INTERIM REMEDIAL MEASURES WORK PLAN

291 Richardson Street
Brooklyn, New York
BCA No. C224292

November 2021

Submitted to:

New York State Department of Environmental Conservation
625 Broadway, 11th Floor
Albany, New York 12233-7014

Prepared for:

CR 17, LLC
1036 Manhattan Avenue
Brooklyn, New York 11222

Prepared by:

EnviroTrac Engineering PE PC
5 Old Dock Rd.
Yaphank, NY 11980
631-924-3001

The following personnel have prepared, reviewed, and approved this document:

Interim Remedial Measures Work Plan

291 Richardson Street
Brooklyn, New York

BCA Site #224292

Tracy Wall

Tracy Wall, PG
Senior Project Manager

Dale C. Konas

Dale C. Konas, P.E.
Principal Engineer

STATE OF NEW YORK
DALE C. KONAS
No. 081035
LICENSED PROFESSIONAL ENGINEER

11/19/21

"I Dale C. Konas, P.E. certify that I am currently a NYS registered professional engineer as defined in 6 NYCRR Part 375 and that this Interim Remedial Measure Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications."

11/19/2021
Date

EnviroTrac
Environmental Services

TABLE OF CONTENTS

FIGURES

APPENDICES

EnviroTrac
Environmental Services

1.0 INTRODUCTION

On January 7, 2020, CR 17 LLC entered into a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) to investigate and remediate the Site located at 291 Richardson Street Brooklyn, New York (herein referred to as the Site) as a Volunteer. The BCA Site No. is C224292. The Site was part of a larger facility that was previously owned by the Former Goodman Brothers Steel Drum Co. The Former Goodman Brothers Steel Drum Co. is listed as a NYSDEC State Superfund Site, Site No.224211. The Site owner, CR 17 LLC, removed the property as part of the Site No. 224211 and entered the BCP with the NYSDEC. The general location of the Site is shown in **Figure 1**. **Figure 2** shows the surrounding land use and outlines the Site location.

Several investigative work phases have taken place at the Site and off-Site from the 1980s to 2021 to determine the impact on the environment and human health from historic site operations. The NYSDEC required a remedial investigation (RI) to determine the nature and extent of contamination on-Site. The work plan was approved by the NYSDEC on July 8, 2020.

Based on results of the previous and most recent investigations conducted at the Site, it has been determined that soil, soil vapor, and groundwater beneath the Site have been impacted by chlorinated volatile organic compounds (CVOCs), petroleum volatile organic compounds (VOCs,) semi-volatile organic compounds (SVOCs), metals, and pesticides, and that remedial measures are warranted to prevent, mitigate, or remedy environmental damage or the consequences of environmental damage. A priority during investigation and/or remediation at a cleanup site is to contain and/or stabilize, to the extent possible, identify sources of contaminants in any media to reduce/eliminate receptor exposure to contaminants or to contain further movement of contaminants through any pathway. This will be accomplished through implementation of interim remedial measures (IRM). The NYSDEC encourages the use of an IRM when a source or exposure pathway can be effectively addressed before completion of the ongoing investigation and remedy selection process.

1.1 Objectives

This IRM Work Plan was developed to address the following objectives:

- provide a brief summary of the Site, including findings pertaining to previous work performed pertinent to the proposed IRM tasks;
- present the technical approach that will be used;
- present procedures that will be employed to address health and safety, quality assurance, and potential community impacts;
- identify applicable regulatory considerations associated with the IRM and discuss their management;
- present information pertaining to a construction completion report (CCR) that will provide results of the completed IRM; and
- provide an IRM implementation schedule.

2.0 SCOPE OF WORK

2.1 Overview

The RI was performed in accordance with the RIWP dated July 2020 to determine the impacts to soil, soil vapor, and groundwater beneath the Site associated with historical usage of the Site. The Site was previously part of a larger facility owned and operated by the Former Goodman Brothers Steel Drum Co., which is a NYSDEC State Superfund Site that has impacted the soil, soil vapor, and groundwater with CVOCs, semi-volatile organic compounds (SVOCs), and metals beneath the buildings to the north of the Site. Previous subsurface investigations were conducted at the Site and off-Site from the 1980s to 2021. The results of the investigations determined that a source of elevated levels of CVOCs, petroleum VOCs, SVOCs, metals, and pesticides are present beneath the Site, which has contributed to elevated levels of CVOCs in groundwater beneath the Site. Due to the presence of elevated levels of CVOCs and petroleum VOCs in soil and groundwater, vapors are also present beneath the Site and have impacted the indoor air and soil vapor beneath the building at the Site.

The NYSDEC and New York State Department of Health (NYSDOH) have required vapor mitigation to address elevated levels of VOCs in indoor air. This IRM will address the contaminated soil vapor and indoor air at the Site through the installation and operation of an on-Site sub-slab depressurization system (SSDS) which will mitigate soil vapor and indoor air impacts beneath and within the building at the Site. EnviroTrac Engineering PE PC will design, install, and conduct annual operations, maintenance, and monitoring (OMM) of the SSDS.

2.2 Summary of Site Investigation Results

Below lists the previously performed remedial investigations for the Site.

- **Draft Resource Conservation and Recovery Act (RCRA) Facility Closure Plan for the Former Goodman Bros., Gannet Fleming Engineers and Architects, P.C. (Gannet), April 2003;**
- **Phase II Environmental Site Assessment (ESA), Castleton Environmental, Inc. (Castleton), December 2018;**

- **Data Summary Report Former Goodman Brothers Steel Drum Company, Site No. 224211, URS, January 2020.**

Soil

Soil samples were collected from the Site during the Draft RCRA Facility Closure Plan (2003), Phase II ESA (2018), and data collected from the adjoining Former Goodman Steel Drum Co. to the north of the Site were also reviewed. The soil sampling results for the Site showed that CVOCs, petroleum VOCs, one (1) PCB, SVOCs, metals, and pesticides were detected above their respective NYSDEC Commercial Use Soil Cleanup Objectives (CUSCOs), NYSDEC Restricted Residential Use Soil Cleanup Objectives (RRUSCOs), or NYSDEC Unrestricted Use Soil Cleanup Objectives (UUSCOs). Tetrachloroethylene (PCE), arochlor 1254 (PCB), and mercury exceeded their respective NYSDEC CUSCOs. Manganese exceeded its NYSDEC RRUSCO. The remaining exceedances were detected above their NYSDEC UUSCOs.

Off-Site soil sample results (adjoining to the north) showed that CVOCs, SVOCs, metals, and PCBs were detected above their respective NYSDEC CUSCOs.

Groundwater

Groundwater sample data collected from the Site and off-Site (adjoining Former Goodman Brothers Steel Drum Co.) during the Draft RCRA Facility Closure Plan (2003) and RI Soil and Groundwater Investigation (2021) was reviewed and summarized. Groundwater sample data also collected from off-Site (adjoining Former Goodman Brothers Steel Drum Co.) was also reviewed and included in the Phase I Remedial Investigation Report (2020). The groundwater monitoring results for the Site in 2003 and 2021 showed that several CVOCs, including PCE, and petroleum VOCs were detected in the groundwater samples above their respective NYSDEC Class GA Ambient Water Quality Standards (Groundwater Standards). The groundwater monitoring results for the adjoining Former Goodman Steel Drum Co. and surrounding areas showed that several CVOCs, petroleum VOCs, SVOCs, metals, and pesticides were detected at concentrations above their respective NYSDEC Groundwater Standards.

Soil Vapor Intrusion

A soil vapor investigation was conducted at the adjoining Former Goodman Brothers Steel Drum Co. from April to August 2019. The most impacted area was the northern portion of the adjoining

property. Seven (7) out of 10 sampling locations indicated that mitigation was required when results were compared to the New York State Department of Health (NYSDOH) Decision Matrices.

A SVI investigation was conducted at the Site in March 2021 and included three (3) sub-slab soil vapor samples within the building, one (1) permanent soil vapor point within the front concrete area, three (3) indoor air samples, and one (1) outdoor air sample. The results showed elevated levels of CVOCs in the sub-slab beneath the Site building, beneath the front concrete area, and within the indoor air within the Site building. The indoor air results were compared to the NYSDOH Air Guideline Values. Indoor air exceedances were reported for PCE, TCE, cis-1,2-dichloroethylene (cis-1,2-DCE), and vinyl chloride (VC). The results were also compared to the NYSDOH Decision Matrices, which indicated that mitigation was required for the Site building.

2.3 Technical Approach

2.3.1 Sub-slab Depressurization System (SSDS) Installation

Installation of a SSDS will mitigate potential SVI impacts within the Site building. A total of three (3) vapor extraction wells will be installed in the building. The wells will be constructed of four (4) inch diameter no-hub cast iron pipe above grade, and four (4) inch diameter 20-slot schedule 40 PVC pipe below grade. No trenching will be conducted during the installation of the SSDS. The wells will be connected to a Radon Away Fan located on the roof and the effluent will discharge to the outdoor air, approximately two (2) feet above the roof line of the building and 10 feet from any air intake. Operation, maintenance, and monitoring (OMM) inspections will be performed on an annual basis following system startup. Effluent testing will be completed upon full (post installation startup testing) operation to comply with High Toxicity Air Contaminant (HTAC) requirements per 6 NYCRR Part 212-2.2 Table 2. In addition to effluent testing, post-mitigation indoor air analytical sampling will be conducted no sooner than 30 days following system start-up, within the heating season, to ensure that indoor air concentrations are within background and to confirm the effectiveness of the SSDS. The system startup testing period will end once communication testing (SSDS performance testing) for the SSDS is complete. If the SSDS is installed outside of the heating season, post-mitigation air sampling will be conducted 30 days following system start-up and then again during the following heating season. A total of two (2)

indoor air samples will be collected. The effluent sample will be collected into a one (1) Liter Summa Canister and will be a grab sample collected over a period of approximately three (3) to five (5) minutes. The indoor air samples will be collected into six (6) Liter Summa Canisters equipped with six (6) hour flow controllers. All samples will be delivered via courier to York Analytical Laboratories, Inc. (York) of Stamford, CT, a NYSDOH-certified laboratory, for analysis of VOCs by US Environmental Protection Agency (EPA) Method TO-15 with Category B Deliverables. Chain of custody forms will be completed to document sample possession. The results of the effluent vapor sample and indoor air samples will also be reviewed by LDC, a third-party data validator, and a Data Usability Summary Report (DUSR) will be provided. The proposed SSDS construction and installation is summarized in the Remedial Design Work Plan (RDWP) provided as **Appendix A** of this report. **Figures 1, 2,** and **3** show the SSDS design. Laboratory certifications and analytical method information is provided in **Appendix B**. The SSDS installation will be conducted under a Department of Buildings (DOB) permit.

2.3.2 Evaluation of IRM Results

2.3.2.1 Sub-slab Depressurization System Performance Testing Results

Following the installation of the SSDS, five (5) vacuum monitoring points will be installed within the building at the Site. The vacuum monitoring point construction is provided in the RDWP in **Appendix A**. Vacuum readings will be recorded from each vacuum monitoring point. Pressure differential/vacuum testing will be completed and documented following the startup of the SSDS. Vacuum beneath the slab will be deemed sufficient if readings are -0.02 inches of water or greater.

Should vacuum readings be insufficient, a larger size blower/fan will be installed to provide the appropriate vacuum beneath the slab. An updated SSDS Plan would be provided to the NYSDEC and NYSDOH prior to the installation of additional SSDS vapor extraction wells.

2.4 Investigation Derived Waste (IDW)

IDW includes materials generated during the performance of the prescribed remedial actions that have been contaminated with contaminants of concern and require disposal. The anticipated IDW

will include removed concrete [three (3) 6-inch diameter concrete cores] during the installation of the SSDS extraction points, removed soil during the installation of the SSDS extraction point, and incidental personal protective equipment ("PPE").

Concrete removed during the installation of the SSDS extraction points will be placed into a 55-gallon drum and staged on-Site for proper off-Site disposal at a later date. Soil removed during the installation of the SSDS extraction points will be placed into a 55-gallon drum and staged on-Site for proper off-Site disposal at a later date. The concrete and soil generated during the installation of the SSDS will be properly disposed off-site as a listed hazardous waste. Contaminated PPE will be collected, double bagged, and properly disposed as appropriate.

2.5 Health and Safety

Health and safety procedures that will be employed during the IRM are presented in the HASP included in **Appendix C**.

2.6 Community Air Monitoring

Community air monitoring procedures that will be implemented during ground intrusive activities at the Site (installation of SSDS extraction wells) are provided in **Appendix D**. Air monitoring will be implemented in accordance with the NYSDOH Generic CAMP with Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Populations or Structures and Special Requirements for Indoor Air Work With Co-Located Residences or Facilities.

Air quality in the work zones and nearby areas will be monitored for organic vapors and dust during the work to ensure worker safety (in accordance with provisions provided in the HASP) and to document that no adverse effects from the work conducted are experienced by the occupants of the building and surrounding properties. If the testing results exceed response triggers, then appropriate corrective actions will be taken.

Concrete dust will be diminished by utilizing wet cutting methods and dust masks will be worn by the individuals conducting the concrete work as per the HASP.

CAMP reports will be provided to the NYSDOH and NYSDEC on a weekly basis. The NYSDOH and NYSDEC will be notified within 24-hours of any CAMP action level exceedances and corrective measures taken.

3.0 REPORTING OF RESULTS

3.1 IRM Construction Completion Report

A Construction Completion Report (CCR) will be prepared and submitted at the completion of the IRM. The CCR will present and discuss the developed remedial action objectives, the selected remedy and the remedial actions performed. Detailed information pertaining to the CCR is provided in DER-10 subdivision 5.8(b)-(d). The CCR will provide a certification and be stamped by a NYS registered professional engineer.

3.2 Electronic Data Deliverable

In accordance with requirements specified in DER-10, laboratory data developed during the IRM will be submitted to the NYSDEC in the NYSDEC-approved Electronic Data Deliverable (EDD) format.

4.0 PROJECT SCHEDULE

The IRM will be conducted in accordance with the following schedule:

Update Document Repositories and NYSDEC Notification

The IRM process will be initiated immediately upon receipt of approval to proceed from the NYSDEC. Copies of the approved IRM Work Plan will be placed in the following repositories:

- Brooklyn Public Library, 81 Devoe Street, Brooklyn, NY 11211;
- Brooklyn Community Board 1, 435 Graham Avenue, Brooklyn, NY 11211; and
- NYSDEC Region 2 Division of Environmental Remediation, 1 Hunter's Point Plaza, 47-40 21st Street, Long Island City, NY 11101.

Install and Initiate SSDS

Field work will be initiated after a two (2) week period following the approval of the IRM Work Plan by the NYSDEC. The NYSDEC case manager will be notified a minimum of seven (7) to 10 days in advance prior to start of work. The SSDS will be installed and operational two (2) months following the approval of the IRM Work Plan by the NYSDEC. The Operations, Maintenance, and Monitoring Plan (OMMP) for the SSDS will be submitted to the NYSDEC and NYSDOH for review 30 days following the SSDS startup.

IRM Completion and Reporting of Results

Findings developed through implementation of the IRM will be provided in a CCR that will be submitted to the NYSDEC within 70 days following SSDS startup. This will allow for laboratory testing, data validation by a third-party chemist, evaluation of results, and preparation of the CCR.

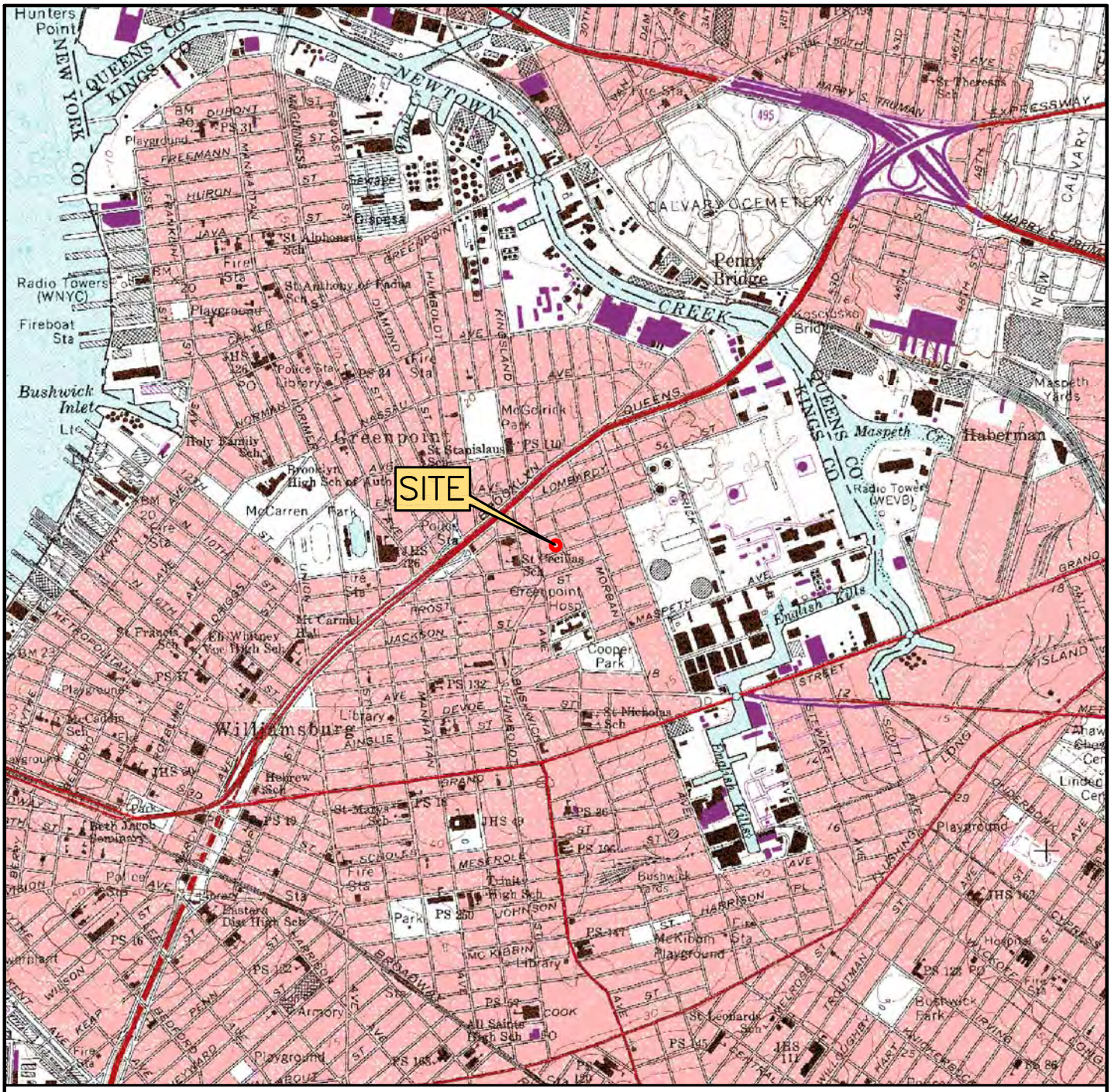
5.0 REFERENCES

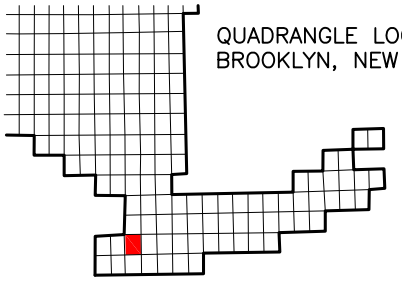
New York State Department of Environmental Conservation (May 3, 2010). Final Program Policy DER-10 - Technical Guidance for Site Investigation and Remediation.

Code of Federal Regulations – Title 40: Protection of the Environment 144.26 – Inventory Requirements.

New York State Department of Health (October 2006, Updates December 2006 – May 2017). Guidance for Evaluating Soil Vapor Intrusion in the State of New York.

FIGURES





QUADRANGLE LOCATION:
BROOKLYN, NEW YORK

APPROXIMATE ELEVATION:
39 FT.

SOURCE:
USGS 7.5 MINUTE SERIES

N
W E
S

0 2,000 6,000
FEET
1,000 4,000

FIGURE #	U.S.G.S. TOPOGRAPHIC MAP	DRAWN BY: B.S.	EnviroTrac ENVIRONMENTAL SERVICES
1	291 RICHARDSON STREET BROOKLYN, NEW YORK	REVISION DATE: 9/2/2021	5 OLD DOCK ROAD, YAPHANK, NEW YORK 11980 PHONE: (631)924-3001 FAX: (631)924-5001

LEGEND:

SUBJECT PROPERTY

N
W E
S

0 200

SCALE IN FEET

FIGURE #	SURROUNDING LAND USE MAP	DRAWN BY: B.S.	EnviroTrac ENVIRONMENTAL SERVICES
2	291 RICHARDSON STREET BROOKLYN, NEW YORK	REVISION DATE: 9/7/2021	5 OLD DOCK ROAD, YAPHANK, NEW YORK 11980 PHONE: (631)924-3001 FAX: (631)924-5001

DEBEVOISE AVENUE

north

Analytical Parameter	SSV03 3/24/2021
VOCs (ug/m3)	
Carbon tetrachloride	9.5 D
1,1-Dichloroethylene	490 D
cis-1,2-Dichlroethylene	96,000 D
Trichloroethylene	5,000 D
Methylene chloride	1,400 D
Tetrachloroethylene	NT
1,1,1-Trichloroethane	120 D
Vinyl chloride	220,000 D

Analytical Parameter	IAQ02 3/24/2021
VOCs (ug/m3)	
Carbon tetrachloride	0.47 D
1,1-Dichloroethylene	ND
cis-1,2-Dichlroethylene	6.8 D
Trichloroethylene	10 D
Methylene chloride	5.2 D
Tetrachloroethylene	80 D
1,1,1-Trichloroethane	ND
Vinyl chloride	2.9 D

SIDEWALK

ADJACENT RESIDENTIAL BUILDINGS

Analytical Parameter	SSV01 3/24/2021
VOCs (ug/m3)	
Carbon tetrachloride	53 D
1,1-Dichloroethylene	55 D
cis-1,2-Dichlroethylene	110,000 D
Trichloroethylene	190,000 D
Methylene chloride	37,000 D
Tetrachloroethylene	400,000 D
1,1,1-Trichloroethane	490 D
Vinyl chloride	2,800 D

Analytical Parameter	SV01 3/24/2021
VOCs (ug/m3)	
Carbon tetrachloride	ND
1,1-Dichloroethylene	3 D
cis-1,2-Dichlroethylene	62 D
Trichloroethylene	31 D
Methylene chloride	58 D
Tetrachloroethylene	180 D
1,1,1-Trichloroethane	13 D
Vinyl chloride	61 D

ADJACENT BUILDING YARD AREA

BATHROOMS AND MEZZANINE LEVEL

CONCRETE DRIVEWAY AREA

SSV03

IAQ01

SSV02

IAQ02

SSV01

SV01

OAQ01

OVERHEAD MARBLE SAW (LIMITED ACCESS)

SIDEWALK

RICHARDSON STREET

ADJACENT COMMERCIAL BUILDINGS

Analytical Parameter	IAQ01 3/24/2021
VOCs (ug/m3)	
Carbon tetrachloride	0.46 D
1,1-Dichloroethylene	ND
cis-1,2-Dichlroethylene	ND
Trichloroethylene	0.28 D
Methylene chloride	4.3 D
Tetrachloroethylene	150 D
1,1,1-Trichloroethane	ND
Vinyl chloride	ND

Analytical Parameter	SSV02 3/24/2021
VOCs (ug/m3)	
Carbon tetrachloride	6.7 D
1,1-Dichloroethylene	15 D
cis-1,2-Dichlroethylene	3,400 D
Trichloroethylene	2,800 D
Methylene chloride	21 D
Tetrachloroethylene	3,300 D
1,1,1-Trichloroethane	92 D
Vinyl chloride	93 D

Analytical Parameter	OAQ01 3/24/2021
VOCs (ug/m3)	
Carbon tetrachloride	0.6 D
1,1-Dichloroethylene	ND
cis-1,2-Dichlroethylene	0.49 D
Trichloroethylene	0.61 D
Methylene chloride	13 D
Tetrachloroethylene	5.7 D
1,1,1-Trichloroethane	ND
Vinyl chloride	0.31 D

LEGEND:

- SUB–SLAB VAPOR POINT
- SOIL VAPOR POINT
- INDOOR AIR SAMPLE
- OUTDOOR AIR SAMPLE

EnviroTrac
ENVIRONMENTAL SERVICES
5 OLD DOCK ROAD, YAPHANK, NEW YORK 11980
PHONE: (631)924–3001 FAX: (631)924–5001

0 15
SCALE IN FEET

REVISION DATE: 10/27/2021

REVISED BY: BS

291 RICHARDSON STREET
BROOKLYN, NEW YORK

SUB–SLAB AND SOIL VAPOR SAMPLE POINT LOCATION MAP

FIGURE # 3

DEBEVOISE AVENUE

north

SIDEWALK

ADJACENT
RESIDENTIAL BUILDING

VMP–1

VMP–3

BATHROOMS AND
MEZZANINE LEVEL

VMP–4

SSDS–1

ADJACENT BUILDING
YARD AREA

SSDS–3

CONCRETE DRIVEWAY
AREA

SSDS–2

ROUTE PIPING TO
VACUUM FAN LOCATIED
ON BUILDING ROOF

VMP–5

VMP–2

OVERHEAD MARBLE SAW
(LIMITED ACCESS)

ADJACENT
COMMERCIAL BUILDING

SIDEWALK

RICHARDSON STREET

LEGEND:

- SSDS SUB–SLAB DEPRESSURIZATION EXTRACTION POINT
- VMP VACUUM MONITORING POINTS
- RADIUS OF INFLUENCE (~25 FEET)

EnviroTrac
ENVIRONMENTAL SERVICES
5 OLD DOCK ROAD, YAPHANK, NEW YORK 11980
PHONE: (631)924–3001 FAX: (631)924–5001

0 15
SCALE IN FEET

REVISION DATE: 10/26/2021 REVISED BY: BS

291 RICHARDSON STREET
BROOKLYN, NEW YORK

SITE PLAN W/ SSDS LAYOUT

FIGURE #
4

APPENDICES

APPENDIX A

Remedial Design Work Plan

EnviroTrac
Environmental Services

Remedial Design Work Plan (RDWP)

Sub-Slab Depressurization System (SSDS)

Site:

291 Richardson Street
Brooklyn, New York
BCP Site No. C224292

Prepared for:

CR 17 LLC
1036 Manhattan Avenue
Brooklyn, New York 11222

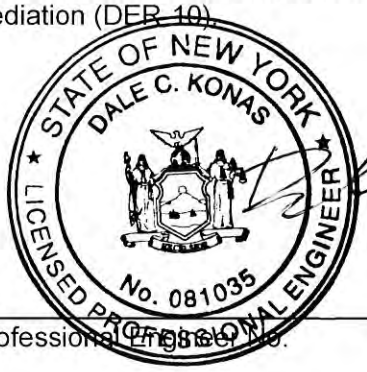
Prepared by:

EnviroTrac Engineering PE PC
5 Old Dock Road
Yaphank, NY 11980

September 2021

CERTIFICATIONS

I, Dale C. Konas, certify that I am currently a NYS-registered Professional Engineer and that this Remedial Design Work Plan was prepared in accordance with applicable statues and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).



081035	11/19/21	
NYS Professional Engineer No.	Date	Signature

EnviroTrac

Table of Contents

Figures

Attachments

SUB-SLAB DEPRESSURIZATION SYSTEM (SSDS)

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

The subject property consists of an approximately 2,375 square-foot, single-story commercial building that includes a slab-on-grade concrete finished floor. This scope of work shall consist of installing a sub-slab depressurization system (SSDS) to allow the lateral movement, collection and venting of gas vapor from below the subject building. System components are to include a network of three (3) 4-inch schedule 40 PVC vent points installed at select locations throughout the building floor slab. Each vent point is routed through individual pipe risers that combine into a common header located along the building ceiling. The header shall the penetrate through the building roof and sealed into position. The common header shall continue up to a location above the roof line, and then vent to atmosphere by mechanical means. The active sub-slab ventilation system shall be equipped with a roof mounted inline fan. All system components shall be installed as indicated, specified, and required within the following sections. A site plan indicating the radius of influence of the proposed SSD system in shown in Figure 1.

This design was prepared based on industry standards and similar systems constructed in similar structures, that were successfully installed and operated within this geographical area. It is estimated that an SSD system vacuum fan capable of a total flow rate of 87 cfm @ 3.0 "H_2O vacuum would provide sufficient vacuum to the underlying soil to provide optimal coverage. With an extraction point network consisting of three (3) wells, a 25-foot radius of influence would be generated.

1.02 STANDARDS AND REGULATIONS

A. Comply with applicable portions of the Building Code of the City of New York, regulations set forth by the New York State Department of Environmental Conservation (DEC) (DER-10), and New York State Department of Health (DOH). Where requirements for products, materials, equipment, methods, and other portion of the work specified herein exceed minimum requirements of City of New York Building Code, contractor shall comply with such requirements specified herein, unless specifically approved otherwise.

B. Standards listed below are referenced in this section.

1. American Society for Testing and Materials (ASTM)

- ASTM 2121-12 "Standard Practices for Installing Radon Mitigation Systems in Existing Low-Rise Residential Buildings"

2. American Standards Association (ASA)

3. American National Standards Institute (ANSI)

1.03 AIR EMISSIONS

Effluent testing will be completed upon full (post installation startup testing) operation to comply with High Toxicity Air Contaminant (HTAC) requirements per 6 NYCRR Part 212-2.2 Table 2.

PART 2 - PRODUCTS

2.01 MATERIALS AND ACCESSORIES

A. SUBSURFACE GAS VAPOR COLLECTION PIPE NETWORK, APPURTANCES, AND BUILDING PENETRATION PIPE

1. Polyvinyl Chloride (PVC) Pressure Pipe:

   PVC pipe for gas vapor collection applications for underground installation shall be 4-inch diameter schedule 40 pipe for individual extraction point piping and 4-inch diameter Schedule 40 well screen (0.2 inch slot) for the inlet screens. The use of PVC pipe shall be limited to all sub-surface locations and the effluent side of the roof mounted vacuum fan and shall be installed as shown in within the design drawings. Raw, unslotted pipe shall have a wall thickness of 0.237-inches, a max working pressure of 133 psi @ 73 degrees F and weigh approximately 201 lbs/100-feet. Joints shall be solvent-welded.

2. Cast Iron (CI) Pipe:

   All above-grade piping, including each of the pipe risers and common header, shall be constructed using 4-inch diameter no-hub cast iron pipe. No-hub cast Iron pipe and fittings shall be manufactured from gray cast iron and shall conform to ASTM A 888 and CISPI Standard 301. All pipe and fittings shall be marked with the collective trademark of the cast Iron Soil Pipe Institute ® and listed by NSF® International. No-hub couplings shall conform to CISPI Standard 310 and be certified by NSF® International. Gaskets shall conform to ASTM C 564. All pipe and fittings to be produced by a single manufacturer and are to be installed in accordance with manufacturer's recommendations and applicable code requirements. Couplings shall be installed in accordance with the manufacturer's band tightening sequence and torque recommendations. Tighten bands with a properly calibrated torque limiting device.

B. FITTINGS

1. Fittings for PVC Pipe:

   a. All fittings shall be of the same manufacturer, material, class, and schedule as the pipe. Any required threaded joints shall be provided with Teflon tape or flange joints with nitrile or urethane gaskets.
   b. Solvent cement joints for the pipe and pipe installation shall be made in accordance with the manufacturer's recommendations and ASTM D2855.

2. Fittings for Cast Iron Pipe:

   a. All fittings shall be of the same manufacturer, material, class, and schedule as the pipe. All fitting shall be manufactured and installed in accordance with ASTM A 888 and CISPI Standard 301.
   b. Couplings shall be installed in accordance with the manufacturer's band tightening sequence and torque recommendations. Tighten bands with a properly calibrated torque limiting device. All couplings shall be manufactured and installed in accordance with the manufacturer's recommendations and ASTM C 1277 and/or ASTM C 1540.

C. VALVES

1. Butterfly Valves:

   All system valves shall be butterfly style valves and appropriately sized to match the corresponding system piping diameter. Each valve shall be grooved end connected. The body and disc of each valve shall be constructed of coated ductile iron and the stem shall be 416 stainless steel. The boot liner shall be EPDM. The valve shall be hand lever actuated with a set position throttle plate. Each butterfly valve shall be model GD-4765-3 Series Ductile Iron Butterfly Valve, manufactured by Nibco Inc.

D. SLEEVES FOR PIPES

1. Sheet metal sleeves shall be 20 gauge.
2. Pipe sleeves shall be service weight cast iron pipe or schedule 40 galvanized steel pipe.
3. Fire stop penetration materials for sealing sleeves shall be listed by Underwriters Laboratories and shall have Material and Equipment Acceptance (MEA) approval.
4. Material for sealing spaces between pipe and sleeve through foundation walls below grade shall be Link- Seal Type "C" as manufactured by Thunderline Corp; Belleville, Mich. Seals shall be modular mechanical

type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve. Links shall be loosely assembled with bolts to form a continuous rubber bolt around the pipe with a pressure plate under each bolt head and nut. Link-Seal pressure plates shall be Type "C" (insulating type) to provide for electrical insulation and cathodic protection.

5. Materials for sealing space between each pipe and sleeve through non-fire rated exterior walls above grade shall be non-shrink cement.

6. Waterproof sleeves shall be Link-Seal Wall Sleeve as manufactured by Thunderline Corp, or MetraSeal wall sleeve by the Metraflex Co.

E. VACUUM MONITORING POINTS

1. Monitoring Point:

The vacuum monitoring points shall be a stainless steel Vapor Pin inserts manufactured by Cox-Colvin / Vapor Pin (sample implant model VPIN0522SS) or approved equal. Each insert shall be installed as per the manufacturer's instructions and utilizing the recommended installation kit. A sample manufacturer's cut sheet and installation instructions can be seen in Attachment B.

3. Access Manhole:

Each vacuum monitoring point shall have a stainless steel Vapor Pin cover fit directly on top of each vacuum monitoring point to provide access to the vacuum point tubing connector. Each cap shall thread directly onto the installed Vapor Pin insert to provide a flush and secure fit. The cap shall be a stainless steel secure cover as manufactured by Cox-Colvin / Vapor Pin or approved equal. A sample manufacturer's cut sheet and installation instructions can be seen in Attachment B.

F. SSDS COMPONENTS

1. **Vacuum Blower (Fan):** Radon Away Inc., Model GX5a, (133W, 110V, 1 PH), or equal. The vacuum fan shall be capable of 87 cfm @ 3 "H_2O vacuum. Construction shall be Eternalast® polycarbonate plastic housing. Motor shall be water hardened thermally protected and rated for outdoor use. The fan shall be rated for commercial or residential use and ETL rated by Interlok to UL507 and CSA 22.2 Standards. The fan shall include a 4-inch diameter inlet and outlet. Contractor shall connect the inline ventilation fans to the existing building electrical service. A sample manufacturer cut sheet and installation instructions for the fan can be seen in Attachment A.

2. **Vacuum Gauges**: Dwyer Instruments Inc., Model/Part No. LPG4-D7222N, 2½" diameter dial, Accuracy = +/-1.5% full scale, ¼" NPT brass connection, Black painted steel case with polycarbonate lens. Individual

manifold laterals shall have 0-15 ”H_2O range. A sample manufacturer cut sheet for the gauge can be seen in Attachment C.

G. GENERAL

- Provide additional installation accessories as necessary.
- Ensure accessories are from same manufacturer as product.

PART 3 - EXECUTION

3.01 INSTALLATION

All components of the SSD System shall be installed as specified in the within these Specifications and Plans.

A. INSTALLATION OF EXTRACTION WELLS

A total of three (3) extraction wells shall be installed and utilized as SSD extraction points in the building as shown in Figure 1 (SSD-1 through SSD-3). At a minimum, each point shall consist of a 4-inch diameter schedule 40 PVC pipe well riser that extends to a depth of 1-inch below the bottom elevation of the existing concrete floor slab at each location. From this elevation to a depth of 1-foot below the bottom of the floor slab, the point shall consist of 4-inch diameter schedule 40 PVC well slotted screen (0.020 slot). Further details of the proposed extraction point construction can be seen in Figure 2. Each extraction point shall be installed utilizing a concrete core drill to penetrate the floor slab and then a manual hand auger to advance a borehole to install the well. The annulus between the well casing/screen and the borehole shall be filled with No. 2 Morie well sand to an elevation above the well screen. The annulus between the outside of the cast iron riser pipe and the concrete edge shall be sealed with quick setting epoxy putty or hydraulic cement.

Any excess soil that is generated during the installation of the extraction points shall be collected and then properly disposed of in accordance with any governing regulations.

B. INSTALLATION OF SSD SYSTEM

Individual pipe risers shall extend from each of the extraction points and route to a common header located along the interior of the building ceiling. Each riser shall be routed along the nearest building interior wall or column and shall be constructed of 4-inch no-hum cast iron pipe. Care shall be made to ensure that all interior piping is placed and routed in a best effort to reduce intrusion into the interior space of the building. The common header pipe shall penetrate the building ceiling/roof in close proximity to the vacuum fan location. The vacuum fan shall be mounted directly on the effluent pipe and sufficiently supported on the roof of the building. The effluent air stream piping shall then be extended vertically up to a location above the roof line of the building to its discharge point. The discharge riser shall terminate at least 2-feet above the surface of the roof at a location at least 10-feet away from any window or other opening into the conditioned space of the building that is less than 2-feet below the exhaust point, and 10-feet away from any adjoining or adjacent

buildings. All piping shall be schedule no-hub cast iron pipe. Details of the SSD system configuration can be seen in Figure 2.

All interior riser pipe, beginning at the floor slab elevation and continuing to the point where the pipe penetrates the building exterior foundation wall, shall be clearly and permanently labeled, and read as such:

"CAUTION: ACTIVE VENT SYSTEM"

Electrical power for vacuum fan shall be provided by an outdoor rated 110V GFCI outlet that shall be installed adjacent to roof mounted fan.

C. INSTALLATION OF THE VACUUM MONITORING POINTS (VMPs)

Vacuum testing of the proposed SSD system shall utilize a network of vacuum monitoring points in order to demonstrate adequate performance of the proposed system. The proposed vacuum monitoring point locations are shown in Figure 1.

Each vacuum monitoring point shall consist of one Vapor Pin stainless steel sampling implant by Cox-Calvin / Vapor Pin (Part No. VPIN0522SS) or approved equal. The Vapor Pin insert shall be fitted with appropriate silicone rubber sleeve and protective plastic cap. Each implant shall be capable of connecting a 0.25-inch inside diameter Teflon tubing for the purposes of vacuum influence measurements. The Implant shall be installed in accordance with the manufacturer's instructions. Once the Vapor Pin has been installed it shall be capped with a Vapor Pin stainless steel Secure Cover. This Cover shall be secured into place using the required #14 spanner tool provided within the installation kit. Details on the installation of each vacuum monitoring point can be seen in Figure 2.

D. PIPING (GENERAL)

1. The run and arrangements of all pipes shall be approximately as shown in the Figures or specified and as directed during installation, and shall be as straight and direct as possible, forming right angles or parallel lines with building walls and other pipes, and neatly spaced. No pipe shall be installed where the headroom will be interfered with unless the conditions are such that it is unavoidable, and permission is obtained from the property owner. Offsets shall be permitted where walls reduce in thickness or beams interfere with direct runs; offsets shall be made at an angle of 45 degrees to the vertical; in no case shall the space between the pipes, partitions, walls, etc., exceed 5". All exposed risers shall be erected plumb, standing free, close to and parallel with walls and other pipes and be uniformly spaced. All horizontal runs of piping hung from structural floor, slab or floor beams shall be erected as closely as possible to bottom of floor slabs, ceilings, or I-beams as the case may be. In no case shall the headroom, beneath the pipe, be less than (7'-0") where the pipe is installed more than (1'-0") from wall, partition, etc., except where piping is required to be installed in Boiler Room and Mechanical spaces above floor. Horizontal piping shall be so graded as

to drain back to each individual extraction point. All piping shall be installed with ample space for pipe covering.

2. Roughing underground or concealed in the floor or wall construction shall be properly installed, tested, and inspected before any of the roughing is covered up. Should any work be covered up before being inspected and tested, it shall be uncovered and recovered at the expense of the Contractor. Plugged fittings shall be installed when called for. Reducer fittings or bushings shall be used in making reductions in sizes of pipes.

E. PIPING JOINTS (PVC)

1. Threaded Joints

The joints piping shall be screwed joints of full length and threads shall be NPT. All pipes shall be screwed close up to their shoulders, not to leave more than 3 threads exposed. The use of lamp wick is prohibited in threaded joints. All burrs shall be removed. Pipe joint cement or Teflon tape shall be used only on male threads.

2. Solvent-cementing:

a) Remove all burrs, chips, filings, and other debris from the pipe i.d. and o.d. before joining.

b) All pipe ends should be beveled to minimize the chances of wiping the solvent cement from the i.d. of the fitting as the pipe is socketed. Beveling can be done with the coarse file or beveling tool.

c) Using a clean, dry cotton rag, wipe away all loose dirt and moisture from the i.d. and o.d. of the pipe end and the i.d. of the fitting. Do not attempt to solvent-cement wet surfaces.

d) Using a natural-bristle brush about one-half the width of the pipe diameter to be joined, apply primer freely to the inner fitting socket. Keep the surface wet by continuously brushing the entire surface for 5 to 15 seconds. Redip the applicators as necessary but avoid puddling inside the fitting. Reapply primer to the fitting socket.

e) Apply primer to the pipe surface in the same manner, making sure that the length of pipe evenly covered is at least equal to the fitting socket depth.

f) Using a second clean natural-bristle brush one-half the size of the pipe diameter, apply a heavy coat of solvent cement to the male end of the pipe. Next apply a liberal coat of solvent cement to the inside of the socket using straight outward strokes to keep excess cement out of the socket.

g) While both surfaces are still wet with solvent cement, insert the pipe into the socket with a twisting motion. The pipe must go to the

bottom of the socket. The application of solvent cement to pipe and fitting, and the insertion of pipe into the fitting, should be completed in less than 1 minute. Hold the joints together for approximately 30 seconds until both surfaces are firmly gripped.

h) After solvent-cementing, hold joints together for 30 seconds until both surfaces are firmly gripped. Allow proper set time before disturbing joints. The initial set time prior to installation is as follows:

Temperature Range	**Pipe Sizes 1/4”- 1/2”**	**Pipe Sizes 1½”-3”**	**Pipe Sizes 4”-8”**	**Pipe Sizes 10”-16”**	**Pipe Sizes 18”-24”**
60°-100°F	15 Min.	30 Min.	1 Hr.	2 Hr.	3 Hr.
40°-60°F	1 Hr.	2 Hr.	4 Hr.	8 Hr.	12 Hr.
0°-40°F	3 Hr.	6 Hr.	12 Hr.	24 Hr.	36 Hr.

F. PIPING JOINTS (Cast Iron)

1. Hubless Shielded Couplings:

a) Lay out, hang and or mount piping and fittings as required. Pipe ends are to be cut as squarely and smoothly as possible. Check coupling and gasket for foreign material, clean if necessary.

b) Insert gasket over pipe or fitting until end of pipe or fitting butts against the gasket’s integrally molded shoulder. Slide the coupling assembly over the other pipe or fitting to be joined.

c) Insert the second pipe or fitting into the gasket until both ends of pipe or fittings butt against the integrally molded shoulder in the center of gasket.

d) Slide the coupling assembly into position centered over gasket.

e) Tighten all the clamps in the coupling assembly with an appropriately sized wrench or clamp tool. Use a preset, or dial indicating type torque wrench and tighten to 60 inch pounds of torque. Tighten clamp 1 and then clamp 2 alternately in 20 lbf-in increments until the recommended 60 lbf-in is reached.

G. SLEEVES FOR PIPES

1. General: All plumbing pipes passing through floors, roofs, walls, partitions, furring, beams, trenches, and wherever else indicated on the drawings shall be provided with sleeves. Where plumbing pipes pass through potentially wet floors that do not have membrane waterproofing such as toilet rooms, cafeteria kitchens, serving areas, dish washing

room, janitor's sink closet, mechanical equipment rooms, pipe chases and areas that are provided with fire protection sprinkler systems, the Contractor shall install sleeves of galvanized steel pipe with welded clips or equivalent at bottom ends for securing sleeves to form work and shall project one inch above finished floors, and shall be caulked watertight.

2. For interior walls and floors and for pipes through roof, the space between each installed pipe and its sleeve shall be sealed with a three hour rated fire stop penetration material. Fire stop materials shall be installed in accordance with the instructions of the manufacturer.

3. Sheet Metal Sleeves

   a. Sleeves for pipes passing through floors, partitions, hung or furred ceilings, shall be installed with 1/2" maximum clearance all around pipes. Each sleeve for a pipe passing through an interior floor slab shall be fitted with a one-inch flange, or equivalent, at the bottom end for the purpose of securing it to the form work or sheet metal deck.

      The sleeve shall finish flush with the top of the finished floor. Sleeves for pipes passing through partitions, hung or furred ceilings shall be of one-piece construction and shall finish flush with the finished surface.

   b. Sleeves installed for pipes passing through vent ducts shall be securely fastened, soldered, and made airtight.

4. Pipe Sleeve: Install pipe sleeves for pipes passing through roofs, concrete beams, utility trenches, grade beams, brick walls, foundation walls and floor slabs on earth. Sleeves shall be installed with 1/2" maximum clearance all around pipe and shall finish flush with the surfaces penetrated. Pipe sleeves for pipes through roof shall be made of service weight cast iron only.

3.02 PIPE AND FITTING SCHEDULE

A. Sub-Slab Depressurization System (Below Grade)

PVC pipe Schedule 40 with solvent welded or threaded joints

B. Sub-Slab Depressurization System (Above Grade or Exposed)

No-Hub Cast Iron with Standard Duty Stainless Steel Banded Hubless Couplings

3.03 PROTECTION

It is the responsibility of the Contractor to ensure that no damage occurs to components of the SSD System prior to, during or following installation of system, or during any

subsequent performance of construction for the facility as identified on the drawings and specifications. This includes the installation of all subsurface utilities required for the operation of building systems.

END OF SECTION

FIGURES

DEBEVOISE AVENUE

north

SIDEWALK

ADJACENT
RESIDENTIAL BUILDING

ADJACENT BUILDING
YARD AREA

VMP–1

VMP–3

BATHROOMS AND
MEZZANINE LEVEL

VMP–4

SSDS–1

SSDS–3

SSDS–2

CONCRETE DRIVEWAY
AREA

ROUTE PIPING TO
VACUUM FAN LOCATIED
ON BUILDING ROOF

VMP–2

VMP–5

OVERHEAD MARBLE SAW
(LIMITED ACCESS)

ADJACENT
COMMERCIAL BUILDING

SIDEWALK

RICHARDSON STREET

LEGEND:

- SSDS SUB–SLAB DEPRESSURIZATION EXTRACTION POINT
- VMP VACUUM MONITORING POINTS

RADIUS OF INFLUENCE (~25 FEET)

EnviroTrac
ENVIRONMENTAL SERVICES
5 OLD DOCK ROAD, YAPHANK, NEW YORK 11980
PHONE: (631)924–3001 FAX: (631)924–5001

0 15
SCALE IN FEET

REVISION DATE: 10/26/2021 REVISED BY: BS

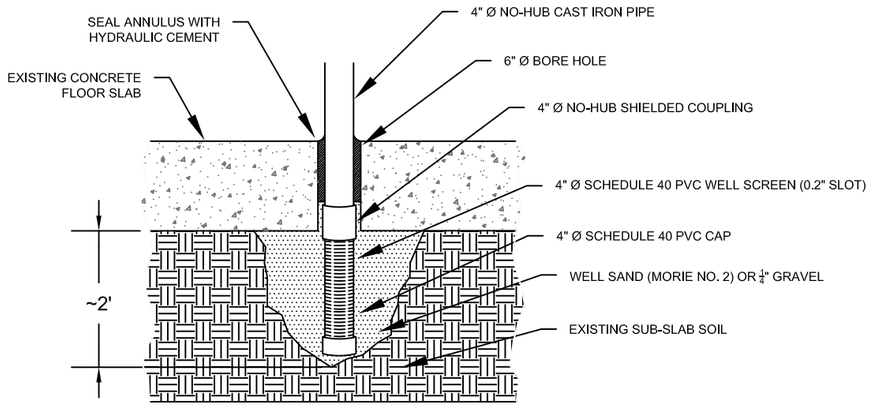
291 RICHARDSON STREET
BROOKLYN, NEW YORK

SITE PLAN W/ SSDS LAYOUT

FIGURE #
3

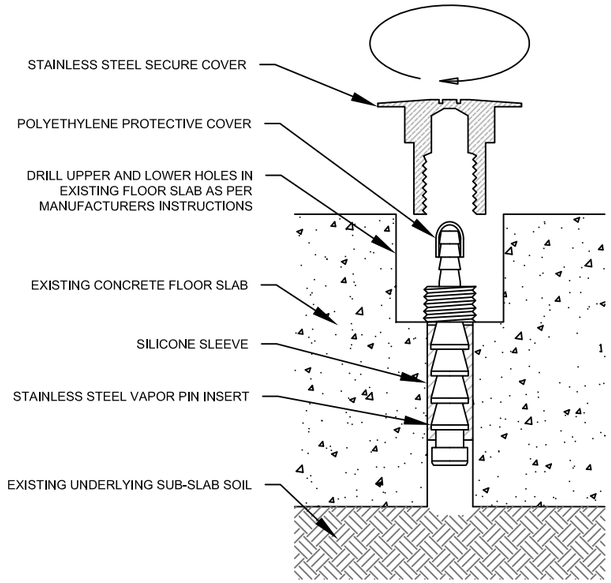
EXTRACTION POINT DETAIL

NOT TO SCALE



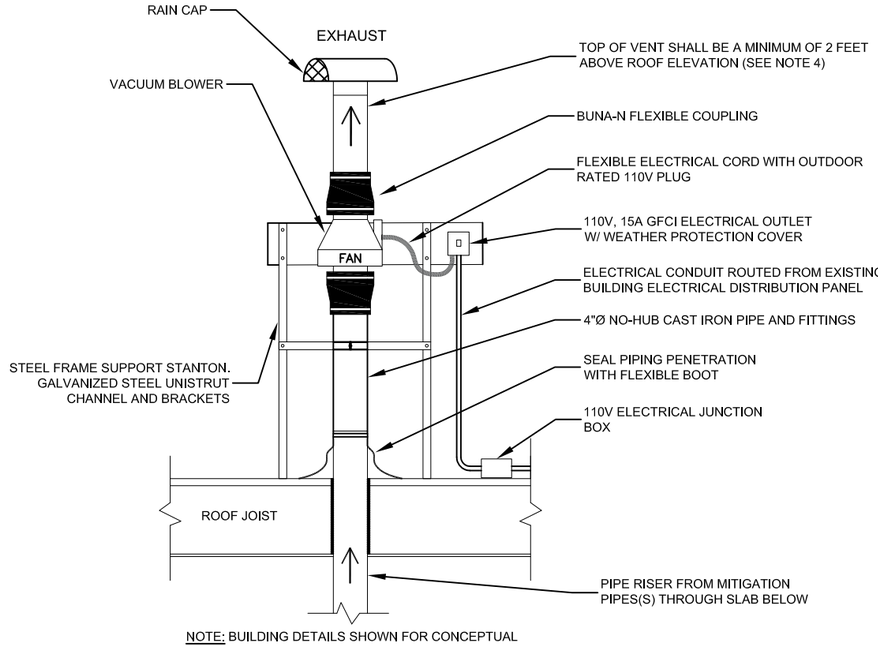
VAPOR / VACUUM MONITORING POINT

NOT TO SCALE



BLOWER AND ROOF PIPING DETAIL

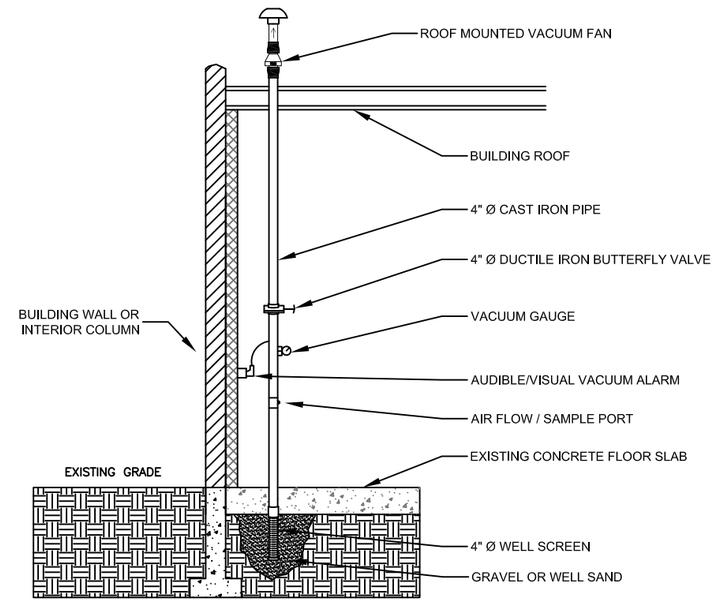
NOT TO SCALE



NOTE: BUILDING DETAILS SHOWN FOR CONCEPTUAL PURPOSES ONLY. NOT TO BE USED FOR STRUCTURAL OR ARCHITECTURAL PURPOSES.

RISER PIPE DETAIL

NOT TO SCALE



NOTE: BUILDING DETAILS SHOWN FOR CONCEPTUAL PURPOSES ONLY. NOT TO BE USED FOR STRUCTURAL OR ARCHITECTURAL PURPOSES.

EnviroTrac
ENVIRONMENTAL SERVICES
5 OLD DOCK ROAD, YAPHANK, NEW YORK 11980
PHONE: (631)924-3001 FAX: (631)924-5001

SCALE: NONE

DATE: 09/14/2021

REVISED BY: DK

291 RICHARDSON STREET
BROOKLYN, NEW YORK

SSD SYSTEM DETAILS

FIGURE # 2

SPECIFICATIONS AND NOTES:

1. VAPOR COLLECTION PIPING: 4 INCH DIAMETER SCHEDULE 40 PVC SLOTTED (0.02" SLOT) WELL SCREEN SHALL BE USED FOR THE SUBSURFACE VERTICAL EXTRACTION POINTS TO BE INSTALLED BELOW THE EXISTING CONCRETE SLAB. A 4" SCHEDULE 40 PVC DOME CAP SHALL BE INSTALLED AT THE BOTTOM OF EACH POINT. ALL PIPE RISERS SHALL TRANSITION TO 4 INCH NO-HUB CAST IRON PIPE PRIOR TO PENETRATING UP THROUGH THE CONCRETE FLOOR SLAB INTO THE INTERIOR OF THE BUILDING.

2. SSDS VENT PIPING:
   - 2.1. SUB-SURFACE SOLID PIPING: 4 INCH DIAMETER SCHEDULE 40 PVC PIPE SHALL BE CONNECTED TO THE VAPOR EXTRACTION POINTS VIA A 4 INCH DIAMETER COUPLING. EACH RISER PIPE SHALL BE EXTENDED TO A DESIGNATED LOCATION IN THE NEAR VICINITY OF A WALL OR INTERIOR BUILDING COLUMN THAT EXTENDS VERTICALLY TO THE BUILDING ROOF LEVEL. ALL PIPE AND FITTING CONNECTIONS SHALL BE EITHER SOLVENT WELD OR THREADED CONNECTIONS.
   - 2.2. ABOVE GRADE PIPING: ALL EXPOSED ABOVE GRADE VENT PIPE SHALL BE CAST IRON, NO-HUB PIPE AND FITTINGS. ALL PIPE AND FITTING CONNECTIONS SHALL BE NEOPRENE FLEXIBLE COUPLINGS WITH STAINLESS STEEL BANDS. THIS PIPING SHALL BE EXTENDED VERTICALLY THOUGH THE BUILDING ROOF WHERE IT WILL CONNECT TO THE BLOWER INLET. THE EXHAUST PIPING SHALL TERMINATE AT LEAST 2 FEET ABOVE THE SURFACE OF THE ROOF, IN A LOCATION AT LEAST 10 FEET AWAY FROM ANY WINDOW OR OTHER OPENING INTO THE CONDITIONED SPACES OF THE BUILDING THAT IS LESS THAN 2 FEET BELOW THE EXHAUST POINT, AND 10 FEET AWAY FROM ANY ADJOINING OR ADJACENT BUILDING.

3. IN BUILDINGS DESIGNED WITH INTERIOR FOOTINGS OR OTHER BARRIERS TO LATERAL FLOW OF SUB-SLAB SOIL GAS, VENT PIPES SHALL BE INSTALLED IN EACH ISOLATED, NON-CONNECTED FLOOR AREA. IF MULTIPLE VENT POINTS ARE USED IN NON-CONNECTED FLOOR AREAS, VENT PIPES ARE PERMITTED TO BE MANIFOLDED BELOW THE FLOOR SLAB INTO A SINGLE VENT.

4. TO RETARD SOIL GAS ENTRY, LARGE OPENINGS THROUGH CONCRETE SLABS OR OTHER FLOOR ASSEMBLIES IN CONTACT WITH THE SOIL, SUCH AS SPACES AROUND BATHTUB, SHOWER, OR TOILET DRAINS, SHALL BE FILLED OR CLOSED WITH MATERIALS THAT PROVIDE A PERMANENT AIRTIGHT SEAL SUCH AS NON-SHRINK MORTAR, GROUTS, EXPANDING FOAM, OR SIMILAR MATERIAL DESIGN FOR SUCH APPLICATION.

5. TO RETARD SOIL GAS ENTRY, SMALLER GAPS AROUND ALL PIPES, WIRE, OR OTHER OBJECTS THAT PENETRATE THE CONCRETE SLAB OR OTHER FLOOR ASSEMBLY SHALL BE MADE AIRTIGHT WITH AN ELASTOMER JOINT SEALANT OR POLYETHYLENE TAPE, AS DEFINED IN ASTM C920-87, AND APPLIED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

6. TO RETARD SOIL GAS ENTRY ALL CONTROL JOINTS, ISOLATION JOINTS AND ANY OTHER JOINTS IN CONCRETE SLABS OR BETWEEN SLABS AND FOUNDATION WALLS SHALL BE SEALED. A CONTINUOUS FORMED GAP "TOOLED EDGE" WHICH ALLOWS THE APPLICATION OF A SEALANT THAT WILL PROVIDE A CONTINUOUS, AIRTIGHT SEAL SHALL BE CREATED ALONG ALL JOINTS. WHEN THE SLAB HAS CURED, THE GAP WILL BE CLEARED OF ANY LOOSE MATERIAL AND FILLED WITH AN ELASTOMER JOINT SEALANT, AS DEFINED IN ASTM C920-87, AND APPLIED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

7. CONCRETE MASONRY FOUNDATION WALLS BELOW THE GROUND SURFACE SHALL BE CONSTRUCTED TO MINIMIZE THE TRANSPORT OF SOIL GAS FROM THE SOIL TO THE BUILDING. HOLLOW BLOCK MASONRY WALLS SHALL BE SEALED AT THE TOP TO PREVENT THE PASSAGE OF AIR FROM THE INTERIOR OF THE WALL TO THE LIVING SPACE. AT A MINIMUM, ONE COURSE OF SOLID MASONRY, ONE COURSE OF MASONRY GROUTED SOLID, OR A POURED CONCRETE BEAM AT OR ABOVE THE FINISHED GROUND SURFACE LEVEL SHALL BE USED FOR THIS PURPOSE. WHERE A BRICK VENEER OR OTHER MASONRY LEDGE IS INSTALLED, THE COURSE IMMEDIATELY BELOW THAT LEDGE SHALL ALSO BE SEALED.

8. JOINTS, CRACKS, OR OTHER OPENINGS AROUND ALL PENETRATIONS OF BOTH EXTERIOR AND INTERIOR SURFACES OF MASONRY BLOCK WALLS BELOW THE GROUND SURFACE SHALL BE SEALED WITH AN ELASTOMETRIC SEALANT THAT PROVIDES AN AIRTIGHT SEAL. PENETRATIONS OF POURED CONCRETE WALLS SHALL ALSO BE SEALED ON THE EXTERIOR SURFACE. THIS INCLUDES SEALING OF WALL TIE PENETRATIONS.

9. ALL EXPOSED AND VISIBLE INTERIOR SSDS VENT PIPES SHALL BE IDENTIFIED WITH AT LEAST ONE LABEL ON EACH FLOOR LEVEL. THE LABEL SHALL READ: "ACTIVE VAPOR MITIGATION SYSTEM".

10. VENTILATION FAN: THE IN-LINE VACUUM BLOWER SHALL BE INSTALLED ON THE ROOF OF THE EXISTING BUILDING. THE BLOWER SHALL BE CAPABLE OF PRODUCING A MINIMUM OF 87 CFM AT A VACUUM OF 3" H2O. THE BLOWER SHALL BE AN IN-LINE VACUUM FAN MODEL NO. GX-5A, MANUFACTURED BY RADON AWAY, WARD HILL, MA., OR EQUAL, AND INSTALLED AS PER THE MANUFACTURER'S INSTRUCTIONS. A 110 V, 1-PHASE, OUTDOOR RATED GFCI ELECTRICAL OUTLET SHALL BE INSTALLED BY A LICENSED ELECTRICIAN IN ACCORDANCE WITH ALL APPLICABLE LOCAL ELECTRICAL CODES. THE ELECTRICAL OUTLET SHALL BE POSITIONED WITHIN 3 FEET OF THE ROOF MOUNTED VACUUM FAN.

11. SYSTEM INDICATOR: A VACUUM GAUGE SHALL BE INSTALLED 0N EACH RISER OF THE VAPOR VENT PIPING IN ORDER TO PROVIDE A VISUAL INDICATION OF THE SYSTEM OPERATION. THE VACUUM GAUGE SHALL BE INSTALLED AT THE LOWEST ACCESSIBLE LOCATION OF EACH MANIFOLD LEG IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. EACH GAUGE SHALL HAVE A 2-1/2" DIAMETER DIAL, A FULL SCALE ACCURACY OF +/-1.5%, AND A ¼" NPT BRASS PIPE CONNECTION. EACH GAUGE SHALL HAVE A BLACK PAINTED STEEL CASE WITH A POLYCARBONATE LENS. THE GAUGES SHALL BE MODEL/PART No. LPG4-D7222N (0 TO -15" H2O) MANUFACTURED BY DWYER INSTRUMENTS IN., OR APPROVED EQUAL.

12. VACUUM MONITORING POINTS: VACUUM TEST POINTS SHALL BE INSTALLED AT A MINIMUM OF THREE (3) LOCATIONS IN THE CONCRETE FLOOR SLAB FOR THE PURPOSE OF TESTING THE EFFECTIVENESS OF THE SSD SYSTEM. THE VACUUM MONITORING POINTS SHALL BE STAINLESS STEEL VAPOR PIN INSERTS, MODEL VPIN0522SS, MANUFACTURED BY COX-COLVIN / VAPOR PIN, OR APPROVED EQUIVALENT, EACH INSERT SHALL BE INSTALLED AS PER THE MANUFACTURER'S INSTALLATION INSTRUCTIONS AND UTILIZING THE RECOMMENDED INSTALLATION KIT/TOOLS. EACH VACUUM MONITORING POINT SHALL BE CAPPED WITH A VAPOR PIN STAINLESS STEEL SECURE FIT COVER. THE COVER SHALL BE INSTALLED SUCH THAT WHEN IT IS SECURED INTO PLACE A FLUSH FIT TO THE EXISTING FLOOR SLAB IS ACHIEVED.

13. ALL COMPONENTS OF THE SUB SLAB DEPRESSURIZATION SYSTEM SHALL BE IN ACCORDANCE WITH ASTM E 2121-13 "STANDARD PRACTICE FOR RADON CONTROL OPTIONS INSTALLING RADON CONTROL SYSTEMS IN EXISTING LOW-RISE BUILDINGS".

EnviroTrac
ENVIRONMENTAL SERVICES
5 OLD DOCK ROAD, YAPHANK, NEW YORK 11980
PHONE: (631)924-3001 FAX: (631)924-5001

NOT TO SCALE

DATE: 09/07/2021

REVISED BY: DK

291 RICHARDSON STREET
BROOKLYN, NEW YORK

SSD SYSTEM SPECIFICATIONS AND NOTES

FIGURE # 3

ATTACHMENT A

GX PRO SERIES

RadonAway

GX5A

Features

- Eternalast™ polycarbonate plastic fan housing
- Revolutionary impeller
- Water-hardened thermally-protected motor
- Quiet operation
- 4” duct for use with 3” or 4” Pipe
- Sealed seams to inhibit radon leakage
- Electrical box for hard wire of plug in
- For indoor or outdoor use
- Rated for commercial or residential use

MODEL	P/N	FAN DUCT DIAMETER	WATTS	RECOM. MAX. OP. PRESSURE “WC	MAX PRESSURE	TYPICAL CFM vs. STATIC PRESSURE WC					
						0"	1.0"	2.0"	3.0"	4.0"	5.0"
GX5a	28536	4”	77-133	5.0”	5.3”	174	150	121	87	50	8

MODEL	DUCT SIZE - OD (d)	DIAMETER (D)	HEIGHT (H)
GX5a	4.5”	11.9”	11.1”

MADE IN USA with U.S. and imported parts.

ETL Listed

RadonAway® Pro Series inline radon fans are covered by a 5-year, limited warranty.

For more information
(800) 767-3703
RadonAway.com

RadonAway

Rev C 0421
P/N 02071

RadonAway®

The world's leading radon fan manufacturer

GX5A Pro Series Fan Installation 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!** 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. **NOTE:** Fan is suitable for use with solid state speed controls; however, use of speed controls is not generally recommended.

2. **WARNING!** Check voltage at the fan to insure it corresponds with nameplate.

3. **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.

4. **NOTICE!** There are no user serviceable parts located inside the fan unit.
   Do NOT attempt to open. Return unit to the factory. (See Warranty, p. 7, for details.)

5. **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.

6. **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. (See p. 7.)

   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 backdrafting. Follow the heating equipment manufacturers' guidelines and safety standards such as those published by any National Fire Protection Association, and the American Society for Heating, Refrigerating 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.

Fan Installation & Operating Instructions
GX5A Pro Series Fan

1.0 SYSTEM DESIGN CONSIDERATIONS

1.1 INTRODUCTION

The GX5A Pro Series Radon Fan is intended for use by trained, professional, certified/licensed radon mitigators. The purpose of these instructions is to provide additional guidance for the most effective use of GX Pro Series Fans. These instructions should be considered supplemental to EPA/radon industry standard practices, state and local building codes and regulations. In the event of a conflict, those codes, practices and regulations take precedence over these instructions.

1.2 FAN SEALING

The GX5A Pro Series Fan is factory sealed; no additional caulk or other materials are required to inhibit air leakage.

1.3 ENVIRONMENTALS

The GX5A Pro Series Fan is 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 GX5A Pro Series Fan, when installed properly, operate 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 inline 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(s). The GX5A Pro Series Fan is 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 GX5A Pro 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. 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 GX5A Pro 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 Radon Fan best suited for the sub-slab material can improve the slab coverage. The GX5A Fan is best suited for tighter soils where higher suction is needed. Consider using the RP260 where additional airflow is required, and the RP265 and RP380 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 GX5A Pro 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 GX5A Pro Series Fan is NOT suitable for underground burial.

For GX5A Pro Series Fan piping, the following table provides the minimum recommended pipe diameter and pitch under several system conditions.

Pipe Diameter	Minimum Rise per Ft of Run*		
	@25 CFM	@50 CFM	@100 CFM
4”	1/8”	1/4”	3/8”
3”	1/4”	3/8”	1 1/2”

See p. 6 for detailed specifications.

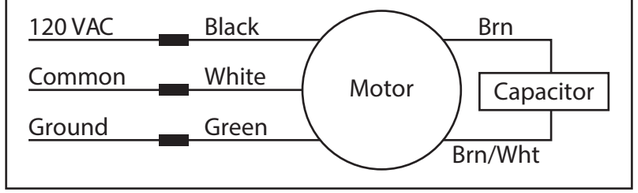
1.8 SYSTEM MONITOR & LABEL

A System Monitor is required to notify the occupants of a fan system malfunction. The GX5A Fan requires a U-tube Manometer >5.5” max. (such as P/N 50036). You may choose to also use an audible alarm (P/N 28001-2, 28001-4, 28421 or 28535). A System Label (provided with Manometers P/N 50036 and 50017) with instructions for contacting the installing contractor for service and identifying the necessity for regular radon tests to be conducted by the building occupants must be conspicuously placed in a location where the occupants frequent and can see the label.

1.9 ELECTRICAL WIRING

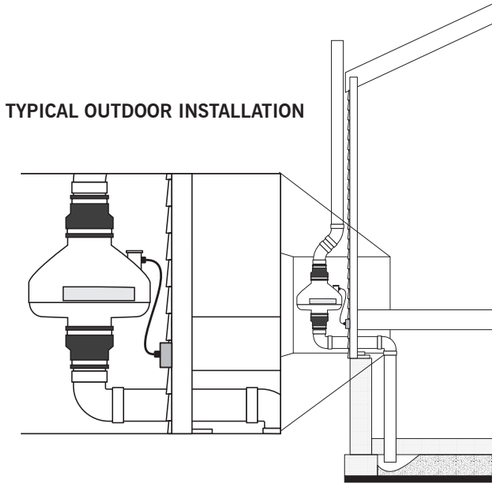
The GX5A Pro Series Fan operates on standard 120V, 60Hz AC. All wiring must be performed in accordance with National Fire Protection (NFPA) National Electrical Code, Standard #70, current edition, for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician. Outdoor installations require the use of a UL 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.

RP, GP, XP Pro Series Fan Wiring Diagram



2.0 INSTALLATION

TYPICAL OUTDOOR INSTALLATION



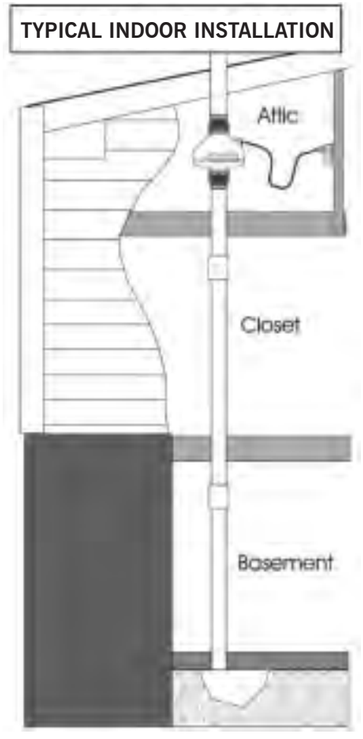
The GX5A Pro Seres Fan can be mounted indoors or outdoors. (It is suggested that EPA and radon mitigation standards recommendations be followed in choosing the fan location.) The GX5A Fan may be mounted directly on the system piping or fastened to a supporting structure by means of an optional mounting bracket.

The ducting from the fan to the outside of the building has a strong effect on noise and fan energy use. 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.

2.1 MOUNTING

Mount the GX5A Pro Series Fan vertically with outlet up. Ensure 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.

TYPICAL INDOOR INSTALLATION



2.2 MOUNTING BRACKET (optional)

The GX5A Pro Series Fan may be optionally secured with the RadonAway P/N 25007 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 a means of disconnect for servicing the unit and for vibration isolation. As 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.

2.4 ELECTRICAL CONNECTION

Connect wiring with wire nuts provided, observing proper connections (See Section 1.9). Note that the fan is not intended for connection to rigid metal conduit.

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**.

_____ **Ensure** the GX5A Pro Series Fan and all ducting are **secure and vibration-free**.

_____ **Verify system vacuum pressure** with manometer. **Ensure** 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 and applicable testing standards.

THE FOLLOWING CHARTS SHOW THE PERFORMANCE OF THE GX5A PRO SERIES FAN

GX5A PRO SERIES FAN Product Specifications

Typical CFM Vs. Static Pressure "WC						
Model	**0"**	**1.0"**	**2.0"**	**3.0"**	**4.0"**	**5.0"**
GX5A	174	150	121	**87**	**50**	**8**

Model	Power Consumption 120VAC, 60Hz, 1.5 Amp Maximum	Maximum Recommended Operation Pressure* (Sea Level Operation)**
GX5A	77-133 watts	5.00" WC

**Reduce by 10% for High Temperature Operation **Reduce by 4% per 1000 ft. of altitude.*

Model	Size	Weight	Inlet/Outlet	L.2
GX5A	11.1"H x 11.9" Dia.	9 lbs	4.5"OD (4.0" PVC Sched 40 size compatible)	25

L.2 = Estimated Equivalent Length of Rigid Metal Ducting resulting in .2" WC pressure loss for Duct Size listed. Longer Equivalent Lengths can be accommodated at Flows Lower than that at .2" WC pressure loss (see CFM Vs Static Pressure "WC Table).

GX5A Pro Series Fan Additional Specifications

Model	Recommended Duct	PVC Pipe Mounting	Thermal Cutout	Insulation Class
GX5A	3" or 4" Schedule 20/40 PVC	Mount on the duct pipe or with optional mounting bracket. For Ventilation: 4", 6" or 8" Rigid or Flexible Ducting.	150°C/302°F	Class F Insulation

Continuous Duty
3000 RPM
Thermally Protected
Residential and Commercial
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

IMPORTANT INSTRUCTIONS TO INSTALLER

Inspect the RadonAway® GX5A Pro 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 the housing.** Return unit to factory. (See Warranty below).

Install the GX Pro Series Fan in accordance with all EPA, ANSI/AARST standard practices, and state and local building codes and 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 GX5A Pro Series Fan (the "Fan") will be free from defects in materials and workmanship for a period of 12 months from the date of purchase or 18 months from the date of manufacture, whichever is sooner (the "Warranty Term").

RadonAway® will replace any fan which fails due to defects in materials or workmanship during the Warranty Term. 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®.

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.

5-YEAR EXTENDED WARRANTY WITH PROFESSIONAL INSTALLATION.

RadonAway® will extend the Warranty Term of the fan to 60 months (5 years) from date of purchase or 66 months from date of manufacture, whichever is sooner, provided that the fan is installed by a professional radon mitigation contractor. Proof of purchase and/or proof of professional installation may be required for service under this warranty. No extended warranty is offered outside the Continental United States and Canada beyond the standard 12 months from the date of purchase or18 months from the date of manufacture, whichever is sooner.

RadonAway® is not responsible for installation, removal or delivery costs associated with this Warranty.

LIMITATION OF WARRANTY

EXCEPT AS STATED ABOVE, THE GX5A PRO SERIES FAN IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULARPURPOSE.

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 Number: Purchase Date:

ATTACHMENT B

Standard Operating Procedure Installation and Extraction of the Vapor Pin®

Updated March 16, 2018

Scope:

This standard operating procedure describes the installation and extraction of the VAPOR PIN® for use in sub-slab soil-gas sampling.

Purpose:

The purpose of this procedure is to assure good quality control in field operations and uniformity between field personnel in the use of the VAPOR PIN® for the collection of sub-slab soil-gas samples or pressure readings.

Equipment Needed:

- Assembled VAPOR PIN® [VAPOR PIN® and silicone sleeve(Figure 1)]; Because of sharp edges, gloves are recommended for sleeve installation;
- Hammer drill;
- 5/8-inch (16mm) diameter hammer bit (hole **must** be 5/8-inch (16mm) diameter to ensure seal. It is recommended that you use the drill guide). (Hilti™ TE-YX 5/8" x 22" (400 mm) #00206514 or equivalent);
- 1½-inch (38mm) diameter hammer bit (Hilti™ TE-YX 1½" x 23" #00293032 or equivalent) for flush mount applications;
- ¾-inch (19mm) diameter bottle brush;
- Wet/Dry vacuum with HEPA filter (optional);
- VAPOR PIN® installation/extraction tool;
- Dead blow hammer;
- VAPOR PIN® flush mount cover, if desired;
- VAPOR PIN® drilling guide, if desired;
- VAPOR PIN® protective cap; and
- VOC-free hole patching material (hydraulic cement) and putty knife or trowel for repairing the hole following the extraction of the VAPOR PIN®.

Figure 1. Assembled VAPOR PIN®

Installation Procedure:

1) Check for buried obstacles (pipes, electrical lines, etc.) prior to proceeding.

2) Set up wet/dry vacuum to collect drill cuttings.

3) If a flush mount installation is required, drill a 1½-inch (38mm) diameter hole at least 1¾-inches (45mm) into the slab. Use of a VAPOR PIN® drilling guide is recommended.

4) Drill a 5/8-inch (16mm) diameter hole through the slab and approximately 1-inch (25mm) into the underlying soil to form a void. Hole **must** be 5/8-inch (16mm) in diameter to ensure seal. It is recommended that you use the drill guide.

5) Remove the drill bit, brush the hole with the bottle brush, and remove the loose cuttings with the vacuum.

6) Place the lower end of VAPOR PIN® assembly into the drilled hole. Place the small hole located in the handle of the installation/extraction tool over the vapor pin to protect the barb fitting, and tap the vapor pin into place using a dead blow hammer (Figure 2). Make sure the installation/extraction tool is aligned parallel to the vapor pin to avoid damaging the barb fitting.

Figure 2. Installing the VAPOR PIN®

During installation, the silicone sleeve will form a slight bulge between the slab and the VAPOR PIN® shoulder. Place the protective cap on VAPOR PIN® to prevent vapor loss prior to sampling (Figure 3).

Figure 3. Installed VAPOR PIN®

7) For flush mount installations, cover the vapor pin with a flush mount cover, using either the plastic cover or the optional stainless-steel Secure Cover (Figure 4).

Figure 4. Secure Cover Installed

8) Allow 20 minutes or more (consult applicable guidance for your situation) for the sub-slab soil-gas conditions to re-equilibrate prior to sampling.

9) Remove protective cap and connect sample tubing to the barb fitting of the VAPOR PIN®. This connection can be made using a short piece of Tygon™ tubing to join the VAPOR PIN® with the

Nylaflow tubing (Figure 5). Put the Nylaflow tubing as close to the VAPOR PIN® as possible to minimize contact between soil gas and Tygon™ tubing.

Figure 5. VAPOR PIN® sample connection

10) Conduct leak tests in accordance with applicable guidance. If the method of leak testing is not specified, an alternative can be the use of a water dam and vacuum pump, as described in SOP Leak Testing the VAPOR PIN® via Mechanical Means (Figure 6). For flush-mount installations, distilled water can be poured directly into the 1 1/2 inch (38mm) hole.

Figure 6. Water dam used for leak detection

11) Collect sub-slab soil gas sample or pressure reading. When finished, replace the protective cap and flush mount cover until the next event. If the sampling is complete, extract the VAPOR PIN®.

Extraction Procedure:

1) Remove the protective cap, and thread the installation/extraction tool onto the barrel of the VAPOR PIN® (Figure 7). Turn the tool clockwise continuously, don't stop turning, the VAPOR PIN® will feed into the bottom of the installation/extraction tool and will extract from the hole like a wine cork, DO NOT PULL.

2) Fill the void with hydraulic cement and smooth with a trowel or putty knife.

Figure 7. Removing the VAPOR PIN®

- Prior to reuse, remove the silicone sleeve and protective cap and discard. Decontaminate the VAPOR PIN® in a hot water and Alconox® wash, then heat in an oven to a temperature of 265° F (130° C) for 15 to 30 minutes. For both steps, **STAINLESS – ½ hour, BRASS 8 minutes**

3) Replacement parts and supplies are available online.

Standard Operating Procedure Use of the VAPOR PIN® Drilling Guide and Secure Cover

Updated March 16, 2018

Scope:

This standard operating procedure (SOP) describes the methodology to use the VAPOR PIN® Drilling Guide and Secure Cover to install and secure a VAPOR PIN® in a flush mount configuration.

Purpose:

The purpose of this SOP is to detail the methodology for installing a VAPOR PIN® and Secure Cover in a flush mount configuration. The flush mount configuration reduces the risk of damage to the VAPOR PIN® by foot and vehicular traffic, keeps dust and debris from falling into the flush mount hole, and reduces the opportunity for tampering. This SOP is an optional process performed in conjunction with the SOP entitled "Installation and Extraction of the VAPOR PIN®". However, portions of this SOP should be performed prior to installing the VAPOR PIN®.

Equipment Needed:

- VAPOR PIN® Secure Cover (Figure 1);
- VAPOR PIN® Drilling Guide (Figure 2);
- Hammer drill;
- 1½-inch diameter hammer bit (Hilti™ TE-YX 1½" x 23" #00293032 or equivalent);
- 5/8-inch diameter hammer bit (Hilti™ TE-YX 5/8" x 22" #00226514 or equivalent);
- assembled VAPOR PIN®;
- #14 spanner wrench;
- Wet/Dry vacuum with HEPA filter (optional); and
- personal protective equipment (PPE).

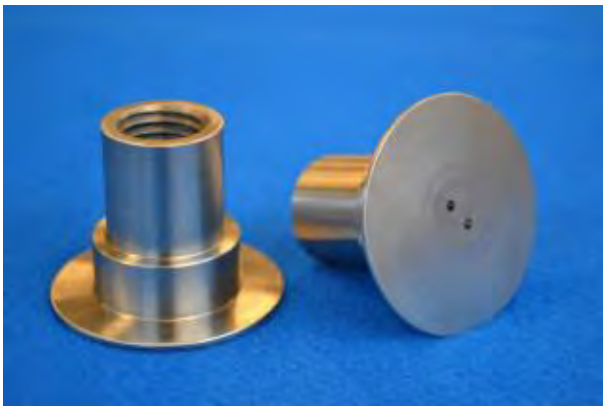


Figure 1. VAPOR PIN® Secure Cover

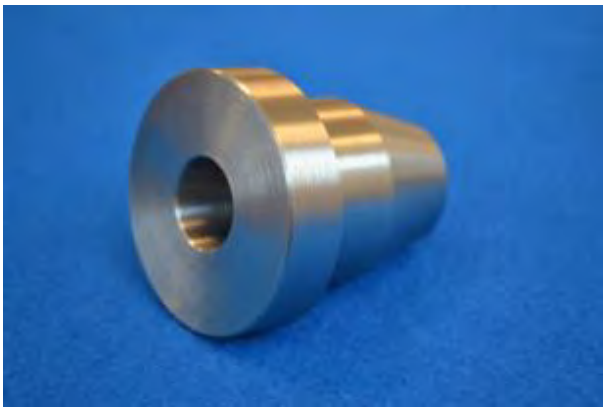


Figure 2. VAPOR PIN® Drilling Guide

Installation Procedure:

1) Check for buried obstacles (pipes, electrical lines, etc.) prior to proceeding.

2) Set up wet/dry vacuum to collect drill cuttings.

3) While wearing PPE, drill a 1½-inch diameter hole into the concrete slab to a depth of approximately 1 3/4 inches. Pre-marking the desired depth on the drill

bit with tape will assist in this process.

4) Remove cuttings from the hole and place the Drilling Guide in the hole with the conical end down (Figure 3). The hole is sufficiently deep if the flange of the Drilling Guide lies flush with the surface of the slab. Deepen the hole as necessary, but avoid drilling more than 2 inches into the slab, as the threads on the Secure Cover may not engage properly with the threads on the VAPOR PIN®.

Figure 3. Testing Depth with the Drilling Guide

5) When the 1½-inch diameter hole is drilled to the proper depth, replace the drill bit with a 5/8-inch diameter bit, insert the bit through the Drilling Guide (Figure 4), and drill through the slab. The Drilling Guide will help to center the hole for the VAPOR PIN®, and keep the hole perpendicular to the slab.

6) Remove the bit and drilling guide, clean the hole, and install the VAPOR PIN® in accordance with the SOP "Installation and Extraction of the VAPOR PIN®.

Figure 4. Using the Drilling Guide

7) Screw the Secure Cover onto the VAPOR PIN® and tighten using a #14 spanner wrench by rotating it clockwise (Figure 5). Rotate the cover counter clockwise to remove it for subsequent access.

Figure 5. Tightening the Secured Cover

Limitations:

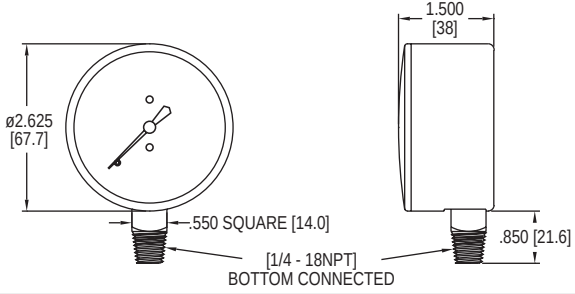
On slabs less than 3 inches thick, it may be difficult to obtain a good seal in a flush mount configuration with the VAPOR PIN.®

ATTACHMENT C

SERIES LPG4

2.5″ LOW PRESSURE GAGE

1.5% Full-Scale Accuracy in a 2.5″ Gage



Our **Series LPG4 2.5″ Low Pressure Gage** offers top of the line performance and accuracy for pressure and vacuum applications up to and including 160 in w.c. The LPG4 is constructed from a single beryllium-copper diaphragm affixed to a precision-machined brass plate. This innovative design, together with a high-precision, milled-teeth brass movement and nickel-silver pinion and bearing surface, provide the user with a top of the line low pressure instrument.

FEATURES/BENEFITS
- Low pressure gage provides a selection to meet specific applications
- Specified with high ambient and process temperature ratings mean more robust uses and longer service-life
- High accuracy gage for applications requiring more precise measurement is a concern

APPLICATIONS
- Air flow indication
- Liquid level
- Draft measurement

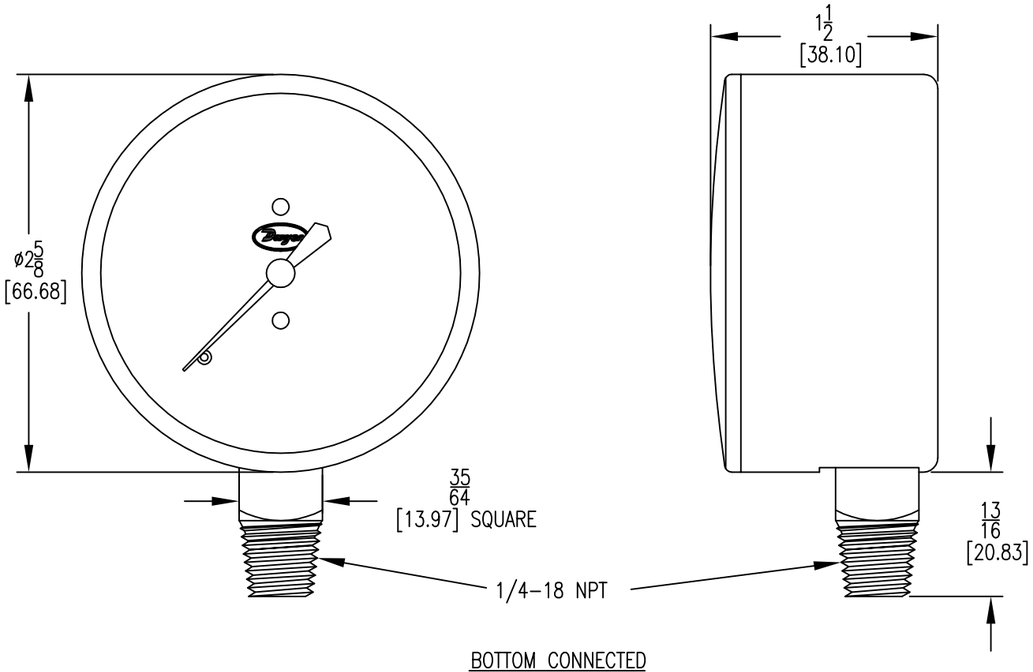
SPECIFICATIONS	
Service: Compatible gases and liquids. **Wetted Materials:** Brass and beryllium copper. **Housing:** Drawn steel, black finish. **Lens:** Polycarbonate (removable). **Accuracy:** ±1.5% FS. **Pressure Limit:** 100% of range scale.	**Temperature Limits:** Process: -40 to 160°F (-40 to 70°C); Ambient: -40 to 140°F (-40 to 60°C). **Size:** 2.5″ (63 mm). **Process Connections:** 1/4″ male NPT. **Enclosure Rating:** NEMA 3 (IP54). **Weight:** 7.3 oz (0.21 kg).

MODEL CHART

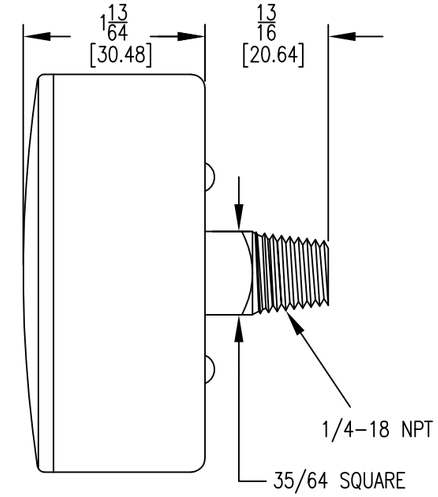
Model	Range	Model	Range
LPG4-D7122N	-10 to 0 in w.c. (-2.5 to 0 kPa)	**LPG4-D8322N**	0 to 40 in w.c. (0 to 10 kPa)
LPG4-D7222N	-15 to 0 in w.c. (-4 to 0 kPa)	**LPG4-D8422N**	0 to 60 in w.c. (0 to 15 kPa)
LPG4-D7322N	-25 to 0 in w.c. (-6 to 0 kPa)	**LPG4-D8522N**	0 to 80 in w.c. (0 to 20 kPa)
LPG4-D7422N	-40 to 0 in w.c. (-10 to 0 kPa)	**LPG4-D8622N**	0 to 100 in w.c. (0 to 25 kPa)
LPG4-D7522N	-60 to 0 in w.c. (-15 to 0 kPa)	**LPG4-D8722N**	0 to 160 in w.c. (0 to 40 kPa)
LPG4-D7622N	-80 to 0 in w.c. (-20 to 0 kPa)	**LPG4-D8922N**	-4 to 0 to 6 in w.c. (-1 to 0 to 1.5 kPa)
LPG4-D7722N	-100 to 0 in w.c. (-25 to 0 kPa)	**LPG4-D9022N**	-6 to 0 to 10 in w.c. (-1.5 to 0 to 2.5 kPa)
LPG4-D7822N	-160 to 0 in w.c. (-40 to 0 kPa)	**LPG4-D9122N**	-8 to 0 to 16 in w.c. (-2 to 0 to 4 kPa)
LPG4-D7922N	-235 to 0 in w.c. (-60 to 0 kPa)	**LPG4-D9222N**	-16 to 0 to 24 in w.c. (-4 to 0 to 6 kPa)
LPG4-D8022N	0 to 10 in w.c. (0 to 2.5 kPa)	**LPG4-D9322N**	-24 to 0 to 40 in w.c. (-6 to 0 to 10 kPa)
LPG4-D8122N	0 to 15 in w.c. (0 to 3.75 kPa)	**LPG4-D9422N**	-30 to 0 to 50 in w.c. (-7.5 to 0 to 12.5 kPa)
LPG4-D8222N	0 to 25 in w.c. (0 to 6 kPa)	**LPG4-D9522N**	-40 to 0 to 60 in w.c. (-10 to 0 to 15.0 kPa)

OPTIONS	
Use order code:	**Description**
NISTCAL-PG1	NIST traceable calibration certificate

USA: California Proposition 65
⚠WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov



BOTTOM CONNECTED



BACK CONNECTED

Ⓒ = CRITICAL DIMENSION
STANDARD TOLERANCES UNLESS NOTED:
ALL DECIMAL DIMENSIONS ± .005
ALL ANGLES ± 1°

SCALE 1:1

NO.	CHANGES	BY/DATE

DATE
DWN BY
CHKD
APPD

NAME
LPG4 SERIES
2.5" LOW PRESSURE GAGE
ACAD2002

MATERIAL
FINISH

DWYER INSTRUMENTS, INC.
MICHIGAN CITY, INDIANA 46360 U.S.A.

FR. NO.

APPENDIX B

Laboratory Certification and Analytical Method Information

EnviroTrac
Environmental Services

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2022
Issued April 01, 2021
Revised April 13, 2021

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. JON WALSH
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 POTABLE WATER
All approved analytes are listed below:

Perfluorinated Alkyl Acids

Perfluorooctanesulfonic acid (PFOS)	EPA 537
	EPA 537.1
Perfluorooctanoic acid (PFOA)	EPA 537
	EPA 537.1

NEW YORK STATE OF OPPORTUNITY. Department of Health

Serial No.: 63520

NELAP RECOGNIZED TNI ACCREDITATION BODY

Analytical Method Information

Printed: 07/12/2021 3:42 pm

Volatile Organics, EPA TO15 Full List in Air (EPA TO-15)

Preservation: None Required

Container: 12_Summa Canister, 6 Liter **Amount Required:** 6 L **Hold Time:** 30 days

Analyte	MDL	Reporting Limit	Surrogate %Rec	Duplicate RPD	----Matrix Spike---- %Rec	RPD	--Blank Spike / LCS-- %Rec	RPD
1,1,1,2-Tetrachloroethane	0.059	0.10 ppbv		25			70-130	
1,1,1-Trichloroethane	0.084	0.10 ppbv		25			70-130	
1,1,2,2-Tetrachloroethane	0.048	0.10 ppbv		25			70-130	
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	0.096	0.10 ppbv		25			70-130	
1,1,2-Trichloroethane	0.043	0.10 ppbv		25			70-130	
1,1-Dichloroethane	0.083	0.10 ppbv		25			70-130	
1,1-Dichloroethylene	0.025	0.025 ppbv		25			70-130	
1,2,4-Trichlorobenzene	0.079	0.10 ppbv		25			70-130	
1,2,4-Trimethylbenzene	0.060	0.10 ppbv		25			70-130	
1,2-Dibromoethane	0.040	0.10 ppbv		25			70-130	
1,2-Dichlorobenzene	0.065	0.10 ppbv		25			70-130	
1,2-Dichloroethane	0.062	0.10 ppbv		25			70-130	
1,2-Dichloropropane	0.051	0.10 ppbv		25			70-130	
1,2-Dichlorotetrafluoroethane	0.098	0.10 ppbv		25			70-130	
1,3,5-Trimethylbenzene	0.054	0.10 ppbv		25			70-130	
1,3-Butadiene	0.038	0.30 ppbv		25			70-130	
1,3-Dichlorobenzene	0.067	0.10 ppbv		25			70-130	
1,3-Dichloropropane	0.031	0.10 ppbv		25			70-130	
1,4-Dichlorobenzene	0.060	0.10 ppbv		25			70-130	
1,4-Dioxane	0.083	0.20 ppbv		25			70-130	
2-Butanone	0.059	0.10 ppbv		25			70-130	
2-Hexanone	0.041	0.20 ppbv		25			70-130	
3-Chloropropene	0.076	0.50 ppbv		25			70-130	
4-Methyl-2-pentanone	0.085	0.10 ppbv		25			70-130	
Acetone	0.098	0.20 ppbv		25			70-130	
Acrolein	0.097	0.10 ppbv		25			70-130	
Acrylonitrile	0.079	0.10 ppbv		25			70-130	
Benzene	0.099	0.10 ppbv		25			70-130	
Benzyl chloride	0.054	0.10 ppbv		25			70-130	
Bromodichloromethane	0.034	0.10 ppbv		25			70-130	
Bromoform	0.049	0.10 ppbv		25			70-130	
Bromomethane	0.098	0.10 ppbv		25			70-130	
Carbon disulfide	0.094	0.10 ppbv		25			70-130	
Carbon tetrachloride	0.025	0.025 ppbv		25			70-130	
Chlorobenzene	0.056	0.10 ppbv		25			70-130	
Chloroethane	0.064	0.10 ppbv		25			70-130	
Chloroform	0.092	0.10 ppbv		25			70-130	
Chloromethane	0.049	0.10 ppbv		25			70-130	
cis-1,2-Dichloroethylene	0.025	0.025 ppbv		25			70-130	
cis-1,3-Dichloropropylene	0.041	0.10 ppbv		25			70-130	
Cyclohexane	0.086	0.10 ppbv		25			70-130	
Dibromochloromethane	0.049	0.10 ppbv		25			70-130	
Dichlorodifluoromethane	0.090	0.10 ppbv		25			70-130	
Ethanol	0.10	0.10 ppbv		25			70-130	
Ethyl acetate	0.068	0.20 ppbv		25			70-130	
Ethyl Benzene	0.069	0.10 ppbv		25			70-130	
Hexachlorobutadiene	0.085	0.10 ppbv		25			70-130	
Isopropanol	0.096	0.20 ppbv		25			70-130	
Isopropylbenzene	0.059	0.10 ppbv		25			70-130	
Methyl Methacrylate	0.031	0.10 ppbv		25			70-130	
Methyl tert-butyl ether (MTBE)	0.097	0.10 ppbv		25			70-130	
Methylene chloride	0.070	0.20 ppbv		25			70-130	
Naphthalene	0.097	0.20 ppbv		25			70-130	

Analytical Method Information

Printed: 07/12/2021 3:42 pm

(Continued)

Volatile Organics, EPA TO15 Full List in Air (EPA TO-15) (Continued)

Analyte	MDL	Reporting Limit	Surrogate %Rec	Duplicate RPD	----Matrix Spike---- %Rec	RPD	--Blank Spike / LCS-- %Rec	RPD
n-Butylbenzene	0.054	0.10 ppbv		25			70-130	
n-Heptane	0.043	0.10 ppbv		25			70-130	
n-Hexane	0.080	0.10 ppbv		25			70-130	
n-Propylbenzene	0.093	0.10 ppbv		25			70-130	
o-Xylene	0.024	0.10 ppbv		25			70-130	
p- & m- Xylenes	0.14	0.20 ppbv		25			70-130	
p-Ethyltoluene	0.076	0.10 ppbv		25			70-130	
p-Isopropyltoluene	0.030	0.10 ppbv		25			70-130	
Propylene	0.042	0.10 ppbv		25			70-130	
sec-Butylbenzene	0.056	0.10 ppbv		25			70-130	
Styrene	0.059	0.10 ppbv		25			70-130	
tert-Butylbenzene	0.051	0.10 ppbv		25			70-130	
Tetrachloroethylene	0.049	0.10 ppbv		25			70-130	
Tetrahydrofuran	0.053	0.20 ppbv		25			70-130	
Toluene	0.059	0.10 ppbv		25			70-130	
trans-1,2-Dichloroethylene	0.079	0.10 ppbv		25			70-130	
trans-1,3-Dichloropropylene	0.092	0.10 ppbv		25			70-130	
Trichloroethylene	0.025	0.025 ppbv		25			70-130	
Trichlorofluoromethane (Freon 11)	0.076	0.10 ppbv		25			70-130	
Vinyl acetate	0.062	0.10 ppbv		25			70-130	
Vinyl bromide	0.096	0.10 ppbv		25			70-130	
Vinyl Chloride	0.044	0.050 ppbv		25			70-130	
Xylenes, Total	0.17	0.30 ppbv						
Tentatively Identified Compounds								
Bromochloromethane								
ISTD: 1,4-Difluorobenzene								
ISTD: d5-Chlorobenzene								

APPENDIX C

Health and Safety Plan

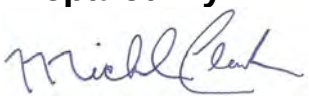
HEALTH AND SAFETY PLAN

Sub-slab Depressurization System (SSDS) Installation

291 Richardson Street
Brooklyn, New York

Prepared for:
CR 17 LLC
1036 Manhattan Avenue
Brooklyn, New York 11222

Prepared By:



EnviroTrac Ltd.
Michael Clark, Director Health and Safety

September 9, 2021

TABLE OF CONTENTS

LIST OF APPENDICES

1.0 INTRODUCTION

This Health and Safety Plan (HASP) has been prepared by EnviroTrac Ltd. (ET) to address the health and safety issues during the installation of the sub-slab depressurization system (SSDS) which includes the removal of the floor slab and surface soil to an approximately depth of two (2) to three (3) feet below grade at three (3) locations within the building at 291 Richardson Street, Brooklyn, NY (the Site). The procedures in this HASP were developed in accordance with the Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HazWOPER) Standard 29 CFR 1910.120 to protect site workers, the public, and the environment.

2.0 OBJECTIVES

The objective of this HASP is to protect on-Site worker health and safety during field activities at each site as well as the welfare of the public and the environment. The health and safety procedures in this plan have been established based on analysis of potential hazards on the Site and the activities/tasks associated with the work in order to alleviate the risks associated with the work to be performed. These procedures have been designed to meet the following objectives:

1. Provide for the identification, recognition, evaluation, and control of health, safety, and environmental hazards;
2. Develop Site specific procedures so personnel are not exposed to avoidable risks, accidents, or injuries in the performance of their duties;
3. Establish site specific monitoring and personal protection requirements to address exposure issues from potentially hazardous substances; and
4. Identify the roles and responsibilities of on-site and support personnel for the project.

3.0 SITE CHARACTERIZATION

The Site is located at 291 Richardson Street, in the Greenpoint/East Williamsburg Industrial section of Brooklyn, New York (**Figure 1**) and is identified as Block No. 2849 Lot 120. The Site is located on the north site of Richardson Street and measures approximately 0.08 acres in size. One, single story, 2,375-square foot building occupies the property. The slab-on-grade building was constructed circa 1970 and occupies the entire northern portion of the parcel while the remaining southern portion is entirely paved with concrete.

The 0.08-acre site was formerly part of a larger, NYSDEC Class 2 Inactive Hazardous Waste Site known as the Former Goodman Brothers Steel Drum Company property. The Goodman Bros. property, listed as NYSDEC Site Number 224211, is located on the south side of Division Place between Kingsland and Debevoise Avenues, and is identified as 18 Division Place on the NYSDEC Environmental Site Remediation database.

The Site and surrounding area are zoned as M1-1, which permits industrial and manufacturing uses. The Site is currently occupied, the specific use in warehousing. The surrounding parcels are currently used for a combination of commercial and industrial purposes. The nearest residential property abuts the Site to the east. Based upon review of the NYSDEC Environmental Zone (Enzone) map, the Site is not in an En-zone.

The near surface geology in the Greenpoint portion of the Brooklyn is similar to other heavily developed areas found in this region. The Site and surrounding area surficial geology is generally considered “urban land” and is characterized by a non-homogenous distribution of soil and fill types classically referred to as historic fill. Excavation and backfilling for building foundations, utility conduits, railway systems, and other construction has resulted in a varied subsurface profile. No bedrock outcroppings are expected at the Site.

Based upon soil boring data collected during previous investigations, groundwater at the Site was not encountered in soil borings up to a depth of 15-feet below ground surface (bgs). Site geology consisted of silty and clayey sands. The nearest body of water is Newtown Creek, located approximately 0.75 mile to the east. Therefore, groundwater flow is estimated to be towards the east or southeast.

The operations at the Former Goodman Bros. property, including 291 Richardson Street (the Site), from approximately 1909 through 2004, consisted of the reconditioning and recycling of used steel drums. Available records listed the Former Goodman Bros. property as a former Resource Conservation and Recovery Act (RCRA) Large Quantity Generator of F001 wastes [including spent halogenated solvents used in degreasing: tetrachloroethylene (PCE), trichloroethylene (TCE), methylene chloride, 1,1,1-TCE, carbon tetrachloride, and chlorinated fluorocarbons].

The Site was sold by Goodman Brothers on December 9, 2004, to Richmond Properties and subsequently occupied by the general contractor MMY Construction (MMY). The Site was utilized by MMY for the storage of tools and construction equipment such as scaffolding and ladders from 2004 until June 2018. Following MMY, the Site was occupied and utilized by Windmill Studios, a commercial film and television studio through February 2019. The Site is currently occupied by the custom marble wholesaler AFP Custom Marble, from June 1, 2019, to the present.

The scope of work is outlined in the Interim Remedial Measures (IRM) Work Plan and consists of the installation of a SSDS within the Site building. The SSDS Plan is provided in **Figure 2**.

4.0 WORK DESCRIPTION

Installation of a SSDS will mitigate potential soil vapor intrusion (SVI) impacts within the Site building. A total of three (3) vapor extraction wells will be installed in the building. The wells will be constructed of four (4) inch diameter no-hub cast iron pipe above grade, and four (4) inch diameter 20-slot schedule 40 PVC pipe below grade. The wells will be connected to a Radon Away Fan located on the roof and the effluent will discharge to the outdoor air, approximately two (2) feet above the roof line of the building and 10 feet from any air intake.

4.1 *PERSONNEL RESPONSIBILITIES*

Responsibilities of Personnel		
Position	**Job Description**	**Interactions**
Tracy Wall, PG (ET) **Project Manager**	Responsible for technical and administrative performance of the project. Supports Site Supervisor and is available to them at all times. Will visit the Site periodically, or as necessary. Reports progress of project on a regular basis. Assigns key personnel, and identifies requests, secures, and monitors use of resources for project. Supervises all on-Site personnel and subcontractors. Coordinates daily Site-specific work efforts, and ensures all activities are in strict compliance with Site-specific health and safety plan. Has authority to suspend all work that possesses any health and safety risk. Briefs subordinate technical personnel on task requirements. Identifies and resolves technical problems. Provides periodic review of project progress.	Is responsible to manage the project for EnviroTrac.
To Be Determined (ET) **Site Health & Safety Officer (SHSO)**	Assures compliance with HASP. Instructs Site personnel in health and safety procedures through daily pre-work meetings. Performs any monitoring activities as required. Has authority to discontinue Site operations if safety violations exist.	Reports directly to Project Manager. Works closely with Director, Health & Safety, and Site Supervisor.
Mr. Michael Clark (ET) **Director, Health & Safety (DHS)**	Develops, implements, and enforces the on-Site safety project. Oversees all health and safety aspects of project, conducts periodic audits to ensure compliance. Available at all times to discuss project progress and health and safety related issues.	Reports directly to President/CEO of EnviroTrac. Works closely with Project Manager, Site Supervisor, and SHSO.

All Site personnel and contract workers will have received the appropriate level of training necessary to perform applicable duties and comply with 29 CFR 1910.120 (aka: HazWOPER). For this project, training requirements are listed in SECTION 6 – PERSONNEL TRAINING of this HASP.

This HASP will be available to all on-Site personnel, subcontractors, and visitors who access the work zone. Personnel responsible for HASP monitoring during on-Site activities will be responsible for informing the field workers, subcontractors, and visitors of any changes in conditions and/or levels of protection required in the work zone.

4.2 ***Exposure Hazard Evaluation***

Contaminant(s) of Concern: Chlorinated Volatile Organic Compounds (CVOCs)

Soil

Soil samples were collected from the Site during the Draft Resources Conservation and Recovery Act (RCRA) Facility Closure Plan (2003), Phase II Environmental Site Assessment (ESA) (2018), Remedial Investigation (RI) Soil and Groundwater Investigation (2021), and data collected from the adjoining Former Goodman Steel Drum Co. to the north of the Site were also reviewed and included in the Phase I Remedial Investigation Report (2020). The soil sampling results for the Site showed that chlorinated volatile organic compounds (CVOCs), petroleum VOCs, one (1) polychlorinated biphenyl (PCB), semi-volatile organic compounds (SVOCs), metals, and pesticides were detected above their respective New York State Department of Environmental Conservation (NYSDEC) Commercial Use Soil Cleanup Objectives (CUSCOs), NYSDEC Restricted Residential Use Soil Cleanup Objectives (RRUSCOs), or NYSDEC Unrestricted Use Soil Cleanup Objectives (UUSCOs). Arochlor 1254 (PCB) and mercury exceeded their respective NYSDEC CUSCOs. Tetrachloroethylene (PCE), mercury, and manganese exceeded their respective NYSDEC RRUSCOs. The remaining exceedances were detected above their NYSDEC UUSCOs.

Groundwater

Groundwater sample data collected from the Site and off-Site (adjoining Former Goodman Brothers Steel Drum Co.) during the Draft RCRA Facility Closure Plan (2003) and RI Soil and Groundwater Investigation (2021) was reviewed and summarized. Groundwater sample data also collected from off-Site (adjoining Former Goodman Brothers Steel Drum Co.) was also reviewed and included in the Phase I Remedial Investigation Report (2020). The groundwater monitoring results for the Site in 2003 and 2021 showed that several CVOCs, including PCE, and petroleum VOCs were detected in the groundwater samples above their respective NYSDEC Class GA Ambient Water Quality Standards (Groundwater Standards). The groundwater monitoring results for the adjoining Former Goodman Steel Drum Co. and surrounding areas showed that several CVOCs, petroleum VOCs, SVOCs, metals, and pesticides were detected at concentrations above their respective NYSDEC Groundwater Standards.

Soil Vapor Intrusion

A soil vapor intrusion (SVI) investigation was conducted at the adjoining Former Goodman Brothers Steel Drum Co. from April to August 2019. The most impacted area was the northern portion of the adjoining property. Seven (7) out of 10 sampling locations indicated that mitigation was required when results were compared to the New York State Department of Health (NYSDOH) Decision Matrices.

A SVI investigation was conducted at the Site in March 2021 and included three (3) sub-slab soil vapor samples within the building, one (1) permanent soil vapor point within the front concrete area, two (2)

indoor air samples, and one (1) outdoor air sample. The results showed elevated levels of CVOCs in the sub-slab beneath the Site building, beneath the front concrete area, and within the indoor air within the Site building. The indoor air results were compared to the NYSDOH Air Guideline Values. Indoor air exceedances were reported for PCE and TCE. The results were also compared to the NYSDOH Decision Matrices, which indicated that mitigation was required for the Site building.

Potential routes by which workers could be exposed generally include inhalation, ingestion, dermal contact, and injection. The following control measures will be used alleviate exposure by routes of entry:

Control of Potential Exposure by Route of Entry

Route of Entry	Control of Potential Exposure
INHALATION	Tasks associated with this project should not reasonably have a risk of exposure to inhalation hazards at or near published exposure limits and therefore, respiratory protection is not required during any task associated with this work. Dust generated from concrete during cutting, drilling, etc. is to be controlled by using wet methods while conducted any dust generating activities. If wet methods cannot be used, or if dust is not controlled using wet methods, then workers will be supplied and wear NIOSH certified N-95 (or better) filtering facepiece (aka, dust mask) If there is a change in scope of work or environmental conditions, the SHSO will stop work and the new conditions will be evaluated for potential inhalation hazards. Work will not proceed until the new conditions are assessed and workers health is addressed.
INGESTION	Tasks associated with this project have a risk of exposure to chemicals or hazardous substances that pose mild to moderate toxicity if ingested. To control exposure, the following precautions will be followed by all site workers and visitors: • **Follow good hygiene practices - wash hands, face, and exposed skin with soap and water after work and prior to eating, drinking, smoking, or applying cosmetics or lip balm, or immediately after contact with chemicals or hazardous substances. Do not touch mouth, nose, or eyes with unwashed hands or with used gloves.** • **Chemical-resistant gloves (e.g., nitrile, neoprene, or butyl rubber gloves) are to be worn during hands-on inspections, removing liquid or cleaning, handling chemicals or hazardous substances, or during other tasks that involve direct contact with chemicals or hazardous substances.**
DERMAL CONTACT	Tasks associated with this project have a risk of exposure to chemicals or hazardous substances that pose mild to moderate toxicity through dermal contact, including contact with eyes. To control exposure, the following precautions will be followed by all site workers and visitors: • **Follow good hygiene practices - wash hands, face, and exposed skin with soap and water after work and prior to eating, drinking, smoking, or applying cosmetics or lip balm, or immediately after contact with chemicals or hazardous substances. Do not touch mouth, nose, or eyes with unwashed hands or with used gloves.** • **Safety glasses with side shields that comply with ANSI Z87.1 requirements are to be worn at all times in the work zone.** • **Chemical-resistant gloves (e.g., nitrile) are to be worn during hands-on inspections, removing liquid or cleaning, handling chemicals or**

	hazardous substances, or during other tasks that involve direct contact with chemicals or hazardous substances. • **Safety shoes/boots that comply with ANSI Z41, ASTM F-2412, or ASTM F-2413 are to be worn when there is a danger of foot injuries due to falling or rolling objects, or objects piercing the sole.** • **Long pants and sleeved shirts are required to be worn at all times in the work zone.**
INJECTION	Tasks associated with this project have a risk of exposure to chemicals, hazardous substances, and biological hazards that pose mild to moderate toxicity through injection. Injection is the puncturing or abrasion of the skin allowing toxins to enter the body. To control exposure, the following precautions will be followed by all site workers and visitors: • **Abrasive-resistant or cut-resistant gloves (i.e., leather, Mechanix®, Kevlar-type, etc.) are to be worn while working with tools or manipulating objects that can cause cuts or abrasions to the hands.** • **Chemical-resistant gloves (e.g., nitrile) are to be worn during hands-on inspections, removing liquid or cleaning, handling chemicals or hazardous substances, or during other tasks that could result in direct contact with chemicals or hazardous substances.** • **Safety glasses with side shields that comply with ANSI Z87.1 requirements are to be worn at all times in the work zone.** • **Long pants and sleeved shirt are required to be worn at all times in the work zone.** • **Safety shoes/boots that comply with ANSI Z41, ASTM F-2412, or ASTM F-2413 are to be worn when there is a danger of foot injuries due to falling or rolling objects, or objects piercing the sole.**

4.3 *Site / Operational Hazard Evaluation*

Precautions must be taken to prevent injuries and exposures to the following potential hazards and implement control measure to reduce any potential risks identified on the next table.

Potential Site Hazards and Risk Characterization		
Hazards	**Risk Characterizations**	**Control Measures**
SLIP/TRIP/FALL	Potential wet, or slippery conditions due to weather, on-site spills, on-site water, and drainage/runoff.	**Inspect/be aware of ground conditions and wet or slippery conditions.** **Use PPE to alleviate hazards, good boots, laced and tied; take small steps in slippery conditions, install handrails, or use walking devices, like hiking poles.** **Use salt, calcium chloride, sand, or other material to alleviate slippery conditions and/or to melt snow/ice.**

	Potential slips, trips, and falls may result due to the proposed equipment and activities at the Site like drilling / excavation, well installation, system installation, loading/unloading, traffic control, etc.	**Clear trip hazards, when possible.** **Use good housekeeping practices and maintain the work zone free of debris and have equipment, supplies, and tools organized and out of main travel paths.** **Focus on path of travel and keep solid footing. Install handrails, steps, ramps, etc. to alleviate trip or fall hazards.**
INJURY TO BACK	Moving / lifting / carrying supplies, equipment, and materials around the work zone. Performing manual equipment operations such as shoveling, sweeping, raking, pushing (such as a wheelbarrow), hand auguring, etc. Removal of well covers, manway covers, or manholes. Lifting and maneuvering cones and barriers to establish Work Zone Protection.	**Use proper lifting techniques: lift with legs, not back; keep load close to the body; do not twist torso, turn by moving your feet.** **Use proper bending techniques: bend at the knees, straighten back, lift, and pull using legs, and do not use back or shoulders to lift up or pull.** **Use proper manual equipment techniques for shoveling, raking, sweeping turn by moving your feet, do not twist torso, use legs not back** **take breaks as needed to alleviate muscle and joint strain.** **Get help or use mechanical lifting equipment when loads exceed 50 lbs or as needed.**
INJURY TO FOOT/FEET	Injury from moving or dropping of equipment, supplies, drums, tanks, and buckets onto foot/feet. Feet being run over by vehicles or being crushed from lowering equipment like a tailgate lift or equipment footing.	**Wear ANSI/ASTM compliant safety boots with steel, composite, or aluminum toes while performing any tasks on site.** **Properly secure equipment and objects. Anticipate and recognize any potential conditions which may cause the dropping of equipment (i.e., ground conditions and wet, icy, or slippery conditions).** **Ensure proper clearance when lowering outriggers on equipment.**

INJURY TO HANDS	Sharps including glass, pieces of metal, wood, plastic, etc. during clean up and debris removal process. Potential pinch points/sharp edges during equipment handling, dropping of equipment on hands. Exposure to hazardous substances from the material stored in the tanks or possible contamination in soil/ground water.	**Debris should not be handled, use shovels, dust pans, etc., to pick up debris. If debris is required to be handled, use cut-resistant gloves (e.g., Kevlar).** **Abrasive-resistant or cut-resistant gloves (e.g., leather, Kevlar, etc.) are to be worn while working with tools, equipment, or manipulating objects that can cause cuts or abrasions to the hands.** **Wear chemical-resistant gloves (e.g., nitrile, neoprene, or butyl rubber gloves) during hands-on inspections, removing liquid or cleaning, handling chemicals or hazardous substances, or during other tasks that involve direct contact with chemicals or hazardous substances.**
INJURY TO HEAD AND EYES	Potential of being struck by overhead equipment such as drill rigs, or other equipment, material, and supplies around work site. Potential projectiles from equipment or surrounding environmental and remediation chemical spills during the proposed monitoring/sampling/injection activities. Potential of being sprayed or splashed in eyes or face while using liquid chemicals under pressure, such as subsurface injection of sodium permanganate. Potential of projectiles impacting face and eyes during preclearing of boreholes.	**Wear a hard hat in compliance with ET's Hard Hat Policy while in the Work Zone (certified ANSI Z89.1)** **Safety glasses with side shields that comply with ANSI Z87.1 requirements are to be worn at all times in the work zone.** **Full faceshield attached to the hard hat <u>in addition</u> to safety glasses with side shields that comply with ANSI Z87.1 requirements are to be worn while using airknife for preclearing, working with liquid chemicals, or similar activities that require the protection offered by a full faceshield.**

INJURY TO HEARING	Potential noise due to operating equipment during the proposed activities will not exceed the following levels at the designated durations: Duration — Decibel Levels. (dB) (hrs.) 8 — 90 6 — 92 4 — 95 3 — 97 2 — 100 1.5 — 102 1 — 105 0.5 — 110 <0.25 — 115	**Wear appropriate ear protection, such as:** **Ear Plugs:** **3M™ E-A-R™ Push-Ins™ corded foam earplugs (NRR 28 dB)** **Earmuffs:** **MSA Cap Mounted Earmuff Model: 10087422 (NRR 28)**
WORK IN HOT WEATHER CONDITIONS	Potential heat stress due to the warmer weather conditions (generally) late Spring through the Summer and into late Fall. Indoor and enclosed environments can produce heat stress related to activity, temperature, and lack of ventilation. Working in protective suites including Tyvek, Saranex, FRC, and Level A and Level B PPE. Chemical protective suites will attribute to heat stress in any weather and temperature conditions.	**Review weather forecast prior to going to site and plan accordingly.** **Use appropriate hot weather work apparel.** **Have fluids available on-site and ensure employees are hydrated, take frequent breaks in shade or air-conditioned space, accordingly.** **Review OSHA Quick Card for: protecting Workers from Heat Stress.** **Follow requirements or EnviroTrac's Heat/Cold Stress Program.**

WORK IN COLD WEATHER CONDITIONS	Potential cold stress due to the cooler weather conditions (generally) late Fall through the Winter and into Spring. NOTE: Contact with water, being wet, and wet conditions (including rain) will exacerbate cold.	**Review weather forecast prior to going to site and plan accordingly.** **Cold conditions effect reaction time and decision making.** **Use appropriate protection from cold weather conditions including insulated gloves, neck, and head coverings, insulated socks, and layering of clothing. Take breaks in warm areas as necessary.** **Protect from water and other wet conditions that can exacerbate cold conditions. Employees are not work in wet clothing.** **Review OSHA Quick Card for: protecting workers from Cold Stress.** **Follow requirements or EnviroTrac's Heat/Cold Stress Program.**
PRE-CLEARING BOREHOLE	Potential to be struck-by debris from air stream Body part can be injured if contacts vacuum from vacuum extractor. Slips, trips from hoses and equipment, fall into bore hole.	**Use face shield attached to hardhat along with safety glasses when preclearing.** **Place a debris catcher, such as a traffic cone, over borehole while pre-clearing to alleviate the amount of debris from hole** **Use good housekeeping and keep hoses, equipment, and materials in order, mark location of bore hole and cover when not actively clearing.** **Do not let intake hose of vacuum extractor come in contact with body part. Shut off equipment when not actively**
HAMMER DRILL USE	Potential injury from moving or vibrating equipment. Damage to hearing from excess noise generated. Potential injury from being struck by hammer drill. Possible injury or fatigue from vibration during use of hammer drill.	**Trained and experienced employees are to operate the hammer drill. Keep hands and feet clear of moving parts. Take breaks and/or alternate operators to reduce fatigue.** **Wear hearing protection while operating hammer drill. Other people are to maintain their distance from operations to lessen noise exposure.** **Maintain good grip on tool. Ensure body parts are not in way when releasing equipment.** **Take breaks when experiencing muscle fatigue. Switch workers, if possible, to avoid fatigue.**

EXPOSURE TO HAZARDOUS SUBSTANCES (i.e., CARBON MONOXIDE)	Exposure to carbon monoxide (CO) from the exhaust of fuel burning equipment in enclosed space. An enclosed space is any place where natural air movement is limited and may allow CO concentrations to elevate.	**When fuel burning equipment is used in an enclosed space, the concentration of CO in air is to be continuously measured using a direct reading instrument (i.e., 5-Gas Analyzer, such as MiniRae)** **If CO levels meets or exceeds 25 PPM, work is to STOP, equipment is to be turned off, and employees are to leave the work area until CO levels decrease to below 25 PPM.** **Work is not to proceed until the area is ventilated to allow working conditions below 25 PPM CO.**
EXPOSURE TO HAZARDOUS SUBSTANCES (i.e., SILICA DUST)	Operations that generate dust in silica containing materials (such as concrete, sand, mortar, brick, stone, etc.) can generate silica dust above the OSHA PEL.	**Wet methods are to be used during any operation that has the potential silica dust from concrete, sand, mortar, brick, stone, etc.** **Wet methods include direct wetting of the operation such as drilling, sawing, etc.; or general wetting of the area using a water truck or the like.** **If wet methods cannot be used, for example due to electrical hazards, or if wet methods are not sufficient to eliminate dust, then all personnel in the area are to be supplied and wear NIOSH certified N-96 (or better) filtering facepiece (aka dust mask).** **Water is to be brought on site if not available and water not being available is not a reason to put workers in respiratory protection.**

5.0 SITE CONTROL

5.1 *Site Work Zones*

Due to the low exposure risk of the contaminants of concern, an Exclusion Zone, Contaminate Reduction Zone, or Support Zone will not be required for this project. If site conditions or scope of work changes, work will be stopped and the need to establish zones will be reevaluated.

5.2 *Spill Containment and Control Procedures*

The following procedures should be followed by on-site personnel in the event of a release of vehicle or equipment fluids:

1. Use proper PPE for handling potential chemical exposure including safety glasses with side

shields, nitrile gloves, sleeved shirts, full-length pants, and safety shoes;

2. Control sensitive receptors such as storm drains, surface water, and soil;
3. Prevent further flow of the material;
4. Contain the discharged material;
5. Vacuum, sweep up, or shovel the material and place into a suitable DOT disposal container for isolation for disposal;
6. Thoroughly wash the area after a spill or leak clean-up;
7. Provide adequate ventilation;
8. Keep combustibles away from the spilled material;
9. In case of large spills, follow all facility emergency response procedures.

5.3 *Fire Prevention*

To protect and prevent against accidental fire hazards, safe work practices will be followed:

1. Smoking is prohibited on site and in ET vehicles.
2. In the event of fire, 1) notify all site occupants of fire and to evacuate area, 2) gather at established primary or secondary muster point, and 3) contact emergency services.
3. At least one (1) ABC/BC rated fire extinguisher (minimum 10 lbs) will be available on site and is to be used according to manufacturer's specifications and guidelines. Only trained personnel are to use an extinguisher and only on incipient fires.
4. Follow ET's Practice for *Hot Works* procedures when using primary or secondary source ignition equipment. A PID will be used to detect flammable atmospheres. If flammable atmospheres are detected at or above 10% of the LEL, work will stop, and all sources of ignition will be contained until the source can be determined and eliminated.
5. Keep flammable liquids in closed containers and away from any possible source of ignition (electric service boxes, remediation enclosures, vehicle exhausts).
6. Keep site clean of debris.

5.4 *Control of Hazardous Energy and Underground Facility Identification*

Follow the requirements listed for the Control of Hazardous Energy, including procedures for Lockout/Tagout, in the ET Health & Safety Manual, section 27 – *Control of Hazardous Energy*.

Prior to any ground disturbance activities, both private and public utility mark outs will be conducted and

respected during activities. Soft dig techniques will be used prior to any drilling or excavation activities and follow procedures in the ET Health & Safety Manual, section 28 – *Ground Disturbance* Program.

5.5 *Emergency Notification*

In the event of a personal injury, motor vehicle accident, or other incident, the Site Safety Officer will follow ET's Personal Injury Accident Procedures and/or Motor Vehicle Accident Procedures listed in **Appendix E**. Contact and emergency numbers are also located in **Appendix D**.

Directions to the nearest Hospital and the nearest ET designated contract medical facility are located in **Appendix I**, the last appendix of the HASP. Incidents are to be reported on the ET Incident Reporting form located in **Appendix E**.

5.6 *Site Communications*

Verbal communication will be the primary means of communication. Cell phones and other communications devices will be used as necessary.

5.7 *Site Security*

The area is monitored, and non-essential personnel will not be allowed in the areas of remediation activities. All equipment, materials, and supplies left overnight will be secured to prevent slip/trip/fall hazards. Facility contacts and emergency numbers are also located in **Appendix D**.

5.8 *Traffic Control and Work Zone Protection*

Employees exposed to vehicular traffic on or near active traffic patterns will wear Class 2 high-visibility attire. Traffic at the work zone is to be controlled using proper Work Zone Protection according to the requirements of the Manual on Uniform Traffic Control Devices (MUTCD) and ET Work Zone Protection Practice. Traffic safety cones will be installed during all site activities to control and designate the work exclusion zone on the site. It is the responsibility of all on site personnel to ensure proper safety measures are implemented or adjusted during site activities for worker safety.

5.9 *Site Illumination*

Temporary lighting will be supplied if facility lighting is not sufficient or not available. Temporary lighting is to be connected through GFCI as per ET's Assured Electrical Grounding practice. Flash lights are to be used for illumination as needed. Workers are not to perform tasks in the dark or insufficient lighting.

5.10 *Noise Control*

Follow the requirements listed for the noise control and hearing protection in the ET Health & Safety

Manual, section 20 – *Hearing Protection Program*.

5.11 ***Assured Electrical Grounding***

Any required electrical power connections will be equipped with Ground Fault Circuit Interrupters (GFI/GFCI) at the source of the power. Electrical cords are to be inspected prior to use and not used if the insulation has been compromised or if wires are exposed, if the cord has been kinked, or if the grounding plug is missing.

5.12 ***Lightning Safety Plan***

- Establish a location during Daily Tailgate Safety meeting where people will go in the event lightning or thunderstorms are predicted or possible;
- Use the 30/30 rule – suspend activities when "flash to bang" (lightning to thunder) is within 30 seconds, and resume work 30 minutes after the last flash or bang; and
- Follow the plan without exception.

5.13 ***General Work Rules***

To protect against the occurrence of accidents and dangerous situations, as well as to minimize the potential for emergency events, all on-site personnel shall:

1. Read and sign this HASP prior to beginning of all on-site activities. The HASP will be reviewed periodically by all personnel conducting field activities and visitors to the work zone.
2. Conduct field work only be during daylight hours unless supplemental lighting is provided.
3. Do not eat, drink, or smoke in the work zone.
4. Be knowledgeable in the use of first-aid equipment.
5. Maintain sufficient quantities of absorbent/spill collection materials to address a spill or release that may occur during work.

To minimize the possibility of injuries, the following general precautions will be taken:

1. All hand and power tools will be inspected prior to use and maintained in a safe condition.
2. Safety guards will be kept in place during use.
3. Power tools will be double-insulated, and all electric cords will be connected through GFI protective circuitry.
4. Walkways will be kept clear of equipment, supplies, excavated material, or other obstructions.
5. Proper work gloves will be provided and used, as required.

6. Hard hats are to be worn if required by the location or activity (refer to ET's Hardhat Policy).
7. Sturdy, enclosed work or safety shoes/boots are to be worn, as required by the activity.
8. Employees exposed to vehicular traffic on or near public roads will wear high-visibility attire. Traffic at the work zone is to be controlled using proper Work Zone Protection according to the requirements of the Manual on Uniform Traffic Control Devices (MUTCD).
9. Employees will observe proper lifting techniques and obey sensible lifting limits and get assistance when required.

5.14 *Health and Safety Responsibilities*

All Project Personnel are responsible to:

1. Take all reasonable precautions to prevent injury to themselves, to their fellow employees, and to the public.
2. Implement the requirements of this HASP and report any deviations from the procedures listed or the conditions described.
3. Perform only those tasks that they believe can be done safely and immediately report any accidents, unsafe conditions, or near misses according to ET's On The Job Accident Procedures and complete the required ET Incident Reporting Forms.
4. **Stop Work** whenever the risk associated with the work is not clearly understood, established, or controlled. Work will not commence until the conditions that caused the Stop Work intervention have been addressed, corrected, or resolved. Any and all workers on the site have the authority and responsibility to initiate a stop work intervention.

5.15 *Decontamination*

Follow the requirements listed for the decontamination of personnel and equipment in the ET Health & Safety Manual, section 31 – *Decontamination.*

6.0 PERSONNEL TRAINING

Field team personnel associated with activities that have a potential for exposure to hazardous substances are required to participate in a health and safety training program that complies with the OSHA standard 29 CFR 1910.120 (aka: HazWOPER) and 1910.1200 (aka: HazCom). This program instructs employees on general health and safety principles and procedures, proper operation of monitoring instruments, and use of personnel protective equipment.

In addition, field team personnel must undergo site-specific training prior to the start-up of any given

project or task. As activities change at a particular work site, related training must be provided as necessary. The site-specific training will address potential hazards and associated risks, site operating procedures, emergency response and site control methods to be employed. The following training is required to perform tasks at this site:

TRAINING REQUIREMENTS FOR SITE TASKS	
Task	**Training Required**
General site operations	• OSHA standard 29 CFR 1910.120 (aka: HazWOPER) • OSHA standard 29 CFR 1910.1200 (aka: HazCom) • First Aid/CPR (at least one (1) worker on-site must be certified in First Aid/CPR) • Requirements of ET's Health and Safety Program and this HASP • API WorkSafe certification
Operator of drilling equipment	• The operator of drilling equipment is required to be a Licensed Driller and have proof of license available for inspection at the worksite.
Operator of other heavy equipment	• Training on operations of equipment per manufacturers specifications.
Operation of power equipment including concrete saw, hammer drill, etc.	• Operators will be trained and/or experienced with the operation of power tool use, the hazards, controls, PPE, and use of assured electrical grounding (GFCI). Inexperienced or untrained employees are not to operate power tools.

6.1 *Personal Protective Equipment*

Based on available data, it is anticipated that all field activities will be performed at **Level D protection**. Personal protection at Level D will consist of the following based on task performed:

PERSONAL PROTECTIVE EQUIPMENT BY TASK	
Task	**PPE**
All Site Tasks	• **Hard hats** are to be worn, if required by the location or activity per to ET's Hardhat Policy. • **Safety glasses with side shields** (ANSI Z-87 + certified) or full-face safety shields are to be worn at all times while on-site. • **Proper gloves** will be provided and used, as required. Abrasion resistant gloves (i.e., leather, or similar) and chemical resistant, gauntlet style gloves (i.e., nitrile/neoprene/butyl rubber) will be used as tasks require. • **Safety boots** (ANSI Z-41, ASTM F-249, or ASTM F-2413 compliant) are to be worn, as required by the activity, laced, and tied. • **High-visibility attire**, i.e., Class 2, Safety Vests, are to be worn when employees are exposed to vehicular traffic. • **Long pants and sleeved shirts** will be worn while on site.

6.2 ***First-Aid Supplies and Safety Equipment***

First-Aid supplies will be available to all personnel on site including an eyewash kit/station. All first aid supplies are to be periodically inspected for sufficient quantities and expiration date and restocked accordingly. At least one (1) ABC/BC rated fire extinguisher (minimum 10 lbs) will be available on site and is to be used according to manufacturer's specifications and guidelines. Only trained personnel are to use an extinguisher and only on incipient fires.

6.3 ***Heat Stress / Cold Stress Prevention***

Follow the requirements listed for heat stress and/or cold stress procedures, as climate conditions require, in the ET Health & Safety Manual, section 25 – *Heat Stress / Cold Stress Policy*. OSHA Quick Cards for Heat Stress and Cold Stress are included in **Appendix F**.

7.0 MEDICAL SURVEILLANCE

A medical surveillance program will be instituted for those employees who:

1. are or may be exposed to hazardous substances or health hazards at or above the established permissible exposure limit without regard to the use of respirators, for 30 days or more a year;
2. wear a respirator for 30 days or more a year or as required by 29 CFR 1910.134 (OSHA Respiratory Protection Standard);
3. are injured, become ill, or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation; or
4. are members of HAZMAT teams.

Employees will be medially evaluated and qualified prior to being fit tested for a respirator or prior to being required to enter a confined space. Records will be retained according to legal requirements.

Employees exposed to noise thresholds equal or exceeding an 8-hour time-weighted average of 85 decibels will participate in an audiometric testing program.

All medical and monitoring records will be retained according to legal requirements and available to employees upon request to the Director of Health and Safety.

8.0 CONFINED SPACE ENTRY PROCEDURES

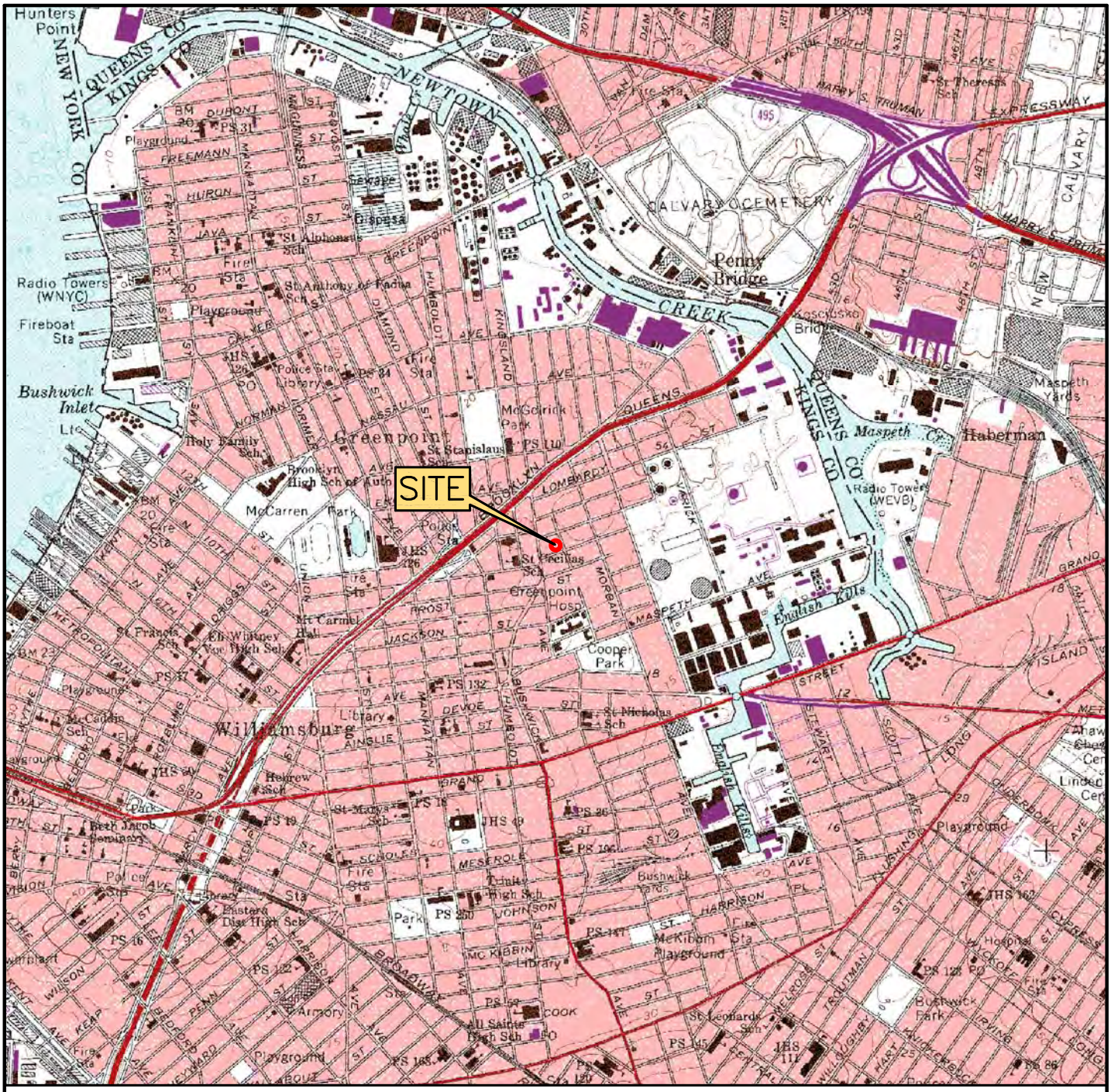
Entry into a confined space is beyond the scope of this project. No employees are to enter a confined space to perform any task associated with this work.

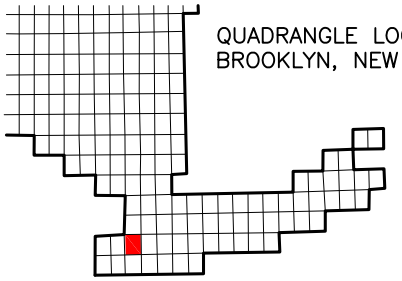
If Confined Space Entry is required, a confined entry safety plan will be developed and a CSE Permit will

be issued prior to allowing employees to enter a confined space.

APPENDIX A

Site Figures





QUADRANGLE LOCATION:
BROOKLYN, NEW YORK

APPROXIMATE ELEVATION:
39 FT.

SOURCE:
USGS 7.5 MINUTE SERIES

N
W E
S

0 2,000 6,000
FEET
1,000 4,000

FIGURE #	U.S.G.S. TOPOGRAPHIC MAP	DRAWN BY: B.S.	EnviroTrac ENVIRONMENTAL SERVICES
1	291 RICHARDSON STREET BROOKLYN, NEW YORK	REVISION DATE: 9/2/2021	5 OLD DOCK ROAD, YAPHANK, NEW YORK 11980 PHONE: (631)924-3001 FAX: (631)924-5001

APPENDIX B

EnviroTrac's Practice

Ground Disturbance Program

28 GROUND DISTURBANCE PROGRAM

28.1 Purpose

To clearly specify under what conditions the employees of EnviroTrac may conduct operations where any indentation, interruption, intrusion, excavation, construction, or other activity results in the penetration of the ground at any depth.

This document also covers the hazards, procedures, and training associated with the entering of trenches and excavations by employees of EnviroTrac, as defined under 29 CFR 1926 Subpart P. It is intended to provide the guidelines that protect employees from the hazards of entrapment and engulfment when working around trenches and excavations.

28.2 Identification of Underground Installations

It is the policy of EnviroTrac that prior to any operations that disturb more than one foot below surface grade that all underground installations are to be identified. Before any ground disturbance activities, available records will be referenced and operator personnel and/or others that may be familiar with the property will be contacted to determine the existence and location of underground installations such as facilities/tanks/pipelines and utilities in the vicinity of the work area to verify, as far as is reasonable and practicable, the existence of known underground installations.

Areas where hand tools are used for ground disturbance operations, such as shovels, hand augers, etc., will be visually assessed for possible underground installations, utilities, and/or facilities. If underground installations are identified as having hazardous energy, such as electrical power, hydraulic pressure, chemical pipe lines, etc., than procedures to control that hazardous energy will be instituted as required in Section 26 – Control of Hazardous Energy Sources (Lockout / Tagout).

Ground disturbance operations that use mechanical equipment pose a greater threat to underground installations. Prior to ground disturbance operations using mechanical equipment, local requirements for identification of underground utilities will be followed, such as notifying a “One Call Center”, “Call Before Your Dig”, etc. or engaging a third party utility mark out contractor. The Regional Safety Coordinator will maintain current underground utility identification requirements for the regional operations.

<u>Exposing Underground Installations</u>

All underground installations within the dig zone or a drill zone will be hand exposed or vacuum excavated (pothole) to sufficiently verify location, line size, and alignment of underground installations. Care has to be taken during the process of exposing underground installations; damage could occur if cautious work procedures are not followed. The process to expose any installations is to be selected based on site conditions/risks.

The pothole(s) will be made large enough and suitably spaced to accurately determine location, depth, orientation, and facility size. The bottom and sides of the pothole are to be adequately illuminated to determine the presence or absence of underground facilities. Visually confirm the presence or absence of underground facilities continuously during potholing. Use a commercial jacking tool or A-frame and winch to extract a hand auger if the force required to extract the tool exceeds personal lifting limits (50 pounds).

Boreholes will be cleared to a minimum of 5 feet and 110 percent of the mechanical drilling tool diameter, or to the client's/facility's requirements, if different. If a boring is located within 2 feet of an underground facility, a protective casing will be placed in the cleared boring prior to mechanical drilling to guide the drilling tool instead of exposing the underground facility.

28.3 Overhead Utilities and other Overhead Hazards

Overhead utilities pose several hazards including electrical shock or burn, electrical arc or blast, and disruption of services provided by the overhead utilities. All work sites will be assessed for hazards associated with the overhead utilities including all means of access to and egress from the site.

In addition, other overhead and low clearance facilities and structures will be evaluated and assessed for hazards associated with the type of work being performed including all means of access to and egress from the site.

For work areas with overhead utilities, all work performed by EnviroTrac personnel or contractors will not violate the **Minimum Approach Distances** specified in the table below:

Nominal voltage in kilovolts (kV)	Distance: Phase to ground exposure
0.05 to 1.0	Avoid contact
1.1 to 15.0	2'-1" (0.64m)
15.1 to 36.0	2'-4" (0.72m)
36.1 to 46.0	2'-7" (0.77m)
46.1 to 72.5	3'-0" (0.90m)
72.6 to 121	3'-2" (0.95m)
138 to 145	3'-7" (1.09m)
161 to 169	4'-0" (1.22m)
230 to 242	5'-3" (1.59m)
345 to 362	8'-6" (2.59m)
500 to 550	11'-3" (3.42m)
764 to 800	14'-11" (4.53m)

Reference Table R-6 in 29 CFR 1910.269(l)(10)

The specific voltage of a line cannot be visually determined strictly by the placement of the line on the utility pole. Contact the local power company to determine specific voltages of power lines if the scope of work or access to or egress from the site could affect overhead utilities.

If Minimum Approach Distances cannot be maintained during the scope of the work, the lines are to be de-energized by the utility company who will need to certify, in writing, that the lines have been de-energized. To prevent damage, provisions will have to be made so de-energized lines are not contacted.

If the scope of work will bring workers or equipment near the Minimum Approach Distances, these areas will be demarcated and/or cordoned off to prevent crossing into unsafe areas. Spotters will be used if demarcation is not sufficient to prevent encroachment into these areas. The sole responsibility of the

spotter will be to warn workers and/or equipment operators that the Minimum Approach Distances may be encroached.

Equipment and vehicles will not be parked overnight or refueled under energized power lines.

In the event of a downed utility line (power or communication), a "circle of safety" will be maintained at a minimum of a 30-foot radius from the downed line. Contact emergency services (911) to report the downed line. Communication lines can become energized when dislodged from the pole or if in contact with power lines.

Other Overhead Hazards

Communication Lines:

Communications lines (generally the lines closest to the ground) usually do not transmit hazardous voltage under normal operating conditions. These lines can cause obstructions that may dislodge loads and/or equipment if contacted. In addition, the company may incur liability for disruption of service if these lines are broken.

Guy Wire:

Guy lines are used to support utility poles and are composed of braded steel cables generally under tension. These lines are not energized under normal operating conditions but may cause damage to equipment or personal injury if contacted.

Demark all Guy Lines in work areas and access to or egress from the site. Spotters will be used if demarcation is not sufficient to prevent contact with Guy Lines.

Building Overhang, Canopies, Bridges, Overpasses, Signs, etc.

In addition to overhead utilities, the project is to be assessed for other overhead hazards that may interfere with the scope of work. These hazards include: canopies, building overhang, signs, bridges, overpass and other hazards. The Project Manager will assess or have the work site assessed for these overhead hazards and include provisions in the work plan to prevent contact, damage, or encroachment of safe Minimum Approach Distances.

28.4 Traffic Control in Construction Sites

Limited space in a construction site increases the potential for worker injury and property damage from vehicle accidents and collisions. To alleviate this, construction sites are to be designed to facilitate vehicle flow and to limit backing.

When vehicles are required to back, a spotter should be used to clear a path of travel. Construction vehicles are to be equipped with a backup beeper. Workers are to wear high visibility apparel (i.e., safety vests), either Class I, II, or III depending on the speed limit of the work site and adjacent traffic areas.

The swing radius of construction equipment is to be demarked so workers are aware of the area and do not enter while equipment is operating. Workers will seek and receive acknowledgement from equipment operators prior to entering the swing radius. Equipment operators will stop operations when workers or equipment enters the swing area.

Operations adjacent to an active traffic area will follow the requirements of EnviroTrac's Work Zone Protection program and the requirements of the USDOT Uniform Traffic Control Manual.

28.5 Environmental Drilling

Work Zone Designation

A Work Zone will be established and controlled around environmental drilling activities that allow only authorized personnel access to the zone. The driller will *Stop Work* when an unauthorized person enters the drilling zone. Follow the procedures listed in the ET Stop Work Practice. The current version of the practice is located on the Safety Portal.

Where open auger operations are used, the driller will establish additional controls such as risk-assessed procedures, signals, an area guard, or other effective means to verify that personnel are clear of the auger any time it is rotating.

Inspection of Drilling Equipment

The driller will inspect the drilling equipment on a daily basis or before each new setup by using an inspection checklist. The inspection will verify that the equipment is in good working order; pressurized hoses are in good condition, and safeguards and kill switches are in place and operational. Any substandard items will be corrected prior to drilling.

Drill Rig Operator

The drill rig operator will remain at the controls unless the rig is shut down. While the drill rig is running, the drill rig operator will not use a mobile phone or radio. The drill rig operator will not wear loose objects or clothing that could inadvertently activate the rig clutch or controls.

Performing Drilling Operations

Prior to conducting drilling operations on site, a Pre-Drilling Site Walkover will be conducted by the drilling operators and a person familiar with the site, preferably the site owner/operator.

During the site walkover, the following will be reviewed, documented, and discussed with the Workforce during the Tailgate Safety Meeting:

- Emergency provisions including the location and operation of emergency shut-offs.
- Ground conditions and topography of locations where drilling rig is to located.
- Overhead utilities and/or obstructions.
- Lay down of materials and supplies including the process to secure of drilling rods and flights, and sampling and waste barrels from falling or rolling.
- Access and egress for the site and muster points in the event of emergency.

If during the site walkover it is determined that the proposed scope of work may impact underground facilities, the project will be re-evaluated for the necessity of data collection versus the risk from impacting underground facilities. If revised or alternative locations are selected, another site walkover will be conducted.

During drilling operations, caution must be taken when drilling between the cleared depth and 20' as underground facilities may still be present. Provisions must be made to communicate during high-noise conditions including the agreement on the meaning of hand signals.

Climbing the Rig

In the event it is necessary to the climb the drilling rig for maintenance or repair, follow procedures listed below:

- If the lowest part of the worker will be higher than 6', Working At Heights provisions will be required and the provisions of the ET Working At Heights practice will be followed.
- If work on the mast is to proceed, the drill rig will be shut down and locked out before any work on the rig, including the mast can proceed.

28.6 Trenching and Excavation

This section defines the conditions under which employees may enter trenches and excavations. The Excavation Awareness Program described herein is based upon the following government regulations and industry standards:

- CFR Title 29 Part 1926 Subpart P - Excavations
- CFR Title 29 Part 1926.650- Scope, applications, definitions
- CFR Title 29 Part 1926.651- General requirements
- CFR Title 29 Part 1926.652- Requirements for protective systems

The following definitions are included in the above regulations, and are considered pertinent to this program:

- EXCAVATION: Any man-made cut, cavity, trench or depression in the earth surface, made by earth removal.
- TRENCH: A narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width cannot exceed 15 feet.
- BENCHING: A method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal steps.
- SHIELDING: A structure that is able to withstand the forces imposed by a cave-in and thereby protects employees within the structure.
- SHORING: A structure that supports the sides of an excavation and which are designed to prevent cave-ins.
- SLOPING: A method of protecting employees from cave-ins by excavating to form sides of an excavation that is inclined away from the bottom of the excavation so as to prevent cave-ins.
- STABLE ROCK: Natural solid mineral material that can be excavated with vertical sides and will remain intact while exposed.
- COMPETENT PERSON: Defined by OSHA as a person capable of identifying existing and predictable hazards in the surroundings, or working conditions that are unsanitary, hazardous, or dangerous to employees. Authorized to take prompt corrective measures to eliminate existing and predictable hazards and to stop work when required. A competent person should have and be able to demonstrate the following:
    1. Training, experience, and knowledge of:
        a. Soil Analysis
        b. Use of protective systems
    2. Ability to detect:
        a. Conditions that could result in cave-ins
        b. Failures in protective systems
        c. Hazardous atmospheres

d. Other hazards including those associated with confined spaces

Any excavation five feet deep or deeper is not considered safe from cave-ins unless one or more of the following conditions exist:

- It is made entirely of stable rock.
- It has been inspected daily by a competent person and pronounced safe.
- Protective systems are installed which have the capacity to protect workers from cave-ins, which include: sloping, benching, shielding, and shoring that have been inspected daily by a competent person and pronounced safe.

Any excavation four feet deep or deeper that requires human occupancy will require a Competent Person to classify the soil and/or rock deposits of the excavation area as Stable Rock, Type A, Type B, or Type C in accordance with the definitions set forth in 1926 CFR Subpart P Appendix A paragraph (b). Protective systems will be selected based on the flow chart listed in 1926 CFR Subpart P, Appendix F – Selection of Protective Systems. For excavations greater than 20 feet, protective systems will be designed by a Professional Engineer. All protective systems will meet or exceed the minimum standards as specified in 1926 CFR Subpart P:

- Appendix B – Sloping and Benching,
- Appendix C – Timer Shoring for Trenches,
- Appendix D – Aluminum Hydraulic Shoring for Trenches, or
- Appendix E – Alternatives to Timber Shoring.

Atmospheric Testing of Excavation and Trenches

Any excavation, including trenches, four feet deep or deeper that requires human occupancy located in an area where hazardous atmospheres could reasonably be expected to exist, such as landfills, hazardous materials storage facilities, hazardous waste sites, and other environmental remediation areas may only be entered after the atmospheres in those excavations are tested to ascertain that the oxygen content in the excavation is greater than 19.5% and the combustible gas concentration is less than 10% of the LEL of the gas present.

Additional air monitoring is to be conducted for the presence of airborne toxins suspected based on the contamination present at the area of ground disturbance. Engineering controls will be instituted to alleviate employee exposure or, if not feasible, sufficient personal protective equipment will be worn to control worker exposure.

Access, Egress, and Crossings of Excavation or Trench

Any excavation four feet deep or deeper that requires human occupancy must have a ladder, ramp, or other safe means of egress located so that each employee need travel no more than 25 feet in any direction to reach a means of escape.

Crossings over the excavation or walkways within six (6) feet of the excavation are to be designed with handrails that meet OSHA requirements for fall protection.

Water Accumulation in Excavation or Trench

In the event water accumulates in the excavation, the following requirements for controlling this

accumulation must be provided if personnel are to enter or work in the excavation:

- Personnel must not work in excavations where standing water has accumulated,
- Water removal or de-watering equipment, such as pumps, are installed and monitored by a competent person,
- Personnel must exit from excavations during rainstorms,
- Trenches must be carefully inspected by a competent person after each rain and before personnel are permitted to re-enter.

Suspended Loads

Workers in the excavation and other areas of the worksite are to be protected against falling loads and are not allowed to be under or in the swing radius of any equipment working with a load.

Authority and Administration

Within EnviroTrac, the Director of Health and Safety, and the designated Regional Health and Safety Coordinators will be responsible for the generation and execution of all portions of the program, and will have the necessary authority to assure that all requirements of this program are properly fulfilled, will administer this program.

28.7 Excavation Entering Procedure

It will be the policy of EnviroTrac not to allow any of its employees to enter excavations for any reason unless that excavation meets the conditions for being safe from cave-in, has been tested to assure that the atmosphere is safe, and has a proper means of ingress/egress as outlined above.

When EnviroTrac is employed as the prime/sole contractor at a facility where excavations are or will be present, the EnviroTrac designated Competent Person will have the responsibility to ascertain that all excavations meet the requirements of the above regulations prior to any employee or contractor entering into such excavations. The Competent Person will perform daily inspections of the excavations or immediately after a rain event using the Trench Inspection and Entry Authorization form located at the end of the this practice.

When EnviroTrac is employed as a sub-contractor at a facility where the client has the responsibility for determining the hazards at the site or location associated with excavations, and consequently controls the compliance to the pertinent excavation regulations, EnviroTrac employees will enter such excavations only if the excavations has been inspected and cleared by the Competent Person and the employee is satisfied that the excavations are safe and meet the conditions for being safe from cave-in.

Should contractors, clients or others request an employee to enter an excavation that the employee does not feel is safe and free from cave-in hazards, the employee is to state that he/she does not consider the excavation safe, inform his/her supervisor and/or the Project Manager, and await further instructions.

28.8 Alternatives to Excavation Entry

Sampling in excavations should always be performed utilizing construction equipment such as backhoes or long handled samplers wherever possible. Entering excavations should always be the last

alternative, and must never be undertaken without first ensuring that the excavation is safe from cave-in.

28.9 Employee Training

All employees who are required to enter excavations for any reason will successfully complete an Excavation Awareness Training Program, which will include, but not be limited to the following topics,:

- The contents of 29 CER 1926 Subpart P
- The contents of this EXCAVATION AWARENESS PROGRAM.
- The dangers of excavation entry.
- Alternatives to entering excavations for sampling.

EnviroTrac employees must be made aware of the danger of sidewall collapse for persons standing near the excavation during training. The awareness training will include Control of Hazardous Energy (Lockout/Tagout) for operations that require ground disturbance and include local and pertinent requirements for underground utility identification and mark out.

Documentation of training will be maintained by the EnviroTrac's Safety Department and will include the employee's name; date(s) of training; subject, curriculum, handouts, and pertinent training materials; and trainer's name and title.

The Regional Health and Safety Coordinator will conduct periodic inspection of random work sites to ascertain that this Excavation Awareness Program is conscientiously being followed.

28.10 Program Evaluation

The Corporate Health and Safety staff will review all aspects of this Excavation Awareness Program at least annually to assure its effectiveness. Whenever modifications in work scope, equipment changes or modification, revision of federal regulations or standards, or any action that would necessitate a change in any of the contents of this Excavation Awareness Program occur, such changes will be made, and everyone affected by those changes notified and retrained, if necessary. All such modifications will be made in writing, and the nature of the modification noted and dated.

28.11 Enforcement

The following disciplinary actions will be administered to employees found to be willfully negligent or not complying with the provisions of this policy:

- First Offense: If the violation is correctable, the employee will receive a written warning detailing the nature of the offense, which will be documented in the employee's personnel file. In addition, if the violation is not correctable, the employee will be dismissed from the site and sent home for the day without pay.
- Second Offense: The employee will receive a written warning detailing the nature of the offense, documented to their personnel file, and one day off without pay, regardless of whether the violation is correctable.
- Third Offense: The employee will receive a written warning detailing the nature of the offense, documented to their personnel file, and one week off without pay, regardless of whether the violation is correctable.

- Fourth Offense: The employee will be terminated with cause.

Should willful noncompliance or negligence to the provisions of this policy result in injury or increased risk to another individual then disciplinary action will be more severe than the normal sequence of the above procedures may be administered. All of the above disciplinary steps will be administered within the scope and intent of written company personnel policies.

EnviroTrac Environmental Services

TRENCH INSPECTION AND ENTRY AUTHORIZATION FORM

LOCATION:	**DATE:**
TIME OF INSPECTION(S)	
WEATHER CONDITIONS:	**APPROX. TEMP.:**
CREW LEADER:	**SUPERVISOR:**

DIMENTIONS:			
	DEPTH =		
	TOP =	W	L
	BOTTOM =	W	L

SOIL TYPE:	**TESTED:**
❑ Solid rock (most stable)	❑ Yes
❑ Average soil	❑ No
❑ Fill material	
❑ Loose sand	

PROTECTION METHODS:

(Walls MUST be vertical—NO voids)

SHORING

- ❑ Timber
- ❑ Pneumatic
- ❑ Hydraulic
- ❑ Screw Jacks
- ❑ Trench Shield

UNEVEN, IRREGULAR WALLS

- ❑ Trench Box
- **Sloping:** ❑ **q 1:1 (45°)** ❑ **q 1 ½:1 (34°)**

Yes	No	**ENVIRONMENTAL CONDITIONS:**
❑	❑	Gas detector used?
❑	❑	Confined space permit issued?

Yes	No	**HAZARDOUS CONDITIONS**
❑	❑	..... Saturated soil / standing or seeping water
❑	❑	..... Cracked or fissured wall(s)
❑	❑	..... Bulging wall(s)
❑	❑	..... Floor heaving
❑	❑	..... Frozen soil
❑	❑	..... Super-imposed loads
❑	❑	..... Vibration
❑	❑	..... Depth greater than 10'

PLACEMENT OF SPOILS & EQUIPMENT

❑	❑ ..... Spoils at least 2 feet from edge of trench
❑	❑ ..... Equipment at least 2 feet from edge
❑	❑ ..... Backhoe at end of trench
❑	❑ ..... Compressor, etc. at remote location

LADDER LOCATION

❑	❑ ..... Located in protected area
❑	❑ ..... Within 25 feet of safe travel
❑	❑ ..... Secured
❑	❑ ..... Extends 36 inches above the landing
❑	❑ ..... Leads to safe landing

OTHER:

❑	❑ Shoring equip. & matls inspected prior to use?
❑	❑ Is trench SAFE to enter?

COMMENTS:

Work Order #

NOTE All unsafe conditions must be corrected prior to trench entry. If any hazardous conditions are observed, the trench must be immediately evacuated and no one is allowed to re-enter until corrective action has been taken.

Certification by Competent Person

Excavation Entry Authorized By: _____

Designated Competent Person

APPENDIX C

HASP AGREEMENT AND ACKNOWLEDGEMENT

HASP
291 Richardson Street
Brooklyn, New York
Site Number: C224292

Acknowledgement Agreement

HEALTH AND SAFETY PLAN REVIEW RECORD

I acknowledge that I have read and understood the contents of this Health and Safety Plan and Job Safety Analysis (JSA's) for the work and I agree to abide by all provisions as set forth.

If unidentified or new hazards not listed in this HASP or JSA's are indentified or if the scope of work changes, I will report these finding to the Site Safety Officer and work will stop and not re-start work until contingencies and/or control measures are in place to address the hazards.

NAME & SIGNATURE	DATE & CELL PHONE NUMBER

Add additional sheets as necessary

APPENDIX D

CONTACT LIST AND INJURY / VEHICLE INCIDENT PROCEDURES

Contact and emergency phone numbers for this project:

NYC Health + Hospitals, Woodhull	718-963-8000
(760 Broadway, Brooklyn, NY 11206)	

All Emergencies call	911
National Response Center	800-424-8802
National Poison Control	800-926-953

ET CONTACTS

Ms. Tracy Wall (ET-Project Manager)	Office: 631-924-3001
	Cell 631-905-4259
Ms. Tracy Wall (ET-Site Supervisor)	Cell 631-905-4259
Mr. Michael Clark (ET-Director of Health and Safety)	Office: 609-387-5553
	Cell: 516-790-0998

CLIENT CONTACT

Mr. Marshal Kesten (Property Owner)	Office: 718-383-2409

APPENDIX E

INCIDENT REPORTING

- Personal Injury Accident Procedures
- Motor Vehicle Accident Procedures

INCIDENT AND NEAR MISS REPORTING FORM

1.Name of person(s) involved:	2. Title of person(s) involved:
3. Type: Personal Injury Motor Vehicle Accident Property Damage Stop Work Intervention Near Miss	
4. Date & Time of Incident: Date: _____ Time: _____ (indicate AM or PM)	5. Location (physical location and street address)
6. Client:	

7. Name of person completing form:		8.Title of person completing form:
9. ET reg office:	10. Contact phone number(s):	11. Witness name(s) & phone numbers:

12. Full Description of Incident: (if incident involves vehicle, provide identification information)

(Describe in detail: weather during the incident, physical attributes of the location, what was happening prior to the incident including procedures being followed, the actual incident, failure of equipment, results of the incident, description of vehicle or property involved, etc. Use additional sheets if necessary.)

INCIDENT AND NEAR MISS REPORTING FORM

1.Name of person(s) involved:	2. Title of person(s) involved:
3. Type: Personal Injury Motor Vehicle Accident Property Damage Stop Work Intervention Near Miss	
4. Date & Time of Incident: Date: _____ Time: _____ (indicate AM or PM)	5. Location (physical location and street address)
6. Client:	

13. List Personal Protective Equipment (PPE) used during the incident, if applicable:
14. Corrective Actions: (What should be done to prevent recurrence of this incident, i.e., employee training, modify procedures, different equipment, etc.?)
15. Miscellaneous information: (Provide any other information or recommendations which you feel are pertinent to this incident. Use this section to list any Police or government agency information, report numbers, contact information, etc.)

INCIDENT AND NEAR MISS REPORTING FORM

1.Name of person(s) involved:	2. Title of person(s) involved:
3. Type: Personal Injury Motor Vehicle Accident Property Damage Stop Work Intervention Near Miss	
4. Date & Time of Incident: Date: _____ Time: _____ (indicate AM or PM)	5. Location (physical location and street address)
6. Client:	

MOTOR VEHICLE INCIDENT DIAGRAM
(MUST BE COMPLETED FOR ALL MOTOR VEHICLE ACCIDENTS)

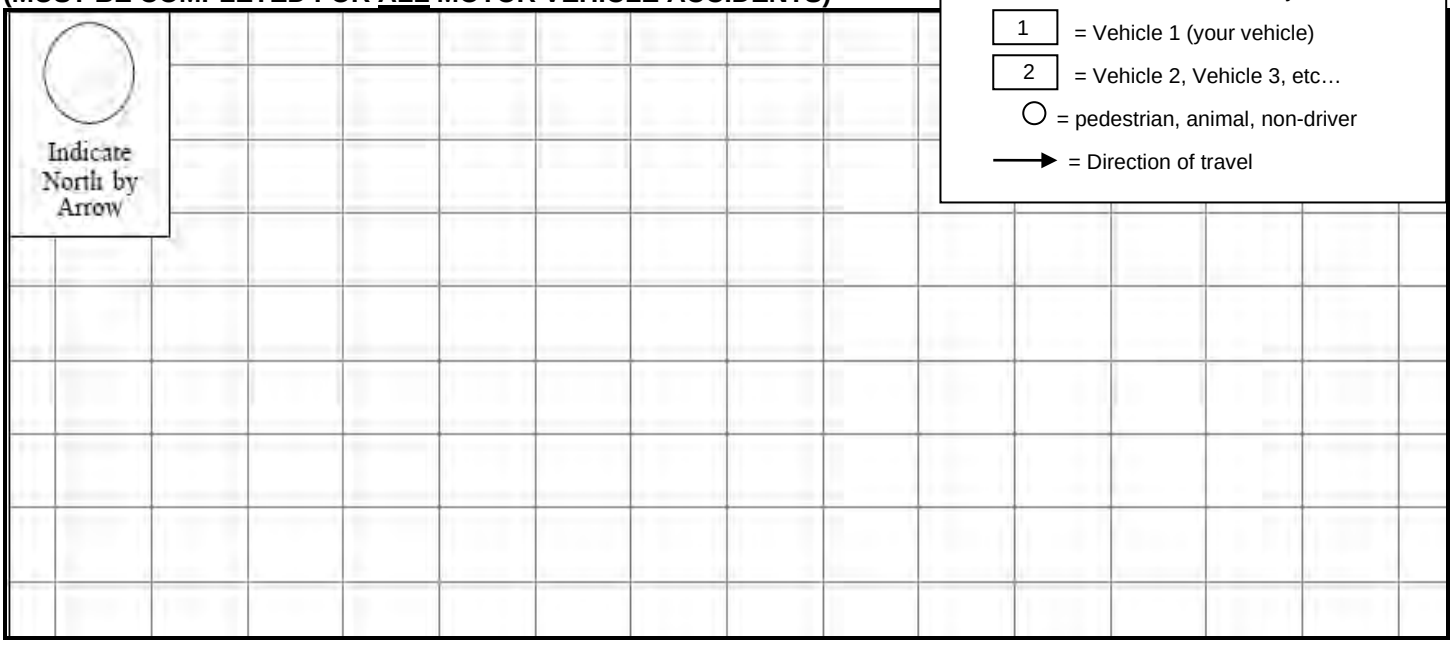
Draw a diagram of the roadway or streets where crash occurred, indicating vehicles involved and direction of travel. Use the follow symbols:

1 = Vehicle 1 (your vehicle)

2 = Vehicle 2, Vehicle 3, etc…

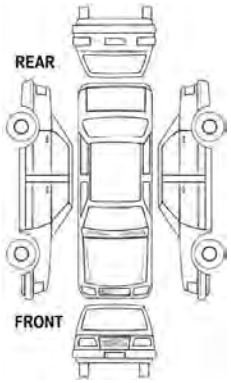
○ = pedestrian, animal, non-driver

→ = Direction of travel

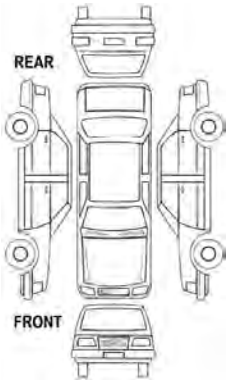


Indicate damage to vehicle(s):

Your Vehicle



Other Vehicle



INCIDENT AND NEAR MISS REPORTING FORM

1.Name of person(s) involved:	2. Title of person(s) involved:
3. Type: Personal Injury Motor Vehicle Accident Property Damage Stop Work Intervention Near Miss	
4. Date & Time of Incident: Date: _____ Time: _____ (indicate AM or PM)	5. Location (physical location and street address)
6. Client:	

MOTOR VEHICLE INCIDENT INFORMATION

Company Vehicle (vehicle 1):

Make / Model: _____

EnviroTrac Vehicle No.: _____

Other Vehicle (vehicle 2):

Make / Model /Yr _____

License Plate No: _____

Driver's Name: _____

Address: _____

Phone No: _____

Driver's License No. & ST: _____

Insurance Co / Policy No: _____

Other Vehicle (vehicle 3):

Make / Model /Yr _____

License Plate No: _____

Driver's Name: _____

Address: _____

Phone No: _____

Driver's License No. & ST: _____

Insurance Co / Policy No: _____

Include any other pertinent information:
(witness name & contact no., injured parties including medical treatment provided and where taken, Police Officer name and badge no., any else to assist in the investigation/claim)

APPENDIX E

OSHA QUICK CARDS FOR:

HEAT STRESS

COLD STRESS

EnviroTrac
Environmental Services

OSHA® QUICK CARD™

Protecting Workers from Heat Stress

Heat Illness

Exposure to heat can cause illness and death. The most serious heat illness is heat stroke. Other heat illnesses, such as heat exhaustion, heat cramps and heat rash, should also be avoided.

There are precautions your employer should take any time temperatures are high and the job involves physical work.

Risk Factors for Heat Illness

- High temperature and humidity, direct sun exposure, no breeze or wind
- Low liquid intake
- Heavy physical labor
- Waterproof clothing
- No recent exposure to hot workplaces

Symptoms of Heat Exhaustion

- Headache, dizziness, or fainting
- Weakness and wet skin
- Irritability or confusion
- Thirst, nausea, or vomiting

Symptoms of Heat Stroke

- May be confused, unable to think clearly, pass out, collapse, or have seizures (fits)
- May stop sweating

To Prevent Heat Illness, Your Employer Should

- Provide training about the hazards leading to heat stress and how to prevent them.
- Provide a lot of cool water to workers close to the work area. At least one pint of water per hour is needed.

For more information:

OSHA® Occupational Safety and Health Administration
U.S. Department of Labor
www.osha.gov (800) 321-OSHA (6742)

OSHA 3154-09-11R

OSHA® QUICK CARD™

- Schedule frequent rest periods with water breaks in shaded or air-conditioned areas.
- Routinely check workers who are at risk of heat stress due to protective clothing and high temperature.
- Consider protective clothing that provides cooling.

How You Can Protect Yourself and Others

- Know signs/symptoms of heat illnesses; monitor yourself; use a buddy system.
- Block out direct sun and other heat sources.
- Drink plenty of fluids. Drink often and BEFORE you are thirsty. Drink water every 15 minutes.
- Avoid beverages containing alcohol or caffeine.
- Wear lightweight, light colored, loose-fitting clothes.

What to Do When a Worker is Ill from the Heat

- Call a supervisor for help. If the supervisor is not available, call 911.
- Have someone stay with the worker until help arrives.
- Move the worker to a cooler/shaded area.
- Remove outer clothing.
- Fan and mist the worker with water; apply ice (ice bags or ice towels).
- Provide cool drinking water, if able to drink.

IF THE WORKER IS NOT ALERT or seems confused, this may be a heat stroke. CALL 911 IMMEDIATELY and apply ice as soon as possible.

If you have any questions or concerns, call OSHA at 1-800-321-OSHA (6742).

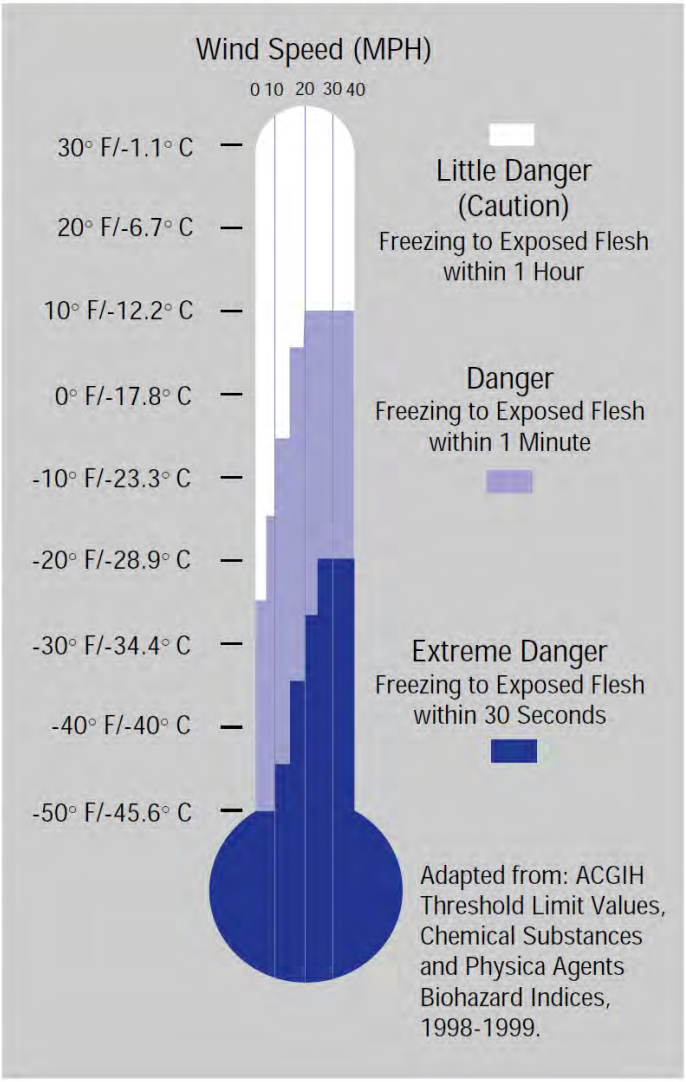
For more information:

OSHA® Occupational Safety and Health Administration
U.S. Department of Labor
www.osha.gov (800) 321-OSHA (6742)

THE COLD STRESS EQUATION

LOW TEMPERATURE + WIND SPEED + WETNESS = INJURIES & ILLNESS

When the body is unable to warm itself, serious cold-related illnesses and injuries may occur, and permanent tissue damage and death may result. **Hypothermia** can occur when *land temperatures* are **above** freezing or *water temperatures* are below 98.6°F/37°C. Cold-related illnesses can slowly overcome a person who has been chilled by low temperatures, brisk winds, or wet clothing.



U.S. Department of Labor
Occupational Safety and Health Administration

OSHA 3156
1998

FROST BITE

What Happens to the Body:

FREEZING IN DEEP LAYERS OF SKIN AND TISSUE; PALE, WAXY-WHITE SKIN COLOR; SKIN BECOMES HARD and NUMB; USUALLY AFFECTS THE FINGERS, HANDS, TOES, FEET, EARS, and NOSE.

What Should Be Done: (land temperatures)

- Move the person to a warm dry area. Don't leave the person alone.
- Remove any wet or tight clothing that may cut off blood flow to the affected area.
- **DO NOT** rub the affected area, because rubbing causes damage to the skin and tissue.
- **Gently** place the affected area in a warm (105°F) water bath and monitor the water temperature to **slowly** warm the tissue. Don't pour warm water directly on the affected area because it will warm the tissue too fast causing tissue damage. Warming takes about 25-40 minutes.
- After the affected area has been warmed, it may become puffy and blister. The affected area may have a burning feeling or numbness. When normal feeling, movement, and skin color have returned, the affected area should be dried and wrapped to keep it warm. **NOTE:** If there is a chance the affected area may get cold again, do not warm the skin. If the skin is warmed and then becomes cold again, it will cause severe tissue damage.
- Seek medical attention as soon as possible.

HYPOTHERMIA - (Medical Emergency)

What Happens to the Body:

NORMAL BODY TEMPERATURE (98.6° F/37°C) DROPS TO OR BELOW 95°F (35^0 C); FATIGUE OR DROWSINESS; UNCONTROLLED SHIVERING; COOL BLUISH SKIN; SLURRED SPEECH; CLUMSY MOVEMENTS; IRRITABLE, IRRATIONAL OR CONFUSED BEHAVIOR.

What Should Be Done: (land temperatures)

- Call for emergency help (i.e., Ambulance or Call 911).
- Move the person to a warm, dry area. Don't leave the person alone. Remove any wet clothing and replace with warm, dry clothing or wrap the person in blankets.
- Have the person drink warm, sweet drinks (sugar water or sports-type drinks) if they are alert. **Avoid drinks with caffeine** (coffee, tea, or hot chocolate) or alcohol.
- Have the person move their arms and legs to create muscle heat. If they are unable to do this, place warm bottles or hot packs in the arm pits, groin, neck, and head areas. **DO NOT** rub the person's body or place them in warm water bath. This may stop their heart.

What Should Be Done: (water temperatures)

- Call for emergency help (Ambulance or Call 911). Body heat is lost up to 25 times faster in water.
- **DO NOT** remove any clothing. Button, buckle, zip, and tighten any collars, cuffs, shoes, and hoods because the layer of trapped water closest to the body provides a layer of insulation that slows the loss of heat. Keep the head out of the water and put on a hat or hood.
- Get out of the water as quickly as possible or climb on anything floating. **DO NOT** attempt to swim unless a floating object or another person can be reached because swimming or other physical activity uses the body's heat and reduces survival time by about 50 percent.
- If getting out of the water is not possible, wait quietly and conserve body heat by folding arms across the chest, keeping thighs together, bending knees, and crossing ankles. If another person is in the water, huddle together with chests held closely.

How to Protect Workers

- Recognize the environmental and workplace conditions that lead to potential cold-induced illnesses and injuries.
- Learn the signs and symptoms of cold-induced illnesses/injuries and what to do to help the worker.
- Train the workforce about cold-induced illnesses and injuries.
- Select proper clothing for cold, wet, and windy conditions. Layer clothing to adjust to changing environmental temperatures. Wear a hat and gloves, in addition to underwear that will keep water away from the skin (polypropylene).
- Take frequent short breaks in warm dry shelters to allow the body to warm up.
- Perform work during the warmest part of the day.
- Avoid exhaustion or fatigue because energy is needed to keep muscles warm.
- Use the buddy system (work in pairs).
- Drink warm, sweet beverages (sugar water, sports-type drinks). Avoid drinks with caffeine (coffee, tea, or hot chocolate) or alcohol.
- Eat warm, high-calorie foods like hot pasta dishes.

Workers Are at Increased Risk When…

- They have predisposing health conditions such as cardiovascular disease, diabetes, and hypertension.
- They take certain medication (check with your doctor, nurse, or pharmacy and ask if any medicines you are taking affect you while working in cold environments).
- They are in poor physical condition, have a poor diet, or are older.

HASP
291 Richardson Street
Brooklyn, New York
Site Number: C224292

APPENDIX G

DAILY TAILGATE SAFETY MEETING LOG

HASP
291 Richardson Street
Brooklyn, New York
Site Number: C224292

Daily Tailgate Safety Meeting Log

(to be completed on site)

Site Name _____

Scope of Work _____

Weather _____

Safety Topics discussed _____

_____

_____

Employee Names:	Signatures

By signing, I acknowledge that I am knowledgeable of the scope of work being performed, the associated hazards, and will institute the controls or contingencies necessary to mitigate those hazards. Furthermore, I will stop work in the event there are new or unidentified hazards and will not commence until proper controls or contingencies are instituted to mitigate those hazards.

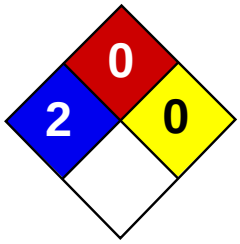
Signature of Site Safety Officer (or designee)_____ Date _____

Add additional sheets as necessary

APPENDIX H

SAFETY DATA SHEETS

(SDS)



Health	2
Fire	0
Reactivity	0
Personal Protection	G

Material Safety Data Sheet
Tetrachloroethylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Tetrachloroethylene

Catalog Codes: SLT3220

CAS#: 127-18-4

RTECS: KX3850000

TSCA: TSCA 8(b) inventory: Tetrachloroethylene

CI#: Not available.

Synonym: Perchloroethylene; 1,1,2,2-Tetrachloroethylene; Carbon bichloride; Carbon dichloride; Ankilostin; Didakene; Dilatin PT; Ethene, tetrachloro-; Ethylene tetrachloride; Perawin; Perchlor; Perclene; Perclene D; Percosolvel; Tetrachloroethene; Tetraleno; Tetralex; Tetravec; Tetroguer; Tetropil

Chemical Name: Ethylene, tetrachloro-

Chemical Formula: C2-Cl4

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
Tetrachloroethylene	127-18-4	100

Toxicological Data on Ingredients: Tetrachloroethylene: ORAL (LD50): Acute: 2629 mg/kg [Rat]. DERMAL (LD): Acute: >3228 mg/kg [Rabbit]. MIST(LC50): Acute: 34200 mg/m 8 hours [Rat]. VAPOR (LC50): Acute: 5200 ppm 4 hours [Mouse].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (anticipated carcinogen) by NTP. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, peripheral nervous system, respiratory tract, skin, central nervous system (CNS). 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. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

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

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

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. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

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: Not applicable.

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:
Absorb with an inert material and put the spilled material in an appropriate waste 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:
Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with skin. 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, metals, acids, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

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.

Personal Protection:
Safety glasses. 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 (ppm) from OSHA (PEL) [United States] TWA: 25 STEL: 100 (ppm) from ACGIH (TLV) [United States] TWA: 170 (mg/m3) from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Ethereal.

Taste: Not available.

Molecular Weight: 165.83 g/mole

Color: Clear Colorless.

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

Boiling Point: 121.3°C (250.3°F)

Melting Point: -22.3°C (-8.1°F)

Critical Temperature: 347.1°C (656.8°F)

Specific Gravity: 1.6227 (Water = 1)

Vapor Pressure: 1.7 kPa (@ 20°C)

Vapor Density: 5.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 5 - 50 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 3.4

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Miscible with alcohol, ether, chloroform, benzene, hexane. It dissolves in most of the fixed and volatile oils. Solubility in water: 0.015 g/100 ml @ 25 deg. C It slowly decomposes in water to yield Trichloroacetic and Hydrochloric acids.

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, metals, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Oxidized by strong oxidizing agents. Incompatible with sodium hydroxide, finely divided or powdered metals such as zinc, aluminum, magnesium, potassium, chemically active metals such as lithium, beryllium , barium. Protect from light.

Special Remarks on Corrosivity: Slowly corrodes aluminum, iron, and zinc.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2629 mg/kg [Rat]. Acute dermal toxicity (LD50): >3228 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 5200 4 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: kidneys, liver, peripheral nervous system, upper respiratory tract, skin, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals:
Lowest Publishe Lethal Dose/Conc: LDL [Rabbit] - Route: Oral; Dose: 5000 mg/kg LDL [Dog] - Route: Oral; Dose: 4000 mg/kg LDL [Cat] - Route: Oral; Dose: 4000 mg/kg

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects and birth defects(teratogenic). May affect genetic material (mutagenic). May cause cancer.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes skin irritation with possible dermal blistering or burns. Symtoms may include redness, itching, pain, and possible dermal blistering or burns. It may be absorbed through the skin with possible systemic effects. A single prolonged skin exposure is not likely to result in the material being absorbed in harmful amounts. Eyes: Contact causes transient eye irritation, lacrimation. Vapors cause eye/conjunctival irritation. Symptoms may include redness and pain. Inhalation: The main route to occupational exposure is by inhalation since it is readily absorbed through the lungs. It causes respiratory tract irritation, . It can affect behavior/central nervous system (CNS depressant and anesthesia ranging from slight inebriation to death, vertigo, somnolence, anxiety, headache, excitement, hallucinations, muscle incoordination, dizziness, lightheadness, disorentiation, seizures, enotional instability, stupor, coma). It may cause pulmonary edema Ingestion: It can cause nausea, vomiting, anorexia, diarrhea, bloody stool. It may affect the liver, urinary system (proteinuria, hematuria, renal failure, renal tubular disorder), heart (arrhythmias). It may affect behavior/central nervous system with symptoms similar to that of inhalation. Chronic Potential Health Effects: Skin: Prolonged or repeated skin contact may result in excessive drying of the skin, and irritation. Ingestion/Inhalation: Chronic exposure can affect the liver(hepatitis,fatty liver degeneration), kidneys, spleen, and heart (irregular heartbeat/arrhythmias, cardiomyopathy, abnormal EEG), brain, behavior/ central nervous system/peripheral nervous system (impaired memory, numbness of extremeties, peripheral neuropathy and other

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 18.4 mg/l 96 hours [Fish (Fatthead Minnow)]. 18 mg/l 48 hours [Daphnia (daphnia)]. 5 mg/l 96 hours [Fish (Rainbow Trout)]. 13 mg/l 96 hours [Fish (Bluegill sunfish)].

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 6.1: Poisonous material.

Identification: : Tetrachloroethylene UNNA: 1897 PG: III

Special Provisions for Transport: Marine Pollutant

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: Tetrachloroethylene 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: Tetrachloroethylene Connecticut hazardous material survey.: Tetrachloroethylene Illinois toxic substances disclosure to employee act: Tetrachloroethylene Illinois chemical safety act: Tetrachloroethylene New York release reporting list: Tetrachloroethylene Rhode Island RTK hazardous substances: Tetrachloroethylene Pennsylvania RTK: Tetrachloroethylene Minnesota: Tetrachloroethylene Michigan critical material: Tetrachloroethylene Massachusetts RTK: Tetrachloroethylene Massachusetts spill list: Tetrachloroethylene New Jersey: Tetrachloroethylene New Jersey spill list: Tetrachloroethylene Louisiana spill reporting: Tetrachloroethylene California Director's List of Hazardous Substances: Tetrachloroethylene TSCA 8(b) inventory: Tetrachloroethylene TSCA 8(d) H and S data reporting: Tetrachloroethylene: Effective date: 6/1/87; Sunset date: 6/1/97 SARA 313 toxic chemical notification and release reporting: Tetrachloroethylene CERCLA: Hazardous substances.: Tetrachloroethylene: 100 lbs. (45.36 kg)

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-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R40- Possible risks of irreversible effects. R51/53- Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S23- Do not breathe gas/fumes/vapour/spray S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S37- Wear suitable gloves. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: g

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

Health: 2

Flammability: 0

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. Safety glasses.

Section 16: Other Information

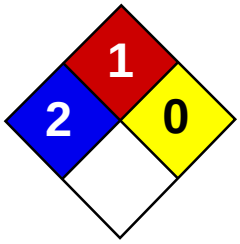
References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:29 PM

Last Updated: 05/21/2013 12:00 PM

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 ScienceLab.com 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 ScienceLab.com has been advised of the possibility of such damages.



Material Safety Data Sheet
Trichloroethylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Trichloroethylene

Catalog Codes: SLT3310, SLT2590

CAS#: 79-01-6

RTECS: KX4560000

TSCA: TSCA 8(b) inventory: Trichloroethylene

CI#: Not available.

Synonym:

Chemical Formula: C2HCl3

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
Trichloroethylene	79-01-6	100

Toxicological Data on Ingredients: Trichloroethylene: ORAL (LD50): Acute: 5650 mg/kg [Rat]. 2402 mg/kg [Mouse]. DERMAL (LD50): Acute: 20001 mg/kg [Rabbit].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, the nervous system, liver, heart, 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. 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:
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. 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: May be combustible at high temperature.

Auto-Ignition Temperature: 420°C (788°F)

Flash Points: Not available.

Flammable Limits: LOWER: 8% UPPER: 10.5%

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

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

Large Spill:
Absorb with an inert material and put the spilled material in an appropriate waste 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 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 gas/fumes/ vapour/

spray. 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. Avoid contact with skin and eyes

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Carcinogenic, teratogenic or mutagenic materials should be stored in a separate locked safety storage cabinet or room.

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: 50 STEL: 200 (ppm) from ACGIH (TLV) TWA: 269 STEL: 1070 (mg/m3) from ACGIH Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 131.39 g/mole

Color: Clear Colorless.

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

Boiling Point: 86.7°C (188.1°F)

Melting Point: -87.1°C (-124.8°F)

Critical Temperature: Not available.

Specific Gravity: 1.4649 (Water = 1)

Vapor Pressure: 58 mm of Hg (@ 20°C)

Vapor Density: 4.53 (Air = 1)

Volatility: Not available.

Odor Threshold: 20 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: See solubility in water, methanol, diethyl ether, acetone.

Solubility:
Easily soluble in methanol, diethyl ether, acetone. 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:
Extremely corrosive in presence of aluminum. 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: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 2402 mg/kg [Mouse]. Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH. The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Passes through the placental barrier in human. Detected in maternal milk in human.

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 6.1: Poisonous material.

Identification: : Trichloroethylene : UN1710 PG: III

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: Trichloroethylene 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: Trichloroethylene Pennsylvania RTK: Trichloroethylene Florida: Trichloroethylene Minnesota: Trichloroethylene Massachusetts RTK: Trichloroethylene New Jersey: Trichloroethylene TSCA 8(b) inventory: Trichloroethylene CERCLA: Hazardous substances.: Trichloroethylene

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

Other Classifications:

WHMIS (Canada):
CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R36/38- Irritating to eyes and skin. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 1

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: 10/10/2005 08:54 PM

Last Updated: 11/06/2008 12:00 PM

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 ScienceLab.com 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 ScienceLab.com has been advised of the possibility of such damages.

Material Safety Data Sheet
1,1,1-Trichloroethane

ACC# 14370

Section 1 - Chemical Product and Company Identification

MSDS Name: 1,1,1-Trichloroethane
Catalog Numbers: AC294930000, AC294930250, AC294932500, AC327940000, AC327940010, AC327942500, S80231, T391-20, T391-4, T398-4
Synonyms: Methyl chloroform; Methyltrichloromethane; Trichloroethane; Trichloromethylmethane; 1,1,1-TCE.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
71-55-6	1,1,1-Trichloroethane	>96	200-756-3
123-91-1	1,4-Dioxane	2.5	204-661-8
106-88-7	1,2-Butylene oxide	0.47	203-438-2
75-52-5	Nitromethane	0.34	200-876-6

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless liquid.
Warning! Causes eye, skin, and respiratory tract irritation. May be harmful if inhaled. May cause central nervous system depression. This is a CFC substance which destroys ozone in the upper atmosphere. Destruction of the ozone layer can lead to increased ultraviolet radiation which, with excess exposure to sunlight, can lead to an increase in skin cancer and eye cataracts.
Target Organs: Central nervous system, respiratory system, eyes, skin.

Potential Health Effects

Eye: Causes mild eye irritation. Vapors may cause eye irritation.
Skin: Causes skin irritation. Prolonged or repeated contact may dry/defat the skin and cause irritation. 1,4-Dioxane may cause an allergic skin reaction, and absorption of this substance may cause systemic toxicty. Methyl chloroform is an acknowledged skin irritant in guinea pigs, where a single topical application of 1 ml or repeated contact over 3 days causes edema, erythema, inflammation, and cellular degeneration. There is one case report of allergic contact dermatitis in a worker exposed to 1,1,1-trichloroethane. It is not possible to draw any conclusions from this single report.
Ingestion: Causes gastrointestinal irritation with nausea, vomiting and diarrhea. Low hazard for usual industrial handling. Although there are no case reports of aspiration, it was induced in rats in one study. In addition, based on its physical properties (viscosity and surface tension), it seems likely that 1,1,1-

trichloroethane can be aspirated.
Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. May cause narcotic effects in high concentration. Causes irritation of the mucous membrane and upper respiratory tract. Numerous deaths due to depression of CNS control of respiration and fatal cardiac arrhythmia have been reported from methyl chloroform inhalation (accidental or intentional) in poorly ventilated rooms, pits, tanks, and other small areas (Documentation of the TLV). Cases of intentional abuse of 1,1,1-trichloroethane in substances such as typewriter correction fluid for euphoric symptoms have been documented.
Chronic: Prolonged or repeated skin contact may cause defatting and dermatitis. Exposure to high concentrations may cause central nervous system depression. Studies with solvent abusers have established that severe cardiac arrhythmias may result from cardiac sensitization, where the heart has an increased response to circulating epinephrine. In these cases, exposures by far exceeded occupational relevant levels. Liver effects have been observed in some animal studies at high

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid.
Skin: In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.
Ingestion: Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Alcoholic beverage consumption may enhance the toxic effects of this substance.

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. Use water spray to keep fire-exposed containers cool. Substance is nonflammable. Vapors may accumulate in confined spaces Methyl chloroform burns only in excess oxygen or in air if a strong source of ignition is present. No flash point in conventional closed tester; however, vapors in containers can explode if subjected to high energy source.
Extinguishing Media: Use extinguishing media most appropriate for the surrounding fire.
Flash Point: Not applicable.
Autoignition Temperature: 500 deg C (932.00 deg F)
Explosion Limits, Lower:7.0 vol %
Upper: 16 vol %
NFPA Rating: (estimated) Health: 2; Flammability: 1; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Clean up spills immediately, observing precautions in the Protective Equipment section. Provide ventilation. Approach spill from upwind.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid breathing vapor.
Storage: Store in a cool, dry, well-ventilated area away from incompatible substances. Do not store in aluminum containers.

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 general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
1,1,1-Trichloroethane	350 ppm TWA; 450 ppm STEL	700 ppm IDLH	350 ppm TWA; 1900 mg/m3 TWA
1,4-Dioxane	20 ppm TWA; Skin - potential significant contribution to overall exposure by the cutaneous r oute	500 ppm IDLH	100 ppm TWA; 360 mg/m3 TWA
1,2-Butylene oxide	none listed	none listed	none listed
Nitromethane	20 ppm TWA	750 ppm IDLH	100 ppm TWA; 250 mg/m3 TWA

OSHA Vacated PELs: 1,1,1-Trichloroethane: 350 ppm TWA; 1900 mg/m3 TWA 1,4-Dioxane: 25 ppm TWA; 90 mg/m3 TWA 1,2-Butylene oxide: No OSHA Vacated PELs are listed for this chemical. Nitromethane: 100 ppm TWA; 250 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to minimize contact with skin.
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: Liquid
Appearance: colorless
Odor: Sweet, mild chloroform-like.
pH: Not applicable.
Vapor Pressure: 100 mm Hg @ 20 deg C
Vapor Density: 4.55 (air=1)
Evaporation Rate:1.0 (carbon tetrachloride=1)
Viscosity: 0.86 cP @ 20 deg C
Boiling Point: 74 deg C
Freezing/Melting Point:-33 deg C
Decomposition Temperature:> 260 deg C
Solubility: Insoluble.
Specific Gravity/Density:1.338 (water=1)
Molecular Formula:C2H3Cl3
Molecular Weight:133.38

Section 10 - Stability and Reactivity

Chemical Stability: Because of 1,1,1-TCE's reactivity with magnesium, aluminum, & their alloys, inhibitors (like 1,4-dioxane, 1,3-dioxolane, isobutyl alcohol, or nitroethane) are often added to increase the stability of the solvent & prevent corrosion of metal parts. 1,1,1-Trichloroethane reacts slowly with water to produce hydrochloric acid.
Conditions to Avoid: High temperatures, ignition sources, moisture, confined spaces.
Incompatibilities with Other Materials: Strong oxidizing agents, strong bases, aluminum, magnesium, chemically active metals.
Hazardous Decomposition Products: Hydrogen chloride, chlorine, phosgene, carbon monoxide, carbon dioxide.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 71-55-6: KJ2975000
CAS# 123-91-1: JG8225000
CAS# 106-88-7: EK3675000
CAS# 75-52-5: PA9800000
LD50/LC50:
CAS# 71-55-6:
Draize test, rabbit, eye: 100 mg Mild;
Draize test, rabbit, eye: 2 mg/24H Severe;
Draize test, rabbit, skin: 5 gm/12D (Intermittent) Mild;
Draize test, rabbit, skin: 20 mg/24H Moderate;
Inhalation, mouse: LC50 = 3911 ppm/2H;
Inhalation, mouse: LC50 = 29492 ppm/10M;
Inhalation, rat: LC50 = 17000 ppm/4H;
Inhalation, rat: LC50 = 14250 ppm/7H;
Inhalation, rat: LC50 = 20000 ppm/2H;
Oral, mouse: LD50 = 6 gm/kg;
Oral, rabbit: LD50 = 5660 mg/kg;
Oral, rat: LD50 = 9600
CAS# 123-91-1:
Draize test, rabbit, eye: 100 mg Severe;
Draize test, rabbit, eye: 100 mg/24H Moderate;
Inhalation, mouse: LC50 = 37 gm/m3/2H;
Inhalation, rat: LC50 = 46 gm/m3/2H;
Oral, mouse: LD50 = 5300 mg/kg;
Oral, rabbit: LD50 = 2 gm/kg;
Oral, rat: LD50 = 4200 mg/kg;
Skin, rabbit: LD50 = 7600 uL/kg;
.

CAS# 106-88-7:
Draize test, rabbit, eye: 100 mg/24H Moderate;
Draize test, rabbit, skin: 500 mg/24H Mild;
Inhalation, rat: LC50 = 6300 mg/m3/4H;
Oral, rat: LD50 = 500 mg/kg;
Skin, rabbit: LD50 = 2100 uL/kg;
.

CAS# 75-52-5:
Oral, mouse: LD50 = 950 mg/kg;
Oral, rat: LD50 = 940 mg/kg;
.

Carcinogenicity:
CAS# 71-55-6: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 123-91-1:

- **ACGIH:** A3 - Confirmed animal carcinogen with unknown relevance to humans
- **California:** carcinogen, initial date 1/1/88
- **NTP:** Suspect carcinogen
- **IARC:** Group 2B carcinogen

CAS# 106-88-7:

- **ACGIH:** Not listed.
- **California:** Not listed.
- **NTP:** Not listed.
- **IARC:** Group 2B carcinogen

CAS# 75-52-5:

- **ACGIH:** A3 - Confirmed animal carcinogen with unknown relevance to humans
- **California:** carcinogen, initial date 5/1/97
- **NTP:** Suspect carcinogen
- **IARC:** Group 2B carcinogen

Epidemiology: No information found
Teratogenicity: Animal evidence suggests that 1,1,1-TCE is not teratogenic at exposures which are not maternally toxic. Slight fetotoxicity (for example, reduced fetal weight) has been reported at doses which were not maternally toxic.
Reproductive Effects: Animal evidence suggests that 1,1,1-TCE does not cause reproductive effects.
Mutagenicity: Evidence from studies using live animals suggests that 1,1,1-trichloroethane is not mutagenic.
Neurotoxicity: Some studies using sensitive neurobehavioural tests have shown altered scores for exposed workers. However, whether or not these results indicate nervous system damage is not clear. Other studies with 1,1,1-TCE have not shown any changes.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Fathead Minnow: EC50 = 52.9 mg/L; 96 Hr; Flow-through at 25.5°CFish: Bluegill/Sunfish: LC50 = 72 mg/L; 96 Hr; Static bioassayFish: Fathead Minnow: LC50 = 52.9 mg/L; 96 Hr; Flow-through at 25.5°CFish: Sheepshead minnow: LC50 = 53-72 mg/L; 96 Hr; UnspecifiedWater flea Daphnia: EC50 > 530 mg/L; 48 Hr; Unspecified Releases to surface water will decrease in concn almost entirely due to evaporation. Spills on land will decrease in concentration almost entirely due to volatilization and leaching.
Environmental: Releases to air may be transported long distances and partially return to earth in rain. In the troposphere, 1,1,1-trichloroethane will degrade very slowly by photooxidation and also slowly diffuse to the stratosphere where photodegradation will be rapid. This substance has a high potential for oxone depletion.
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# 71-55-6: waste number U226.
CAS# 123-91-1: waste number U108.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	1,1,1-TRICHLOROETHANE	1,1,1-TRICHLOROETHANE
Hazard Class:	6.1	6.1
UN Number:	UN2831	UN2831
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 71-55-6 is listed on the TSCA inventory.
CAS# 123-91-1 is listed on the TSCA inventory.
CAS# 106-88-7 is listed on the TSCA inventory.
CAS# 75-52-5 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 71-55-6: Effective 10/4/82, Sunset 10/4/92 CAS# 106-88-7: Effective 10/4/82, Sunset 10/4/92
CAS# 75-52-5: Effective 4/13/89, Sunset 12/19/95
Chemical Test Rules
CAS# 71-55-6: 40 CFR 799.5000
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# 71-55-6: 1000 lb final RQ; 454 kg final RQ CAS# 123-91-1: 100 lb final RQ; 45.4 kg final RQ
CAS# 106-88-7: 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 # 71-55-6: immediate.
CAS # 123-91-1: delayed, fire.
CAS # 106-88-7: immediate.
CAS # 75-52-5: immediate, delayed, fire, reactive.
Section 313
This material contains 1,1,1-Trichloroethane (CAS# 71-55-6, >96%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR
This material contains 1,4-Dioxane (CAS# 123-91-1, 2.5%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
This material contains 1,2-Butylene oxide (CAS# 106-88-7, 0.47%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 71-55-6 is listed as a hazardous air pollutant (HAP).
CAS# 123-91-1 is listed as a hazardous air pollutant (HAP).
CAS# 106-88-7 is listed as a hazardous air pollutant (HAP).
CAS# 71-55-6 is listed as a Class 1 ozone depletor with an 0.1 ODP; 110 GWP
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# 71-

55-6 is listed as a Priority Pollutant under the Clean Water Act. CAS# 71-55-6 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

CAS# 75-52-5 is considered highly hazardous by OSHA.

STATE

CAS# 71-55-6 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 123-91-1 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 106-88-7 can be found on the following state right to know lists: New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 75-52-5 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

WARNING: This product contains 1,4-Dioxane, a chemical known to the state of California to cause cancer.
WARNING: This product contains Nitromethane, a chemical known to the state of California to cause cancer.
California No Significant Risk Level: CAS# 123-91-1: 30 æg/day NSRL

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XN N

Risk Phrases:

R 20 Harmful by inhalation.
R 59 Dangerous for the ozone layer.

Safety Phrases:

S 24/25 Avoid contact with skin and eyes.
S 59 Refer to manufacturer/supplier for information on recovery/recycling.
S 61 Avoid release to the environment. Refer to special instructions /safety data sheets.

WGK (Water Danger/Protection)

CAS# 71-55-6: 3
CAS# 123-91-1: 2
CAS# 106-88-7: 3
CAS# 75-52-5: 2

Canada - DSL/NDSL

CAS# 71-55-6 is listed on Canada's DSL List.
CAS# 123-91-1 is listed on Canada's DSL List.
CAS# 106-88-7 is listed on Canada's DSL List.
CAS# 75-52-5 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D1B, 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# 71-55-6 is listed on the Canadian Ingredient Disclosure List.
CAS# 123-91-1 is listed on the Canadian Ingredient Disclosure List.
CAS# 75-52-5 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 6/11/1999
Revision #5 Date: 3/16/2007

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
Lead

ACC# 12510

Section 1 - Chemical Product and Company Identification

MSDS Name: Lead
Catalog Numbers: S71957, S719571, S75257, S80049, L18-500, L246-500, L27-1LB, L27-1RL, NC9657609, NC9888945, XXL24625KG
Synonyms: Lead metal.
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7439-92-1	Lead	99.8	231-100-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: bluish white, silvery gray solid.
Warning! Possible cancer hazard. May cause cancer based on animal data. Causes eye and skin irritation. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. May be absorbed through intact skin. May cause central nervous system depression. May cause kidney damage. May cause adverse reproductive effects. May cause fetal effects.
Target Organs: Kidneys, central nervous system, blood forming organs.

Potential Health Effects

Eye: Causes eye irritation.
Skin: Causes skin irritation. May be absorbed through the skin.
Ingestion: Causes gastrointestinal irritation with nausea, vomiting and diarrhea. Ingestion of lead compounds can cause toxic effects in the blood-forming organs, kidneys and central nervous system. Symptoms of lead poisoning or plumbism include weakness, weight loss, lassitude, insomnia, and hypotension. It also includes constipation, anorexia, abdominal discomfort and colic.
Inhalation: May cause respiratory tract irritation. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count. May cause effects similar to those described for ingestion.
Chronic: Possible cancer hazard based on tests with laboratory animals. Chronic exposure may cause reproductive disorders and teratogenic effects. Chronic exposure to lead may result in plumbism which is characterized by lead line in gum, headache, muscle weakness, mental changes.

Section 4 - First Aid Measures

Eyes: 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. Discard contaminated clothing in a manner which limits further exposure.
Ingestion: 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.
Antidote: The use of Dimercaprol or BAL (British Anti-Lewisite) as a chelating agent should be determined by qualified medical personnel. The use of d-Penicillamine as a chelating agent should be determined by qualified medical personnel. The use of Calcium disodium EDTA as a chelating agent should be determined by qualified medical personnel.

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. Use extinguishing media appropriate to the surrounding fire. Substance is noncombustible. Dust can be an explosion hazard when exposed to heat or flame.
Extinguishing Media: For small fires, use water spray, dry chemical, carbon dioxide or chemical foam. Substance is noncombustible; use agent most appropriate to extinguish surrounding fire.
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: Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Avoid ingestion and inhalation. Wash clothing before reuse.
Storage: Store in a cool, dry place. Keep from contact with oxidizing materials. Keep containers tightly closed.

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 general or local exhaust ventilation to keep airborne concentrations below

the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Lead	0.05 mg/m3 TWA	0.050 mg/m3 TWA 100 mg/m3 IDLH	50 æg/m3 TWA; 50 æg/m3 TWA (as Pb); 30 æg/m3 Action Level (as Pb. Poison - see 29 CFR 1910.10 25)

OSHA Vacated PELs: Lead: 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: 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: bluish white, silvery gray
Odor: none reported
pH: Not applicable.
Vapor Pressure: 1.3 mm Hg @ 970C
Vapor Density: Not available.
Evaporation Rate: Not applicable.
Viscosity: Not applicable.
Boiling Point: 1740 deg C
Freezing/Melting Point:327.4 deg C
Decomposition Temperature: Not available.
Solubility: Insoluble in water.
Specific Gravity/Density:11.3
Molecular Formula: Pb
Molecular Weight:207.2

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Dust generation, excess heat.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Lead/lead oxides.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 7439-92-1: OF7525000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 7439-92-1:

- **ACGIH:** A3 - Confirmed animal carcinogen with unknown relevance to humans
- **California:** carcinogen, initial date 10/1/92
- **NTP:** Suspect carcinogen
- **IARC:** Group 2A carcinogen

Epidemiology: There are several reports that certain lead compounds administered to animals in high doses are carcinogenic, primarily producing renal tumors. Salts demonstrating carcinogenicity in animals are usually soluble salts. Epidemiological studies have not shown a relationship between lead exposure and the incidence of cancer in lead workers. However, one study of lead-exposed workers demonstrated a statistically significant elevation in the standardized mortality ratio for gastric and lung cancer in battery plant workers only.
Teratogenicity: Lead penetrates the placental barrier and has caused fetal abnormalities in animals. Excesssive exposure to lead during pregnancy has caused neurological disorders in infants.
Reproductive Effects: Reproductive effects from lead have been documented in animals and human beings of both sexes. In battery workmen with a mean exposure of 8.5 years to lead, there was an increased frequency of sperm abnormalities as compared with a control group.
Mutagenicity: Mutagenic effects have occurred in humans.
Neurotoxicity: Subtle neurologic effects have been demonstrated with relatively low blood levels of lead. The performance of lead workers on various neurophysiological tests was mildly reduced when compared with a control group. Anxiety, depression, poor concentration, forgetfulness, mild reductions in motor and sensory nerve conduction velociities have been documented in lead-exposed workers.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. LC50 Japanese quail (Coturnix japonica), males or females, 14 days old, oral (5-day adlibitum in diet) >5,000 ppm; at 1000, 2236 & 5000 onset of toxic signs began at 7, 7 & 7 days and remissed at 11, 11 & 12 days, respectively, no mortality was observed; control references were dieldrin & dicrotophos; corn oil diluent was added to diet at ratio of 2:98 by wt; (extreme concentrations: 1,000-5,000 ppm) /Lead metal, 100%.
Environmental: Terrestrial: Extremely stable metal. While some corrosion may be expected in soil, generally an inert coat of an insoluble salt will form and limit further corrosion. Aquatic: Lead will simply sink into the sediment. Atmospheric: Will be in particulate matter and be subject to washout and gravitational settling. Will biodegrade and bioconcentrate.
Physical: No information available.
Other: For more information, see "HANDBOOK OF ENVIRONMENTAL FATE AND EXPOSURE DATA."

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	Not Regulated
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7439-92-1 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# 7439-92-1: 10 lb final RQ (no reporting of releases of this hazardous substance is required
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 7439-92-1: immediate, delayed.
Section 313
This material contains Lead (CAS# 7439-92-1, 99.8%),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# 7439-92-1 is listed as a Priority Pollutant under the Clean Water Act. CAS# 7439-92-1 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# 7439-92-1 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 Lead, a chemical known to the state of California to cause cancer.
WARNING: This product contains Lead, a chemical known to the state of California to cause male reproductive toxicity.
California No Significant Risk Level: CAS# 7439-92-1: 15 æg/day NSRL (oral)

European/International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
T N
Risk Phrases:
R 20/22 Harmful by inhalation and if swallowed.
R 33 Danger of cumulative effects.
R 61 May cause harm to the unborn child.
R 62 Possible risk of impaired fertility.
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# 7439-92-1: No information available.

Canada - DSL/NDSL

CAS# 7439-92-1 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# 7439-92-1 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 4/29/1999
Revision #5 Date: 5/22/2007

Material Safety Data Sheet
Benzene

ACC# 02610

Section 1 - Chemical Product and Company Identification

MSDS Name: Benzene
Catalog Numbers: AC167660000, AC167660010, AC167660025, AC167660250, AC167665000, AC168650250, AC295330000, AC295330010, AC295330025, AC295330250, AC296880000, AC296880010, AC296880025, AC296880250, AC610230010, AC610231000, AC611001000, B243-4, B245-4, B245-500, B411-1, B411-4, B412-1, S79920ACS
Synonyms: Benzol; Cyclohexatriene; Phenyl hydride.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
71-43-2	Benzene	> 99	200-753-7

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear colorless liquid. Flash Point: -11 deg C.
Danger! Extremely flammable liquid and vapor. Vapor may cause flash fire. Harmful if swallowed, inhaled, or absorbed through the skin. Causes eye, skin, and respiratory tract irritation. Contains benzene. Benzene can cause cancer. Aspiration hazard if swallowed. Can enter lungs and cause damage. May cause blood abnormalities. May cause central nervous system effects.
Target Organs: Blood, central nervous system, respiratory system, eyes, bone marrow, immune system, skin.

Potential Health Effects

Eye: Causes eye irritation.
Skin: Causes skin irritation. Harmful if absorbed through the skin. Prolonged and/or repeated contact may cause defatting of the skin and dermatitis.
Ingestion: May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. May cause effects similar to those for inhalation exposure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.
Inhalation: Causes respiratory tract irritation. May cause drowsiness, unconsciousness, and central nervous system depression. Exposure may lead to irreversible bone marrow injury. Exposure may lead to aplastic anemia. Potential symptoms of overexposure by inhalation are dizziness, headache, vomiting, visual disturbances, staggering gait, hilarity, fatigue, and other symptoms of CNS depression.
Chronic: May cause bone marrow abnormalities with damage to blood forming tissues. May cause anemia

and other blood cell abnormalities. Chronic exposure to benzene has been associated with an increased incidence of leukemia and multiple myeloma (tumor composed of cells of the type normally found in the bone marrow). Immunodepressive effects have been reported. This substance has caused adverse reproductive and fetal effects in laboratory animals.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid.
Skin: In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.
Ingestion: Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.
Inhalation: If inhaled, remove to fresh air. 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. Use water spray to keep fire-exposed containers cool. Extremely flammable liquid and vapor. Vapor may cause flash fire. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas. This liquid floats on water and may travel to a source of ignition and spread fire. May accumulate static electricity.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: -11 deg C (12.20 deg F)
Autoignition Temperature: 498 deg C (928.40 deg F)
Explosion Limits, Lower:1.3 vol %
Upper: 7.1 vol %
NFPA Rating: (estimated) Health: 2; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Remove all sources of ignition. Provide ventilation. Approach spill from upwind. Use water spray to cool and disperse vapors, protect personnel, and dilute spills to form nonflammable mixtures.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Take precautionary measures against static discharges. Keep container tightly closed. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame. Avoid breathing vapor.

Storage: Keep away from sources of ignition. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. See 29CFR 1910.1028 for the regulatory requirements for the control of employee exposure to benzene.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Benzene	0.5 ppm TWA; 2.5 ppm STEL; Skin - potential significant contribution to overall exposure by the cutaneous r oute	0.1 ppm TWA 500 ppm IDLH	1 ppm TWA; 10 ppm TWA (applies to industry segments exempt from the benzene stan dard at 29 CFR 1910.1028); 25 ppm Ceiling (applies to industry segments exempt from the 1 ppm TWA and 5 ppm STEL of th e benzene standard); 0.5 ppm Action Level; 1 ppm TWA; 5 ppm STEL (Cancer hazard, Flammable - see 29 C FR 1910.1028)

OSHA Vacated PELs: Benzene: 10 ppm TWA (unless specified in 1910.1028)
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: 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: Liquid
Appearance: clear colorless
Odor: sweetish odor - aromatic odor
pH: Not applicable.
Vapor Pressure: 75 mm Hg @ 20 deg C
Vapor Density: 2.8 (air=1)
Evaporation Rate: Not available.
Viscosity: 0.647mPa @ 20 deg C
Boiling Point: 80.1 deg C
Freezing/Melting Point:5.5 deg C
Decomposition Temperature: Not available.
Solubility: 0.180 g/100 ml @ 25°C
Specific Gravity/Density:0.8765 @ 20°C
Molecular Formula:C6H6
Molecular Weight:78.11

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Ignition sources, excess heat, confined spaces.
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# 71-43-2: CY1400000
LD50/LC50:
CAS# 71-43-2:
Dermal, guinea pig: LD50 = >9400 uL/kg;
Draize test, rabbit, eye: 88 mg Moderate;
Draize test, rabbit, eye: 2 mg/24H Severe;
Draize test, rabbit, skin: 20 mg/24H Moderate;
Inhalation, mouse: LC50 = 9980 ppm;
Inhalation, mouse: LC50 = 24 mL/kg/2H;
Inhalation, rat: LC50 = 10000 ppm/7H;
Inhalation, rat: LC50 = 34 mL/kg/2H;
Inhalation, rat: LC50 = 6.5 mL/kg/4H;
Oral, mouse: LD50 = 4700 mg/kg;
Oral, rat: LD50 = 930 mg/kg;
Oral, rat: LD50 = 1 mL/kg;
Oral, rat: LD50 = 1800 Benzene is considered very toxic; probable human oral lethal dose would be 50-500 mg/kg. Human inhalation of approximately 20,000 ppm (2% in air) was fatal in 5-10 minutes.While percutaneous absorption of liquid benzene through intact human skin can be limited (e.g., 0.05% of the applied dose), the absorbed dose via direct dermal contact combined with that received from body surface exposure to benzene in workplace air is such that a substantial fraction (20-40%) of the total exposure is due to skin absorption.
Carcinogenicity:
CAS# 71-43-2:

- **ACGIH:** A1 - Confirmed Human Carcinogen
- **California:** carcinogen, initial date 2/27/87
- **NTP:** Known carcinogen
- **IARC:** Group 1 carcinogen

Epidemiology: IARC has concluded that epidemiological studies have established the relationship between benzene exposure and the development of acute myelogenous leukemia, and that there is sufficient evidence that benzene is carcinogenic to humans.
Teratogenicity: Inhalation, rat: TCLO = 50 ppm/24H (female 7-14 day(s) after conception) Effects on Embryo or Fetus - extra-embryonic structures (e.g., placenta, umbilical cord) and Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus).; Inhalation,mouse: TCLo = 5 ppm (female 6-15 day(s) after conception) Effects on Embryo or Fetus - cytological changes (including somatic cell genetic material) and Specific Developmental Abnormalities - blood and lymphatic systems (including spleen and marrow).
Reproductive Effects: Inhalation, rat: TCLO = 670 mg/m3/24H (female 15 day(s) pre-mating and female 1-22 day(s) after conception) female fertility index (e.g. # females pregnant per # sperm positive females; # females pregnant per # females mated).; Oral, mouse: TDLo = 12 gm/kg (female 6-15 day(s) after conception) Fertility - post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants).
Mutagenicity: DNA Inhibition: Human, Leukocyte = 2200 umol/L.; DNA Inhibition: Human, HeLa cell = 2200 umol/L.; Mutation Test Systems - not otherwise specified: Human, Lymphocyte = 5 umol/L.; Cytogenetic Analysis: Inhalation, Human = 125 ppm/1Y.; Cytogenetic Analysis: Human, Leukocyte = 1 mmol/L/72H.; Cytogenetic Analysis: Human, Lymphocyte = 1 mg/L.

Neurotoxicity: See actual entry in RTECS for complete information.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Mosquito Fish: TLm = 395 mg/L; 24 Hr; UnspecifiedFish: Goldfish: LC50 =46 mg/L; 24 Hr; Modified ASTM D 1345Fish: Fathead Minnow: LC50 = 15.1 mg/L; 96 Hr; Flow-through at 25°C (pH 7.9-8.0)Fish: Rainbow trout: LC50 = 5.3 mg/L; 96 Hr; Flow-through at 25°C (pH 7.9-8.0)Fish: Bluegill/Sunfish: LD50 = 20 mg/L; 24-48 Hr; Unspecified If benzene is released to soil, it will be subject to rapid volatilization near the surface and that which does not evaporate will be highly to very highly mobile in the soil and may leach to groundwater. If benzene is released to water, it will be subject to rapid volatilization. It will not be expected to significantly adsorb to sediment, bioconcentrate in aquatic organisms or hydrolyze. It may be subject to biodegradation.
Environmental: If benzene is released to the atmosphere, it will exist predominantly in the vapor phase. Gas-phase benzene will not be subject to direct photolysis but it will react with photochemically produced hydroxyl radicals with a half-life of 13.4 days. The reaction time in polluted atmospheres which contain nitrogen oxides or sulfur dioxide is accelerated with the half-life being reported as 4-6 hours. Benzene is fairly soluble in water and is removed from the atmosphere in rain.
Physical: Products of photooxidation include phenol, nitrophenols, nitrobenzene, formic acid, and peroxyacetyl nitrate.
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# 71-43-2: waste number U019 (Ignitable waste, Toxic waste).

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	BENZENE	BENZENE
Hazard Class:	3	3
UN Number:	UN1114	UN1114
Packing Group:	II	II
Additional Info:		FLASHPOINT -11 C

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 71-43-2 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# 71-43-2: 10 lb final RQ (received an adjusted RQ of 10 lbs based on potential carcinogeni

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 71-43-2: immediate, delayed, fire.

Section 313

This material contains Benzene (CAS# 71-43-2, > 99%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 71-43-2 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 71-43-2 is listed as a Hazardous Substance under the CWA. CAS# 71-43-2 is listed as a Priority Pollutant under the Clean Water Act. CAS# 71-43-2 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# 71-43-2 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 Benzene, a chemical known to the state of California to cause cancer.
WARNING: This product contains Benzene, a chemical known to the state of California to cause male reproductive toxicity.
California No Significant Risk Level: CAS# 71-43-2: 6.4 æg/day NSRL (oral); 13 æg/day NSRL (inhalation)

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T F

Risk Phrases:

R 11 Highly flammable.
R 36/38 Irritating to eyes and skin.
R 45 May cause cancer.
R 46 May cause heritable genetic damage.
R 48/23/24/25 Toxic : danger of serious damage to health by prolonged exposure through inhalation, contact with skin and if swallowed.
R 65 Harmful: may cause lung damage if swallowed.

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.

WGK (Water Danger/Protection)

CAS# 71-43-2: 3

Canada - DSL/NDSL

CAS# 71-43-2 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B2, D2A, 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# 71-43-2 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 6/11/1999
Revision #8 Date: 9/11/2008

SAFETY DATA SHEET
p,p'-DDT

Revision: 07/27/2018

according to Regulation (EC) No. 1907/2006 as amended by (EC) No. 2015/830 and US OSHA HCS 2015

Section 1. Identification of the Substance/Mixture and of the Company/Undertaking

1.1 Product Code: 24243

Product Name: p,p'-DDT

Synonyms: 1,1'-(2,2,2-trichloroethylidene)bis[4-chloro-benzene]; 4,4'-DDT; 4,4'-Dichlorodiphenyltrichloroethane; p,p'-Dichlorodiphenyltrichloroethane; Dicophaner; NSC 8939;

1.2 Relevant identified uses of the substance or mixture and uses advised against:

Relevant identified uses: For research use only, not for human or veterinary use.

1.3 Details of the Supplier of the Safety Data Sheet:

Company Name: Cayman Chemical Company
1180 E. Ellsworth Rd.
Ann Arbor, MI 48108

Web site address: www.caymanchem.com

Information: Cayman Chemical Company +1 (734)971-3335

1.4 Emergency telephone number:

Emergency Contact: CHEMTREC Within USA and Canada: +1 (800)424-9300
CHEMTREC Outside USA and Canada: +1 (703)527-3887

Section 2. Hazards Identification

2.1 Classification of the Substance or Mixture:

Acute Toxicity: Oral, Category 3

Carcinogenicity, Category 2

Specific Target Organ Toxicity (repeated exposure), Category 1

Aquatic Toxicity (Acute), Category 1

Aquatic Toxicity (Chronic), Category 1

2.2 Label Elements:

GHS Signal Word: **Danger**

GHS Hazard Phrases:

H301: Toxic if swallowed.

H351: Suspected of causing cancer.

H372: Causes damage to organs through prolonged or repeated exposure.

H400: Very toxic to aquatic life.

H410: Very toxic to aquatic life with long lasting effects.

GHS Precaution Phrases:

P201: Obtain special instructions before use.

P202: Do not handle until all safety precautions have been read and understood.

P260: Do not breathe {dust/fume/gas/mist/vapors/spray}.

P264: Wash {hands} thoroughly after handling.

P273: Avoid release to the environment.

P280: Wear {protective gloves/protective clothing/eye protection/face protection}.

GHS Response Phrases:

P301+310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.

P308+313: IF exposed or concerned: Get medical attention/advice.

P314: Get medical attention/advice if you feel unwell.

P330: Rinse mouth.

P391: Collect spillage.

GHS Storage and Disposal Phrases:

Please refer to Section 7 for Storage and Section 13 for Disposal information.

2.3 Adverse Human Health Effects and Symptoms: Causes damage to organs through prolonged or repeated exposure.
Material may be irritating to the mucous membranes and upper respiratory tract.
May be harmful by inhalation or skin absorption.
May cause eye, skin, or respiratory system irritation.
Suspected of causing cancer.
Toxic if swallowed.
Very toxic to aquatic life with long lasting effects.
To the best of our knowledge, the toxicological properties have not been thoroughly investigated.

Section 3. Composition/Information on Ingredients

CAS # / RTECS #	Hazardous Components (Chemical Name)/ REACH Registration No.	Concentration	EC No./ EC Index No.	GHS Classification
50-29-3 KJ3325000	DDT {1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane; Clofenotane; 4,4-DDT; Dichlorodiphenyltrichloroethane}	100.0 %	200-024-3 602-045-00-7	Acute Tox.(O) 3: H301 Carcinogen 2: H351 STOT (RE) 1: H372 Aquatic (A) 1: H400 Aquatic (C) 1: H410

Section 4. First Aid Measures

4.1 Description of First Aid Measures:

In Case of Inhalation: Remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Get immediate medical attention.

In Case of Skin Contact: Immediately wash skin with soap and plenty of water for at least 15 minutes. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse.

In Case of Eye Contact: Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Have eyes examined and tested by medical personnel.

In Case of Ingestion: Wash out mouth with water provided person is conscious. Never give anything by mouth to an unconscious person. Get medical attention. Do NOT induce vomiting unless directed to do so by medical personnel.

Section 5. Fire Fighting Measures

5.1 Suitable Extinguishing Media: Use alcohol-resistant foam, carbon dioxide, water, or dry chemical spray.
Use water spray to cool fire-exposed containers.

Unsuitable Extinguishing Media: A solid water stream may be inefficient.

5.2 Flammable Properties and Hazards: No data available.

No data available.

Flash Pt: No data.

Explosive Limits: LEL: No data. UEL: No data.

Autoignition Pt: No data.

5.3 Fire Fighting Instructions: As in any fire, wear self-contained breathing apparatus pressure-demand (NIOSH approved or equivalent), and full protective gear to prevent contact with skin and eyes.

Section 6. Accidental Release Measures

6.1 Protective Precautions, Protective Equipment and Emergency Procedures: Avoid breathing vapors and provide adequate ventilation. As conditions warrant, wear a NIOSH approved self-contained breathing apparatus, or respirator, and appropriate personal protection (rubber boots, safety goggles, and heavy rubber gloves).

6.2 Environmental Precautions: Take steps to avoid release into the environment, if safe to do so.

6.3 Methods and Material For Containment and Cleaning Up: Contain spill and collect, as appropriate. Transfer to a chemical waste container for disposal in accordance with local regulations.

Section 7. Handling and Storage

7.1 Precautions To Be Taken in Handling: Avoid breathing dust/fume/gas/mist/vapours/spray. Avoid prolonged or repeated exposure.

7.2 Precautions To Be Taken in Storing: Keep container tightly closed. Store in accordance with information listed on the product insert.

Section 8. Exposure Controls/Personal Protection

8.1 Exposure Parameters:

CAS # Chemical Name	Jurisdiction	Recommended Exposure Limits	Notations
50-29-3 DDT {1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane; Clofenotane; 4,4-DDT; Dichlorodiphenyltrichloroethane}	ACGIH TLV	TLV: 1 mg/m3	
	France VL	TWA: 1 mg/m3	
	OSHA PELs	PEL: 1 mg/m3	

8.2 Exposure Controls:

8.2.1 Engineering Controls (Ventilation etc.): Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

8.2.2 Personal protection equipment:

Eye Protection: Safety glasses

Protective Gloves: Compatible chemical-resistant gloves

Other Protective Clothing: Lab coat

Respiratory Equipment (Specify Type): NIOSH approved respirator, as conditions warrant.

Work/Hygienic/Maintenance Practices: Do not take internally. Facilities storing or utilizing this material should be equipped with an eyewash and a safety shower. Wash thoroughly after handling.

No data available.

Section 9. Physical and Chemical Properties

9.1 Information on Basic Physical and Chemical Properties

Physical States:	[ ] Gas [ ] Liquid [X] Solid
Appearance and Odor:	A solid
pH:	No data.
Melting Point:	No data.
Boiling Point:	No data.
Flash Pt:	No data.
Evaporation Rate:	No data.
Flammability (solid, gas):	No data available.
Explosive Limits:	LEL: No data. UEL: No data.
Vapor Pressure (vs. Air or mm Hg):	No data.
Vapor Density (vs. Air = 1):	No data.
Specific Gravity (Water = 1):	No data.
Solubility in Water:	No data.
Solubility Notes:	Soluble in: MeOH (heated); chloroform (slightly);
Octanol/Water Partition Coefficient:	No data.
Autoignition Pt:	No data.
Decomposition Temperature:	No data.
Viscosity:	No data.

9.2 Other Information

Percent Volatile:	No data.
Molecular Formula & Weight:	C14H9Cl5 354.5

Section 10. Stability and Reactivity

10.1	**Reactivity:**	No data available.
10.2	**Stability:**	Unstable [ ] Stable [X]
10.3	**Stability Note(s):**	Stable if stored in accordance with information listed on the product insert.
	Polymerization:	Will occur [ ] Will not occur [X]
10.4	**Conditions To Avoid:**	No data available.
10.5	**Incompatibility - Materials To Avoid:**	iron and iron salts oxidizing agents
10.6	**Hazardous Decomposition or Byproducts:**	carbon dioxide carbon monoxide hydrogen chloride gas

Section 11. Toxicological Information

11.1 Information on Toxicological Effects: The toxicological effects of this product have not been thoroughly studied.
p,p'-DDT - Toxicity Data: Oral LDLO (infant): 150 mg/kg; Oral TDLO (man): 6 mg/kg; Oral LD50 (rat): 87 mg/kg; Intraperitoneal LD50 (rat): 9100 ug/kg; Subcutaneous LD50 (rat): 1500 mg/kg; Intraperitoneal LD50 (mouse): 32 mg/kg;

Irritation or Corrosion:

Chronic Toxicological Effects: p,p'-DDT - Investigated as an agricultural chemical, mutagen, reproductive effector, and tumorigen.
Only select Registry of Toxic Effects of Chemical Substances (RTECS) data is presented here.
See actual entry in RTECS for complete information.
p,p'-DDT RTECS Number: KJ3325000

Carcinogenicity: NTP? No IARC Monographs? No OSHA Regulated? No

CAS #	Hazardous Components (Chemical Name)	NTP	IARC	ACGIH	OSHA
50-29-3	DDT {1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane; Clofenotane; 4,4-DDT; Dichlorodiphenyltrichloroethane}	Possible	2B	A3	n.a.

Section 12. Ecological Information

12.1 Toxicity: Avoid release into the environment.
Runoff from fire control or dilution water may cause pollution.

12.2 Persistence and Degradability: No data available.

12.3 Bioaccumulative Potential: No data available.

12.4 Mobility in Soil: No data available.

12.5 Results of PBT and vPvB assessment: No data available.

12.6 Other adverse effects: No data available.

Section 13. Disposal Considerations

13.1 Waste Disposal Method: Dispose in accordance with local, state, and federal regulations.

Section 14. Transport Information

14.1 LAND TRANSPORT (US DOT):

DOT Proper Shipping Name: Toxic solid, organic, n.o.s. (p,p'-DDT)
DOT Hazard Class: 6.1 POISON
UN/NA Number: UN2811 **Packing Group:** III

14.1 LAND TRANSPORT (European ADR/RID):

ADR/RID Shipping Name: Toxic solid, organic, n.o.s. (p,p'-DDT)
UN Number: 2811 **Packing Group:** III
Hazard Class: 6.1 - POISON

14.3 AIR TRANSPORT (ICAO/IATA):

ICAO/IATA Shipping Name:	Toxic solid, organic, n.o.s. (p,p'-DDT)		
UN Number:	2811	**Packing Group:**	III
Hazard Class:	6.1 - POISON	**IATA Classification:**	6.1

Additional Transport Information: Transport in accordance with local, state, and federal regulations. When sold in quantities of less than or equal to 1 mL, or 1 g, with an Excepted Quantity Code of E1, E2, E4, or E5, this item meets the De Minimis Quantities exemption, per IATA 2.6.10. Therefore packaging does not have to be labeled as Dangerous Goods/Excepted Quantity.

Section 15. Regulatory Information

EPA SARA (Superfund Amendments and Reauthorization Act of 1986) Lists

CAS #	Hazardous Components (Chemical Name)	S. 302 (EHS)	S. 304 RQ	S. 313 (TRI)
50-29-3	DDT {1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane; Clofenotane; 4,4-DDT; Dichlorodiphenyltrichloroethane}	No	Yes 1 LB	No

CAS #	Hazardous Components (Chemical Name)	Other US EPA or State Lists
50-29-3	DDT {1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane; Clofenotane; 4,4-DDT; Dichlorodiphenyltrichloroethane}	CAA HAP,ODC: No; CWA NPDES: Yes; TSCA: Yes - Inventory, 5A(2), 12(b); CA PROP.65: Yes: Canc+RDTox(F/M)

Regulatory Information Statement: This SDS was prepared in accordance with 29 CFR 1910.1200 and Regulation (EC) No.1272/2008.

Section 16. Other Information

Revision Date: 07/27/2018

Additional Information About This Product: No data available.

Company Policy or Disclaimer: DISCLAIMER: This information 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.

Material Safety Data Sheet
Ethylbenzene

ACC# 00596

Section 1 - Chemical Product and Company Identification

MSDS Name: Ethylbenzene
Catalog Numbers: AC118080000, AC118080025, AC118080250, AC118080251, AC118085000, 11808-0010, O2751-1
Synonyms: Ethylbenzol; Phenylethane.
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
100-41-4	Ethylbenzene	>99	202-849-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid. Flash Point: 15 deg C.
Warning! Flammable liquid and vapor. Causes eye, skin, and respiratory tract irritation. May be harmful if inhaled. Aspiration hazard if swallowed. Can enter lungs and cause damage. May cause central nervous system depression.
Target Organs: Central nervous system.

Potential Health Effects

Eye: Causes severe eye irritation. Causes redness and pain.
Skin: Causes skin irritation. Prolonged and/or repeated contact may cause irritation and/or dermatitis. May be absorbed through the skin. Causes redness and pain.
Ingestion: May cause irritation of the digestive tract. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.
Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation. Vapors may cause dizziness or suffocation.
Chronic: Chronic inhalation may cause effects similar to those of acute inhalation.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.
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: 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: 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. Use water spray to keep fire-exposed containers cool. Flammable liquid and vapor. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas. This liquid floats on water and may travel to a source of ignition and spread fire. May accumulate static electricity.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: 15 deg C (59.00 deg F)
Autoignition Temperature: 432 deg C (809.60 deg F)
Explosion Limits, Lower:1.2%
Upper: 6.8%
NFPA Rating: (estimated) Health: 2; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Remove all sources of ignition. Provide ventilation. Control runoff and isolate discharged material for proper disposal. Use water spray to cool and disperse vapors and protect personnel.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Keep away from heat, sparks and flame. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Avoid breathing vapor or mist.
Storage: Keep away from sources of ignition. Store in a tightly closed container. Keep from contact with oxidizing materials. 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 general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs

Ethylbenzene	100 ppm TWA; 125 ppm STEL	100 ppm TWA; 435 mg/m3 TWA 800 ppm IDLH	100 ppm TWA; 435 mg/m3 TWA

OSHA Vacated PELs: Ethylbenzene: 100 ppm TWA; 435 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: aromatic odor
pH: Not available.
Vapor Pressure: 9.6 mm Hg @ 25 deg C
Vapor Density: 3.7 (air=1)
Evaporation Rate:<1 (butyl acetate=1)
Viscosity: 0.63 mPa s 20 C
Boiling Point: 136 deg C
Freezing/Melting Point:-95 deg C
Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density:0.86
Molecular Formula:C8H10
Molecular Weight:106.17

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Ignition sources, excess heat.
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# 100-41-4: DA0700000
LD50/LC50:
CAS# 100-41-4:
Draize test, rabbit, eye: 500 mg Severe;
Inhalation, mouse: LC50 = 35500 mg/m3/2H;
Inhalation, rat: LC50 = 55000 mg/m3/2H;
Oral, rat: LD50 = 3500 mg/kg;
Oral, rat: LD50 = 3500 mg/kg;
Skin, rabbit: LD50 = 17800 uL/kg;
.
Inhalation rat LC50: 17.2 mg/l/4H from BASF.
Carcinogenicity:
CAS# 100-41-4:

- **ACGIH:** A3 - Confirmed animal carcinogen with unknown relevance to humans
- **California:** carcinogen, initial date 6/11/04
- **NTP:** Not listed.
- **IARC:** Group 2B carcinogen

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: Mutation in mammalian somatic cells(Rodent,mouse) Lymphocyte = 80 mg/L.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: LC50 = 14.0 mg/L; 96 Hr.; Static BioassayFish: Fathead Minnow: LC50 = 12.1 mg/L; 96 Hr.; Flow-through BioassayFish: Bluegill/Sunfish: LC50 = 150.0 mg/L; 96 Hr.; Static Bioassay, pH 6.5-7.9, 21-23 degrees CWater flea EC50 = 2.1 mg/L; 48 Hr.; Static BioassayWater flea EC50 = 75.0 mg/L; 48 Hr.; Static Bioassay Shrimp (mysidoposis bahia), LC50=87.6 mg/L/96hr. Sheepshead minnow LC50=275 mg/L/96hr. Fathead minnow LC50=42.3 mg/L/96hr in hard water &48.5 mg/L/96hr in softwater.
Environmental: Experimental data on the bioconcentration of ethylbenzene include a log BCF of 1.9 in goldfish and the log BCF of 0.67 for clams exposed to the water-soluble fraction of crude oil. Using its octanol/water partition coefficient (log Kow= 3.15) and using a recommended regression equation, one can calculate a log BCF in fish of 2.16 indicating that ethylbenzene should not significantly bioconcentrate in aquatic organisms. Ethylbenzene has a moderate adsorption for soil. The measured Koc for silt loam was 164
Physical: The predominant photochemical reaction of ethylbenzene in the atmosphere is with hydroxyl radicals; the tropospheric half-life for this reaction is 5.5 and 24 hr in the summer and winter, actively. Degradation is somewhat faster under photochemical smog situations. Photooxidation products which have been identified include ethylphenol, benzaldehyde, acetophenone and m- and p-ethylnitrobenzene. Ethylbenzene is resistant to hydrolysis. Ethylbenzene does not significantly absorb light above 290 nm in methanol solution.
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: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	ETHYLBENZENE	ETHYLBENZENE
Hazard Class:	3	3
UN Number:	UN1175	UN1175
Packing Group:	II	II
Additional Info:		FLASHPOINT 15 C

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 100-41-4 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 100-41-4: Effective 6/19/87, Sunset 6/19/97
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# 100-41-4: 1000 lb final RQ; 454 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 100-41-4: immediate, delayed, fire.
Section 313
This material contains Ethylbenzene (CAS# 100-41-4, >99%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 100-41-4 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
CAS# 100-41-4 is listed as a Hazardous Substance under the CWA. CAS# 100-41-4 is listed as a Priority Pollutant under the Clean Water Act. CAS# 100-41-4 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# 100-41-4 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 Ethylbenzene, a chemical known to the state of California to cause cancer.
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 F
Risk Phrases:
R 11 Highly flammable.
R 20 Harmful by inhalation.

Safety Phrases:
S 16 Keep away from sources of ignition - No smoking.
S 24/25 Avoid contact with skin and eyes.
S 29 Do not empty into drains.

WGK (Water Danger/Protection)
CAS# 100-41-4: 1
Canada - DSL/NDSL
CAS# 100-41-4 is listed on Canada's DSL List.
Canada - WHMIS

This product has a WHMIS classification of B2, D2B, 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# 100-41-4 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 4/28/1999
Revision #6 Date: 11/29/2007

SAFETY DATA SHEET

Creation Date 24-Nov-2010 **Revision Date** 19-Jan-2018 **Revision Number** 3

1. Identification

Product Name **Manganese, powder, -325 mesh**

Cat No. : **AC317440000; AC317440010; AC317442500**

CAS-No 7439-96-5
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

Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **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)

Flammable solids	Category 2
Serious Eye Damage/Eye Irritation	Category 2

Label Elements

Signal Word
Warning

Hazard Statements
Flammable solid
Causes serious eye irritation

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Wear protective gloves/protective clothing/eye protection/face protection
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Hazards not otherwise classified (HNOC)
None identified

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Manganese	7439-96-5	>95

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Skin Contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention.

Inhalation Remove from exposure, lie down. Remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.

Ingestion Clean mouth with water. Get medical attention.

Most important symptoms and effects No information available.

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Dry chemical.

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
Combustible material.

Hazardous Combustion Products
None known.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	2	0	N/A

6. Accidental release measures

Personal Precautions	Ensure adequate ventilation. Use personal protective equipment as required.
Environmental Precautions	See Section 12 for additional Ecological Information.
Methods for Containment and Clean Up	Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment. Sweep up and shovel into suitable containers for disposal.

7. Handling and storage

Handling	Avoid contact with skin and eyes. Do not breathe dust. Use spark-proof tools and explosion-proof equipment. Use only non-sparking tools.
Storage	Keep in a dry, cool and well-ventilated place. Refer product specification and/or product label for specific storage temperature requirement. Keep container tightly closed. Keep away from heat, sparks and flame. Keep under nitrogen.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Manganese	TWA: 0.02 mg/m³ TWA: 0.1 mg/m³	(Vacated) TWA: 1 mg/m³ Ceiling: 5 mg/m³ (Vacated) STEL: 3 mg/m³ (Vacated) Ceiling: 5 mg/m³	IDLH: 500 mg/m³ TWA: 1 mg/m³ STEL: 3 mg/m³	TWA: 0.2 mg/m³ TWA: 1 mg/m³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures	Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/face Protection	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin and body protection	Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection No protective equipment is needed under normal use conditions.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Powder Solid
Appearance	Dark brown
Odor	No information available
Odor Threshold	No information available
pH	No information available
Melting Point/Range	1260 °C / 2300 °F
Boiling Point/Range	1900 °C / 3452 °F
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	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	Mn
Molecular Weight	54.94

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Moisture sensitive.

Conditions to Avoid Incompatible products. Exposure to moisture.

Incompatible Materials Acids, Bases, Halogens

Hazardous Decomposition Products None under normal use conditions

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Manganese	LD50 = 9 g/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
Manganese	7439-96-5	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated. See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity
Do not empty into drains.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Manganese	Not listed	LC50: > 3.6 mg/L, 96h semi-static (Oncorhynchus mykiss)	Not listed	Not listed

Persistence and Degradability Insoluble in water

Bioaccumulation/ Accumulation No information available.

Mobility Is not likely mobile in the environment due its low 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 UN3089
Proper Shipping Name Metal powder, flammable, n.o.s.
Technical Name Manganese
Hazard Class 4.1
Packing Group III

TDG
UN-No UN3089
Proper Shipping Name Metal powder, flammable, n.o.s.
Hazard Class 4.1
Packing Group III

IATA

UN-No	UN3089
Proper Shipping Name	Metal powder, flammable, n.o.s.
Hazard Class	4.1
Packing Group	III

IMDG/IMO

UN-No	UN3089
Proper Shipping Name	Metal powder, flammable, n.o.s.
Hazard Class	4.1
Packing Group	III

15. Regulatory information

United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
Manganese	7439-96-5	X	ACTIVE	-

Legend:
TSCA - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
Manganese	7439-96-5	X	-	231-105-1	X	X	X	X	KE-22999

U.S. Federal Regulations

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Manganese	7439-96-5	>95	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Manganese	X		-

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA Not applicable

California Proposition 65 This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Manganese	X	X	X	X	X

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

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date	24-Nov-2010
Revision Date	19-Jan-2018
Print Date	19-Jan-2018
Revision Summary	This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

Material Safety Data Sheet
Mercury, 99.999%

ACC# 96252

Section 1 - Chemical Product and Company Identification

MSDS Name: Mercury, 99.999%
Catalog Numbers: AC193480000, AC193480500
Synonyms: Colloidal mercury; Hydrargyrum; Metallic mercury; Quick silver; Liquid silver
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
7439-97-6	Mercury	99.999	231-106-7

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: silver liquid.
Danger! Corrosive. Harmful if inhaled. May be absorbed through intact skin. Causes eye and skin irritation and possible burns. May cause severe respiratory tract irritation with possible burns. May cause severe digestive tract irritation with possible burns. May cause liver and kidney damage. May cause central nervous system effects. This substance has caused adverse reproductive and fetal effects in animals. Inhalation of fumes may cause metal-fume fever. Possible sensitizer.
Target Organs: Blood, kidneys, central nervous system, liver, brain.

Potential Health Effects

Eye: Exposure to mercury or mercury compounds can cause discoloration on the front surface of the lens, which does not interfere with vision. Causes eye irritation and possible burns. Contact with mercury or mercury compounds can cause ulceration of the conjunctiva and cornea.
Skin: May be absorbed through the skin in harmful amounts. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. Causes skin irritation and possible burns. May cause skin rash (in milder cases), and cold and clammy skin with cyanosis or pale color.
Ingestion: May cause severe and permanent damage to the digestive tract. May cause perforation of the digestive tract. May cause effects similar to those for inhalation exposure. May cause systemic effects.
Inhalation: Causes chemical burns to the respiratory tract. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count. May cause central nervous system effects including vertigo, anxiety, depression, muscle incoordination, and emotional instability. Aspiration may lead to pulmonary edema. May cause systemic effects. May cause respiratory sensitization.
Chronic: May cause liver and kidney damage. May cause reproductive and fetal effects. Effects may be delayed. Chronic exposure to mercury may cause permanent central nervous system damage, fatigue, weight loss, tremors, personality changes. Chronic ingestion may cause accumulation of mercury in body tissues. Prolonged or repeated exposure may cause inflammation of the mouth and gums, excessive salivation, and loosening of the teeth.

Section 4 - First Aid Measures

Eyes: Get medical aid immediately. Do NOT allow victim to rub eyes or keep eyes closed. Extensive 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. Wash clothing before reuse. Destroy contaminated shoes.
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. Wash mouth out with water.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Notes to Physician: The concentration of mercury in whole blood is a reasonable measure of the body-burden of mercury and thus is used for monitoring purposes. Treat symptomatically and supportively. Persons with kidney disease, chronic respiratory disease, liver disease, or skin disease may be at increased risk from exposure to this substance.
Antidote: The use of d-Penicillamine as a chelating agent should be determined by qualified medical personnel. The use of Dimercaprol or BAL (British Anti-Lewisite) as a chelating agent should be determined by qualified medical personnel.

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. Water runoff can cause environmental damage. Dike and collect water used to fight fire. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
Extinguishing Media: Substance is nonflammable; use agent most appropriate to extinguish surrounding fire. Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. Keep container tightly closed. Do not get on skin or in eyes. Do not ingest or inhale. Use only in a chemical fume hood. Discard contaminated shoes. Do not breathe vapor.
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. Keep away from metals. Store protected from azides.

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 only under a chemical fume hood.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Mercury	0.025 mg/m3 TWA; Skin - potential significant contribution to overall exposure by the cutaneous r oute	0.05 mg/m3 TWA (vapor) 10 mg/m3 IDLH	0.1 mg/m3 Ceiling

OSHA Vacated PELs: Mercury: 0.05 mg/m3 TWA (vapor)

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: Liquid
Appearance: silver
Odor: odorless
pH: Not available.
Vapor Pressure: 0.002 mm Hg @ 25C
Vapor Density: 7.0
Evaporation Rate: Not available.
Viscosity: 15.5 mP @ 25 deg C
Boiling Point: 356.72 deg C
Freezing/Melting Point:-38.87 deg C
Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density:13.59 (water=1)
Molecular Formula: Hg
Molecular Weight:200.59

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: High temperatures, incompatible materials.
Incompatibilities with Other Materials: Metals, aluminum, ammonia, chlorates, copper, copper alloys, ethylene oxide, halogens, iron, nitrates, sulfur, sulfuric acid, oxygen, acetylene, lithium, rubidium, sodium carbide, lead, nitromethane, peroxyformic acid, calcium, chlorine dioxide, metal oxides, azides, 3-bromopropyne, alkynes + silver perchlorate, methylsilane + oxygen, tetracarbonylnickel + oxygen, boron diiodophosphide.
Hazardous Decomposition Products: Mercury/mercury oxides.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 7439-97-6: OV4550000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 7439-97-6: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: Intraperitoneal, rat: TDLo = 400 mg/kg/14D-I (Tumorigenic - equivocal tumorigenic agent by RTECS criteria - tumors at site of application).
Teratogenicity: Inhalation, rat: TCLo = 1 mg/m3/24H (female 1-20 day(s) after conception) Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus).
Reproductive Effects: Inhalation, rat: TCLo = 890 ng/m3/24H (male 16 week(s) pre-mating) Paternal Effects - spermatogenesis (incl. genetic material, sperm morphology, motility, and count).; Inhalation, rat: TCLo = 7440 ng/m3/24H (male 16 week(s) pre-mating) Fertility - post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants).
Mutagenicity: Cytogenetic Analysis: Unreported, man = 150 ug/m3.
Neurotoxicity: The brain is the critical organ in humans for chronic vapor exposure; in severe cases, spontaneous degeneration of the brain cortex can occur as a late sequela to past exposure.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: LC50 = 0.16-0.90 mg/L; 96 Hr; UnspecifiedFish: Bluegill/Sunfish: LC50 = 0.16-0.90 mg/L; 96 Hr; UnspecifiedFish: Channel catfish: LC50 = 0.35 mg/L; 96 Hr; UnspecifiedWater flea Daphnia: EC50 = 0.01 mg/L; 48 Hr; Unspecified In aquatic systems, mercury appears to bind to dissolved matter or fine particulates, while the transport of mercury bound to dust particles in the atmosphere or bed sediment particles in rivers and lakes is generally less substantial. The conversion, in aquatic environments, of inorganic mercury cmpd to methyl mercury implies that recycling of mercury from sediment to water to air and back could be a rapid process.
Environmental: Mercury bioaccumulates and concentrates in food chain (concentration may be as much as 10,000 times that of water). Bioconcentration factors of 63,000 for freshwater fish and 10,000 for salt water fish have been found. Much of the mercury deposited on land, appears to revaporize within a day or two, at least in areas substantially heated by sunlight.
Physical: All forms of mercury (Hg) (metal, vapor, inorganic, or organic) are converted to methyl mercury. Inorganic forms are converted by microbial action in the atmosphere to methyl mercury.
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# 7439-97-6: waste number U151.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	DOT regulated - small quantity provisions apply (see 49CFR173.4)	MERCURY

Hazard Class:		8
UN Number:		UN2809
Packing Group:		III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7439-97-6 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
CAS# 7439-97-6: Section 5
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 7439-97-6: 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 # 7439-97-6: immediate, delayed.
Section 313
This material contains Mercury (CAS# 7439-97-6, 99.999%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 7439-97-6 (listed as Mercury compounds) is listed as a hazardous air pollutant (HAP).
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# 7439-97-6 is listed as a Priority Pollutant under the Clean Water Act. CAS# 7439-97-6 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# 7439-97-6 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65
WARNING: This product contains Mercury, a chemical known to the state of California to cause developmental reproductive toxicity.
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 23 Toxic by inhalation.
R 33 Danger of cumulative effects.

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

S 7 Keep container tightly closed.

WGK (Water Danger/Protection)

CAS# 7439-97-6: 3

Canada - DSL/NDSL

CAS# 7439-97-6 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D2A, E.

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# 7439-97-6 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 6/15/1999
Revision #5 Date: 3/16/2007

Date of Issue:
27 May 2015

SAFETY DATA SHEET

1. Substance and Source Identification

Product Identifier

SRM Number: 3079
SRM Name: Aroclor 1254 in Transformer Oil
Other Means of Identification: Not Applicable.

Recommended Use of This Material and Restrictions of Use

This Standard Reference Material (SRM) is a solution of Aroclor 1254 in transformer oil. This SRM is intended primarily for calibrating chromatographic instrumentation and methods of analysis used for the determination of Aroclor 1254 and polychlorinated biphenyls (PCBs) in transformer oil. A unit of SRM 3079 consists of five 2 mL ampoules, each containing approximately 1.2 mL of transformer oil.

Company Information

National Institute of Standards and Technology
Standard Reference Materials Program
100 Bureau Drive, Stop 2300
Gaithersburg, Maryland 20899-2300

Telephone: 301-975-2200
FAX: 301-948-3730
E-mail: SRMMSDS@nist.gov
Website: http://www.nist.gov/srm

Emergency Telephone ChemTrec:
1-800-424-9300 (North America)
+1-703-527-3887 (International)

2. Hazards Identification

Classification

Physical Hazard:	Not classified.	
Health Hazard:	Carcinogenicity	Category 1B
	Reproductive Toxicity	Category 2
	Aspiration Hazard	Category 1

Label Elements

Symbol

Signal Word

DANGER

Hazard Statement(s)

H304	May be fatal if swallowed and enters airways.
H350	May cause cancer <inhalation, ingestion>.
H361	Suspected of damaging fertility or the unborn child.

Precautionary Statement(s):

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P280	Wear protective gloves, protective clothing, and eye protection.
P308+P313	If exposed or concerned: Get medical attention.
P301+P310	If swallowed: Immediately call a doctor.
P331	Do NOT induce vomiting.
P405	Store locked up.
P501	Dispose of contents and container according to local regulations.

Hazards Not Otherwise Classified: Not applicable.

Ingredients(s) with Unknown Acute Toxicity: Not applicable.

3. Composition and Information on Hazardous Ingredients

Substance: Aroclor 1254 in transformer oil.

Other Designations:

Transformer oil (hydrotreated light naphthenic distillate (petroleum), hydraulic petroleum oil, distillates, petroleum).

Aroclor 1254 (PCB 1254; chlorodiphenyl (54% Cl); polychlorinated biphenyl; chlorobiphenyls; PCB; PCBs)

Components are listed in compliance with OSHA 29 CFR 1910.1200.

Hazardous Component(s)	CAS Number	EC Number (EINECS)	Nominal Mass Concentration (%)
Transformer oil	64742-53-6	265-156-6	>99
Aroclor 1254	11097-69-1	215-648-1[(a)]	0.3

[(a)] EC Number as PCB, polychlorinated biphenyl

4. First Aid Measures

Description of First Aid Measures:

Inhalation: If adverse effects occur, remove to uncontaminated area. If not breathing, give artificial respiration or oxygen by qualified personnel. Seek immediate medical attention.

Skin Contact: Wash exposed skin with soap and water for at least 15 minutes. Seek medical attention if needed.

Eye Contact: Immediately flush eyes, including under the eyelids with copious amounts of water for at least 15 minutes. Seek immediate medical attention.

Ingestion: Aspiration hazard. Do not induce vomiting. If vomiting occurs, keep head lower than hips to prevent aspiration. If not breathing, give artificial respiration by qualified personnel. Seek immediate medical attention.

Most Important Symptoms/Effects, Acute and Delayed: Irritation, dizziness, nausea, coughing, and aspiration.

Indication of any immediate medical attention and special treatment needed, if necessary: Not applicable.

5. Fire Fighting Measures

Fire and Explosion Hazards: Slight fire hazard. See Section 9, "Physical and Chemical Properties" for flammability properties.

Extinguishing Media:

Suitable: Regular dry chemical, carbon dioxide, regular foam.
Unsuitable: Straight streams of water.

Specific Hazards Arising from the Chemical: None listed.

Special Protective Equipment and Precautions for Fire-Fighters: Avoid inhalation of material or combustion byproducts. Wear full protective clothing and NIOSH approved self-contained breathing apparatus (SCBA).

NFPA Ratings (0 = Minimal; 1 = Slight; 2 = Moderate; 3 = Serious; 4 = Severe)

Health = 2 Fire = 1 Reactivity = 0

6. Accidental Release Measures

Personal Precautions, Protective Equipment and Emergency Procedures: Use suitable protective equipment; see Section 8, "Exposure Controls and Personal Protection".

Methods and Materials for Containment and Clean up: Absorb spilled material with sand or non-combustible material and collect in appropriate container for disposal. Keep out of water supplies and sewers.

7. HANDLING AND STORAGE

Safe Handling Precautions: See Section 8, "Exposure Controls and Personal Protection".

Storage: Store and handle in accordance with all current regulations and standards. The storage floor must be impermeable and form a collecting basin so that, in the event of an accident spillage, the liquid cannot spread beyond the storage area.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits:

Transformer oil: No occupational exposure limits established.

Aroclor 1254: NIOSH (TWA): 0.001 mg/m^3 (related to 1,1'-Biphenyl, chloro derivatives)

Engineering Controls: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

Personal Protection Measures: In accordance with OSHA 29 CFR 1910.132, subpart I, wear appropriate Personal Protective Equipment (PPE) to minimize exposure to this material.

Respiratory Protection: If workplace conditions warrant a respirator, a respiratory protection program that meets OSHA 29CFR 1910.134 must be followed. Refer to NIOSH 42 CFR 84 for applicable certified respirators.

Eye/Face Protection: Wear splash resistant safety goggles with a face shield. An eye wash station should be readily available near areas of use.

Skin and Body Protection: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Chemical-resistant gloves should be worn at all times when handling chemicals.

9. PHYSICAL AND CHEMICAL PROPERTIES

Descriptive Properties	**Transformer oil (>99 %)**
Appearance (physical state, color, etc.):	clear, yellow liquid
Molecular Formula:	not applicable
Molar Mass (g/mol):	not applicable
Odor:	not available
Odor threshold:	not available
pH:	not available
Evaporation rate:	not available
Melting point/freezing point:	–55 °C (–67 °F)
Pour point:	–40 °C (–40 °F)
Density:	0.8912 g/mL at 22 °C[(b)]
Vapor Pressure:	0.1 mmHg 20 °C[(a)]
Vapor Density (air = 1):	>5 at 101 kPa[(a)]
Kinematic Viscosity:	12 cSt (12 mm^2/s) at 40 °C
Solubility(ies):	insoluble in water
Partition coefficient (n-octanol/water):	>6.5[(a)]
Thermal Stability Properties	
Autoignition Temperature:	>315 °C (599 °F)[(a)]
Thermal Decomposition:	not available
Initial boiling point and boiling range:	260 °C to 371 °C (500 °F to 700 °F)
Explosive Limits, LEL:	not available
Explosive Limits, UEL:	not available
Flash Point:	>145 °C (293 °F)[(a)]
Flammability (solid, gas):	not applicable

[(a)] Physical property listed in the NIST Certificate of Analysis. Values are not certified.
[(b)] Vendor supplied health and safety information.

10. STABILITY AND REACTIVITY

Reactivity: Stable at normal temperatures and pressure.

Stability: X Stable _____ Unstable

Possible Hazardous Reactions: None listed.

Conditions to Avoid: Avoid excessive heat; high energy ignition sources.

Incompatible Materials: Oxidizers.

Fire/Explosion Information: See Section 5, "Fire Fighting Measures".

Hazardous Decomposition: Oxides of carbon, sulfur oxides, aldehydes.

Hazardous Polymerization: _____ Will Occur X Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Exposure: X Inhalation X Skin X Ingestion

Symptoms Related to the Physical, Chemical and Toxicological Characteristics: Dizziness, nausea, coughing.

Potential Health Effects (Acute, Chronic and Delayed):

Inhalation: Acute exposure to high levels of vapor from transformer oil may cause central nervous system depression, headache, dizziness, nausea, vomiting, anorexia, incoordination and unconsciousness. Prolonged or repeated exposure may cause irritation. Short term exposure to Aroclor 1254 may cause irritation or liver damage; long term exposure may cause rash, itching, hair loss, digestive issues, headache, dizziness, impotence, coma, and cancer.

Skin Contact: Short term and long term contact with transformer oil may cause skin irritation and dermatitis. Short-term exposure to Aroclor 1254 may cause skin irritation or liver damage; long term exposure to Aroclor 1254 may cause same effects as for inhalation, plus hair loss and reproductive effects.

Eye Contact: Acute exposure of liquid or vapor may cause irritation.

Ingestion: Acute ingestion of transformer oil may cause abdominal pain, nausea, and vomiting. Small amounts of oil aspirated during ingestion or vomiting may cause lung damage; no information available for long-term exposure to transformer oil. Short term exposure to Aroclor 1254 may cause liver damage; long term exposure to Aroclor 1254 may cause same effects as for inhalation, plus hyperactivity, menstrual disorders, reproductive effects.

Numerical Measures of Toxicity:

Acute Toxicity: Not classified.
Component: Transformer oil
Rat, Oral LD50: >5000 mg/kg
Rat, Inhalation LC50: 2180 mg/m^3 (4 h)
Rabbit, Skin LD50: >2000 mg/kg

Component: Aroclor 1254
Rat, Oral LD50: 1010 mg/kg

Skin Corrosion/Irritation: Not classified.
Transformer oil, Rabbit, skin: 0.5 mL/24 h, moderate

Serious Eye Damage/ Eye Irritation: Not classified.
Transformer oil, Rabbit, eye: 0.1 mL, mild

Respiratory Sensitization: No data available; not classified.

Skin Sensitization: No data available; not classified.

Germ Cell Mutagenicity: No data available; not classified.

Carcinogenicity: Category 1B

Listed as a Carcinogen/Potential Carcinogen X Yes _____ No

Transformer oil is not listed by NTP, IARC, or OSHA as a carcinogen/potential carcinogen.

Aroclor 1254 is listed by NTP as *reasonably anticipated to be a human carcinogen* (as PCB, polychlorinated biphenyl, CAS number 1336-36-3) and by IARC as Group 1, c*arcinogenic to humans* (related to Polychlorinated biphenyls).

Reproductive Toxicity: Category 2

Aroclor 1254: Overexposure has resulted in decreased birth weight in offspring of exposed mothers. Significant exposure to PCBs that reach the fetus can cause teratogenic effects.

Oral Mammal TDLo - species unspecified: 14 mg/kg, prior to copulation 30 day(s)

STOT, Single Exposure: No data available; not classified.

STOT, Repeated Exposure: Not classified; this SRM contains less than 1 % of Archlor 1254, a Category 2 target organ toxicant.

Aspiration Hazard: Category 1

Transformer oil is a human aspiration toxicity hazard.

12. ECOLOGICAL INFORMATION

Ecotoxicity Data:

Transformer oil:	Fish, Rainbow Trout (*Oncorhynchus mykiss*) LC50: >5000 mg/L (96 h)
	Invertebrate, Water flea (*Daphnia magna*) EC50: >1000 mg/L (48 h)
Aroclor 1254:	No data available.

Persistence and Degradability: Has the potential to biodegradable.

Bioaccumulative Potential: No data available

Mobility in Soil: Expected to migrate from land to water and vice versa.

Other Adverse effects: Keep out of water supplies.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: Dispose of waste in accordance with all applicable federal, state, and local regulations.

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA: This material is not regulated by IATA or DOT.

15. REGULATORY INFORMATION

U.S. Regulations:

CERCLA Sections 102a/103 (40 CFR 302.4): Aroclor 1254, 1 lb. (0.454 kg) final RQ.

SARA Title III Section 302 (40 CFR 355.30): Not regulated.

SARA Title III Section 304 (40 CFR 355.40): Not regulated.

SARA Title III Section 313 (40 CFR 372.65): Aroclor 1254, 0.1 % supplier notification limit (related or polychlorinated biphenyls).

OSHA Process Safety (29 CFR 1910.119): Not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE HEALTH:	Yes.
CHRONIC HEALTH:	Yes.
FIRE:	No.
REACTIVE:	No.
PRESSURE:	No.

State Regulations:

California Proposition 65:

> WARNING! This product contains a chemical (Aroclor 1254, related to PCBs) known to the state of California to cause cancer, reproductive, and/or developmental effects.

U.S. TSCA Inventory: Transformer oil is listed.

TSCA 12(b), Export Notification: Aroclor 1254 is listed in Section 6, 50 ppm de minimis concentration (see 40 CFR 761, related to polychlorinated biphenyls).

Canadian Regulations:

WHMIS Information: Not provided for this material.

16. OTHER INFORMATION

Issue Date: 27 May 2015

Sources: ChemADVISOR, Inc., SDS, *Aroclor 1254*, 20 March 2015.

ChemADVISOR, Inc., SDS, *Transformer Oil*, 20 March 2015.

Vendor MSDS, Exxon Mobile Corporation, UNIVOLT N 61 B, 30 May 2014.

Key of Acronyms:

ACGIH	American Conference of Governmental Industrial Hygienists	NRC	Nuclear Regulatory Commission
ALI	Annual Limit on Intake	NTP	National Toxicology Program
CAS	Chemical Abstracts Service	OSHA	Occupational Safety and Health Administration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	PEL	Permissible Exposure Limit
CFR	Code of Federal Regulations	RCRA	Resource Conservation and Recovery Act
DOT	Department of Transportation	REL	Recommended Exposure Limit
EINECS	European Inventory of Existing Commercial Chemical Substances	RQ	Reportable Quantity
EPCRA	Emergency Planning and Community Right-to-Know Act	RTECS	Registry of Toxic Effects of Chemical Substances
IARC	International Agency for Research on Cancer	SARA	Superfund Amendments and Reauthorization Act
IATA	International Air Transportation Agency	SCBA	Self-Contained Breathing Apparatus
IDLH	Immediately Dangerous to Life and Health	RM	Reference Material
LC50	Lethal Concentration	STEL	Short Term Exposure Limit
LD50	Median Lethal Dose or Lethal Dose, 50 %	STOT	Specific Target Organ Toxicity
LEL	Lower Explosive Limit	TLV	Threshold Limit Value
MSDS	Material Safety Data Sheet	TPQ	Threshold Planning Quantity
NFPA	National Fire Protection Association	TSCA	Toxic Substances Control Act
NIOSH	National Institute for Occupational Safety and Health	TWA	Time Weighted Average
NIST	National Institute of Standards and Technology	UEL	Upper Explosive Limit
		WHMIS	Workplace Hazardous Materials Information System

Disclaimer: Physical and chemical data contained in this SDS are provided only for use in assessing the hazardous nature of the material. The SDS was prepared carefully, using current references; however, NIST does not certify the data in the SDS. The certified values for this material are given in the NIST Certificate of Analysis.

Users of this SRM should ensure that the SDS in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at http://www.nist.gov/srm.

Material Safety Data Sheet
Toluene

ACC# 23590

Section 1 - Chemical Product and Company Identification

MSDS Name: Toluene
Catalog Numbers: AC167900000, AC167900025, AC176850000, AC176850025, AC176850050, AC176850051, AC176850250, AC176855000, AC177160000, AC177160025, AC177160050, AC177160100, AC177160250, AC268370000, AC268370010, AC326980000, AC326980010, AC326981000, AC326982500, AC332070000, AC332070010, AC332070025, AC364410000, AC364410010, AC364410025, AC364411000, AC364415000, AC379140010, AC379140025, AC386760000, AC386760050, AC421160000, AC421160010, AC421160040, AC421170000, AC424550000, AC424550250, AC610590190, AC610590500, AC610591150, AC610592000, AC610790190, AC610790500, AC610791150, AC610792000, 16790-0010, 17685-0010, 17716-0010, 26837-0025, 42117-0040, 42117-5000, 42455-0010, 42455-5000, 61011-0040, 61046-0010, 61046-1000, 61095-1000, BP2625100, S80229HPLC, T288-1, T288RS-19, T290-1, T290-1LC, T290-4, T290N-219, T290RS-19, T290RS-200, T290RS-28, T290SK-1, T290SK-4, T290SS-115, T290SS-200, T290SS-28, T290SS-50, T291-4, T291-4LC, T291RS-200, T291SK-4, T291SK4, T291SS19, T313-4, T313SK-4, T323-20, T323-4, T324-1, T324-20, T324-200, T324-200LC, T324-20LC, T324-4, T324-500, T324CU1300, T324FB-115, T324FB-19, T324FB-200, T324FB-50, T324J-500, T324POP-200, T324POPB-200, T324RB-115, T324RB-19, T324RB-200, T324RS-115, T324RS-19, T324RS-200, T324RS-28, T324RS-50, T324S-4, T324SK-4, T324SS-115, T324SS-200, T324SS-28, T324SS-50, T326F-1GAL, T326P-4, T326S-20, T326S20LC, T330-4
Synonyms: Methylbenzene; Methylbenzol; Phenylmethane; Toluol.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
108-88-3	Toluene	>99	203-625-9

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless liquid. Flash Point: 4 deg C.
Warning! **Flammable liquid and vapor.** Causes eye, skin, and respiratory tract irritation. Breathing vapors may cause drowsiness and dizziness. May be absorbed through intact skin. Aspiration hazard if swallowed. Can enter lungs and cause damage. Possible risk of harm to the unborn child. May cause central nervous system depression. May cause liver and kidney damage.
Target Organs: Kidneys, central nervous system, liver, respiratory system, eyes, skin.

Potential Health Effects

Eye: Causes eye irritation. Vapors may cause eye irritation.
Skin: Causes skin irritation. May be absorbed through the skin. Repeated or prolonged exposure may cause

drying and cracking of the skin. Not expected to cause an allergic skin reaction.
Ingestion: May cause effects similar to those for inhalation exposure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal. May cause central nervous system depression.
Inhalation: Causes respiratory tract irritation. Inhalation of high concentrations (>200 ppm) of toluene are clearly associated with CNS encephalopathy, headache, depression, lassitude (weakness, exhaustion), impaired coordination, transient memory loss, and impaired reaction time.
Chronic: Prolonged or repeated skin contact may cause defatting and dermatitis. Repeated exposure in combination with constant, loud noise can produce hearing loss and dizziness. Chronic hydrocarbon abuse (for example, sniffing glue or light hydrocarbons such as contained in this material) has been associated with irregular heart rhythms and potential cardiac arrest. Toluene abuse has been linked with kidney disease, as evidenced by blood, protein, & pus in the urine, accompanied by elevated serum creatinine, decreased urinary output, & metabolic & renal tubular acidosis. Although kidney toxicity has not been common in cases of occupational toluene exposure, there has been at least one report of renal toxicity following a 40-year occupational toluene exposure. Toluene does not cause the severe injury to the bone marrow that is characteristic of benzene poisoning. Intentional abuse of toluene vapors has been linked to damage of the brain, liver, kidney and to death. Repeated inhalation exposure of toluene to animals causes histological changes in the brain, degeneration of the heart tissue, and possible immune

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid.
Skin: In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.
Ingestion: Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Causes cardiac sensitization to endogenous catelcholamines which may lead to cardiac arrhythmias. Do NOT use adrenergic agents such as epinephrine or pseudoepinephrine.

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. Water runoff can cause environmental damage. Dike and collect water used to fight fire. Use water spray to keep fire-exposed containers cool. Water may be ineffective. Material is lighter than water and a fire may be spread by the use of water. Flammable liquid and vapor. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas. This liquid floats on water and may travel to a source of ignition and spread fire. May accumulate static electricity.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or appropriate foam. Solid streams of water may be ineffective and spread material.
Flash Point: 4 deg C (39.20 deg F)
Autoignition Temperature: 480 deg C (896.00 deg F)
Explosion Limits, Lower:1.1 vol%
Upper: 7.1 vol%
NFPA Rating: (estimated) Health: 2; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Remove all sources of ignition. Provide ventilation. Use only non-sparking tools and equipment.

Control runoff and isolate discharged material for proper disposal. Use water spray to cool and disperse vapors and protect personnel.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame. Avoid breathing vapor or mist.
Storage: Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Separate from oxidizing materials.

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 general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits. Ventilation fans and other electrical service must be non-sparking and have an explosion-proof design.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Toluene	20 ppm TWA	100 ppm TWA; 375 mg/m3 TWA 500 ppm IDLH	200 ppm TWA; 300 ppm Ceiling

OSHA Vacated PELs: Toluene: 100 ppm TWA; 375 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate 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: Liquid
Appearance: colorless
Odor: sweetish odor - pleasant odor - benzene-like
pH: Not applicable.
Vapor Pressure: 28.4 mm Hg @ 25 deg C
Vapor Density: 3.1 (Air=1)
Evaporation Rate:2.4 (Butyl acetate=1)
Viscosity: 0.59 cps @ 20 deg C
Boiling Point: 110.6 deg C
Freezing/Melting Point:-95 deg C
Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density:0.86 (Water=1)
Molecular Formula:C6H5CH3
Molecular Weight:92.14

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Ignition sources, excess heat, confined spaces.
Incompatibilities with Other Materials: Strong oxidizing agents, nitric acid, sulfuric acid.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 108-88-3: XS5250000
LD50/LC50:
CAS# 108-88-3:
Draize test, rabbit, eye: 870 ug Mild;
Draize test, rabbit, eye: 2 mg/24H Severe;
Draize test, rabbit, skin: 435 mg Mild;
Draize test, rabbit, skin: 500 mg Moderate;
Draize test, rabbit, skin: 20 mg/24H Moderate;
Inhalation, mouse: LC50 = 400 ppm/24H;
Inhalation, mouse: LC50 = 30000 mg/m3/2H;
Inhalation, mouse: LC50 = 19900 mg/m3/7H;
Inhalation, mouse: LC50 = 10000 mg/m3;
Inhalation, rat: LC50 = 49 gm/m3/4H;
Oral, rat: LD50 = 636 mg/kg;
Skin, rabbit: LD50 = 14100
Carcinogenicity:
CAS# 108-88-3: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information available.
Teratogenicity: In an epidemiologic study of toluene and pregnancy, occupational exposures to toluene were said to be associated with an increased incidence of renal, urinary, gastrointestinal, and cardiac anomalies.Fetotoxicity (reduced fetal weight), behavioural effects (effects on learning and memory) and hearing loss (in males) were observed in the offspring of rats exposed by inhalation to toluene, in the absence of maternal toxicity.
Reproductive Effects: Many reports of reproductive effects of toluene abuse or heavy occupational exposure are confounded by mixed solvent exposure or fetal alcohol syndrome. Women exposed to toluene in lab work had a 4.7-fold increased risk of spontaneous abortions.
Mutagenicity: No information available.
Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. Bluegill LC50=17 mg/L/24H Shrimp LC50=4.3 ppm/96HFathead minnow LC50=36.2 mg/L/96HSunfish (fresh water) TLm=1180 mg/L/96H
Environmental: From soil, substance evaporates and is microbially biodegraded. In water, substance volatilizes and biodegrades.
Physical: Photochemically produced hydroxyl radicals degrade substance.
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# 108-88-3: waste number U220.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	TOLUENE	TOLUENE
Hazard Class:	3	3
UN Number:	UN1294	UN1294
Packing Group:	II	II
Additional Info:		FLASHPOINT 4 C

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 108-88-3 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 108-88-3: Effective 10/4/82, Sunset 10/4/92
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# 108-88-3: 1000 lb final RQ; 454 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 108-88-3: immediate, fire.
Section 313
This material contains Toluene (CAS# 108-88-3, >99%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 108-88-3 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
CAS# 108-88-3 is listed as a Hazardous Substance under the CWA. CAS# 108-88-3 is listed as a Priority Pollutant under the Clean Water Act. CAS# 108-88-3 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# 108-88-3 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

WARNING: This product contains Toluene, a chemical known to the state of California to cause developmental reproductive toxicity.
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 F

Risk Phrases:

R 11 Highly flammable.
R 38 Irritating to skin.
R 48/20 Harmful : danger of serious damage to health by prolonged exposure through inhalation.
R 63 Possible risk of harm to the unborn child.
R 65 Harmful: may cause lung damage if swallowed.
R 67 Vapours may cause drowsiness and dizziness.

Safety Phrases:

S 36/37 Wear suitable protective clothing and gloves.
S 46 If swallowed, seek medical advice immediately and show this con tainer or label.
S 62 If swallowed, do not induce vomiting: seek medical advice immed iately and show this container or label.

WGK (Water Danger/Protection)

CAS# 108-88-3: 2

Canada - DSL/NDSL

CAS# 108-88-3 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B2, D2A, 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# 108-88-3 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 6/01/1999
Revision #10 Date: 2/13/2008

Xylenes, Reagent Grade

SECTION 1: Identification of the substance/mixture and of the supplier

Product name: **Xylenes, Reagent Grade**

Manufacturer/Supplier Trade name:

Manufacturer/Supplier Article number: **S25629**

Recommended uses of the product and restrictions on use:

Manufacturer Details:

AquaPhoenix Scientific, Inc
9 Barnhart Drive, Hanover, PA 17331
(717) 632-1291

Supplier Details:

Fisher Science Education
6771 Silver Crest Road, Nazareth, PA 18064
(724)517-1954

Emergency telephone number:

Fisher Science Education
Emergency Telephone No.: 800-535-5053

SECTION 2: Hazards identification

Classification of the substance or mixture:

Flammable
Flammable liquids, category 3

Irritant
Acute toxicity (oral, dermal, inhalation), category 4
Skin irritation, category 2

Environmentally Damaging
Chronic hazards to the aquatic environment, category 2

Acute hazards to the aquatic environment, category 2
Flam. Liq. 3.
Acute inhalation tox. 4.
Acute Dermal Tox. 4.
Skin Irrit. 2.
Aquatic Acute 2.
Aquatic Chronic 2.

Signal word: Warning

Hazard statements:

Flammable liquid and vapour.
Harmful in contact with skin.
Harmful if inhaled.
Causes skin irritation.
Toxic to aquatic life with long lasting effects.

Precautionary statements:

If medical advice is needed, have product container or label at hand.
Keep out of reach of children.
Read label before use.
Keep away from heat/sparks/open flames/hot surfaces. No smoking.
Avoid release to the environment.
Wear protective gloves/protective clothing/eye protection/face protection.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ventilating/light/equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Avoid breathing dust/fume/gas/mist/vapours/spray.
Wash skin thoroughly after handling.
Use only outdoors or in a well-ventilated area.
IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
Call a POISON CENTER or doctor/physician if you feel unwell.
Specific measures (see supplemental first aid instructions on this label).
If skin irritation occurs: Get medical advice/attention.
Take off contaminated clothing and wash before reuse.
In case of fire: Use agents recommended in section 5 for extinction.
Collect spillage.
Store in a well ventilated place. Keep cool.
Dispose of contents and container to an approved waste disposal plant.

Other Non-GHS Classification:

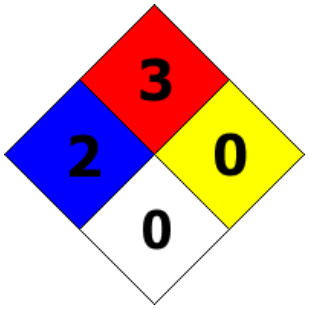
WHMIS

D2A 

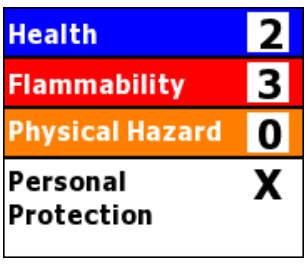
D2B 

B2 

NFPA/HMIS



NFPA SCALE (0-4)



HMIS RATINGS (0-4)

SECTION 3: Composition/information on ingredients

Ingredients:		
CAS 1330-20-7	Xylenes	100 %
		Percentages are by weight

SECTION 4: First aid measures

Description of first aid measures

After inhalation:

Move exposed to fresh air. Give artificial respiration if necessary. If breathing is difficult give oxygen. Loosen clothing and place exposed in a comfortable position. Seek medical assistance if cough or other symptoms appear.

After skin contact:

Wash hands and exposed skin with soap and plenty of water. Seek medical attention if irritation persists or if concerned.

After eye contact:

Protect unexposed eye. Flush exposed eye gently using water for 15-20 minutes. Remove contact lenses while rinsing. Seek medical attention if irritation persists or concerned.

After swallowing:

Rinse mouth with water. Do not induce vomiting. Never give anything by mouth to an unconscious person. Seek medical attention if irritation, discomfort, or vomiting persists.

Most important symptoms and effects, both acute and delayed:

Irritation. Shortness of breath. Headache. Nausea. Dizziness. Blurred vision. Prolonged or repeated exposure to skin causes defatting and dermatitis.

Indication of any immediate medical attention and special treatment needed:

If seeking medical attention provide SDS document to physician. Physician should treat symptomatically.

SECTION 5: Firefighting measures

Extinguishing media

Suitable extinguishing agents:

Use dry chemical, chemical foam, carbon dioxide, or alcohol-resistant foam. Use appropriate foam to blanket release and suppress vapors.

Unsuitable extinguishing agents:

Water may be ineffective.

Special hazards arising from the substance or mixture:

Thermal decomposition can lead to release of irritating gases and vapors. Containers may explode when heated. Vapors may travel to sources of ignition. Vapors may form explosive mixtures with air. Vapors may form an explosive mixture with air. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas. This liquid floats on water and may travel to a source of ignition and spread fire. May accumulate static electricity.

Advice for firefighters:

Protective equipment:

Wear protective eyeware, gloves, and clothing. Refer to Section 8.

Additional information (precautions):

Avoid inhaling gases, fumes, dust, mist, vapor, and aerosols. Avoid contact with skin, eyes, and clothing. Cool closed containers exposed to fire with water spray.

SECTION 6: Accidental release measures

Personal precautions, protective equipment and emergency procedures:

Ensure adequate ventilation. Ensure that air-handling systems are operational. Remove all sources of ignition.

Environmental precautions:

Should not be released into environment. Prevent from reaching drains, sewer, or waterway.

Methods and material for containment and cleaning up:

Wear protective eyeware, gloves, and clothing. Refer to Section 8. Always obey local regulations. If necessary use trained response staff or contractor. Evacuate personnel to safe areas. Containerize for disposal. Refer to Section 13. Keep in suitable closed containers for disposal. Remove source from ignition. Absorb with inert material and place in chemical waste container. Ventilate spill area. Have extinguishing agent available in case of fire. Eliminate all ignition sources. Stop or control the leak, if this can be done without undue risk. Use appropriate foam to blanket release and suppress vapors. Control runoff and isolate discharged material for proper disposal.

Reference to other sections: None

SECTION 7: Handling and storage

Precautions for safe handling:

Avoid contact with skin, eyes, and clothing. Follow good hygiene procedures when handling chemical materials. Refer to Section 8. Follow proper disposal methods. Refer to Section 13. Do not eat, drink, smoke, or use personal products when handling chemical substances. Keep away from open flames, sources of ignition, hot surfaces. Use explosion-proof equipment and non-sparking tools.

Conditions for safe storage, including any incompatibilities:

Store in a cool location. Keep away from food and beverages. Protect from freezing and physical damage. Provide ventilation for containers. Keep container tightly sealed. Store away from incompatible materials. Store as flammable. Keep away from open flames, hot surfaces and sources of ignition.

SECTION 8: Exposure controls/personal protection



Control Parameters:	1330-20-7, Xylenes, ACGIH TLV TWA 435 mg/m3. 1330-20-7, Xylenes (o-, m-, p- isomers), OSHA PEL 100 ppm TWA; 435 mg/m3 TWA.
Appropriate Engineering controls:	Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling. Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor and mists below the applicable workplace exposure limits (Occupational Exposure Limits-OELs) indicated above. Use under a chemical fume hood.
Respiratory protection:	Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. When necessary use NIOSH approved breathing equipment.
Protection of skin:	Select glove material impermeable and resistant to the substance. Select glove material based on rates of diffusion and degradation. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Use proper glove removal technique without touching outer surface. Avoid skin contact with used gloves. Wear protective clothing.

Eye protection: Wear equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses or goggles are appropriate eye protection.

General hygienic measures: Perform routine housekeeping. Wash hands before breaks and immediately after handling the product. Avoid contact with skin, eyes, and clothing. Before rewearing wash contaminated clothing. Work clothing that becomes wet should be immediately removed due to its flammability hazard.

SECTION 9: Physical and chemical properties

Appearance (physical state, color):	Clear, colorless liquid	**Explosion limit lower**: **Explosion limit upper**:	0.9% (V) 6.7% (V)
Odor:	Sweet Aromatic	**Vapor pressure at 20°C**:	8 mbar @20C
Odor threshold:	0.05 ppm	**Vapor density**:	3.67
pH-value:	Not Determined	**Relative density**:	0.86 g/mL at 25 °C (77 °F)
Melting/Freezing point:	-34C	**Solubilities**:	Soluble in most organic solvents.
Boiling point/Boiling range:	137 - 140 °C (279 - 284 °F)	**Partition coefficient (n-octanol/water)**:	log Kow 3.12
Flash point (closed cup):	25 °C (77 °F)	**Auto/Self-ignition temperature**:	460C
Evaporation rate:	Not determined	**Decomposition temperature**:	Not Determined
Flammability (solid, gaseous):	flammable liquid	**Viscosity**:	a. Kinematic: Not determined b. Dynamic: Not Determined
Density at 20°C:	Not Determined		

SECTION 10: Stability and reactivity

Reactivity:

Nonreactive under normal conditions.

Chemical stability:

Stable under normal conditions.

Possible hazardous reactions:

None under normal processing. Vapours may form explosive mixture with air.

Conditions to avoid:

Incompatible materials. Ignition sources. excess heat. Open Flames. Hot surfaces.

Incompatible materials:

Oxidizing agents. Acids.

Hazardous decomposition products:

Carbon oxides.

SECTION 11: Toxicological information

Acute Toxicity:

Oral:

1330-20-7 (Xylenes) LD50 Rat: 4,300 mg/kg

Dermal:

1330-20-7 (Xylenes) LD50 Rabbit: >1,700 mg/kg

Inhalation:

1330-20-7 (Xylenes) LD50 Rat: 5000 ppm - 4h

Chronic Toxicity: No additional information.
Corrosion Irritation:

Dermal:

1330-20-7 (Xylenes) Rabbit: Skin Irritation - 24 h

Ocular:

1330-20-7 (Xylenes) Rabbit: mild eye irritation

Sensitization: No additional information.
Numerical Measures: No additional information.
Carcinogenicity:

IARC:: Group 3: Not classifiable as to its carcinogenicity to humans (Xylene)
NTP (National Toxicology Program) : Evidence of Carcinogenicity - Male Rat - No Evidence; Female Rat - No Evidence; Male Mice - No Evidence; Female Mice - No Evidence (TR-327, mixed) (Xylenes 1330-20-7)
ACGIH - A4 -: Not Classifiable as a Human Carcinogen Xylene (o-, m-, p- isomers) 1330-20-7

Mutagenicity: No additional information.
Reproductive Toxicity: No additional information.

SECTION 12: Ecological information

Ecotoxicity: No additional information.
Persistence and degradability:

Readily biodegradable.

Bioaccumulative potential:

potential for bioconcentration in aquatic organisms is low.

Mobility in soil: No additional information.
Other adverse effects: No additional information.

SECTION 13: Disposal considerations

Waste disposal recommendations:

Contact a licensed professional waste disposal service to dispose of this material. Dispose of empty containers as unused product. Product or containers must not be disposed together with household garbage. It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities (US 40CFR262.11). 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. Ensure complete and accurate classification. RCRA (40 CFR 261.33 Haz Waste Code): Xylenes, mixed isomers (1330-20-7) waste number U239. Included in waste stream: F039.

SECTION 14: Transport information

US DOT

UN Number:
ADR, ADN, DOT, IMDG, IATA

1307

Limited Quantity Exception: None

Bulk:
RQ (if applicable): None
Proper shipping Name: Xylenes.
Hazard Class: 3
Packing Group: III.
Marine Pollutant (if applicable): No
additional information.
Comments: None

Non Bulk:
RQ (if applicable): None
Proper shipping Name: Xylenes.
Hazard Class: 3
Packing Group: III.
Marine Pollutant (if applicable): No
additional information.
Comments: None

SECTION 15: Regulatory information

United States (USA)

SARA Section 311/312 (Specific toxic chemical listings):

Acute, Fire

SARA Section 313 (Specific toxic chemical listings):

1330-20-7 xylenes, mixed isomers 1.0 % de minimis concentration.

RCRA (hazardous waste code):

1330-20-7 Xylenes - U239.
1330-20-7 xylenes, mixed isomers RCRA waste code U239.

TSCA (Toxic Substances Control Act):

All ingredients are listed.

CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act):

1330-20-7 xylenes, mixed isomers 100 lbs.

Proposition 65 (California):

Chemicals known to cause cancer:

None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for females:

None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for males:

None of the ingredients are listed.

Chemicals known to cause developmental toxicity:

None of the ingredients are listed.

Canada

Canadian Domestic Substances List (DSL):

All ingredients are listed.

Canadian NPRI Ingredient Disclosure list (limit 0.1%):

None of the ingredients are listed.

Canadian NPRI Ingredient Disclosure list (limit 1%):

None of the ingredients are listed.

SECTION 16: Other information

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations. Note. The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations applicable to this material.

GHS Full Text Phrases: None

Abbreviations and Acronyms: None

Effective date: 01.31.2015
Last updated: 06.17.2015

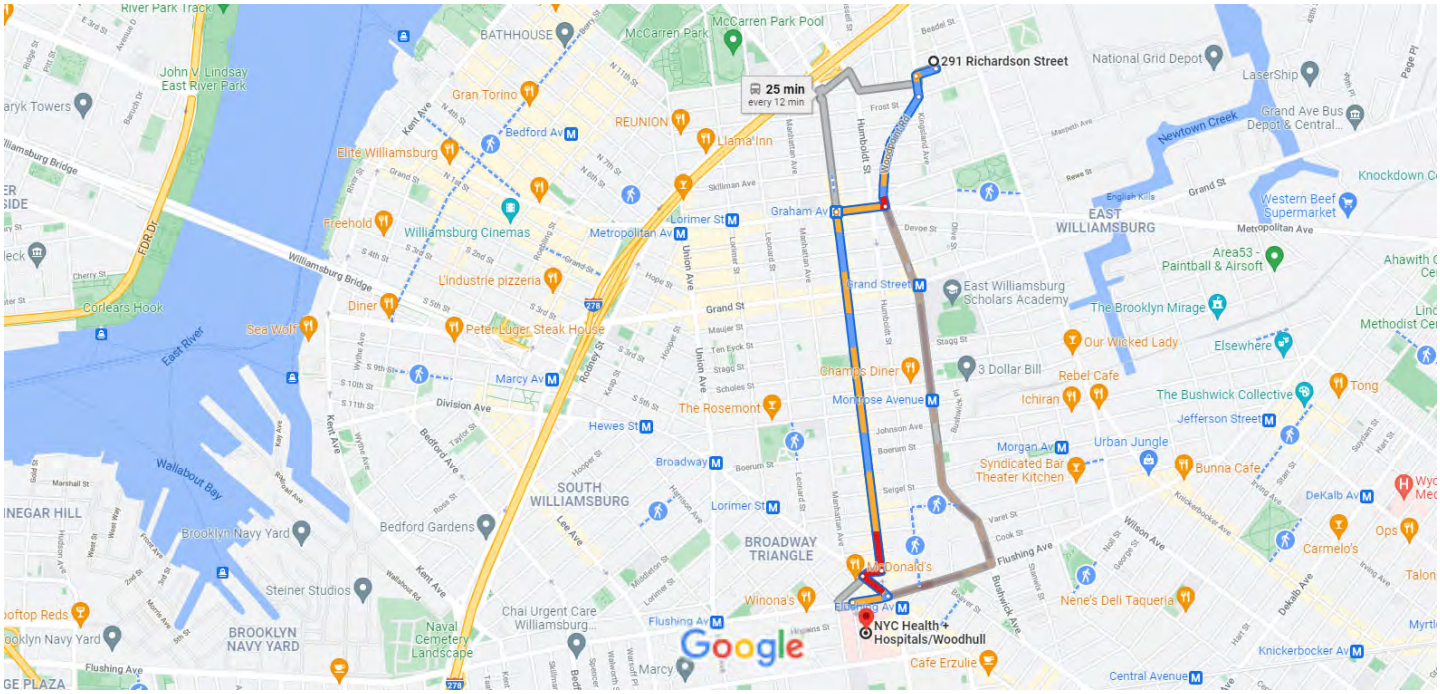
HASP
291 Richardson Street
Brooklyn, New York
Site Number: C224292

APPENDIX I

DIRECTIONS TO NEAREST HOSPITAL

291 Richardson St, Brooklyn, NY 11222 to NYC Health + Hospitals/Woodhull

Drive 1.6 miles, 14 min



291 Richardson St

Brooklyn, NY 11222

1. Head west on Richardson St toward Kingsland Ave

17 s (285 ft)

Drive along Woodpoint Rd and Graham Ave

12 min (1.6 mi)

2. Turn left onto Kingsland Ave

279 ft

3. Turn right onto Woodpoint Rd

0.3 mi

4. Turn right onto Metropolitan Ave

0.1 mi

5. Turn left at the 2nd cross street onto Graham Ave/Via Vespucci

Continue to follow Graham Ave

Pass by Bank of America Financial Center (on the right in 0.8 mi)

0.9 mi

6. Turn right onto Debevoise St

256 ft

7. Turn left onto Broadway

423 ft

8. Turn right onto Flushing Ave

469 ft

9. Turn left

6 s (23 ft)

NYC Health + Hospitals/Woodhull

760 Broadway, Brooklyn, NY 11206

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

APPENDIX D

Community Air Monitoring Plan

EnviroTrac
Environmental Services

CR 17, LLC

291 RICHARDSON STREET, BROOKLYN

KINGS COUNTY, NEW YORK

Community Air Monitoring Plan

NYSDEC BCP Number: C224292

Prepared for:
CR 17, LLC
1036 Manhattan Avenue
Brooklyn, New York 11222

Prepared by:
EnviroTrac Engineering PE PC
5 Old Dock Road, Yaphank, New York 11980
631-924-3001

SEPTEMBER 2021

This Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) within and at the downwind perimeter of each designated work area when certain activities are in progress. It is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community and occupants of the building (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

Reliance on the procedures specified in the CAMP should not preclude simple, common-sense measures to keep VOCs and odors at a minimum around the work areas.

Proposed Monitoring

Real-time monitoring for volatile organic compounds (VOCs) will be conducted during implementation of the non-emergency Interim Remedial Measure (IRM) to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses) from potential airborne contaminant releases as a direct result of the remedial work activities.

Periodic monitoring for VOCs will be required during sub-slab depressurization system (SSDS) installation activities. In some instances, depending upon the proximity of potentially exposed individuals and/or field observations during implementation of such work, continuous monitoring may be required during these activities.

<u>VOC Monitoring, Response Levels, and Actions</u>

VOCs will be monitored at the downwind perimeter of the work area on a periodic basis during the installation of the SSDS wells. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The results will be compared to the levels specified below:

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area exceeds 5 parts per million (ppm) above background for a 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 can resume with continued monitoring.

- 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 can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for a 15-minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 ppm, monitoring should occur within the occupied structure(s). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings should be discussed with New York State Department of Health (NYSDOH) prior to commencement of the work.

All readings will be recorded and available for the New York State Department of Environmental Conservation (NYSDEC) and the NYSDOH personnel to review.

New York State Department of Health
Special Requirements Community Air Monitoring Plan

Special Requirements for Work within 20 Feet of Potentially Exposed Individuals or Structures
When work areas are within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates must reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices should be considered to prevent exposures related to the work activities and to control dust and odors. Consideration should be given to implementing the planned activities when potentially exposed populations are at a minimum, such as during weekends or evening hours in non-residential settings.

- If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 ppm, monitoring should occur within the occupied structure(s). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings should be discussed with NYSDOH prior to commencement of the work.
- If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 mcg/m3, work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 mcg/m3 or less at the monitoring point.
- Depending upon the nature of contamination and remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen sulfide, carbon monoxide) may also need to be monitored. Response levels and actions should be pre-determined, as necessary, for each site.

Special Requirements for Indoor Work with Co-Located Residences or Facilities
Unless a self-contained, negative-pressure enclosure with proper emission controls will encompass the work area, all individuals not directly involved with the planned work must be absent from the room in which the work will occur. Monitoring requirements shall be as stated above under “Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures” except that in this instance “nearby/occupied structures” would be adjacent occupied rooms. Additionally, the location of all exhaust vents in the room and their discharge points, as well as potential vapor pathways (openings, conduits, etc.) relative to adjoining rooms, should be understood and the monitoring locations established accordingly. In these situations, it is strongly recommended that exhaust fans or other engineering controls be used to create negative air pressure within the work area during remedial activities. Additionally, it is strongly recommended that the planned work be implemented during hours (e.g. weekends or evenings) when building occupancy is at a minimum.