for all personnel on-site.

4. The data associated with the demonstration capability are true, accurate, complete and self-explanatory (1).

5. All raw data (including a copy of this certification form) necessary to reconstruct and validate these analyses have been retained at the facility, and that the associated information is well organized and available for review by authorized assessors.

Technical Director's Name and Title	Signature	Date
Quality Assurance Officer's Name	Signature	Date

This certification form must be completed each time a demonstration of capability study is completed.

(1) True: Consistent with supporting data.
Accurate: Based on good laboratory practices consistent with sound scientific principles/practices.
Complete: Includes the results of all supporting performance testing.
Self-explanatory: Data properly labeled and stored so that the results are clear and require no additional explanation.

(Note: Form may be modified so long as the essential items are included in the revised form)

APPENDIX D - ESSENTIAL QUALITY CONTROL REQUIREMENTS

The quality control protocols specified by the laboratory's method manual (10.1.2) shall be followed. The laboratory shall ensure that the essential standards outlined in Appendix D are incorporated into their method manuals.

All quality control measures shall be assessed and evaluated on an ongoing basis and quality control acceptance criteria shall be used to determine the validity of the data. The laboratory shall have procedures for the development of acceptance/rejection criteria where no method or regulatory criteria exists.

The requirements from the body of Chapter 5, e.g., Section 5.4, apply to all types of testing. The specific manner in which they are implemented is detailed in each of the sections of this Appendix, i.e., chemical testing.

D.1 CHEMICAL TESTING

D.1.1 Positive and Negative Controls

a) Negative Controls

1) Method Blanks - Shall be performed at a frequency of one per preparation batch of samples per matrix type. The results of this analysis shall be one of the QC measures to be used to assess the batch. The source of contamination must be investigated and measures taken to correct, minimize or eliminate the problem if

i) the blank contamination exceeds a concentration greater than 1/10 of the measured concentration of any sample in the associated sample batch or

ii) the blank contamination exceeds the concentration present in the samples and is greater than 1/10 of the specified regulatory limit.

Any sample associated with the contaminated blank shall be reprocessed for analysis or the results reported with appropriate data qualifying codes.

b) Positive Controls

1) Laboratory Control Sample (LCS) - (QC Check Samples) Shall be analyzed at a minimum of 1 per preparation batch of 20 or less samples per matrix type, except for analytes for which spiking solutions are not available such as total suspended solids, total dissolved solids, total volatile solids, total solids, pH, color, odor, temperature, dissolved oxygen or turbidity. The results of these samples shall be used to assess the batch. NOTE: The matrix spike (see 2 below) may be used in place of this control as long as the acceptance criteria are as stringent as for the LCS.

a. The NELAC requirements (2009 Standard, Section 1.7.4.2 b) allow the usage of LCS Marginal Exceedance control limits for those analyses with multiple reporting analytes.

b. The NELAC standards state that if a large number of analytes are in the LCS, it becomes statistically likely that a few will be outside control limits. This may not indicate that the system is out of control; therefore, corrective action may not be necessary. Upper and lower marginal exceedance (ME) limits can be established to determine when corrective action is necessary. ME is defined as being beyond the LCS control limit but within the ME limits. ME limits are between 3 and 4 standard deviations around the mean.

c. The number of allowable marginal exceedance is based on the number of analytes in the LCS. If there is any analyte that exceed the LCS control limits, it does not necessary mean the LCS fails. The NELAC standard states if the number of analytes fails LCS control limits but is within the ME limits, it is acceptable.

2) Matrix Spikes (MS) - Shall be performed at a frequency of one out of every 20 samples per matrix type prepared over time, except for analytes for which spiking solutions are not available such as, total suspended solids, total dissolved solids, total volatile solids, total solids, pH, color, odor, temperature, dissolved oxygen or turbidity. The selected sample(s) shall be rotated among client samples so that various matrix problems may be noted and/or addressed. Poor performance in a matrix spike may indicate a problem with the sample composition and shall be reported to the client whose sample was used for the spike.

3) Surrogates - Surrogate compounds must be added to all samples, standards, and blanks, for all organic chromatography methods except when the matrix precludes its use or when a surrogate is not available. Poor surrogate recovery may indicate a problem with the sample composition and shall be reported to the client whose sample produced the poor recovery.

4) If the mandated or requested test method does not specify the spiking components, the laboratory shall spike all reportable components to be reported in the Laboratory Control Sample and Matrix Spike. However, in cases where the components interfere with accurate assessment (such as simultaneously spiking chlordane, toxaphene, and PCBs in Method 608), the test method has an extremely long list of components or components that are incompatible, a representative number (minimum of 10%) of the listed components may be used to control the test method. The selected components of each spiking mix shall represent all chemistries, elution patterns and masses, permit-specified analytes, and other client-requested components. However, the laboratory shall ensure that all reported components are used in the spike mixture within a two-year time period.

D.1.2 Analytical Variability/Reproducibility

Matrix Spike Duplicates (MSDs) or Laboratory Duplicates - Shall be analyzed at a minimum of 1 in 20 samples per matrix type per sample extraction or preparation method. The laboratory shall document its procedure to select the use of appropriate type of duplicate. The selected sample(s) shall be rotated among client samples so that various matrix problems may be noted and/or addressed. Poor performance in the duplicates may indicate a problem with the sample composition and shall be reported to the client whose sample was used for the duplicate.

D.1.3 Method Evaluation

In order to ensure the accuracy of the reported result, the following procedures shall be in place:

a) Demonstration of Analytical Capability - (Section 10.5) shall be performed initially (prior to the analysis of any samples) and with a significant change in instrument type, personnel, matrix or test method.

b) Calibration - Calibration protocols specified in Section 9.4 shall be followed.

c) Proficiency Test Samples - The results of such analyses (4.2.j or 5.3.4) shall be used by the laboratory to evaluate the ability of the laboratory to produce accurate data.

D.1.4 Analytical Measurement Uncertainty Estimation

Uncertainty is “a parameter associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the measurand” (as defined by the International Vocabulary of Basic and General Terms in Metrology, ISO Geneva, 1993, ISBN 92-67-10175-1).

Uncertainty is not error. Error is a single value, the difference between the true result and the measured result. For environmental samples, the true result is never known. The measurement is the sum of the unknown true value and the unknown error.

Unknown error is a combination of systematic error, or bias, and random error. Bias varies predictably, constantly, and independently from the number of measurements. Random error is unpredictable, assumed to have a Gaussian distribution, and be reducible by increasing the total number of measurements.

Knowledge of the uncertainty of a measurement provides additional confidence in the validity of a result as its value accounts for all the factors which could possibly affect the result. Certain test methods will specify limits to the values of sources of uncertainty of measurement (EPA 500 series methods, etc.) and will specify the

form of presentation of calculated results.

When the method makes these stipulations, there is no need to provide a mechanism for calculating the uncertainty. Where this information is not provided within a method or other regulatory device, the uncertainty associated with results generated by the laboratory can be determined by using the Laboratory Control Sample (LCS) accuracy range for a given analyte because LCS recoveries incorporate all of the laboratory-related variables associated with a given test over time. It is recognized that other approaches exist; however, YORK's standard for estimating analytical data uncertainty uses this approach.

D.1.4.1 Using the Laboratory Control Sample (LCS) to Estimating Analytical Uncertainty

a) The estimated measurement uncertainty can be expressed as a range (±) around the reported analytical results at a specified confidence level. For methods that use statistically-derived LCS control limits based on historical LCS recovery data to assess the performance of the measurement system, these limits are considered an estimate of the minimum laboratory contribution to measurement uncertainty at a 99% confidence interval, The percent recovery of the LCS is compared either to the method-required LCS accuracy limits or to the statistical, historical, in-house LCS accuracy limits.

- Uncertainty values may be reported for specific projects upon request. In absence of alternate client-specified approaches or confidence levels,

  YORK will use the following procedure:

  To calculate the uncertainty value of a reported analytical result, the lower uncertainty range value is calculated by subtracting the product of the result and the lower LCS percent recovery from the result; and the upper uncertainty value result is calculated by adding the product of the result and the upper LCS percent recovery.

  These calculated values represent approximately a 99% confidence level. In other words, approximated 99% of the measured values for the analyte will fall within this calculated range.

- Example: If the reported result is 1.0 mg/l, and the LCS percent recovery range is 75 to 125%. The uncertainty range would be 0.75 to 1.25 mg/l, which could also be written as 1.0 +/- 0.25 mg/l.

- The Laboratory Quality and Accreditation Office has made available to the public both a spreadsheet that calculates analytical measurement uncertainty and an SOP describing how to use it. This SOP applies to test methods that are within the scope of ISO/IEC 17025-1999 Standard: General Requirements for the Competence of Testing and Calibration Laboratories and it is based on the general rules outlined in Guide to the Expression of Uncertainty in Measurement (GUM).

  The spreadsheet provides a QC-based nested approach for estimating measurement uncertainty using laboratory generated calibration and QC spike results

D.1.4.2 Additional Components to Estimating Analytical Uncertainty

When estimating analytical measurement uncertainty, all significant components of uncertainty must be identified and quantified. Components that affect analytical measurement uncertainty include sampling, handling, transport, storage, preparation and testing. A typical environmental laboratory will have the greatest contribution to uncertainty in the storage, preparation and testing portion of the analytical train, hence the estimation can be limited to those three areas, assuming all other factors are within recommended guidelines for sample size, container type, preservation (chemical, temperature, temporal) and handling/transport. If the latter are *NOT* within guidelines then these additional estimations of variability must be accounted for, and may supersede the laboratory contribution to uncertainty.

Definitive references and procedural manuals for calculating Analytical Measurement Uncertainty are listed below. Note that there are different theories on the "best" way to estimate uncertainty, it is up to the end user to determine that which best meets their project needs.

a) "Environmental Analytical Measurement Uncertainty Estimation – Nested Hierarchical Approach", William Ingersoll, Defense Technical Information Center # ADA396946, 2001

b) "Quantifying Uncertainty in Analytical Measurement", EuraChem / CITAC Guide CG 4, Second Edition, QUAM 2000.1

c) "Quantifying Measurement Uncertainty in Analytical Chemistry – A Simplified Practical Approach", Thomas W. Vetter, National Institute of Standards and Technology

d) ISO Guide to the Expression of Uncertainty in Measurement (GUM), 1993

e) "Estimation of Analytical Measurement Uncertainty - Laboratory Quality and Accreditation Office Uncertainty Calculator Standard Operating Procedure. Downloaded from http://www.denix.osd.mil/edqw/upload/UNCERTAINTY-SOP.PDF , 2013

f) QC-based Nested Approach for Estimating Measurement Uncertainty Spreadsheet, Microsoft Excel Spreadsheet, Ingersoll, William Stephen, 2002

The process in general involves the following steps:

1. Specify the Measurand – Write down a clear statement of what is being measured, including the relationship between the measurand and the input quantities, i.e., measured quantities, constants, calibration standard values, etc.

2. Identify uncertainty sources – This will include sources that contribute to the uncertainty on the parameters in the relationships identified in step 1, but may include other sources and must include sources arising from chemical assumptions.

3. Quantify uncertainty components – Measure or estimate the size of the uncertainty component associated with each potential source of uncertainty identified. It is often possible to estimate or determine a single contribution to uncertainty from the aggregate of multiple sources.

4. Calculate combined uncertainty – The information obtained in step 3 will consist of a number of quantified contributions to overall uncertainty, whether associated with individual sources or with the combined effects of several sources.

The process outlined above relates to the measurement of uncertainty for the preparative / analytical laboratory procedure. However, there are uncertainty contributions from other factors outside the preparative / analytical procedure. These can be controlled to a great extent by specifying uniform and standardized training or conditions.

Examples: Human Factors

a) All personnel at YORK undergo documented training in the method and / or instrument used. Minimum levels of education or experience are required.

b) Initial and continuing Demonstrations of Capability (DOC) must be performed and documented prior to and in continuance of analytical work related to their areas of responsibilities.

c) Blind Proficiency Testing samples are analyzed twice a year to gauge each department, matrix and method.

d) Data Integrity and Ethics Training are provided to new employees and on an annual basis to all employees.

Accommodation and Environmental Conditions

a) YORK has standardized operating procedures for transport, storage and tracking of samples, extracts and digests throughout the laboratory. All incoming orders are logged into a Laboratory Information System that assigns a specific identifier code to each work order, sample container and analytical result.

b) The sample control areas are secured with restricted access using card key portals. Internal chain of custody is available if the project requires.
c) The laboratory has over 13,000 sq ft of laboratory space with temperature controlled and air positive or negative environmental controls.

d) Regular safety inspections are performed to identify potentially hazardous conditions and to ensure general cleanliness.

Environmental Test Methods and Method Validation

a) All methods in use have Standard Operating Procedures (SOPs) based upon published methods from the EPA, ASTM, Standard Methods or other established body. These are controlled documents assigned to each department. An annual review is performed.

b) Each method has internal and external quality control criteria for preparative efficiency, instrument performance, calibration, continuing method performance and possible matrix effects as appropriate.

c) Ongoing Proficiency Testing program.

Equipment and Instrumentation

a) Each instrument in use has performance parameters that must be evaluated to specific standards based on the established method prior to any analytical use.

b) Routine and preventative maintenance is performed to maintain optimum operational performance.

c) Complex instrument systems are covered under manufacturer service contracts as appropriate.
Measurement Traceability

a) Every reagent used must meet the indicated purity and fitness for usage as referenced in the method SOPs.

b) All calibration standards are certified by the manufacturer to meet or exceed purity levels as recorded in the accompanying Certificate of Traceability to NIST or other standards verification.

c) Each reagent, standard or working standard is recorded, assigned a tracking identifier. This is referenced in the analytical log book as needed to assure traceability to the original source.

d) All Balances, Dispensers, Pipettors, Refrigerators, Freezers and Thermometers are checked on a daily or other routine basis to specified tolerances.

D.1.5 Detection Limits

The laboratory shall utilize a test method that provides a detection limit that is appropriate and relevant for the intended use of the data. Detection limits shall be determined by the protocol in the mandated test method or applicable regulation, e.g., Reporting Limit and or Method Detection Limit (MDL). If the protocol for determining detection limits is not specified, the selection of the procedure must reflect instrument limitations and the intended application of the test method.

a) A detection limit study is not required for any component for which spiking solutions or quality control samples are not available such as temperature.

b) The detection limit shall be initially determined for the compounds of interest in each test method in a matrix in which there are not target analytes nor interferences at a concentration that would impact the results or the detection limit must be determined in the matrix of interest (see definition of matrix).

c) Detection limits must be determined each time there is a change in the test method that affects how the test is performed, or when a change in instrumentation occurs that affects the sensitivity of the analysis.

d) All samples processing steps of the analytical method shall be included in the determination of the detection limit.

e) All procedures used must be documented. Documentation must include the matrix type. All supporting data must be retained.

f) The laboratory must have established procedures to relate detection limits with quantitation limits.

g) The test method's quantitation limits must be established and must be above the detection limits.

D.1.6 Data Reduction

The procedures for data reduction, such as use of linear regression or Quadratic regression shall be documented.

D.1.7 Quality of Standards and Reagents

a) The source of standards shall comply with 9.3.

b) Reagent Quality, Water Quality and Checks:

1) Reagents - In methods where the purity of reagents is not specified, analytical reagent grade (ACS) shall be used. Reagents of lesser purity than those specified by the test method shall not be used. The labels on the container should be checked to verify that the purity of the reagents meets the requirements of the particular test method. Such information shall be documented.

2) Water - The quality of water sources shall be monitored and documented and shall meet method specified requirements.

3) The laboratory will verify the concentration of titrants in accordance with written laboratory procedures.

D.1.8 Selectivity

a) Absolute retention time and relative retention time aid in the identification of components in chromatographic analyses and to evaluate the effectiveness of a column to separate constituents. The laboratory shall develop and document acceptance criteria for retention time windows.

b) The laboratory shall document acceptance criteria for mass spectral tuning.

D.1.9 Constant and Consistent Test Conditions

a) The laboratory shall assure that the test instruments consistently operate within the specifications required of the application for which the equipment is used.

b) Glassware Cleaning - Glassware shall be cleaned to meet the sensitivity of the test method.

Any cleaning and storage procedures that are not specified by the test method shall be documented in laboratory records and SOPs.

D.1.10 Method Validation – Modified Procedures, Non-Standard Methods, Additional Analytes

Often times, modifications to published methods are promulgated to allow the laboratory flexibility, increased productivity and, in some cases, it allows for better hazardous waste management, all while maintaining the quality of the data generated. But, this cannot be done without following standard method validation procedures to guarantee that the results achieved from the modified version are equal to or greater than the actual published or routinely accepted method.

Validation procedures are done to make sure that the sensitivity and selectivity of the process is appropriate

for the method or analytes chosen. Interference checks are performed to show that the changes or additions will not contribute interferences to previous analytes or on-going processes. Accuracy and precsion requirements are established, or previously defined, and used to demonstrate the capability of an analyst to perform the method, initially and on-going.

In the event that a non-standard method (significantly modified or newly-developed) is needed to meet client requirements, the method specifications and how they impact the project requirements must be relayed to the client for approval prior to beginning work on project samples. The client must understand the limits of the method, why it was developed and when it will be used on their project samples, and they must agree to its use.

Any significantly modified or newly-developed method (including the addition of analytes to established procedures) must be fully defined in a Standard Operating Procedure. The validation must be performed by qualified personnel, using appropriate reagents, standards and equipment/instrumentation and that process must be documented. The following items must be performed (as applicable to the method) and the completed documentation with all raw data provided to the Laboratory Manager and QA Officer for review prior to granting approval for use. A new method cannot be put into production without Operations and QA approval. For situations where NELAP approval is being sought, the method cannot be used for client samples until the certification has been received from the State, unless approval is given by the client.

D.1.10.1 Significant Modification / New Method / Additional Analyte Documentation:

Prior to the acceptance of client samples for analysis, the following documentation, as applicable to the type of modification or method status, must be provided to both Operations and QA for review and approval.

1. Approved Standard Operating Procedure for Analytical or Preparation Processes. Include all related raw data for the SOP revision with the draft version.

    a) Modification of existing method: - Revised SOP with modifications clearly spelled out:

    b) New Method: - New SOP in NELAC format – QA will assign SOP number

    c) Additional Analytes: - Revised SOP with modifications clearly spelled out:

2. Method Detection Limit (MDL) Study: Compliant with 40CFR, Part 136.

    a) Include summary form and all raw data for the review

3. MDL Verification Standard spiked at 1-4x the MDL, or the level specified by the specific program or contract. Example: 1-2x the MDL, reference specific program requirements.

    b) Recovery within 30 -150%, or a minimum response distinguishable from the established instrument noise level.

4. Reporting Limit Verification (when an MDL verification is not performed)

    a) For analytical methods, reprocess the low calibration standard as percent recovery – recovery between 50% and 150% is acceptable.

    b) For extraction methods, or where required by project or program, spike a blank matrix at the 1 - 2 x t h e reporting limit and process through all steps of the procedure. Note the spike level and percent recoveries. Method defined control limits are used for recovery evaluation, or default recoveries between 40% and 160% if method defined limits are not available.

5. Tuning Check (as applicable to the method)

6. Degradation Check (as applicable to the method)

7. A Valid Initial Calibration and Verification

    a) Minimum of 5 sequential points, unless otherwise stated in the method or in-house SOP.

b) Low calibration standard at or below the Reporting/Quantitation Limit where required.

c) Initial Calibration Verification Standard

8. Retention Time Window Study where required by the method

9. Second Column Confirmation for all analytes (as applicable to the method)

10. Inter-element Correction (as applicable to the method)

11. Linear Range Study (as applicable to the method)

12. GCMS Spectral Profile(s) (as applicable to the method)

13. Interference Check – Method Blank

a) Analysis of a blank matrix that has gone through all related steps, preparation and /or analysis, as applicable.

14. Acceptable PT Sample required for all new analytes where NELAP accreditation is being sought.

a) At least one PT sample (preferably two) required for all new methods

b) Where a PT sample is not available, or accreditation is not needed, accuracy can be measured through the use of a second source standard.

c) Use Tap Water for drinking water only methods, tap or other clean water source for ground, surface, etc. methods

d) Local Soil sample or Ottawa sand for SW-846 methods (if applying for soil or soil/water)

15. Initial Demonstration of Capability (IDOC) per analyst

a) 4 LCS for each matrix, spiked with all associated new analytes – most acceptance criteria are in the methods, if none, use an initial recovery range of 40-160% and an RPD of 30%.

b) Non-Standard methods – Follow the procedure in the 2003 NELAC Standards, Chapter 5 appendix C.3.3 (b).

16. Certification / Approval from Regulatory Agency where available.

D.1.11 Proficiency Testing

The purpose of proficiency testing is to ensure the quality of analytical work carried out in the laboratory. These control measures test the analysts as well as the laboratory procedures for their accuracy.

The list of proficiency programs the laboratory participates in is maintained by the QA officer and includes NYSDOH ELAP, CTDOH Proficiency Program and NJDEP Office of Quality Assurance for TO-15 Air and NJDEP EPH.

The PT samples MUST be received, processed and tested as routine samples in the laboratory. Instruction sheets associated with the PT samples MUST be followed. PT studies MUST be analyzed in the same manner as regular samples. The same test method procedures and the same internal QC protocol MUST be used when analyzing PT studies.

NEVER send PT samples to another laboratory for any reason. NEVER discuss PT results with another laboratory (including intra-laboratory communication).

Laboratories are responsible for submitting PT results to the PT provider by the deadline listed on the instruction form. Results are entered online to the PT provider and the laboratory must retain a copy of the data submission form and any attestation sheets, if provided by the PT provider. Attestation sheets must be signed by the appropriate designee.

The QA Officer reviews the evaluated results from the PT program and circulates the results to the Laboratory Director, Technical Director and Laboratory Management for final review. The QA Officer maintains records of all PT results and Corrective Actions due to any PT failure.

The laboratory must retain a copy of all PT records for a minimum of 5 years from the date of testing. This includes raw data, the data submission for, evaluation report, and corrective actions if required.

APPENDIX E – LIST OF CERTIFICATIONS, ACCREDITED METHODS AND ANALYTE CLASSES

To View all details click on our Dataport link below and log in
To request a user name and password please contact clientservices@yorklab.com

http://24.187.239.122/ElmntCC/DataPORT/LabCertifications

- New York State Department of Health Lab Cert. No. 10854 (CT Lab)
  - Volatiles Organics – soil, non-potable water, potable water
  - Semi-Volatiles Organics - soil, non-potable water
  - Pesticides, Herbicides, PCBs - soil, non-potable water
  - TPH-DRO, TPH-GRO - soil, non-potable water
  - Metals, including Mercury- soil, non-potable water, potable water
  - Wet Chemistry parameters - soil, non-potable water, potable water

- **New York State Department of Health Lab Cert. No. 12058 (NYC Lab)**
  - Volatiles Organics – soil, non-potable water
  - Volatile Organics- Air
  - PFAS – potable water
- **New Jersey Dept. of Environmental Protection Lab Cert. No. CT-005 (CT Lab)**
  - Volatiles Organics – soil, non-potable water
  - Semi-Volatiles Organics - soil, non-potable water
  - Pesticides, Herbicides, PCBs - soil, non-potable water
  - EPH, TPH-DRO, TPH-GRO - soil, non-potable water
  - Metals, including Mercury- soil, non-potable water
  - Wet Chemistry parameters - soil, non-potable water
- **New Jersey Dept. of Environmental Protection Lab Cert. No. NY-037 (NYC Lab)**
  - Volatiles Organics – soil, non-potable water
  - Volatile Organics - Air
- **Pennsylvania Environmental Protection Lab Cert. No. 68-04440 (CT Lab)**
  - Volatiles Organics – soil, non-potable water
  - Semi-Volatiles Organics - soil, non-potable water
  - Pesticides, Herbicides, PCBs - soil, non-potable water
  - TPH-DRO, TPH-GRO - soil, non-potable water
  - Metals, including Mercury- soil, non-potable water
  - Wet Chemistry parameters - soil, non-potable water
- **Connecticut Dept. of Health –PH-0723 (CT Lab)**
  - Volatiles Organics – soil, non-potable water, potable water
  - Semi-Volatiles Organics - soil, non-potable water
  - Pesticides, Herbicides, PCBs - soil, non-potable water
  - TPH-DRO, TPH-GRO - soil, non-potable water
  - Metals, including Mercury- soil, non-potable water
  - Wet Chemistry parameters - soil, non-potable water

- **Connecticut Dept. of Health –PH-0721 (NY Lab)**
  - Volatiles Organics – soil, non-potable water
  - PFAS in potable water

APPENDIX F – LIST OF PHYSICAL LOCATIONS

F.1 Connecticut Laboratories

- 120 Research Drive Stratford, CT 06615
- 203-325-1371 Fax 203-357-0166
  - clientservices@yorklab.com

- 56 Church Hill Road #2 Newtown, CT 06470
- 203-325-1371 Fax 203-357-0166
  - clientservices@yorklab.com

F.2 New York City Laboratory

- 132-02 89th Avenue Suite 217 Richmond Hill, NY 11418
- 203-325-1371 Fax 203-357-0166
  - clientservices@yorklab.com

F.3 New Jersey Service Center

- 94 Planten Avenue Prospect Park, NJ 07506
- 203-325-1371 Fax 203-357-0166
  - clientservices@yorklab.com
)

F.4 New York Service Center (Long Island)

- 163 Bridge Road, Suite 102, Islandia, NY 11749
- 203-325-1371 Fax 203-357-0166
  - clientservices@yorklab.com

F.5 Executive Offices

- 50 Gedney Street Nyack, NY 10960
- 203-325-1371
  - clientservices@yorklab.com

APPENDIX G – LISTING OF MAJOR ANALYTICAL INSTRUMENTATION

Equipment & Instrumentation	*Year Acquired*	*Quantity*
Accelerated Solvent Extraction System-Buchi-Speed Extractor	2012	1
Automated Concentration Systems – Biotage TurboVap II and LV	2014, 2016, 2021	8
Balances, Analytical Mettler AT 200)	2003	1
Balance, Analytical (Sartorius E24-15)	2016	1
Balance, Analytical (S/P 120, ASP, Inc.)	2019	1
Balances-Scout and Radwag Pro top loaders	2008-2021	7
Balance, Top Loading (EC, Symmetry)	2010	1
Balance, Top Loading (ANDEJ)	2015-2016	3
Barometer (Airguide Model 211B)	1991	1
Centrifuges, low speed	2020,2021	3
Class S Weights, 10 mg to 100 g (Troemner, Inc.)	2008, 2012,2020	3
Clean_up System_Florisil/Alumina_ 12 Position (Supelco, Inc.)	1997	1
Cold Vapor Mercury Analysis System (Buck Scientific, Inc.)	2018	1
Computers –Data Server/LIMS Servers/E-mail server, Terminal Server	2021	6
Computers –Backup servers on site DATTO and off site-Hypervisor/cloud	2013, 2014, 2016,2021	6
Computers/Workstations (Various mfg.)	2008-2021	100
Conductance Meter, Field/Laboratory Model (YSI)	1999, 2021	2
Conductivity Meter (YSI)	2007	1
Dessicator, Stainless Steel, 1 CF (Boekel)	1999	2
Dessicator, Stainless Steel, 3 CF (Boekel)	1997, 2016	3
Diazomethane generator, Wheaton/Aldrich DIAZALD KIT	2002, 2005	2
Dispensing Pipet, 1.0 mL (Eppendorf, Inc.)	2001-2013	10
Dispensing Pipet, 5 mL_100 L (Eppendorf, Inc.)	2005-2013	10
Distillation System, Ammonia (Wheaton)	1997	9
Extraction Apparatus, Liquid_Liquid (Supelco, Inc.)	1995	5
Extractors, Zero Headspace TCLP	2013, 2015, 2018	25
Extraction systems, Automated SPE-Promochrom Technologies	2018, 2020, 2022	3
Eye Wash Station, Portable (Bel_Art, Inc.)	2001	1
Eyewash System (Speakman Company)	2004	1
Flash Point Apparatus (Pensky_Martin, Closed Cup)	2012	1
Furnace (Thermolyne Type 1500)	2005	2
Furnace, Muffle Furnace, 1.5 CF , Thermolyne	2010	1
Gas Chromatograph (HP 5890 ECD,FID ALS7673,HP ChemSta.)	1999	1
Gas Chromatograph (HP 5890 dual ECD dual ALS7673,HP ChemSta.)	2004, 2006,2013	7
Gas Chromatograph (HP 5890II,G.S.V.FPD,TCD	1995	1
Gas Chromatographs (HP 6890 dual ECD dual ALS7673,HP ChemSta.)	2015-2020	5

Equipment & Instrumentation	*Year Acquired*	*Quantity*
Gas Chromatograph (HP 5890 Dual Inj/Dual FID, HP Chem Sta.)	2011-2014	3
EST PT2 VOA analysis interface modules	2006	3
Gas Chromatograph/Mass Spectrometer/Data System (HP 6890 II/5973 / HP Chemstation)	2006-2020	12
Gas Chromatograph/Mass Spectrometer/Data System (HP 6890 II/5973/w/ ALS 7673,7683)	2009, 2016, 2020	9
Gas Chromatograph/Mass Spectrometer/Data System (HP 7890/5975 / HP Chemstation) (1 TO15 Air))-Queens Lab	2011, 2016	2
Gas Concentration System/Interface TO-15-ENTECH 7200 with 7016 autosampler and 3100 canister cleaning systems-	2011, 2016	2
Gas Dilution Systems (Environics Model 2000); Entech 3150-	2005, 2016	2
Gas Leak Detector (GM 21_250)-Helium detector; Restek	2001, 2016	2
Gas Regulators, Brass (Airco, Inc.)	Various	45
Gas Regulators, SS (Airco,Inc.)	Various	7
Heater (Lab_Line Multi Boil Heater No. 2090)	1994	1
Hot Plate (Corning PC_100 1 SF)	2001-2012	6
Hot Plate (Thermolyne Type 2200)	2010	1
Hot Plate/Stirrer (Cimarec 3, Thermolyne)	2011	1
Hot Plate/Stirrer (Corning PC_351)	2010	1
Hot Plate/Stirrer (Nuova II, Sybron/Nalge)	2010	1
Hot Plate/Stirrer (Thermolyne Cimarec 2)	2010	1
Hot Plate/Stirrer (Thermolyne Cimarec 3)	2012	1
HPLC/MS-MS- Agilent 1260/6470A triple Quad system w/ autosampler	2018	1
HPLC/MS-MS- Agilent 1290/6460C triple Quad system w/autosampler	2020	1
HPLC/MS-MS- Agilent 1260/6460C triple Quad system w/ autosampler	2022	1
HPLC –Agilent 1100 with DAD/UV detectors	2014	1
Incubator, 20C, BOD (VWR 2005)	2005	2
Inductively Coupled Plasma/Mass Spectrometer (PE Nexion 350)	2020	1
Inductively Coupled Plasma/Mass Spectrometer (PE Nexion 2000)	2018	1
Inductively Coupled Plasma (PE7300 DV_Axial/Radial)	2016	1
Inductively Coupled Plasma (PE Avio 500_Axial/Radial)	2020	1
Ion Chromatograph Dionex 1100 with AS40 ALS-PeakNet 7 software; Dionex ICS 1500/AS 50ALS system Chromeleon data system	2012, 2016	2
Laboratory Hoods (Labconco, others)	Various	12
LIMS System- Promium Element/instrument interfaces	2010	1
Mercury Analysis Systems-Milestone DMA-80 Tricell Direct systems	2012, 2015	2
Microwave Digestion Systems- Milestone Ethos UP	2016, 2020	2
Microwave Extraction Systems-Milestone Ethos EXII	2020	2
Microwave Extraction system-Milestone Ethos EX	2017	1
Nitrogen/TKN Digestor-Westco Smart Digest system	2015	1

Equipment & Instrumentation	*Year Acquired*	*Quantity*
Oven, 5 CF (OF-02 TDS forced air oven)	2016	1
Oven, 3 CF (Baxter S/P Tempcon)	2001	1
Oven, 5 CF (Blue M)-drying oven	2005	1
Oven, Radiant Heat (Lab_Line Imperial II)	2001	1
Oxygen Meter/BOD Probe (VWR 122372)	2005, 2011	2
pH/ISE Meter, Portable (Orion Serial)	1999	1
pH Meter (Corning Model 10)	2004	1
pH Meter (Orion EA 940)	2006	1
pH Meter/Specific Ion Meter (Orion SA_720)	2004	1
Photocopier/Scanner (Image runner 5055)	2011	1
Printers (HP2055dn)	2005-2012	6
Printer Brother HL diff. models	2006-2012	5
Printer (HP LaserJet 4000N)	2005	4
Printer (Okidata Microline 320)	2004	1
Printer, Xerox Phaser 6300	2006	1
Pump, Liquid, Peristaltic, 4 gpm (Cole Parmer)	1999	1
Pump, Vacuum (GE)	1998	1
Pump, Vacuum (GE)	2004	1
Pumps, Personal Sampling (SKC & Gilian)	2001	6
Purge & Trap (Tekmar LCS 3000)	2001-2012	3
Purge & Trap autosampler systems-Archon 51/81 position samplers	2004-2012	6
Purge & Trap autosamplers-Encon Evolution	2013, 2014, 2016	5
P/T autosamplers-Centurion-EST	2015-2016	3
Reflux/Distillation Systems-cyanide	2004	8
Refrigeration Freezer (Kenmore)	2001,2018	4
Refrigerator (Sanyo)	2002, 2018	4
Refrigerator (Summit)	2002	1
Refrigerator, Walk-in custom design-CCI-350 ft2	2016	1
Refrigerator (Welbilt 1.5 C.F.)	2003, 2010	3
Refrigerator (Westinghouse)	2005	4
Refrigerator, 10 CF (Sears)	2008	1
Refrigerator, 14 CF (Gibson)	2009	5
Refrigerator(Sanyo,1.5 C.F.)	2003	2
Sample Concentrator (Supelco, Inc. Mini_VAP_6) and tubes	2001	1
Sample Concentrator (Zymak Turbo VAP II ZW8001)	2003	2
Sample Concentrator (Zymark Tubro VAP II ZW8001)	2004	1
Sample Concentrators (Zymark Turbo VAP II)	2005, 2016	3
SKALAR Flow injection Analyzer-NO3, NO2, NH3, o-PO4, TN, TOC	2010	1
Sonic Cleaning System (Branson 1200)	2010	1
Sonic Disruptor (Tekmar)	1997	3
Sonic Disruptor & Sound Enclosure (Heat Systems, Inc.)	2004	3
Sonic Disruptor Sound Chambers	1997-2004	3

Equipment & Instrumentation	*Year Acquired*	*Quantity*
Soxhlet Extraction Apparati/hot plates	2010	24
Specific Ion Electrode, Chloride (Orion)	2001	1
Specific Ion Electrode, Chlorine (Orion)	2004	1
Specific Ion Electrode, Flouride (Orion)	2005	1
Spectrophotometer (Bausch & Lomb Spectronic 2D0)	1995	1
Spectrophotometer, Visible (Milton_Roy, SPEC_20D)	2012	1
Stirrer, Gang, 6 Position (Phipps & Bird)	1994	1
Storage Cabinet (ACIDS)	2004	2
Storage Cabinet, Solvent, Safety (Justrite, Inc.)	2004	2
Summa Canisters, Restek, Entech, 6 liter	2000-2021	230
Summa Canister Flow controllers, 1 hr, 4 hr, 8 hr, 24 hr adjustable, Entech	2005-2014	125
TCLP Extraction Pressure Filtration System (Millipore)	2001, 2004	2
TCLP Extraction System (Millipore, Inc.)	2001	4
TCLP Rotator, 12 Position (Assoc. Design & Mfg 12)	2001, 2010, 2013	3
TCLP_ZHE Volatile Extraction System	2001-2012	20
Thermometers, NIST Traceable (ASP, Inc.)	2001, 2012	2
Thermometers, Various Ranges (ASP, Inc.)	1999-2012	10
Total Organic Carbon Analyzer-SKALAR	2010	1
Turbidity Meter (Lamotte)	2012	1
Vortex _ Genie SI)	1995	1
Water Bath (25_100C, ASP, Inc.)	1996	1
Water Purification System (Hydro Inc. RO/DI/Carbon)	2004, 2012	2
Hydrogen Generator, Parker Hannifan H2-500	2013	1
Generator, 200 KVA for full facility, Cummins Diesel	2020	1

APPENDIX H – LISTING OF CONTROLLED DOCUMENTS

SOP#	Description	SOP Name	Effective Date
		PFAS	
1	Preparation of Non-Potable Water and Soils for Target Per- and Polyfluorinated Alkyl Substances (PFAS) for analysis by LC-MS/MS	PFASExtr_AQ_S Rev 1.0	5/10/2019
2	Analysis of Target Per- and Polyfluorinated Alkyl Substances (PFAS) in Non-Potable Water and Soil by EPA Method 537 Modified using LC/MS-MS	PFAS_LCMSMS_MOD Rev. 1.1	2/13/2020
3	Analysis of Target Per- and Polyfluorinated Alkyl Substances (PFAS) in Potable Water by EPA Method 537.1 using HPLC/MS-MS	PFAS_ LCMSMS537.1 Rev 1.5	01/22/2022
		GC/MS-TO-15	
1	VOCs in AIR by EPA TO-15	GCMSAIRQTO15-Rev 9.9	03/01/2022
2	Cleaning of Summa Canisters	SummaClean Rev 1.5	03/01/2022
3	Calibration of Flow Controllers	FLOWCONT Rev 1.4	03/01/2022
		GC/MS - Volatiles	
1	Volatile Organics using GC/MS by EPA method 8260C	GCMS QVOC8260C-Rev 3.8	04/01/2021
2	Volatile Organics using GC/MS by EPA method 8260D	GCMS QVOC8260D – Rev 1.0	12/7/2016
3	Soil Sampling Procedure by EPA method 5035A	GCMS VOC5035 060712-Rev 1.0	6/7/2012
4	Screening of Aqueous and Soil Samples for Volatile Compounds by Dynamic Headspace/GC/FID	VOASCREEN121615-Rev.1.1	11/17/2016
5	Determination of Gasoline Range Organics in Aqueous and Solid Samples by method 8015D	GC GROFID 022715-Rev. 1.2	3/27/2017
		GC/MS - Semi-volatiles	

1	Semi-Volatiles using GC/MS by EPA 8270C and 8270D	GCMS SVOC-Rev 3.3	4/20/2017
1	Semi-Volatiles using GC/MS by EPA 8270E	GCMS SVOC-Rev 3.4	8/24/2020
1	Analysis of 1,4-Dioxane by GC/MS/SIM by EPA method 8270E SIM with Isotope Dilution	SVOC-1,4-DIOX_ALL-01 Rev 1.4	8/28/2020
1	Analysis of 1,4-Dioxane by GC/MS/SIM by EPA method 522	SVOC-1,4-DIOXPW-01 Rev 1.1	2/9/2021

Gas Chromatography			
1	PCBs using GC/ECD by EPA 8082	GC PCB-Rev 1.8	1/20/2021
2	TPH-DRO using GC/FID by EPA 8015D	GC TPHDRO 091009 Rev.1.7	6/28/2019
3	Pesticides (Chlorinated) using GC/ECD by EPA 8081	GC Pest 011799-Rev 1.9	12/11/2019
4	Herbicides using GC/ECD by EPA 8151A	GC Herb-Rev 1.7	1/21/2020
6	CT ETPH	GC ETPH 111704-Rev 1.7	11/9/2228
7	NJ EPH	GC NJEPH 031313-Rev 1.0	3/13/2013
8	EDB, DBCP	GC EDB,DBCP 102413-Rev 1.3	7/13/2019
Extractions			
1	Herbicide Extraction of Solids	EXT Herb-Rev 1.7	6/17/2019
1a	Extraction of Chlorinated Herbicides from Aqueous Samples and TCLP extracts by EPA SW-846 Method 8151A	EXT AQ TCLP Herb- Rev 1.5	6/17/2019
2	UltraSonic Extraction of Solids [EPA 3550]	EXT SSVOC-Rev 2.8	8/14/2019
3	ASE Extraction of Solids [EPA 3545]	EXT SVOCASE-Rev 2.4	2/10/2017

4	Aqueous Extraction [EPA 3510C]	EXT AqSVOC -Rev 2.9	5/24/2016
5	Extraction Laboratory Glassware Washing Procedure	EXTGP052600Rev1.1	4/3/2012
6	Soxhlet Extraction of Solids for PCBs [3540C]	EXT PCBSox-Rev 1.2	9/6/2020
7	MA EPH Extraction from Waters and Soils	EXTMAEPHAQASE121207Rev2.0	10/22/2009
8	Spike and Surrogate Standard Preparation for Extractable Organics	EXT SVOCStds-Rev 1.3	5/31/2016
9	NJEPH Extraction from Waters and Soils	EXT NJEPH-Rev 1.1	1/15/2014
10	Extraction of Herbicides [SM 6640B]	EXT HerbSM-Rev 1.1	12/3/2014
11	Glycols Extraction with SPE Tubes	EXT GlyLL-Rev 1.1	7/13/2015
12	Extraction of Semi-Volatile Organic Compounds from Solid Samples using Microwave Assisted Extraction by SW-846 3546	EXT SSVOCMAE-Rev1.1	5/24/2016
12	Extraction of 1,4-Dioxane from Aqueous Samples using SPE by EPA Method 3535A	EXT AQ_1,4-DIOXANE	9/9/2020
Metals			
1	ICP/MS Analysis of Sample Digestates by EPA 200.8 and SW-846 6020A and B	ICPMS 080106-Rev1.8	6/16/2018
2	Preparation of Samples for Metals Analysis by ICP and ICP/MS by SW-846 3010A and 3050B	M SPrep 030695-Rev1.8	10/25/2017
3	ICP Analysis of Sample Digestates by EPA 200.7 and SW-846 6010C	M ICP 031195-Rev1.8	11/20/2017
3	ICP Analysis of Sample Digestates by EPA 6010D	M ICP 031195-Rev1.2	7/10/2018

4	Mercury by Cold Vapor Technique EPA SW-846 7470 annd 7471	M Hg 120998-Rev 1.8	3/27/2017
5	Mercury by Direct Technique EPA SW-846 7473	M Hg2-Rev 1.4	3/29/2018
6	Preparation of Samples for Metals Analysis by ICP and ICP/MS by SW-846 3015	M PrepMAD071715-Rev 1.1	11/20/2017
Wet Chemistry			
1	Chemical Oxygen Demand	WC COD Rev 2.3	4/29/2014
2	TKN, Ammonia and TON	WC TKN-Rev. 1.8	5/4/2018
3	Reactivity-Cyanide	WC CNR-Rev 1.4	4/3/2018
4	Hexavalent Chromium	WC Cr+6-Rev 1.7	4/5/2018
5	Total Cyanide	WC CNT-Rev 1.9	1/10/2018
6	Reactivity-Sulfide	WC ReacSulf-Rev 1.5	4/3/2018
7	Alkalinity	WC T-Alk 022600-Rev 1.5	1/2/2015
8	Hexane Extactable Material (O&G)	WC HemGrav-Rev.1.8	6/8/2015
9	Ion Chromatography	WC IC-Rev2.2	4/4/2018

10	Biochemical Oxygen Demand (BOD)	WC BOD-Rev1.7	3/28/2017

11	TSS / VSS in Aqueous Samples	WC TSS-Rev1.7	5/10/2018
12	pH	WC pH-Rev1.9	4/3/2018
13	Total Phosphorous and Ortho-Phosphate	WC Phos 051000-Rev-1.7	7/3/2017
14	TCLP / SPLP Extraction	WC TCLPEX-Rev1.7	6/4/2018
15	Cyanide Amenable to Chlorination	WC CNA-Rev1.4	10/15/2014
16	Flash Point	WC FP-Rev1.5	1/5/2014
17	Methylene Blue Active Substances (MBAS)	WC MBAS-Rev1.4	7/18/2017
18	TS, VS, TDS in Aqueous Samples	WC TSTDS-Rev1.5	2/15/2016
19	Color	WC COLOR 04262010 Rev1.2	3/27/2017
20	Glassware Washing	WC GlassPrep 090299Rev2.1	12/16/2013
21	Total Phenols (low level)	WC PhenolsLL-Rev1.5	1/5/2014
22	Total Phenols	WC Phenols-Rev 1.6	5/18/2017

23	Conductivity	WCCond-Rev 1.3	1/5/2014
24	Turbidity	WC Turbidity-Rev 1.6	3/27/2017
25	TS, FS, VS and % Moisture in Solid Samples	WC TS%M 022912-Rev 1.2	4/5/2018

26	Extractable Organic Halogens (EOX) in Soil Samples	WC EOX 041112-Rev 1.2	11/9/2012
27	Total Organic Carbon (TOC) in Aqueous Samples	WC TOC Rev 1.3	10/7/2014
28	Oxidation-Reduction Potential (ORP)	WC ORP 031213-Rev 1.0	3/12/2013
29	Settleable Solids	WC SetSol-Rev 1.2	1/5/2014
30	Sulfide	WC Sulfide-Rev 1.1	1/5/2014
31	Chlorine Demand	WC Cl Demand-Rev 1.0	4/9/2014
32	TKN by Skalar	WC TKN SK- Rev 1.5	5/10/2018
33	Free Liquids	WC Free Liquids Rev 1.0	3/7/2016
General Laboratory			
1	MDL Studies, Organics	GL MDL 113005-Rev.1.4	3/9/2018
2	Chemical Expiration Dates	GL ExpDt 041812 Rev1.0	4/18/2012
3	LOQ/LOD Determination and Verification	GL LODLOQ 122812-Rev 1.4	1/27/2017
4	Balance Calibration Check Procedure	GL Balance 082514-Rev 1.0	8/25/2014
Sample Control			
1	Sample Control Procedures (Receipt, Log-in, Storage, Archival, Disposal)	SC Proc 011501-Rev 2.5	5/27/2015
2	Sample Handling and Chain-of-Custody for Sample Couriers	Couriers091207Rev1.1	3/25/2015

Administration			
1	Laboratory Safety and Health	ADMINSAFETY011600Rev1.1	11/13/2017
2	Purchasing	ADMIN Purchasing 043010-Rev1.2	4/11/2013
3	QC Review/Evaluation of Data	QC040202Rev1.2	9/28/2016
4	Education and Training in Ethics and Legal Responsibilities	ADMIN Ethics-Rev1.6	11/20/2017
5	Training of Personnel	ADMIN Training-Rev 1.4	9/4/2014
6	Manual Integration of Chromatographic Data	Admin Integration 091107 Rev. 2.3	9/27/2018
7	Laboratory Notebook Control and Use	ADMIN LabNote 091107-Rev 1.1	1/13/2013
8	Control of Records	ADMIN Records 043010-Rev 1.2	11/20/2017
9	Control of Nonconforming Work	QSP 4-9-1 Rev1.0	4/30/2010
10	Management Review	ADMINMGMTREVIEW043010Rev1.1	9/27/2016
11	Internal Quality Audit	ADMIN IntAudit 043010Rev 1.2	2/22/2017
12	Estimation of Uncertainty	ADMINESTUNCERT043010 rev 1.1	10/17/2014
13	Document Control	ADMINDOC043010Rev1.2	6/2/2012
14	Corrective/Preventive Action	ADMIN CorrAction 043010 Rev 1.2	6/15/2016

15	Complaints	COMPLAINTS043010 Rev. 1.1	9/12/2016
16	Review of Chromatographic Data for Detection of Manual Re-Integration Issues	SOP ADMINManINTReview04302010 Rev 1.0	4/30/2010
17	Additional Policies/Procedures	Additional Policies 05/07/10 Rev1.2	10/17/2014

18	EDDs and Reports for Client Connect	ADMIN REPORT100714 Rev1.0	9/16/2010
19	Preparation of CTDEP RCP Deliverables	ADMINRCPDELIVS Rev1.0	8/2/2010
19	Preparation , Documentation and Traceability of Standards within the Element LIMS	ADMIN_STDS031816 Rev 1.0	4/15/2016

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2025
Issued April 01, 2024

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. CATHERINE L. MOSHER
YORK ANALYTICAL LABORATORIES INC
120 RESEARCH DRIVE
STRATFORD, CT 06615

NY Lab Id No: 10854

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES POTABLE WATER
All approved analytes are listed below:

Fuel Additives

Methyl tert-butyl ether	EPA 524.2
Naphthalene	EPA 524.2

Metals I

Arsenic, Total	EPA 200.8 Rev. 5.4
Barium, Total	EPA 200.7 Rev. 4.4
Cadmium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Chromium, Total	EPA 200.7 Rev. 4.4
Copper, Total	EPA 200.7 Rev. 4.4
Iron, Total	EPA 200.7 Rev. 4.4
Lead, Total	EPA 200.8 Rev. 5.4
Manganese, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Mercury, Total	EPA 245.1 Rev. 3.0
Selenium, Total	EPA 200.8 Rev. 5.4
Silver, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Zinc, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4

Metals II

Aluminum, Total	EPA 200.7 Rev. 4.4
Antimony, Total	EPA 200.8 Rev. 5.4
Beryllium, Total	EPA 200.7 Rev. 4.4
Molybdenum, Total	EPA 200.8 Rev. 5.4
Nickel, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4

Serial No.: 68592

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Metals II

Thallium, Total	EPA 200.8 Rev. 5.4
Vanadium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4

Metals III

Calcium, Total	EPA 200.7 Rev. 4.4
Magnesium, Total	EPA 200.7 Rev. 4.4
Potassium, Total	EPA 200.7 Rev. 4.4
Sodium, Total	EPA 200.7 Rev. 4.4

Miscellaneous

1,4-Dioxane	EPA 522
Turbidity	EPA 180.1 Rev. 2.0

Non-Metals

Alkalinity	SM 21-23 2320B (-97)
Calcium Hardness	EPA 200.7 Rev. 4.4
Chloride	EPA 300.0 Rev. 2.1
Color	SM 21-23 2120B (-01)
Fluoride, Total	EPA 300.0 Rev. 2.1
Orthophosphate (as P)	SM 19, 21-23 4500-P E (-99)
Solids, Total Dissolved	SM 21-23 2540C (-97)
Specific Conductance	EPA 120.1 Rev. 1982
Sulfate (as SO4)	EPA 300.0 Rev. 2.1

Volatile Aromatics

1,2,3-Trichlorobenzene	EPA 524.2
1,2,4-Trichlorobenzene	EPA 524.2
1,2,4-Trimethylbenzene	EPA 524.2
1,2-Dichlorobenzene	EPA 524.2

Serial No.: 68592

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All approved analytes are listed below:

Volatile Aromatics

1,3,5-Trimethylbenzene	EPA 524.2
1,3-Dichlorobenzene	EPA 524.2
1,4-Dichlorobenzene	EPA 524.2
2-Chlorotoluene	EPA 524.2
4-Chlorotoluene	EPA 524.2
Benzene	EPA 524.2
Bromobenzene	EPA 524.2
Chlorobenzene	EPA 524.2
Ethyl benzene	EPA 524.2
Hexachlorobutadiene	EPA 524.2
Isopropylbenzene	EPA 524.2
n-Butylbenzene	EPA 524.2
n-Propylbenzene	EPA 524.2
p-Isopropyltoluene (P-Cymene)	EPA 524.2
sec-Butylbenzene	EPA 524.2
Styrene	EPA 524.2
tert-Butylbenzene	EPA 524.2
Toluene	EPA 524.2
Total Xylenes	EPA 524.2

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 524.2
1,1,1-Trichloroethane	EPA 524.2
1,1,2,2-Tetrachloroethane	EPA 524.2
1,1,2-Trichloroethane	EPA 524.2
1,1-Dichloroethane	EPA 524.2
1,1-Dichloroethene	EPA 524.2
1,1-Dichloropropene	EPA 524.2

Serial No.: 68592

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MS. CATHERINE L. MOSHER
YORK ANALYTICAL LABORATORIES INC
120 RESEARCH DRIVE
STRATFORD, CT 06615

NY Lab Id No: 10854

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All approved analytes are listed below:

Volatile Halocarbons

1,2,3-Trichloropropane	EPA 524.2
1,2-Dichloroethane	EPA 524.2
1,2-Dichloropropane	EPA 524.2
1,3-Dichloropropane	EPA 524.2
2,2-Dichloropropane	EPA 524.2
Bromochloromethane	EPA 524.2
Bromomethane	EPA 524.2
Carbon tetrachloride	EPA 524.2
Chloroethane	EPA 524.2
Chloromethane	EPA 524.2
cis-1,2-Dichloroethene	EPA 524.2
cis-1,3-Dichloropropene	EPA 524.2
Dibromomethane	EPA 524.2
Dichlorodifluoromethane	EPA 524.2
Methylene chloride	EPA 524.2
Tetrachloroethene	EPA 524.2
trans-1,2-Dichloroethene	EPA 524.2
trans-1,3-Dichloropropene	EPA 524.2
Trichloroethene	EPA 524.2
Trichlorofluoromethane	EPA 524.2
Vinyl chloride	EPA 524.2

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Acrylates

Acrolein (Propenal)	EPA 8260D
	EPA 8260C
	EPA 624.1
Acrylonitrile	EPA 8260D
	EPA 8260C
	EPA 624.1
Methyl methacrylate	EPA 8260D
	EPA 8260C

Amines

1,2-Diphenylhydrazine	EPA 8270D
	EPA 8270E
2-Nitroaniline	EPA 8270D
	EPA 8270E
3-Nitroaniline	EPA 8270D
	EPA 8270E
4-Chloroaniline	EPA 8270D
	EPA 8270E
4-Nitroaniline	EPA 8270D
	EPA 8270E
Aniline	EPA 625.1
	EPA 8270D
	EPA 8270E
Carbazole	EPA 625.1
	EPA 8270D
	EPA 8270E
Diphenylamine	EPA 8270D
	EPA 8270E

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Amines

Pyridine	EPA 625.1
	EPA 8270D
	EPA 8270E

Benzidines

3,3'-Dichlorobenzidine	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzidine	EPA 625.1
	EPA 8270D
	EPA 8270E

Chlorinated Hydrocarbon Pesticides

4,4'-DDD	EPA 8081B
	EPA 608.3
4,4'-DDE	EPA 8081B
	EPA 608.3
4,4'-DDT	EPA 8081B
	EPA 608.3
Aldrin	EPA 8081B
	EPA 608.3
alpha-BHC	EPA 8081B
	EPA 608.3
alpha-Chlordane	EPA 8081B
beta-BHC	EPA 8081B
	EPA 608.3
Chlordane Total	EPA 8081B
	EPA 608.3

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Chlorinated Hydrocarbon Pesticides

delta-BHC	EPA 8081B
	EPA 608.3
Dieldrin	EPA 8081B
	EPA 608.3
Endosulfan I	EPA 8081B
	EPA 608.3
Endosulfan II	EPA 8081B
	EPA 608.3
Endosulfan sulfate	EPA 8081B
	EPA 608.3
Endrin	EPA 8081B
	EPA 608.3
Endrin aldehyde	EPA 8081B
	EPA 608.3
Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
	EPA 608.3
Heptachlor epoxide	EPA 8081B
	EPA 608.3
Lindane	EPA 8081B
	EPA 608.3
Methoxychlor	EPA 8081B
	EPA 608.3
Mirex	EPA 8081B
Toxaphene	EPA 8081B
	EPA 608.3

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Chlorinated Hydrocarbons

1,2,3-Trichlorobenzene	EPA 8260D
	EPA 8260C
1,2,4,5-Tetrachlorobenzene	EPA 8270D
	EPA 8270E
1,2,4-Trichlorobenzene	EPA 625.1
	EPA 8270D
	EPA 8270E
2-Chloronaphthalene	EPA 625.1
	EPA 8270D
	EPA 8270E
Hexachlorobenzene	EPA 8270D
	EPA 8270E
Hexachlorobutadiene	EPA 625.1
	EPA 8270D
	EPA 8270E
Hexachlorocyclopentadiene	EPA 625.1
	EPA 8270D
	EPA 8270E
Hexachloroethane	EPA 625.1
	EPA 8270D
	EPA 8270E
Pentachlorobenzene	EPA 8270D
	EPA 8270E

Chlorophenoxy Acid Pesticides

2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
	SM 6640B-2006

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Chlorophenoxy Acid Pesticides

2,4-D	EPA 8151A
Dicamba	EPA 8151A

Demand

Biochemical Oxygen Demand	SM 5210B-2016
Carbonaceous BOD	SM 5210B-2016
Chemical Oxygen Demand	SM 5220D-2011

Fuel Oxygenates

Di-isopropyl ether	EPA 8260D
	EPA 8260C
Ethanol	EPA 8260D
	EPA 8260C
Methyl tert-butyl ether	EPA 8260D
	EPA 8260C
tert-amyl alcohol	EPA 8260D
	EPA 8260C
tert-amyl methyl ether (TAME)	EPA 8260D
	EPA 8260C
tert-butyl alcohol	EPA 8260D
	EPA 8260C
tert-butyl ethyl ether (ETBE)	EPA 8260D
	EPA 8260C

Haloethers

2,2'-Oxybis(1-chloropropane)	EPA 625.1
	EPA 8270D
	EPA 8270E
4-Bromophenylphenyl ether	EPA 625.1

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Haloethers

4-Bromophenylphenyl ether	EPA 8270D
	EPA 8270E
4-Chlorophenylphenyl ether	EPA 625.1
	EPA 8270D
	EPA 8270E
Bis(2-chloroethoxy)methane	EPA 625.1
	EPA 8270D
	EPA 8270E
Bis(2-chloroethyl)ether	EPA 625.1
	EPA 8270D
	EPA 8270E

Low Level Halocarbons

1,2,3-Trichloropropane, Low Level	EPA 8011
1,2-Dibromo-3-chloropropane, Low Le	EPA 8011
1,2-Dibromoethane, Low Level	EPA 8011

Low Level Polynuclear Aromatics

Acenaphthene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Acenaphthylene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Anthracene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Benzo(a)anthracene Low Level	EPA 8270D

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Low Level Polynuclear Aromatics

Benzo(a)anthracene Low Level	EPA 8270E
	EPA 8270E SIM
Benzo(a)pyrene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Benzo(b)fluoranthene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Benzo(g,h,i)perylene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Benzo(k)fluoranthene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Chrysene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Dibenzo(a,h)anthracene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Fluoranthene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Fluorene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Indeno(1,2,3-cd)pyrene Low Level	EPA 8270D

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Low Level Polynuclear Aromatics

Indeno(1,2,3-cd)pyrene Low Level	EPA 8270E
	EPA 8270E SIM
Naphthalene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Phenanthrene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM
Pyrene Low Level	EPA 8270D
	EPA 8270E
	EPA 8270E SIM

Metals I

Barium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
Cadmium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Calcium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
Chromium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D

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Metals I

Chromium, Total	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Copper, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Iron, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Lead, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Magnesium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
Manganese, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D

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Metals I

Manganese, Total	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Nickel, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Potassium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
Silver, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Sodium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D

Metals II

Aluminum, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B

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Metals II

Aluminum, Total	EPA 200.8, Rev. 5.4 (1994)
Antimony, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Arsenic, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Beryllium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Chromium VI	EPA 7196A
	SM 3500-Cr B-2011
Mercury, Total	EPA 245.1, Rev. 3.0 (1994)
	EPA 245.2 (Issued 1974, Rev. 1983)
	EPA 7470A
	EPA 7473
Vanadium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C

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Metals II

Vanadium, Total	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Zinc, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D

Metals III

Cobalt, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Molybdenum, Total	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Thallium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Tin, Total	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Titanium, Total	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)

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Mineral

Alkalinity	SM 2320B-2011
Calcium Hardness	EPA 200.7, Rev. 4.4 (1994)
Chloride	EPA 300.0, Rev. 2.1 (1993)
Fluoride, Total	EPA 300.0, Rev. 2.1 (1993)
Hardness, Total	SM 2340B-2011
Sulfate (as SO4)	EPA 300.0, Rev. 2.1 (1993)

Miscellaneous

Boron, Total	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Bromide	EPA 300.0, Rev. 2.1 (1993)
Color	SM 2120B-2011
Cyanide, Total	SM 4500-CN E-2016
Oil and Grease Total Recoverable	EPA 1664A
Phenols	EPA 420.1 (Rev. 1978)
Specific Conductance	EPA 120.1 (Rev. 1982)
Sulfide (as S)	SM 4500-S2- F-2011
Surfactant (MBAS)	SM 5540C-2011
Turbidity	EPA 180.1, Rev. 2.0 (1993)

Nitroaromatics and Isophorone

2,4-Dinitrotoluene	EPA 625.1
	EPA 8270D
	EPA 8270E
2,6-Dinitrotoluene	EPA 625.1
	EPA 8270D
	EPA 8270E
Isophorone	EPA 625.1

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Nitroaromatics and Isophorone

Isophorone	EPA 8270D
	EPA 8270E
Nitrobenzene	EPA 625.1
	EPA 8270D
	EPA 8270E

Nitrosoamines

N-Nitrosodimethylamine	EPA 625.1
	EPA 8270D
	EPA 8270E
N-Nitrosodi-n-propylamine	EPA 625.1
	EPA 8270D
	EPA 8270E
N-Nitrosodiphenylamine	EPA 625.1
	EPA 8270D
	EPA 8270E

Nutrient

Ammonia (as N)	SM 4500-NH3 D-2011 or E-2011
Kjeldahl Nitrogen, Total	SM 4500-N Org D-2011
	SM 4500-NH3 D-2011 or E-2011
Nitrate (as N)	EPA 300.0, Rev. 2.1 (1993)
Nitrate-Nitrite (as N)	EPA 300.0, Rev. 2.1 (1993)
Nitrite (as N)	EPA 300.0, Rev. 2.1 (1993)
Orthophosphate (as P)	EPA 300.0, Rev. 2.1 (1993)
	SM 4500-P E-2011

Organophosphate Pesticides

Atrazine	EPA 8270D

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Organophosphate Pesticides	
Atrazine	EPA 8270E
Parathion ethyl	EPA 8270D
	EPA 8270E
Petroleum Hydrocarbons	
Diesel Range Organics	EPA 8015D
Gasoline Range Organics	EPA 8015D
Phthalate Esters	
Benzyl butyl phthalate	EPA 625.1
	EPA 8270D
	EPA 8270E
Bis(2-ethylhexyl) phthalate	EPA 625.1
	EPA 8270D
	EPA 8270E
Diethyl phthalate	EPA 625.1
	EPA 8270D
	EPA 8270E
Dimethyl phthalate	EPA 625.1
	EPA 8270D
	EPA 8270E
Di-n-butyl phthalate	EPA 625.1
	EPA 8270D
	EPA 8270E
Di-n-octyl phthalate	EPA 625.1
	EPA 8270D
	EPA 8270E

Serial No.: 68593

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WADSWORTH CENTER

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CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. CATHERINE L. MOSHER
YORK ANALYTICAL LABORATORIES INC
120 RESEARCH DRIVE
STRATFORD, CT 06615

NY Lab Id No: 10854

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Polychlorinated Biphenyls

Aroclor 1016 (PCB-1016)	EPA 8082A
	EPA 608.3
Aroclor 1221 (PCB-1221)	EPA 8082A
	EPA 608.3
Aroclor 1232 (PCB-1232)	EPA 8082A
	EPA 608.3
Aroclor 1242 (PCB-1242)	EPA 8082A
	EPA 608.3
Aroclor 1248 (PCB-1248)	EPA 8082A
	EPA 608.3
Aroclor 1254 (PCB-1254)	EPA 8082A
	EPA 608.3
Aroclor 1260 (PCB-1260)	EPA 8082A
	EPA 608.3
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A

Polynuclear Aromatics

Acenaphthene	EPA 625.1
	EPA 8270D
	EPA 8270E
Acenaphthylene	EPA 625.1
	EPA 8270D
	EPA 8270E
Anthracene	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzo(a)anthracene	EPA 625.1

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Polynuclear Aromatics

Benzo(a)anthracene	EPA 8270D
	EPA 8270E
Benzo(a)pyrene	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzo(b)fluoranthene	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzo(g,h,i)perylene	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzo(k)fluoranthene	EPA 625.1
	EPA 8270D
	EPA 8270E
Chrysene	EPA 625.1
	EPA 8270D
	EPA 8270E
Dibenzo(a,h)anthracene	EPA 625.1
	EPA 8270D
	EPA 8270E
Fluoranthene	EPA 625.1
	EPA 8270D
	EPA 8270E
Fluorene	EPA 625.1
	EPA 8270D
	EPA 8270E
Indeno(1,2,3-cd)pyrene	EPA 625.1

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Polynuclear Aromatics

Indeno(1,2,3-cd)pyrene	EPA 8270D
	EPA 8270E
Naphthalene	EPA 625.1
	EPA 8270D
	EPA 8270E
Phenanthrene	EPA 8270D
	EPA 8270E
Pyrene	EPA 625.1
	EPA 8270D
	EPA 8270E

Priority Pollutant Phenols

2,3,4,6 Tetrachlorophenol	EPA 8270D
	EPA 8270E
2,4,5-Trichlorophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
2,4,6-Trichlorophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
2,4-Dichlorophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
2,4-Dimethylphenol	EPA 625.1
	EPA 8270D
	EPA 8270E
2,4-Dinitrophenol	EPA 8270E
2-Chlorophenol	EPA 625.1

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Priority Pollutant Phenols

2-Chlorophenol	EPA 8270D
	EPA 8270E
2-Methyl-4,6-dinitrophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
2-Methylphenol	EPA 625.1
	EPA 8270D
	EPA 8270E
2-Nitrophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
4-Chloro-3-methylphenol	EPA 625.1
	EPA 8270D
	EPA 8270E
4-Methylphenol	EPA 625.1
	EPA 8270D
	EPA 8270E
4-Nitrophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
Cresols, Total	EPA 8270D
	EPA 8270E
Pentachlorophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
Phenol	EPA 625.1
	EPA 8270D

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Priority Pollutant Phenols	
Phenol	EPA 8270E
Residue	
Settleable Solids	SM 2540 F-2015
Solids, Total	SM 2540 B-2015
Solids, Total Dissolved	SM 2540 C-2015
Solids, Total Suspended	SM 2540 D-2015
Semi-Volatile Organics	
1,1'-Biphenyl	EPA 8270D
	EPA 8270E
1,2-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
1,3-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
1,4-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
2-Methylnaphthalene	EPA 8270D
	EPA 8270E
Acetophenone	EPA 8270D
	EPA 8270E
alpha-Terpineol	EPA 625.1
	EPA 8270E
Benzaldehyde	EPA 8270D
	EPA 8270E
Benzoic Acid	EPA 8270D
	EPA 8270E
Benzyl alcohol	EPA 8270D

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Semi-Volatile Organics

Benzyl alcohol	EPA 8270E
Caprolactam	EPA 8270D
	EPA 8270E
Dibenzofuran	EPA 8270D
	EPA 8270E

Volatile Aromatics

1,2,4-Trichlorobenzene, Volatile	EPA 8260D
	EPA 8260C
1,2,4-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,2-Dichlorobenzene	EPA 8260D
	EPA 8260C
	EPA 624.1
1,3,5-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,3-Dichlorobenzene	EPA 8260D
	EPA 8260C
	EPA 624.1
1,4-Dichlorobenzene	EPA 8260D
	EPA 8260C
	EPA 624.1
2-Chlorotoluene	EPA 8260D
	EPA 8260C
4-Chlorotoluene	EPA 8260D
	EPA 8260C
Benzene	EPA 8260D
	EPA 8260C

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Volatile Aromatics

Benzene	EPA 624.1
Bromobenzene	EPA 8260D
	EPA 8260C
Chlorobenzene	EPA 8260D
	EPA 8260C
	EPA 624.1
Ethyl benzene	EPA 8260D
	EPA 8260C
	EPA 624.1
Isopropylbenzene	EPA 8260D
	EPA 8260C
m/p-Xylenes	EPA 8260D
	EPA 8260C
	EPA 624.1
Naphthalene, Volatile	EPA 8260D
	EPA 8260C
n-Butylbenzene	EPA 8260D
	EPA 8260C
n-Propylbenzene	EPA 8260D
	EPA 8260C
o-Xylene	EPA 8260D
	EPA 8260C
	EPA 624.1
p-Isopropyltoluene (P-Cymene)	EPA 8260D
	EPA 8260C
sec-Butylbenzene	EPA 8260D
	EPA 8260C

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Volatile Aromatics

Styrene	EPA 8260D
	EPA 8260C
	EPA 624.1
tert-Butylbenzene	EPA 8260D
	EPA 8260C
Toluene	EPA 8260D
	EPA 8260C
	EPA 624.1
Total Xylenes	EPA 8260D
	EPA 8260C
	EPA 624.1

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 8260D
	EPA 8260C
1,1,1-Trichloroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
1,1,2,2-Tetrachloroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260D
	EPA 8260C
1,1,2-Trichloroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
1,1-Dichloroethane	EPA 8260D
	EPA 8260C

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Volatile Halocarbons

1,1-Dichloroethane	EPA 624.1
1,1-Dichloroethene	EPA 8260D
	EPA 8260C
	EPA 624.1
1,1-Dichloropropene	EPA 8260D
	EPA 8260C
1,2,3-Trichloropropane	EPA 8260D
	EPA 8260C
1,2-Dibromo-3-chloropropane	EPA 8260D
	EPA 8260C
1,2-Dibromoethane	EPA 8260D
	EPA 8260C
1,2-Dichloroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
1,2-Dichloropropane	EPA 8260D
	EPA 8260C
	EPA 624.1
1,3-Dichloropropane	EPA 8260D
	EPA 8260C
2,2-Dichloropropane	EPA 8260D
	EPA 8260C
2-Chloroethylvinyl ether	EPA 8260D
	EPA 8260C
	EPA 624.1
Bromochloromethane	EPA 8260D
	EPA 8260C

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Volatile Halocarbons

Bromodichloromethane	EPA 8260D
	EPA 8260C
	EPA 624.1
Bromoform	EPA 8260D
	EPA 8260C
	EPA 624.1
Bromomethane	EPA 8260D
	EPA 8260C
	EPA 624.1
Carbon tetrachloride	EPA 8260D
	EPA 8260C
	EPA 624.1
Chloroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
Chloroform	EPA 8260D
	EPA 8260C
	EPA 624.1
Chloromethane	EPA 8260D
	EPA 8260C
	EPA 624.1
cis-1,2-Dichloroethene	EPA 8260D
	EPA 8260C
	EPA 624.1
cis-1,3-Dichloropropene	EPA 8260D
	EPA 8260C
	EPA 624.1

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Volatile Halocarbons

Dibromochloromethane	EPA 8260D
	EPA 8260C
	EPA 624.1
Dibromomethane	EPA 8260D
	EPA 8260C
Dichlorodifluoromethane	EPA 8260D
	EPA 8260C
	EPA 624.1
Hexachlorobutadiene, Volatile	EPA 8260D
	EPA 8260C
Methylene chloride	EPA 8260D
	EPA 8260C
	EPA 624.1
Tetrachloroethene	EPA 8260D
	EPA 8260C
	EPA 624.1
trans-1,2-Dichloroethene	EPA 8260D
	EPA 8260C
	EPA 624.1
trans-1,3-Dichloropropene	EPA 8260D
	EPA 8260C
	EPA 624.1
trans-1,4-Dichloro-2-butene	EPA 8260D
	EPA 8260C
Trichloroethene	EPA 8260D
	EPA 8260C
	EPA 624.1

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Volatile Halocarbons

Trichlorofluoromethane	EPA 8260D
	EPA 8260C
	EPA 624.1
Vinyl chloride	EPA 8260D
	EPA 8260C
	EPA 624.1

Volatiles Organics

1,4-Dioxane	EPA 8260D
	EPA 8260C
	EPA 8270D SIM
	EPA 8270E
	EPA 8270E SIM
2-Butanone (Methylethyl ketone)	EPA 8260D
	EPA 8260C
2-Hexanone	EPA 8260D
	EPA 8260C
4-Methyl-2-Pentanone	EPA 8260D
	EPA 8260C
Acetone	EPA 8260D
	EPA 8260C
Carbon Disulfide	EPA 8260D
	EPA 8260C
Cyclohexane	EPA 8260D
	EPA 8260C
Methyl acetate	EPA 8260D
	EPA 8260C
Methyl cyclohexane	EPA 8260D

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All approved analytes are listed below:

Volatiles Organics

Methyl cyclohexane	EPA 8260C
Vinyl acetate	EPA 8260D
	EPA 8260C

Sample Preparation Methods

SM 4500-P B(5)-2011
EPA 5030C
SM 4500-CN B-2016 and C-2016
EPA 3015A
EPA 3010A
EPA 3005A
EPA 3510C
SM 4500-N Org B-2011 or C-2011

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ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved subcategories and/or analytes are listed below:

Miscellaneous

non-Polar Extractable Material (TPH)	EPA 1664A
Organic Carbon, Total	SM 5310B-2014

Serial No.: 68594

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All approved analytes are listed below:

Acrylates

Acrolein (Propenal)	EPA 8260D
	EPA 8260C
Acrylonitrile	EPA 8260D
	EPA 8260C
Methyl methacrylate	EPA 8260D
	EPA 8260C

Amines

1,2-Diphenylhydrazine	EPA 8270D
	EPA 8270E
2-Nitroaniline	EPA 8270D
	EPA 8270E
3-Nitroaniline	EPA 8270D
	EPA 8270E
4-Chloroaniline	EPA 8270D
	EPA 8270E
4-Nitroaniline	EPA 8270D
	EPA 8270E
Aniline	EPA 8270D
	EPA 8270E
Carbazole	EPA 8270D
	EPA 8270E
Diphenylamine	EPA 8270D
	EPA 8270E

Benzidines

3,3'-Dichlorobenzidine	EPA 8270D
	EPA 8270E

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Benzidines

Benzidine	EPA 8270D
	EPA 8270E

Characteristic Testing

Corrosivity (pH)	EPA 9045D
Free Liquids	EPA 9095B
Ignitability	EPA 1010A
Synthetic Precipitation Leaching Proc.	EPA 1312
TCLP	EPA 1311

Chlorinated Hydrocarbon Pesticides

4,4'-DDD	EPA 8081B
4,4'-DDE	EPA 8081B
4,4'-DDT	EPA 8081B
Aldrin	EPA 8081B
alpha-BHC	EPA 8081B
alpha-Chlordane	EPA 8081B
Atrazine	EPA 8270D
	EPA 8270E
beta-BHC	EPA 8081B
Chlordane Total	EPA 8081B
delta-BHC	EPA 8081B
Dieldrin	EPA 8081B
Endosulfan I	EPA 8081B
Endosulfan II	EPA 8081B
Endosulfan sulfate	EPA 8081B
Endrin	EPA 8081B
Endrin aldehyde	EPA 8081B

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Chlorinated Hydrocarbon Pesticides

Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
Heptachlor epoxide	EPA 8081B
Lindane	EPA 8081B
Mirex	EPA 8081B
Toxaphene	EPA 8081B

Chlorinated Hydrocarbons

1,2,3-Trichlorobenzene	EPA 8260D
	EPA 8260C
1,2,4,5-Tetrachlorobenzene	EPA 8270D
	EPA 8270E
1,2,4-Trichlorobenzene	EPA 8270D
	EPA 8270E
2-Chloronaphthalene	EPA 8270D
	EPA 8270E
Hexachlorobenzene	EPA 8270D
	EPA 8270E
Hexachlorobutadiene	EPA 8270D
	EPA 8270E
Hexachlorocyclopentadiene	EPA 8270D
	EPA 8270E
Hexachloroethane	EPA 8270D
	EPA 8270E

Chlorophenoxy Acid Pesticides

2,4,5-T	EPA 8151A

Serial No.: 68595

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MS. CATHERINE L. MOSHER
YORK ANALYTICAL LABORATORIES INC
120 RESEARCH DRIVE
STRATFORD, CT 06615

NY Lab Id No: 10854

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All approved analytes are listed below:

Chlorophenoxy Acid Pesticides

2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
Dicamba	EPA 8151A

Haloethers

2,2'-Oxybis(1-chloropropane)	EPA 8270D
	EPA 8270E
4-Bromophenylphenyl ether	EPA 8270D
	EPA 8270E
4-Chlorophenylphenyl ether	EPA 8270D
	EPA 8270E
Bis(2-chloroethoxy)methane	EPA 8270D
	EPA 8270E
Bis(2-chloroethyl)ether	EPA 8270D
	EPA 8270E

Metals I

Barium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Cadmium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Calcium, Total	EPA 6010C
	EPA 6010D
Chromium, Total	EPA 6010C

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Metals I

Chromium, Total	EPA 6010D
	EPA 6020A
	EPA 6020B
Copper, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Iron, Total	EPA 6010C
	EPA 6010D
Lead, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Magnesium, Total	EPA 6010C
	EPA 6010D
Manganese, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Nickel, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Potassium, Total	EPA 6010C
	EPA 6010D
Silver, Total	EPA 6010C
	EPA 6010D

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Metals I

Silver, Total	EPA 6020A
	EPA 6020B
Sodium, Total	EPA 6010C
	EPA 6010D

Metals II

Aluminum, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Antimony, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Arsenic, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Beryllium, Total	EPA 6010C
	EPA 6010D
Chromium VI	EPA 7196A
Mercury, Total	EPA 7471B
	EPA 7473
Selenium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Vanadium, Total	EPA 6010C

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Metals II

Vanadium, Total	EPA 6010D
	EPA 6020A
	EPA 6020B
Zinc, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B

Metals III

Cobalt, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Molybdenum, Total	EPA 6020A
Thallium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Tin, Total	EPA 6020A
	EPA 6020B
Titanium, Total	EPA 6020A

Miscellaneous

Boron, Total	EPA 6020A
	EPA 6020B
Cyanide, Total	EPA 9014
Extractable Organic Halides	EPA 9023

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Nitroaromatics and Isophorone

2,4-Dinitrotoluene	EPA 8270D
	EPA 8270E
2,6-Dinitrotoluene	EPA 8270D
	EPA 8270E
Isophorone	EPA 8270D
	EPA 8270E
Nitrobenzene	EPA 8270D
	EPA 8270E
Pyridine	EPA 8270D
	EPA 8270E

Nitrosoamines

N-Nitrosodimethylamine	EPA 8270D
	EPA 8270E
N-Nitrosodi-n-propylamine	EPA 8270D
	EPA 8270E
N-Nitrosodiphenylamine	EPA 8270D
	EPA 8270E

Organophosphate Pesticides

Parathion ethyl	EPA 8270D
	EPA 8270E

Petroleum Hydrocarbons

Diesel Range Organics	EPA 8015D
Gasoline Range Organics	EPA 8015D

Phthalate Esters

Benzyl butyl phthalate	EPA 8270D
	EPA 8270E

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Phthalate Esters

Bis(2-ethylhexyl) phthalate	EPA 8270D
	EPA 8270E
Diethyl phthalate	EPA 8270D
	EPA 8270E
Dimethyl phthalate	EPA 8270D
	EPA 8270E
Di-n-butyl phthalate	EPA 8270D
	EPA 8270E
Di-n-octyl phthalate	EPA 8270D
	EPA 8270E

Polychlorinated Biphenyls

Aroclor 1016 (PCB-1016)	EPA 8082A
Aroclor 1016 (PCB-1016) in Oil	EPA 8082A
Aroclor 1221 (PCB-1221)	EPA 8082A
Aroclor 1221 (PCB-1221) in Oil	EPA 8082A
Aroclor 1232 (PCB-1232)	EPA 8082A
Aroclor 1232 (PCB-1232) in Oil	EPA 8082A
Aroclor 1242 (PCB-1242)	EPA 8082A
Aroclor 1242 (PCB-1242) in Oil	EPA 8082A
Aroclor 1248 (PCB-1248)	EPA 8082A
Aroclor 1248 (PCB-1248) in Oil	EPA 8082A
Aroclor 1254 (PCB-1254)	EPA 8082A
Aroclor 1254 (PCB-1254) in Oil	EPA 8082A
Aroclor 1260 (PCB-1260)	EPA 8082A
Aroclor 1260 (PCB-1260) in Oil	EPA 8082A
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1262 (PCB-1262) in Oil	EPA 8082A

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Polychlorinated Biphenyls

Aroclor 1268 (PCB-1268)	EPA 8082A
Aroclor 1268 (PCB-1268) in Oil	EPA 8082A

Polynuclear Aromatic Hydrocarbons

Acenaphthene	EPA 8270D
	EPA 8270E
Acenaphthylene	EPA 8270D
	EPA 8270E
Anthracene	EPA 8270D
	EPA 8270E
Benzo(a)anthracene	EPA 8270D
	EPA 8270E
Benzo(a)pyrene	EPA 8270D
	EPA 8270E
Benzo(b)fluoranthene	EPA 8270D
	EPA 8270E
Benzo(g,h,i)perylene	EPA 8270D
	EPA 8270E
Benzo(k)fluoranthene	EPA 8270D
	EPA 8270E
Dibenzo(a,h)anthracene	EPA 8270D
	EPA 8270E
Fluoranthene	EPA 8270D
	EPA 8270E
Fluorene	EPA 8270D
	EPA 8270E
Indeno(1,2,3-cd)pyrene	EPA 8270D
	EPA 8270E

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Polynuclear Aromatic Hydrocarbons

Naphthalene	EPA 8270D
	EPA 8270E
Phenanthrene	EPA 8270D
	EPA 8270E
Pyrene	EPA 8270D
	EPA 8270E

Priority Pollutant Phenols

2,3,4,6 Tetrachlorophenol	EPA 8270D
	EPA 8270E
2,4,5-Trichlorophenol	EPA 8270D
	EPA 8270E
2,4,6-Trichlorophenol	EPA 8270D
	EPA 8270E
2,4-Dichlorophenol	EPA 8270D
	EPA 8270E
2,4-Dimethylphenol	EPA 8270D
	EPA 8270E
2,4-Dinitrophenol	EPA 8270D
	EPA 8270E
2-Chlorophenol	EPA 8270D
	EPA 8270E
2-Methyl-4,6-dinitrophenol	EPA 8270D
	EPA 8270E
2-Methylphenol	EPA 8270D
	EPA 8270E
2-Nitrophenol	EPA 8270D
	EPA 8270E

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Priority Pollutant Phenols

4-Chloro-3-methylphenol	EPA 8270D
	EPA 8270E
4-Methylphenol	EPA 8270D
	EPA 8270E
4-Nitrophenol	EPA 8270D
	EPA 8270E
Pentachlorophenol	EPA 8270D
	EPA 8270E
Phenol	EPA 8270D
	EPA 8270E

Semi-Volatile Organics

1,1'-Biphenyl	EPA 8270D
	EPA 8270E
1,2-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
1,3-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
1,4-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
2-Methylnaphthalene	EPA 8270D
	EPA 8270E
Acetophenone	EPA 8270D
	EPA 8270E
Benzaldehyde	EPA 8270D
	EPA 8270E
Benzoic Acid	EPA 8270D
	EPA 8270E

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Semi-Volatile Organics

Benzyl alcohol	EPA 8270D
	EPA 8270E
Caprolactam	EPA 8270D
	EPA 8270E
Dibenzofuran	EPA 8270D
	EPA 8270E

Volatile Aromatics

1,2,4-Trichlorobenzene, Volatile	EPA 8260D
	EPA 8260C
1,2,4-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,2-Dichlorobenzene	EPA 8260D
	EPA 8260C
1,3,5-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,3-Dichlorobenzene	EPA 8260D
	EPA 8260C
1,4-Dichlorobenzene	EPA 8260D
	EPA 8260C
2-Chlorotoluene	EPA 8260D
	EPA 8260C
4-Chlorotoluene	EPA 8260D
	EPA 8260C
Benzene	EPA 8260D
	EPA 8260C
Bromobenzene	EPA 8260D
	EPA 8260C

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Volatile Aromatics

Chlorobenzene	EPA 8260D
	EPA 8260C
Ethyl benzene	EPA 8260D
	EPA 8260C
Isopropylbenzene	EPA 8260D
	EPA 8260C
m/p-Xylenes	EPA 8260D
	EPA 8260C
Naphthalene, Volatile	EPA 8260D
	EPA 8260C
n-Butylbenzene	EPA 8260D
	EPA 8260C
n-Propylbenzene	EPA 8260D
	EPA 8260C
o-Xylene	EPA 8260D
	EPA 8260C
p-Isopropyltoluene (P-Cymene)	EPA 8260D
	EPA 8260C
sec-Butylbenzene	EPA 8260D
	EPA 8260C
Styrene	EPA 8260D
	EPA 8260C
tert-Butylbenzene	EPA 8260D
	EPA 8260C
Toluene	EPA 8260D
	EPA 8260C
Total Xylenes	EPA 8260D

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Volatile Aromatics

Total Xylenes	EPA 8260C

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 8260D
	EPA 8260C
1,1,1-Trichloroethane	EPA 8260D
	EPA 8260C
1,1,2,2-Tetrachloroethane	EPA 8260D
	EPA 8260C
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260D
	EPA 8260C
1,1,2-Trichloroethane	EPA 8260D
	EPA 8260C
1,1-Dichloroethane	EPA 8260D
	EPA 8260C
1,1-Dichloroethene	EPA 8260D
	EPA 8260C
1,1-Dichloropropene	EPA 8260D
	EPA 8260C
1,2,3-Trichloropropane	EPA 8260D
	EPA 8260C
1,2-Dibromo-3-chloropropane	EPA 8260D
	EPA 8260C
1,2-Dibromoethane	EPA 8260D
	EPA 8260C
1,2-Dichloroethane	EPA 8260D
	EPA 8260C
1,2-Dichloropropane	EPA 8260D

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Volatile Halocarbons

1,2-Dichloropropane	EPA 8260C
1,3-Dichloropropane	EPA 8260D
	EPA 8260C
2,2-Dichloropropane	EPA 8260D
	EPA 8260C
2-Chloroethylvinyl ether	EPA 8260D
	EPA 8260C
Bromochloromethane	EPA 8260D
	EPA 8260C
Bromodichloromethane	EPA 8260D
	EPA 8260C
Bromoform	EPA 8260D
	EPA 8260C
Bromomethane	EPA 8260D
	EPA 8260C
Carbon tetrachloride	EPA 8260D
	EPA 8260C
Chloroethane	EPA 8260D
	EPA 8260C
Chloroform	EPA 8260D
	EPA 8260C
Chloromethane	EPA 8260D
	EPA 8260C
cis-1,2-Dichloroethene	EPA 8260D
	EPA 8260C
cis-1,3-Dichloropropene	EPA 8260D
	EPA 8260C

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Volatile Halocarbons

Dibromochloromethane	EPA 8260D
	EPA 8260C
Dibromomethane	EPA 8260D
	EPA 8260C
Dichlorodifluoromethane	EPA 8260D
	EPA 8260C
Hexachlorobutadiene, Volatile	EPA 8260D
	EPA 8260C
Methylene chloride	EPA 8260D
	EPA 8260C
Tetrachloroethene	EPA 8260D
	EPA 8260C
trans-1,2-Dichloroethene	EPA 8260D
	EPA 8260C
trans-1,3-Dichloropropene	EPA 8260D
	EPA 8260C
Trichloroethene	EPA 8260D
	EPA 8260C
Trichlorofluoromethane	EPA 8260D
	EPA 8260C
Vinyl chloride	EPA 8260D
	EPA 8260C

Volatile Organics

1,4-Dioxane	EPA 8260D
	EPA 8260C
	EPA 8270D SIM
	EPA 8270E

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Volatile Organics

1,4-Dioxane	EPA 8270E SIM
2-Butanone (Methylethyl ketone)	EPA 8260D
	EPA 8260C
2-Hexanone	EPA 8260D
	EPA 8260C
4-Methyl-2-Pentanone	EPA 8260D
	EPA 8260C
Acetone	EPA 8260D
	EPA 8260C
Carbon Disulfide	EPA 8260D
	EPA 8260C
Cyclohexane	EPA 8260D
	EPA 8260C
Methyl acetate	EPA 8260D
	EPA 8260C
Methyl cyclohexane	EPA 8260D
	EPA 8260C
Methyl tert-butyl ether	EPA 8260D
	EPA 8260C
tert-butyl alcohol	EPA 8260D
	EPA 8260C
Vinyl acetate	EPA 8260D
	EPA 8260C

Sample Preparation Methods

	EPA 5035A-L
	EPA 5035A-H
	EPA 3580A

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Sample Preparation Methods

EPA 3010A
EPA 3050B
EPA 3550C
EPA 3546
EPA 3545A
EPA 9010C

Serial No.: 68595

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2025
Issued April 01, 2024

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. CATHERINE L. MOSHER
YORK ANALYTICAL LABORATORIES INC
120 RESEARCH DRIVE
STRATFORD, CT 06615

NY Lab Id No: 10854

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Lead in Dust Wipes	EPA 6010C
Lead in Paint	EPA 6010C

Sample Preparation Methods

	EPA 3050B

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MR. KRZYSZTOF TRAFALSKI
YORK ANALYTICAL LABORATORIES, INC. (II)
132-02 89TH AVENUE SUITE 217
RICHMOND HILL, NY 11418

NY Lab Id No: 12058

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES AIR AND EMISSIONS
All approved analytes are listed below:

Acrylates

Acrylonitrile	EPA TO-15
Methyl methacrylate	EPA TO-15

Chlorinated Hydrocarbons

1,2,4-Trichlorobenzene	EPA TO-15
Hexachlorobutadiene	EPA TO-15
Hexachloroethane	EPA TO-15

Purgeable Aromatics

1,2,4-Trimethylbenzene	EPA TO-15
1,2-Dichlorobenzene	EPA TO-15
1,3,5-Trimethylbenzene	EPA TO-15
1,3-Dichlorobenzene	EPA TO-15
1,4-Dichlorobenzene	EPA TO-15
Benzene	EPA TO-15
Chlorobenzene	EPA TO-15
Ethyl benzene	EPA TO-15
Isopropylbenzene	EPA TO-15
m/p-Xylenes	EPA TO-15
o-Xylene	EPA TO-15
Styrene	EPA TO-15
Toluene	EPA TO-15
Total Xylenes	EPA TO-15

Purgeable Halocarbons

1,1,1-Trichloroethane	EPA TO-15
1,1,2,2-Tetrachloroethane	EPA TO-15
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA TO-15
1,1,2-Trichloroethane	EPA TO-15

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Purgeable Halocarbons

1,1-Dichloroethane	EPA TO-15
1,1-Dichloroethene	EPA TO-15
1,2-Dibromoethane	EPA TO-15
1,2-Dichloroethane	EPA TO-15
1,2-Dichloropropane	EPA TO-15
3-Chloropropene (Allyl chloride)	EPA TO-15
Bromodichloromethane	EPA TO-15
Bromoform	EPA TO-15
Bromomethane	EPA TO-15
Carbon tetrachloride	EPA TO-15
Chloroethane	EPA TO-15
Chloroform	EPA TO-15
Chloromethane	EPA TO-15
cis-1,2-Dichloroethene	EPA TO-15
cis-1,3-Dichloropropene	EPA TO-15
Dibromochloromethane	EPA TO-15
Dichlorodifluoromethane	EPA TO-15
Methylene chloride	EPA TO-15
Tetrachloroethene	EPA TO-15
trans-1,2-Dichloroethene	EPA TO-15
trans-1,3-Dichloropropene	EPA TO-15
Trichloroethene	EPA TO-15
Trichlorofluoromethane	EPA TO-15
Vinyl bromide	EPA TO-15
Vinyl chloride	EPA TO-15

Volatile Chlorinated Organics

Benzyl chloride	EPA TO-15

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All approved analytes are listed below:

Volatile Organics

1,2-Dichlorotetrafluoroethane	EPA TO-15
1,3-Butadiene	EPA TO-15
1,4-Dioxane	EPA TO-15
2-Butanone (Methylethyl ketone)	EPA TO-15
4-Methyl-2-Pentanone	EPA TO-15
Acetone	EPA TO-15
Carbon Disulfide	EPA TO-15
Cyclohexane	EPA TO-15
Hexane	EPA TO-15
Isopropanol	EPA TO-15
Methyl tert-butyl ether	EPA TO-15
n-Heptane	EPA TO-15
Vinyl acetate	EPA TO-15

Serial No.: 69093

END OF DOCUMENT

APPENDIX F
COMMUNITY AIR MONITORING PLAN

COMMUNITY AIR MONITORING PLAN (CAMP)

32-01 57th STREET
QUEENS, NEW YORK

NYSDEC Site Number: 241197

1. Introduction

The Community Air Monitoring Plan (CAMP) has been prepared to monitor the air quality during the intrusive activities to be performed in accordance with the Excavation Work Plan (EWP) and as part of the Site Management Plan (SMP) developed for the Tibetan Community of New York & New Jersey Site located at 32-01 57th Street in Queens, NY. This property is identified as New York State Department of Environmental Conservation (NYSDEC) Site Number 241197. This plan has been prepared in accordance with requirements, processes and action levels established in Appendix 1A New York State Department of Health Generic Community Air Monitoring Plan and Appendix 1B Fugitive Dust and Particulate Monitoring (see **Attachment A**) from DER-10/Technical Guidance for Site Investigation and Remediation issued by New York State Department of Environmental Conservation. Levels of VOCs and dust in the air will be monitored continuously and periodically utilizing a Photo Ionization Detector (PID) and Real-Time Particulate Dust Tracker, respectively. For this investigation, the PID will be calibrated at the beginning of each day to the compound isobutylene, which is published by the manufacturer. The PID has a minimum detection limit of 0.1 parts per million (ppm). The Dust Tracker provides real-time measurement based on 90° light scattering. The Dust Tracker has a minimum detection limit of 0.001 mg/m^3.

Continuous real-time air monitoring for VOCs and particulate levels at the perimeter of the exclusion zone or work area will be performed for all ground intrusive activities. Ground intrusive activities include but are not limited to the installation of soil borings, monitoring wells and soil vapor probes.

Periodic monitoring for VOCs will be performed during non-intrusive activities such as the collection of soil samples, the collection of groundwater samples from monitoring wells. For instance, periodic monitoring during sample collection will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well bailing/purging, and taking a reading prior to leaving a sample location. Depending upon the proximity of potentially exposed individuals, continuous monitoring may be performed 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. Exceedances of action levels observed during performance of the Community Air Monitoring Plan (CAMP) will be reported to the NYSDEC and recorded in a field daily log. A summary of daily logs/reports will be provided in the Remedial Investigation Report (RIR).

2. VOCs Monitoring, Response Levels and Actions

VOCs will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during invasive work. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using a PID, which will be calibrated at least daily for isobutylene. The PID will 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 will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will 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 will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will 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. Activities will be shut down if the organic vapor level at the perimeter of the work area is above 25 ppm.

4. All 15-minute readings must be recorded in a daily field log. Instantaneous readings, if any, used for decision purposes will also be recorded.

3. PM Monitoring, Response Levels And Actions

Particulate concentrations will be monitored continuously at the downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will be performed using a Dust Tracker 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 will 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 will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels are not 150 mcg/m^3 or greater 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 150 mcg/m^3 or greater above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work will 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 will be recorded in a daily field log.

4. CAMP with Special Requirements

CAMP with special requirements will be implemented if residential buildings or sensitive receptors such as day care, hospitals, public schools and health care facilities are located within 20 feet radius of the Site. The purpose of CAMP with special requirements is to provide additional

protection for the nearest potentially exposed individuals and the intake for the ventilation systems in these structures. Currently, there's no residential buildings or sensitive receptors located within 20 feet radius of the Site. A commercial/office building is located at the east-adjacent lot, which is within 20 feet radius of the Site. The action levels for CAMP with special requirements are specified below:

1. If total VOC concentrations along the walls of occupied structures or next to the intake vents exceeded 1 ppm, then monitoring will be conducted within the occupied structure. Background readings in the occupied spaces will be taken prior to the commencement of the planned work.

2. If total particulate concentrations along walls of occupied structures or next to intake vents exceeded 100 mcg/m^3 above background concentrations measured at the upwind direction, work activities will then be suspended until controls are implemented and the total particulate concentration falls below 100 mcg/m^3 above background concentrations and prevented visible dust migration by using water to dampen the surrounding area.