

**Former West 18<sup>th</sup> Street Gas Works – Operable Unit 5**  
**550 West 20<sup>th</sup> Street**  
**NEW YORK COUNTY**  
**NEW YORK, NEW YORK**

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# **SITE MANAGEMENT PLAN**

**NYSDEC Site Number: V00530**

**Prepared for:**

Consolidated Edison Company of New York, Inc.  
3101 20<sup>th</sup> Avenue  
Building 136, 2<sup>nd</sup> Floor  
Long Island City, NY 11105

**Prepared by:**

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**Revisions to Final Approved Site Management Plan:**

<b>Revision No.</b>	<b>Date Submitted</b>	<b>Summary of Revision</b>	<b>NYSDEC Approval Date</b>

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**JUNE 2019**



## CERTIFICATION STATEMENT

I Jason D. Brien, P.E., certify that I am currently a New York State registered professional engineer and that this Site Management Plan (dated June 2019) for the 550 West 20th Street Property of the Former West 18th Street Manufactured Gas Plant (MGP) site (NYSDEC Site # V00530) was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the Division of Environmental Remediation (DER) *Technical Guidance for Site Investigation and Remediation* (DER-10) (NYSDEC, 2010).

\_\_\_\_ P.E.

\_\_\_\_ DATE

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550 West 20<sup>th</sup> Street  
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## **List of Acronyms**

AMSL	above mean sea level
ASP	Analytical Services Protocol
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAMP	Community Air Monitoring Plan
CFR	Code of Federal Regulation
COC	constituents of concern
DER	Division of Environmental Remediation
DUSR	Data Usability Summary Report
EC	Engineering Control
ECL	Environmental Conservation Law
EDD	electronic data deliverable
EWP	Excavation Work Plan
FSP	Field Sampling Plan
HASP	Health and Safety Plan
IC	Institutional Control
MGP	manufactured gas plant
mV	millivolts
NAPL	non-aqueous phase liquid
NAVD	North American Vertical Datum of 1988
NOAA	National Oceanic and Atmospheric Administration
NTU	nephelometric turbidity unit
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
NYCRR	New York Codes, Rules and Regulations
ORP	oxidation/reduction potential
PAH	polycyclic aromatic hydrocarbons
ppm	parts per million
PRR	Periodic Review Report
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QEP	Qualified Environmental Professional
RAO	Remedial Action Objective
RI	remedial investigation
RP	Remedial Party
SCG	Standards, Criteria and Guidelines
SCO	Soil Cleanup Objective
SMP	Site Management Plan
SVI	Soil Vapor Intrusion
SVOC	semi-volatile organic compound
TBD	to be determined

Site Management Plan, Site # V00530

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TCL	Target Compound List
TOGS	Technical and Operational Guidance Series
TPH	total petroleum hydrocarbons
TSCA	Toxic Substances Control Act
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound



## ES EXECUTIVE SUMMARY

The following provides a brief summary of the controls implemented for the Property located at 550 W 20<sup>th</sup> Street (the site), as well as the inspections, monitoring, maintenance and reporting activities required by this Site Management Plan (SMP):

Site Identification: 550 W 20th Street Property  
Former W 18th Street Gas Works  
New York County, New York, NY  
New York State Department of Environmental Conservation  
(NYSDEC) Site number V00530

Institutional Controls:	1. The site may be used for restricted residential use.
	2. All future activities on the site that will disturb remaining residuals in subsurface soil and groundwater must be conducted in accordance with this SMP.
	3. All Engineering Controls (ECs) must be maintained as specified in this SMP.
	4. All ECs must be inspected at a frequency and in a manner defined in this SMP.
	5. The use of the groundwater underlying the site is prohibited without necessary water quality treatment rendering it safe for intended use.
	6. Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP.
	7. Inspection to assess the performance and effectiveness of the existing site conditions must be performed as defined in this SMP.
	8. Maintenance, inspection, and reporting of any component of the existing site conditions shall be performed as defined in this SMP.



	10. Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the Property Owner to assure compliance with the restrictions identified by the Environmental Easement.	
	11. The potential for vapor intrusion must be evaluated for any buildings developed at the site and any potential impacts that are identified must be monitored or mitigated.	
	12. Vegetable gardens and farming on the site are prohibited.	
	13. The site must not be used as a single family residential property or for active recreational purposes (i.e., public uses with a reasonable potential for soil contact).	
Engineering Controls:	1. Surface cover system	
Inspections:		Frequency
1. Surface cover inspection		Annually
Reporting:		
1. Periodic Review Report		Annually, starting 16 months after NYSDEC issuance of a Certificate of Completion, or as otherwise determined by the NYSDEC

The Property Owner is required to comply with this SMP including all notifications to Consolidated Edison Company of New York, Inc. and the provisions in the Excavation Work Plan (EWP) (Appendix A).

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



## **1.0 INTRODUCTION**

### **1.1 General**

This Site Management Plan (SMP) is for a portion of the Former West 18<sup>th</sup> Street Manufactured Gas Plant (MGP) Site designated as Operable Unit 5), which includes the 550 West 20<sup>th</sup> Street, New York, New York property (the site). The site is currently in the Order on Consent (OC) (Site No. 231005) which is administered by New York State Department of Environmental Conservation (NYSDEC).

Consolidated Edison Company of New York, Inc. (Con Edison) entered into a Voluntary Cleanup Agreement on August 15, 2002 with the NYSDEC to remediate MGP contamination on the site. Upon the discontinuation of Voluntary Cleanup Agreement, NYSDEC and Con Edison entered into an Order on Consent on July 13, 2018 that continues Con Edison's obligations to remediate MGP contamination. A figure showing the site location and boundaries of this site is provided in Figures 1 and 2, respectively. The limits of the site are shown on Figure 3. The boundaries of the site will be more fully described in the metes and bounds description that will be part of the Environmental Easement to be included in Appendix B. The Environmental Easement will be executed after the NYSDEC issues a final Decision Document for the site and remediation is completed, if any.

Extensive soil and groundwater sampling conducted in 2018 indicated that residual impacts consistent with: (1) petroleum tanks operated below the former Annex Building after the closure of the MGP and (2) urban fill material remain on the site. These residual impacts are hereafter referred to as "remaining residuals". Institutional and Engineering Controls (ICs and ECs) are also anticipated to be incorporated into the remedy for the site to control exposure to remaining residuals to ensure protection of public health and the environment. An Environmental Easement (when issued) granted to the NYSDEC, and recorded with the New York County Clerk, requires compliance with this SMP and all ECs and ICs placed on the site.



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

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the Environmental Easement (when issued). Failure to properly implement the SMP is a violation of the Environmental Easement, which is grounds for revocation of the Certificate of Completion;
- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6 of the New York Codes, Rules and Regulations (NYCRR) Part 375 and, with respect to any residual MGP contamination should it be encountered, the Order on Consent (Index #CO 0-20180516-519) (Site #231005), and thereby subject to applicable penalties.

All reports associated with the site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State. A list of contacts for persons involved with the site is provided in Table 4-2.

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



## **1.2 Revisions**

Revisions to this plan will be proposed in writing to the NYSDEC's project manager. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, post-remedial removal of contaminated soil, or other significant change to the site conditions. In accordance with the Environmental Easement (when issued) for the site, the NYSDEC will provide a notice of any approved changes to the SMP and append these notices to the SMP that is retained in its files.

## **1.3 Notifications**

All intrusive activities must be approved by NYSDEC. Sufficient notification must be made to the NYSDEC so they can make the decision on the type of reporting. Typically, the type of notification and reporting requirements depend on the scope of work. Large-scale intrusive work will require additional investigation and, depending on findings of the investigation, may require a detailed work plan, such as a Remedial Action Work Plan while smaller scale (i.e., "limited") intrusive activities will comply with the Excavation Work Plan (Appendix A) and may require a Notice of Intrusion letter or a simple letter work plan.

Notifications will be submitted by the Property Owner to Con Edison and the NYSDEC, as needed, in accordance with NYSDEC's DER – 10 for the following reasons:

- 60-day advance notice of any proposed changes in site use that are required under the terms of the 6NYCRR Part 375, the Order on Consent and/or Environmental Conservation Law.
- 15-day advance notice of any proposed ground-intrusive activity pursuant to the EWP.
- 18-month advance notice of any large-scale development.
- Notice will be provided to the NYSDEC within 48-hours of any damage or defect to the foundation, structures or EC that reduces or has the potential to



reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.

- Verbal notice will be provided to the NYSDEC within 48 hours of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the site, with written confirmation within 7 days (to the extent practicable) that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action shall be submitted to the NYSDEC within 45 days and shall describe and document actions taken to restore the effectiveness of the ECs.

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

- At least 60 days prior to the change, the NYSDEC and Con Edison will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party (RP) has been provided with a copy of the Order on Consent, and all approved work plans and reports, including this SMP.
- Within 15 days after the transfer of all or part of the site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC and Con Edison.

Table 1-1 includes contact information for the above notification. The information in this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Table 4-1.

**Table 1-1: Notifications\***

<b>Name</b>	<b>Contact Information</b>
NYSDEC Project Manager: Douglas MacNeal	Phone: 518.402.9662 (Office) E-Mail: <a href="mailto:douglas.macneal@dec.ny.gov">douglas.macneal@dec.ny.gov</a>
NYSDEC Regional Solid and Hazardous Materials Engineer	Phone: 718.482.4996



NYSDEC Site Control	Phone: 518.402.9553 E-mail: derweb@dec.ny.gov
Con Edison Project Manager: Yelena Skorobogatov	Phone: 718.204.4205 E-Mail: skorobogatovy@coned.com

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



## **2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS**

### **2.1 Site Location and Description**

The site covered by this SMP is identified as Borough of Manhattan Block 691 and Lot 1 on the New York County Tax Map (see Figure 2). It is part of the former West 18<sup>th</sup> Street Manufactured Gas Plant (MGP) Site, which is located in New York, New York County, New York and includes several properties bounded by the Hudson River to the west, West 16<sup>th</sup> Street to the south, 10<sup>th</sup> Avenue to the east, and West 20<sup>th</sup> Street to the north, as identified on Figure 2. The site is an approximately 0.36-acre area and is bounded by West 20<sup>th</sup> Street to the north, the 100 11<sup>th</sup> Avenue condominium complex to the south, the Anton Kern Gallery to the east, and 11<sup>th</sup> Avenue to the west (see Figure 3). The boundaries of the site will be more fully described in Appendix B – Environmental Easement (when issued). The owner of the Property parcel at the time of issuance of this SMP is the New York State Urban Development Corporation.

### **2.2 Physical Setting**

#### **2.2.1 Land Use**

The site is located in an urban area generally consisting of parking lots/driveways, sidewalks, roadways, and buildings. The properties in the area are zoned for residential or commercial use and are primarily occupied by residents and businesses. The area occupants include condominiums, art galleries, restaurants, and retail stores. The site is currently occupied by an 8-story main building and 6-story annex building that is currently vacant, but was formerly used as a prison.

The properties adjoining the site and in the neighborhood surrounding the site primarily include commercial and residential properties. The properties immediately north of the site include residential/commercial properties; the properties immediately south of



the site include residential properties; the properties immediately east of the site include commercial properties; and the properties to the west of the site include commercial properties.

### 2.2.2 Geology

Subsurface investigations identified two principle geologic units of interest at the site, consisting of a layer of historic urban fill overlying silty sand. In order of increasing depth from the ground surface, these geologic units are presented in Table 2-1.

**Table 2-1  
Generalized Geologic Column**

<b>Thickness Range</b>	<b>Depth Range</b>	<b>Stratigraphic Unit</b>
<b>(Feet)</b>	<b>(Feet below ground surface [bgs])</b>	
6-23	0.5-1.5	Fill - Highly heterogeneous, consisting of silt, sand, gravel and boulders, along with anthropogenic materials such as brick, concrete, ash, timbers, coal, glass and metal pieces. The fill layer is consistent with the pre-site history of this area of Manhattan which was the former riverbed of the Hudson River. The shoreline was originally along 10th Avenue to the east of the site and this area was substantially filled.
1-14	7-21.5	Silty Clay/Clayey, Sandy Silt - Underlies the fill and consists predominantly of brown, gray or black silty clay, with occasional sand and peat lenses that contain traces of shell fragments and decayed plant material. The unit is interpreted to be a tidal marsh deposit formed on the shallow banks of the Hudson River adjacent to the predevelopment shoreline. Some of this unit exists as re-worked pockets within the fill unit.

A geologic cross section location map is shown in Figure 3 and cross sections are shown in Figures 4 and 5. Boring logs completed at the site are provided in Appendix C.



### 2.2.3 Hydrogeology

The site is located near the Hudson River and is the natural base level discharge for both surface water and groundwater. The Hudson River is classified by NYSDEC as a Class I saline water body adjacent to the site, which best usages include secondary contact recreation and fishing. Though the river remains the ultimate discharge point, the natural drainage systems in Manhattan have been significantly altered by urban development.

The Hudson River in the vicinity of the site is a tidal estuary, approximately 0.75 miles wide. The stage of the river next to the site oscillates about sea level on a diurnal tide with an observed range of approximately 6 feet (based on a 2-day continuous monitoring period in September 2007) and National Oceanic and Atmospheric Administration (NOAA) records. The mean sea level observed through this period was -0.35 feet above mean sea level (AMSL) (North American Vertical Datum of 1988 [NAVD88]).

No tributary streams exist in the area. All predevelopment streams and surface drainages have been filled and are no longer active.

The site and most of the surrounding areas are covered by impervious surfaces and the majority of the storm water runoff is captured in the combined sewer system. Relatively little surface water is interpreted to infiltrate directly to groundwater. Groundwater recharge near the site is likely dominated by indirect sources, such as leaking water-distribution and sewer lines, and improperly plumbed floor or roof drains.

The water-level data indicate the water table beneath the site occurs in the fill unit and is generally identified at a depth of approximately 7 feet bgs (based on the sidewalk of West 20<sup>th</sup> Street). The water table is nearly flat and is encountered at an average elevation approximately equal to mean sea level. Groundwater level data indicate that groundwater generally flows in a west-southwesterly direction towards the Hudson River.



Groundwater in the Sand Unit flows to the Hudson River. Measured water-level elevations in the Sand Unit monitoring wells are typically about the same as the water table elevation (i.e. Fill Unit). Groundwater in both the Sand Unit and Fill Unit are in quasi equilibrium with the river and no significant vertical gradient exists across the Silty-Clay Unit. The Fill Unit and Sand Unit are interpreted to be hydraulically disconnected, with no exchange occurring across the Silty-Clay Unit.

The fill is interpreted as a highly permeable medium, with occasional discontinuous pockets of low-permeability materials such as silt and clay. The fill is present everywhere at the site, but is obstructed in places by barrier walls; deep utilities; and foundations, piles and sheet-piling. The Silty-Clay Unit is interpreted to be a low-permeability aquitard. The unit includes heterogeneity consistent with a tidal marsh deposit and thus includes discontinuous lenses of fine sand, silt and peat, within a bulk mass dominated by silty-clay. The unit is interpreted to have little transmissivity and to restrict vertical groundwater flow.

The most recent water level map for the fill unit for water level gauging performed on January 21, 2009 is shown on Figure 6. Groundwater monitoring well construction logs are provided in Appendix C.

## **2.3 Summary of Investigation and Remedial History**

A series of investigations were performed to characterize the nature and extent of environmental impacts at the Former West 18<sup>th</sup> Street MGP Site. The results of these investigations are described in detail in the following reports:

### Former West 18<sup>th</sup> Street MGP Site-Wide Reports

- *Site History Report* prepared by Parsons in 2002.
- *Site Characterization Study Report* prepared by TRC in January 2006.
- *Site-Wide Remedial Investigation Report – Former West 18<sup>th</sup> Street Gas Works* prepared by Arcadis in 2009.



### Site - Specific Reports

- *Report of the Evaluation of Indoor Air, Sub-Slab Gas and Ambient Air Sampling Program – Bayview Correctional Facility* prepared by TRC in January 2006.
- *Supplemental Remedial Investigation Report* prepared by Arcadis in April 2016 (revised January 2017).
- *Geotechnical Due Diligence Desk Study – The Women’s Building, New York, New York* prepared by Langan Engineering and Environmental Services, Inc. (Langan) dated November 21, 2016
- *Phase II Environmental Site Investigation Report for 550 West 20<sup>th</sup> Street, New York, New York, 10011* (Phase II Report) prepared by Langan in December 2018.

During the above-identified investigations, 8 groundwater monitoring wells were installed within or adjacent to the site and 21 soil borings were drilled within the site. In total 86 samples of environmental media were analyzed to characterize the nature and extent of impacts. The primary constituents of concern (COCs) include volatile organic compounds (VOCs) and semi volatile organic compounds (SVOCs). The VOCs of concern include benzene, toluene, ethylbenzene, and xylenes (BTEX) and SVOCs of concern include polycyclic aromatic hydrocarbons (PAHs).

Based on field observations and/or measurements during drilling and screening of soil cores, only residually impacted soil was observed on the site and included sheens and MGP- and petroleum hydrocarbon-like odors.

A summary of investigation activities completed on the site is presented below.

### Surface Soil

The entirety of the site is covered by concrete sidewalks, asphalt roadways, and buildings. No surface soil samples were collected during the RI.

### Subsurface Soil



Subsurface soil samples were collected throughout the site, but were primarily focused within and adjacent to the former gas holder. A total of 60 subsurface soil samples were collected for laboratory analysis from 24 soil borings. Samples were analyzed for polychlorinated biphenyls, Target Compound List (TCL) VOCs, TCL SVOCs, total petroleum hydrocarbons (TPH), inorganics, priority pollutant metals, and/or total and amenable cyanide

The laboratory analytical results for subsurface soil samples were compared to the restricted-residential use soil cleanup objectives (SCOs) presented in 6 NYCRR Part 375-6.8(b). The restricted-residential use SCOs are applicable to the site given that the current and future site use is residential/commercial. The only constituents exceeding SCOs remaining in subsurface soil on the site included several PAHs located throughout the site at depths generally starting at and extending below the water table. The analytical results for PAHs are consistent with urban fill. Mercury and/or lead were also identified in six samples from five locations (B-92, SB-01, SB-05, SB-09, and SB-12) at concentrations slightly exceeding the SCO. Concentrations of SVOCs in subsurface soils ranged from non-detect to 140 parts per million (ppm). Soils containing residual non-aqueous phase liquid (NAPL) (i.e., sheens) remaining at the site are primarily located in the eastern portion of the site beneath the Annex Building, as shown on Figure 7.

### Groundwater

A total of three monitoring wells were installed adjacent to the site and five temporary monitoring wells were installed on the site.

Groundwater impacts on the site are limited to benzene and several PAHs exceeding the Class GA Standards and Guidance Values (i.e., drinking water standards) presented in the NYSDEC Division of Water, Technical and Operational Guidance Series document titled “Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations” (TOGS 1.1.1), dated June 1998 (last revised June 2004). . A



petroleum-like odor and sheen was observed in monitoring well MW-01 during groundwater sampling in November 2018. The existing analytical data for monitoring wells provide evidence that groundwater on the site has not significantly been impacted by MGP operations.

Groundwater samples were also analyzed for inorganics and/or priority pollutant metals, with slight exceedances of the respective standards/guidance values for antimony, arsenic, copper, and mercury. Lead was also identified at three locations (MW-01, MW-02 and MW-10) exceeding the TOGS 1.1.1 standard. Several other inorganic compounds were also identified at concentrations exceeding the standards/guidance values, including iron, magnesium, manganese, and sodium.

The laboratory analytical results for groundwater samples collected from monitoring wells located at and adjacent to the site are presented in Table 2. Groundwater analytical results for BTEX and PAHs exceeding TOGS 1.1.1 standards/guidance values are also shown on Figure 8.

### Soil Vapor Intrusion

Two potential soil vapor intrusion (SVI) investigations were performed at the site: in September 2005 (by TRC) and November 2018 (by Langan) and included sampling indoor air, headspace air, and soil gas within the footprint of the main or annex buildings located at the site. Ambient air samples were collected immediately adjacent to the main and annex buildings. A total of five indoor air (four separate locations plus a co-located duplicate), one headspace (from a trench-like crawl space and utility chase), eight sub-slab soil-gas, and three ambient air samples were collected at the site and submitted for analysis of VOCs.

A building reconnaissance and product inventory was performed prior to the September 2005 sampling. Various products used during routine maintenance and operations at the site were observed to have been stored in the basement of the building.



Several of the products, which included cleaner/degreasers, paint thinners, solvents, paints, cleaners, carpet adhesives, etc., contained VOCs, including many of those detected in the indoor air.

During the September 2005 SVI investigation conducted at the site, a total of 19 VOCs were detected at low concentrations in sub-slab soil vapor samples. However, only five VOCs (bromomethane, chloroform, 1,4-dichlorobenzene, m,p-xylenes and styrene) were detected in indoor air samples in excess of the 90th percentile background indoor air concentrations presented in the New York State Department of Health (NYSDOH) document titled draft Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated February 2005 (hereinafter, “the NYSDOH VI Guidance”). Two of the compounds, m,p-xylenes and styrene, may be related to MGP and/or petroleum sources. The remaining three compounds are not associated with MGP sources.

The report on the September 2005 SVI investigation indicates that the presence of VOCs in sub-slab soil vapor may have the potential to impact indoor air quality. However, the analytical data, in conjunction with the observed presence of numerous VOC-containing products stored and used at the facility during routine operations and maintenance and the air flow in the basement, suggest that these potential indoor sources are likely having a greater influence on the overall indoor air quality than potential intrusion of VOCs from soil vapor into the basement. The report further indicated that based on the comparisons to the NYSDOH published background concentrations, the concentrations of the various VOCs detected in indoor air are generally typical for indoor air. The report concluded that “Based on the results of the air and sub-slab soil-gas sampling program presented herein, it is recommended that further assessment for the potential intrusion of sub-slab soil gas is not warranted.”

The November 2018 SVI investigation conducted at the site indicated that total benzene, toluene, ethylbenzene, and xylenes (BTEX) concentrations in sub-slab soil vapor samples ranged from 1.29 µg/m<sup>3</sup> to 34.35 µg/m<sup>3</sup>. Trichloroethene (TCE) and tetrachloroethene (PCE) were also detected in sub-slab soil vapor samples, but at levels



below the lowest concentrations for which monitoring or mitigation is recommended in Matrices A and B, respectively, of the NYSDOH VI Guidance. Neither TCE nor PCE are MGP-related compounds. The report on the November 2018 SVI investigation indicated that “No detected sub-slab soil vapor sample concentrations were above the threshold at which monitoring or mitigation is recommended.” No indoor air samples were collected during the 2018 SVI investigation.

The laboratory analytical results for indoor air, headspace air, soil gas, and ambient air samples collected from the site are summarized in Table 3. The complete results of the above investigations are presented in the following reports: *Report of the Evaluation of Indoor Air, Sub-Slab Gas and Ambient Air Sampling Program – Bayview Correctional Facility* (TRC, 2006) and Phase II Report (Langan, 2018).

## **2.4 Remedial Action Objectives**

The Remedial Action Objectives (RAOs) for the site, as listed in the NYSDEC *Proposed Decision Document. CE--W. 18th St. Gas Works Operable Unit 5: Bay View Correctional Facility, Voluntary Cleanup Program, New York, New York County, Site No. V00530*, dated June 2018 (Proposed Decision Document) (NYSDEC, 2018) and include:

### **Soil**

#### Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.

#### Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.



## **Groundwater**

### Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of volatiles, from contaminated groundwater.

## **Soil Vapor**

### Public Health Protection

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

## **2.5 Remaining Contamination**

The location and extent of residual contamination remaining at the site is presented below.

### **2.5.1 Surface Soil**

The entirety of the site is covered by concrete sidewalks, asphalt roadways, and buildings and no surface soil samples were collected during the RI. Surface soil that could potentially have exhibited MGP-related impacts would have either been removed during construction of the building after demolition of MGP-related structures or covered by sub-grade materials necessary for driveways/sidewalks and buildings. The existing concrete, or asphalt cover system will address potential future human exposure.



### 2.5.2 Subsurface Soil

Limited site residuals are present in subsurface soils at the site. Soil containing PAHs at concentrations greater than restricted-residential use SCO are identified throughout the site, primarily at depths generally starting at and extending below the water table. Mercury was also identified at one location beneath the Annex Building slightly exceeding the restricted-residential use SCO. Residual NAPL, in the form of sheens, also remain in subsurface soil at isolated locations beneath the Annex Building. The locations and depths of remaining soil impacts are identified on Figure 7, and analytical results are presented in Table 1.

### 2.5.3 Groundwater

Results from the groundwater sampling events performed at monitoring wells on and adjacent to the site in October 2005 and November 2018 indicate that impacts on the site are limited to benzene and several PAHs exceeding the TOGS 1.1.1 standards/guidance values.

Inorganic constituents were not identified at concentrations exceeding groundwater standards/guidance values at monitoring wells on and adjacent to the site.

Analytical results for VOCs, SVOCs, and inorganic constituents identified in groundwater on and adjacent to the site are presented in Table 2.

### 2.5.4 Soil Vapor

The most recent soil vapor sampling conducted at the site in November 2018 indicated that total benzene, toluene, ethylbenzene, and xylenes (BTEX) concentrations in sub-slab soil vapor samples ranged from 1.29 µg/m<sup>3</sup> to 34.35 µg/m<sup>3</sup>. Trichloroethene (TCE) and tetrachloroethene (PCE) were also detected in sub-slab soil vapor samples, but at levels below the lowest concentrations for which monitoring or mitigation is recommended in Matrices A and B, respectively, of the NYSDOH VI Guidance. Neither TCE nor PCE are MGP-related compounds. The November 2018 SVI investigation report



indicated that “No detected sub-slab soil vapor sample concentrations were above the threshold at which monitoring or mitigation is recommended.” Analytical results for VOCs identified in sub-slab soil vapor at the site are presented in Table 3.



## **3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN**

### **3.1 General**

Since residuals remain in soil, groundwater, and soil vapor at the site, IC/ECs are required to protect human health and the environment. This Institutional and Engineering Control Plan describes the procedures for the implementation and management of anticipated IC/ECs at the site. The Engineering and Institutional Control Plan is one component of the SMP and is subject to revision by the NYSDEC.

This plan provides:

- A description of the anticipated IC/ECs on the site;
- The basic implementation and intended role of each IC/EC;
- A description of the key components of the ICs anticipated to be set forth in the Environmental Easement (when issued);
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of IC/ECs, such as the implementation of the EWP (as provided in Appendix A) for the proper handling of remaining residuals that may be disturbed during maintenance or redevelopment work on the site;
- A description of the roles and responsibilities of each party with respect to this SMP; and
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs required by the remedy for the site, as determined by the NYSDEC in conjunction with Con Edison.

### **3.2 Institutional Controls**

A series of ICs is proposed in the Decision Document for the site to: (1) implement, maintain, and monitor EC systems; (2) ensure compliance with the approved SMP; (3)



prevent future exposure to remaining residuals by controlling disturbances of subsurface soils containing residuals; (4) restrict use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by NYSDOH; (5) limit the use and development of the site to residential uses only; and (6) complete and submit periodic certification of ICs/ECs to NYSDEC. Adherence to these ICs on the site will be required by the Environmental Easement (when issued) and will be implemented under this SMP. ICs identified in the Environmental Easement (when issued) may not be discontinued without an amendment to or extinguishment of the Environmental Easement. The IC boundaries coincide with the limits of the site and are shown on Figure 9. These ICs are:

- Complying with the requirements of this SMP;
- Utilizing the site for restricted residential use;
- Inspecting and maintaining all ECs as specified in this SMP;
- Prohibiting the use of groundwater underlying the site without necessary water quality treatment as determined by the NYSDOH or the New York County Department of Health to render it safe for potable or industrial purposes. The user must first notify and obtain written approval from the NYSDEC to utilize groundwater underlying the property.
- Conducting periodic property inspections as defined in this SMP;
- Reporting data and information pertinent to site management at the frequency and in a manner defined in this SMP;
- Conducting all future activities that will disturb remaining site residuals in subsurface soil and groundwater in accordance with this SMP;
- Inspection and reporting of any component of the anticipated remedy shall be performed as defined in this SMP;
- Providing access to the site to agents, employees or other representatives of the State of New York with reasonable prior notice to the Property Owner to ensure compliance with the restrictions to be identified by the Environmental Easement (when issued);
- Evaluating the potential for vapor intrusion for any buildings developed on the site. Monitor or mitigate any potential impacts that are identified;



- Prohibiting the planting of vegetable gardens and farming on the site;
- The Property Owner will submit to NYSDEC the certification identified in Section 7.0. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow and will be made by an expert that the NYSDEC finds acceptable.

A matrix of the responsibilities identified in this SMP for the Property Owner (i.e, RP) is provided in the table below.



**Table 3-1: Matrix of Responsibilities**

Responsible Party	Responsibilities
Property Owner (RP)	<ul style="list-style-type: none"> <li>• Follow the SMP provisions regarding construction/excavation (i.e., ground intrusive activities)</li> <li>• Periodically certify to NYSDEC that the ECs and ICs identified in this SMP remain in place/are complied with</li> <li>• Maintain the site cover system</li> <li>• Grant access to Con Edison and NYSDEC and their agents</li> <li>• Assure security of remedial components of site</li> <li>• Notify Con Edison and NYSDEC in event of an emergency that reduces or has the potential to reduce the effectiveness of the site cover system</li> <li>• If remedial components are damaged, notify Con Edison and NYSDEC</li> <li>• If Property Owner action/inaction adversely impacts the site, notify Con Edison</li> <li>• If ownership changes, notify Con Edison and NYSDEC</li> <li>• Follow the SMP provisions regarding construction/excavation (i.e., ground intrusive activities)</li> <li>• Comply with reporting and certification requirements</li> <li>• Provide site visit data generated to Con Edison and NYSDEC</li> <li>• Conduct site-wide inspection of all remedial components on an annual (minimum) basis</li> <li>• Submit NYSDEC-approved changes to the SMP to Con Edison</li> <li>• Notify NYSDEC if RP ownership changes,</li> <li>• Notify NYSDEC in event of an emergency that reduces or has potential to reduce the effectiveness of the site and provide follow-up status report</li> <li>• Notify NYSDEC if damage/modification to remedial components is identified</li> <li>• Notify NYSDEC and submit amended SMP to NYSDEC if site use changes</li> <li>• Contact NYSDEC if significant changes are made to SMP/legal documents</li> </ul>



### **3.3 Engineering Controls**

#### **3.3.1 Cover System**

Exposure to remaining residuals in soil at the site is prevented by a combined cover system present at the site. Depending on location, this cover system consists of the following: (1) an approximately 0.5 to 1.5-foot thick asphalt pavement system or concrete; or (2) buildings. A cover-type map showing the limits of the cover system on the site is presented on Figure 9. The EWP provided in Appendix A outlines the procedures required to be implemented in the event the cover system is breached, penetrated or temporarily removed, and any underlying remaining subsurface soil containing site residuals is disturbed. The EWP requirements will be triggered when removing the existing building slabs/asphalt pavement/concrete sidewalks and exposing underlying native subsurface soil.

Procedures for inspecting the cover system are provided in the Monitoring and Sampling Plan included in Section 4.0 of this SMP. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in the site-specific Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) prepared provided in Appendices D and E, respectively.

#### **3.3.2 Criteria for Completion of Remediation/Termination of Remedial Systems**

Generally, remedial processes are considered completed when monitoring indicates that the remedy has achieved the RAOs identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.4 of NYSDEC DER-10.

##### **3.3.2.1 – Cover System**

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



The cover system's purpose is to maintain a barrier between the site occupants/public and site residuals. The inspection will focus on the structural/remedial integrity of the cover system. Monitoring for aesthetics or functionality apart from the remedial purpose is not required by the SMP.



## **4.0 MONITORING AND SAMPLING PLAN**

### **4.1 General**

The anticipated remedy for the site does not rely on any media monitoring and sampling to protect public health and the environment. Therefore, the procedures for such components are not included in this SMP.

### **4.2 Notifications**

All intrusive activities must be approved by NYSDEC. Sufficient notification must be made to the NYSDEC so they can make the decision on the type of reporting. Typically, the type of notification and reporting requirements depend on the scope of work. Large-scale intrusive work will require additional investigation and, depending on findings of the investigation, may require a detailed work plan, such as a Remedial Action Work Plan while smaller scale (i.e., “limited”) intrusive activities will comply with the EWP (Appendix A) and may require a Notice of Intrusion letter or a simple letter work plan.

Notifications will be submitted by the Property Owner to the NYSDEC as needed for the reasons and timeframes identified below. Timely notifications will be submitted by the Property Owner to Con Edison to support these notifications.

- 60-day advance notice of any proposed changes in site use that are required under the terms of the 6 NYCRR Part 375 and/or ECL.
- 15-day advance notice of any proposed ground-intrusive activities pursuant to the EWP except those that include excavation and/or repair of the existing clean cover system.
- 30-day advance notice of any field activity not pursuant to the EWP.
- 18-month advance notice of any large-scale development.
- Notice will be provided to the NYSDEC within 48-hours of any damage or defect to the foundation, structures or EC that reduces or has the potential to reduce the



effectiveness of an EC and likewise any action to be taken to mitigate the damage or defect.

- Verbal notice will be provided to the NYSDEC within 48 hours of any emergency, such as a fire, flood, or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the site, with written confirmation within 7 days (to the extent practical) that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action shall be submitted by the Property Owner to the NYSDEC within 45 days and shall describe and document actions taken to restore the effectiveness of the ECs.

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

- At least 60 days prior to the change, the NYSDEC and Con Edison will be notified in writing of the proposed change. This will include a certification that the prospective purchaser has been provided with a copy of the Order on Consent, and all approved work plans and reports, including this SMP.
- Within 15 days after the transfer of all or part of the site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC and Con Edison.

### **4.3 Contingency Plan**

Emergencies may include injury to personnel, fire or explosion, environmental release, or serious weather conditions. Contingency information is presented below and is further described in the EWP.



#### 4.3.1 Emergency Telephone Numbers

In the event of any environmentally related situation or unplanned occurrence requiring assistance, the Property Owner or Property Owner's representative(s) should contact the appropriate party from the contact list below. For emergencies, appropriate emergency response personnel should be contacted. These emergency contact lists must be maintained in an easily accessible location at the site.

**Table 4-1  
Emergency Contact Numbers**

Medical (New York Presbyterian Hospital)	911 or (212) 746-7200
Fire	911
Police	911
Utility Markout/Clearance One Call Center (DigSafely NY):	(800) 272-4480 or 811 (2 full working day notice required [excluding day of call] for utility markout)
Poison Control Center:	(800) 222-1222
Pollution Toxic Chemical Oil Spills:	(800) 424-8802
NYSDEC Spills Hotline	(800) 457-7362

**Table 4-2  
Other Contact Numbers**

Property Owner (New York State Department of Corrections and Community Supervision) Representative: Main Office	(212) 239-6436 (Office)
Arcadis Project Manager: Jason D. Brien	(315) 671-9114 (Office) (315) 263-5898 (Cell)
Arcadis Task Manager: Matthew S. Hysell	(315) 671-9189 (Office) (607) 206-6179 (Cell)
NYSDEC Project Manager: Douglas MacNeal	(518) 402-9662 (Office)



NYSDOH Project Manager: Dawn Hettrick	(518) 402-7860 (Office)
Con Edison Project Manager: Yelena Skorobogatov	(718) 204-4205 (Office) (917) 658-6715 (Cell)

\* Note: Contact numbers subject to change and should be updated as necessary

#### 4.3.2 Map and Directions to Nearest Health Facility

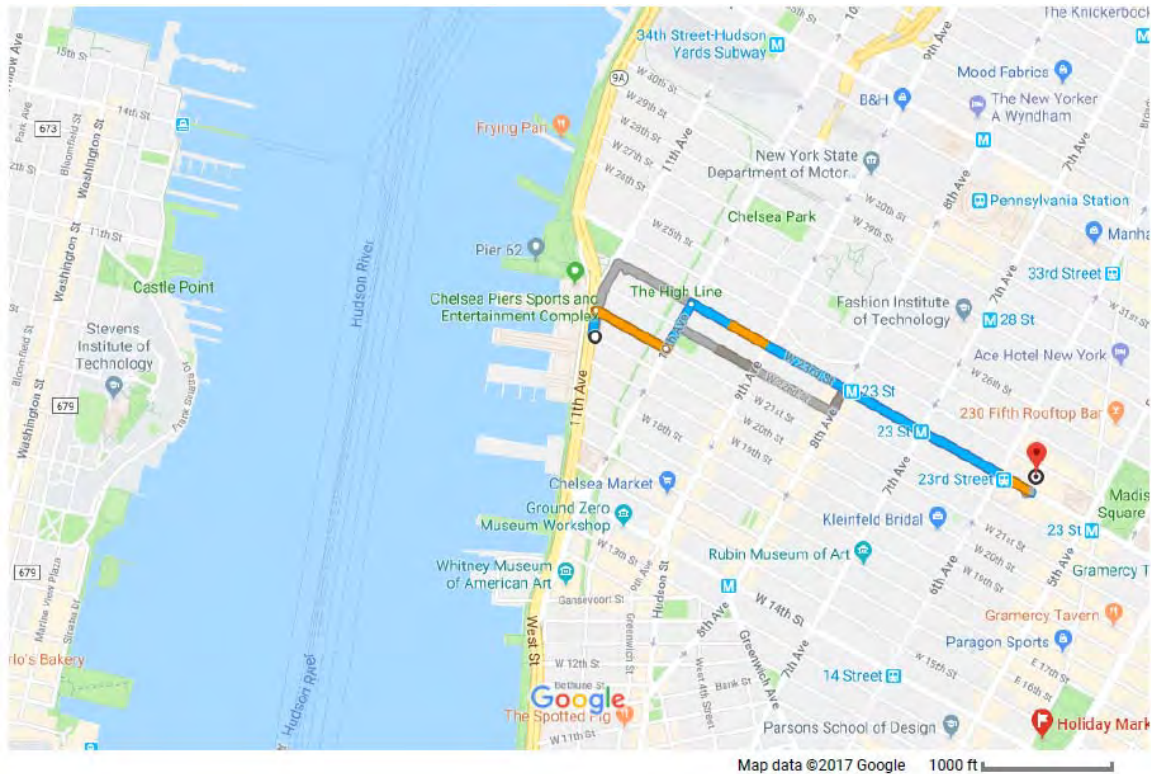
Site Location: 550 West 20<sup>th</sup> Street, New York, NY 10010

Nearest Hospital Name: New York Presbyterian Hospital

Hospital Location: 53 W 23rd St, New York, NY 10010

Hospital Telephone: (212) 746-7200

#### **Map Showing Route from the Site to the Hospital:**





### 550-598 W 20th St

New York, NY 10011

- ↑ 1. Head northwest on W 20th St toward 11th Ave 23 ft
- 2. Turn right onto 11th Ave 259 ft
- 3. Turn right onto W 21st St 0.2 mi
- 4. Turn left at the 1st cross street onto 10th Ave 0.7 mi
- 5. Turn right at the 2nd cross street onto W 23rd St 0.8 mi  
Destination will be on the left

### NewYork-Presbyterian Hospital

53 W 23rd St, New York, NY 10010

#### 4.3.3 Response Procedures

As appropriate, the fire department and other emergency response group will be notified immediately by telephone of the emergency. The emergency telephone number list is found at the beginning of this Contingency Plan (Table 4-1). The list will also be posted prominently at the site and made readily available to all personnel at all times.

##### 4.3.3.1 Spill Response Plan

Spill response procedures have been developed for responding to unplanned release of oil, products, materials, hazardous waste, etc. to soil or groundwater. In accordance with Article 12 of the Navigation Law, all petroleum spills that occur within New York State must be reported to the NYS Spill Hotline (1-800-457-7362) within 2 hours of discovery, except spills which meet all of the following criteria:

1. The quantity is known to be less than 5 gallons; and
2. The spill is contained and under the control of the spiller; and
3. The spill has not and will not reach the State's water or any land; and



4. The spill is cleaned up within 2 hours of discovery.

A spill is considered to have not impacted land if it occurs on a paved surface such as asphalt or concrete. A spill in a dirt or gravel parking lot is considered to have impacted land and is reportable. Spill reporting to NYSDEC will be made by the Property Owner (as required above).

The guidance below is primarily intended for construction workers (non-routine activities within the limits of the site). Properly trained personnel will implement the following general spill response procedures (when possible):

1. *Ceasing Operation of the Affected Equipment:* This will consist of shutting off the equipment and/or closing any valves and stopping the leak, if possible.
2. *Containing the Spill:* If the spilled material is floating on a water surface, spill-absorbent pads/booms will be placed across the path of the floating spill. If the spilled material sinks below the water surface, a dam, weir, or other containment method will be used to stop the flow of the spilled material. If the spill occurs on land, a ditch, dam, or other containment unit will be constructed to stop the flow of the spilled material. Absorbent material will be applied as necessary.
3. *Cleaning Up the Spill:* Spills in water will be recovered using pumps, sorbent material, etc. as necessary until the spilled material is recovered (and no sheen or other evidence of the spill is observed on the water surface). Spills on land will be recovered using pumps, sorbent material, and heavy equipment, as necessary until the spilled material is recovered. Other activities to be conducted during spill cleanup activities include: removing impacted soil/sorbent pads; using rags and cleaning solution to remove excess spilled material from equipment; and collecting verification samples to confirm that the impacted soil has been removed.



4. *Containerizing Spill Materials:* Spill materials, impacted soil, sorbent pads, etc. will be containerized in New York State Department of Transportation- (NYSDOT-) approved containers. The containers will be labeled with the waste type and date of accumulation in accordance with applicable regulations contained in 49 Code of Federal Regulations (CFR) Part 172. Samples will be collected to characterize the spilled materials for disposal (e.g., as a hazardous/non-hazardous waste and/or Toxic Substances Control Act (TSCA)/non-TSCA waste, if necessary).
5. *Disposing of Spill Materials:* Impacted materials and spill cleanup debris will be disposed of at a facility permitted to accept the materials. The Property Owner will be responsible for the coordination of the disposal activities.
6. *Performing Post-Spill Maintenance:* Following cleanup of the spill, the Property Owner will ensure that all used spill cleanup material and equipment has been disposed of or cleaned, as appropriate. If the equipment that caused the spill (if applicable) cannot be properly repaired, replacement equipment will be obtained.

In the event that the release is of sufficient magnitude and cannot be controlled by diking, damming, absorbing, or other method, the local fire department, NYSDEC, and National Response Center will be notified.

#### 4.3.3.2 Evacuation Plan

In the event of an emergency that requires site evacuation; on-site personnel will vacate the site as directed by on-site fire/police/rescue responders. In the event of an injury to on-site personnel, emergency procedures outlined in the HASP should be followed.

#### 4.3.3.3 Amendments to Contingency Plan

With NYSDEC notification, this Contingency Plan and/or emergency contact list will be periodically updated to reflect changes in contacts or site information.



#### 4.4 Site Inspection

Site inspections will be performed by the Property Owner's QEP on a regular schedule at a minimum of once a year. Modification to the frequency or duration of the inspections will require approval from the NYSDEC. Site inspections will also be performed after all severe weather conditions that may affect ECs or monitoring devices. During these inspections, an inspection form will be completed (Appendix F). The inspections will be performed by the Property Owner (or their representatives) to compile sufficient information to assess the following:

- Compliance with all ICs, including site usage.
- An evaluation of the condition and continued effectiveness of ECs.
- If these controls continue to be protective of human health and the environment.
- Compliance with requirements of this SMP and the Environmental Easement (when issued).
- Achievement of remedial performance criteria.
- General site conditions at the time of the inspection.
- The site management activities being conducted including, where appropriate, a health and safety inspection.
- Confirmation that site records are up to date.
- Changes, or needed changes, to the remedial system.

Inspections will be conducted in accordance with the procedures set forth in the Monitoring Plan of this SMP (Section 4.0). The reporting requirements are outlined in the Periodic Review Reporting section of this plan (Section 7.2).

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of ECs in place at the site, verbal notice to the NYSDEC must be given by noon of the following day, to the extent practicable. In addition,



an inspection of the site will be conducted within 5 days of the event, to the extent practicable, to verify the effectiveness of the IC/ECs implemented at the site by a qualified environmental professional, as determined by the NYSDEC. Written confirmation must be provided to the NYSDEC within 7 days of the event, to the extent practicable, that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.



## **5.0 OPERATION AND MAINTENANCE PLAN**

### **5.1 General**

The anticipated remedy for the site does not rely on any mechanical systems, such as groundwater treatment systems, sub-slab depressurization systems, or air sparge/soil vapor extraction systems to protect public health and the environment. Therefore, the operation and maintenance of such components is not included in this SMP.

This Operation and Maintenance Plan will be revised (as necessary) to include the measures necessary to operate, monitor and maintain the mechanical components of the overall site groundwater remedy, if any.



## **6.0 PERIODIC ASSESSMENTS/EVALUATIONS**

### **6.1 Climate Change Vulnerability Assessment**

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

This section provides a summary of vulnerability assessments that will be conducted for the site during periodic assessments, and briefly summarizes the vulnerability of the site and/or ECs to severe storms/weather events and associated flooding.

The remedy has a low susceptibility to climate change related impacts due to the primarily passive components of the remedy. The site will be evaluated for climate change related impacts during the periodic site inspections (e.g., evaluating erosion/ponded water). The periodic site inspections will also include photographic documentation of potentially susceptible areas/site features.

### **6.2 Green Remediation Evaluation**

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section of the



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

#### 6.2.1 Frequency of System Checks, Sampling and Other Periodic Activities

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



## **7.0. REPORTING REQUIREMENTS**

### **7.1 Site Management Reports**

All site management inspection, maintenance and monitoring events will be recorded on the appropriate site management forms provided in Appendix F. These forms are subject to NYSDEC revision.

All applicable inspection forms and other records, including media sampling data, generated for the site during the reporting period will be provided in electronic format to the NYSDEC by the Property Owner's QEP and summarized in the PRR. A schedule of monitoring/inspection reports is presented in Table 7-1 below.

**Table 7-1: Schedule of Monitoring/Inspection Reports**

<b>Task/Report</b>	<b>Reporting Frequency*</b>
Site Inspection Form	Annual (include in PRR)
PRR	Annual

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

All inspections reports will include, at a minimum:

- Date of event or reporting period;
- Name, company, and position of person(s) conducting monitoring/inspection activities;
- Description of the activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet);
- Copies of all field forms completed (e.g., inspection form, etc.);



- Any observations, conclusions, or recommendations; and
- A determination as to whether contaminant conditions have changed since the last reporting event.

Data will be reported in digital format as determined by the NYSDEC.

## **7.2 Periodic Review Report**

A PRR will be submitted by the Property Owner's QEP to the NYSDEC beginning sixteen (16) months after the Certificate of Completion or equivalent document (e.g., Satisfactory Completion Letter, No Further Action Letter, etc.) is issued. The RP will submit the PRR annually to the NYSDEC after submittal of the initial PRR.

In the event that the site is subdivided into separate parcels with different ownership, a single PRR will be prepared that addresses the site will be described in Appendix B - Environmental Easement (when issued). The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the PRR. The report will include:

- Identification, assessment, and certification of all ECs/ICs required by the anticipated remedy for the site.
- Results of the required periodic site inspections and severe condition inspections, if applicable.
- All applicable site management forms and other records generated for the site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.
- Data summary tables and graphical representations of COCs by media (i.e., groundwater), which include a listing of all constituents analyzed, along with the applicable standards/guidance values, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of COC concentration trends.
- An evaluation of the site, which includes the following:



- The compliance of the anticipated remedy with the requirements of the site-specific Decision Document (when issued);
- Any new conclusions or observations regarding site MGP-related impacts based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;
- Recommendations regarding any necessary changes to the anticipated remedy and/or Monitoring and Sampling Plan; and
- The overall performance and effectiveness of the anticipated remedy.

One hard-copy and one electronic copy (as a portable document format file) of the PRR will be submitted to the NYSDEC Central Office, the NYSDOH Bureau of Environmental Exposure Investigation, and Property Owner.

#### 7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, the Property Owner's QEP or Professional Engineer licensed to practice in New York State will prepare, and include in the PRR, the following certification as per the requirements of NYSDEC DER-10:

*“I, [insert name of Professional Engineer] of [insert name of business and address], certify that I am currently a New York State registered professional engineer and I had direct responsibility for the site inspection[s] performed at the property located at 550 West 20<sup>th</sup> Street (the site) of the Former West 18<sup>th</sup> Street Gas Works Site (Site # V00530), during the period between [enter dates covered by the PRR]. These activities were performed to confirm the effectiveness of each institutional and engineering control for the site, as required by the New York State Department of Environmental Conservation- (NYSDEC-) approved Site Management Plan [enter document date, and latest revision]. These activities were performed by persons under my direction on behalf of the Property Owner responsible for the performance of the existing remedy. Based on my inquiry of the Property Owner, and persons under my direction who performed the activities summarized herein, I certify that the following statements are true:*



- *The inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction.*
- *The institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the NYSDEC.*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment.*
- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control.*
- *If a financial assurance mechanism is required under the oversight document for the site, the mechanism remains valid and sufficient for the intended purpose under the document.*
- *Use of the site is compliant with the Environmental Easement.*
- *The engineering control systems are performing as designed and are effective.*
- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the overall site remedial program and generally accepted engineering practice.*
- *The information presented in this report is accurate and complete.*

*I understand that a false statement made herein is punishable as a Class “A” misdemeanor, pursuant to Section 210.45 of the Penal Law.”*

The PRR will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the site is located and the NYSDOH Bureau of Environmental Exposure Investigation. The PRR may need to be submitted in hard-copy format, as requested by the NYSDEC project manager.



### **7.3 Corrective Measures Work Plan**

If any component of the anticipated remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an IC or EC, a Corrective Measures Work Plan will be submitted to the NYSDEC by the Property Owner's QEP for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC.



## 8.0 REFERENCES

- NYSDEC. 1998. Division of Water Technical and Operational Guidance Series (1.1.1): Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998. (April 2000 addendum).
- NYSDEC. 2003. Voluntary Cleanup Agreement Index No. D2-0003-02-08. Signed by the NYSDEC on August 15, 2002.
- NYSDEC. 2006. 6 NYCRR Subpart 375-6, Remedial Program Soil Cleanup Objectives. December 14, 2006.
- NYSDEC. 2009. CP-43: Groundwater Monitoring Well Decommissioning Policy, November 3, 2009
- NYSDEC. 2010b. Final DER-10 Technical Guidance for Site Investigation and Remediation. May 3, 2010.
- NYSDEC. 2016. *New York Standards and Specifications for Erosion and Sediment Control*. November 2016.
- NYSDEC. 2018. Proposed Decision Document. CE--W. 18<sup>th</sup> St. Gas Works Operable Unit 5: Bay View Correctional Facility, Voluntary Cleanup Program, New York, New York County, Site No. V00530. June 2018.
- NYSDEC. 2018b. Multi-Site Voluntary Cleanup Program Transition Order on Consent and Administrative Settlement (Index No. CO 0-20180516-519). July 2018.
- State of New York. Title 6 of the Official Compilation of Codes, Rules, and Regulations (6 NYCRR Part 375), Environmental Remediation Programs. December 14, 2006.



Tables





Table 1  
Soil Analytical Results (ppm)

Site Management Plan  
Consolidated Edison Company of New York, Inc.  
Former West 18th Street Gas Works  
550 West 20th Street, New York NY

Location ID:	6 NYCRR Part 375 -	SB-90	SB-91				SB-92			SB-300		SB-301			
Depth Interval (feet bgs):	Restricted Use	4 - 5	4 - 5	8 - 11	11 - 15	0 - 1	3	9 - 13	5 - 6	16.5 - 17	4.5 - 5	6 - 7	17.5 - 18	18.5 - 19	
Date Collected:	SCOs	11/04/05	11/04/05	11/04/05	11/04/05	11/04/05	11/04/05	11/04/05	11/18/15	11/18/15	11/09/15	11/18/15	11/18/15	11/18/15	
Detected VOCs															
PCB 1254	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Total PCBs	1	--	--	--	--	--	--	--	--	--	--	--	--	--	
Detected VOCs															
1,2,4,5-Tetramethylbenzene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,2,4-Trimethylbenzene	190	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,3,5-Trimethylbenzene	190	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,4-Diethyl Benzene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
2-Butanone	100	< 0.015	< 0.015	< 0.017	< 0.017	< 0.0035	< 0.019	< 0.0042	< 0.00075 J	< 0.00092 J	< 0.00098	0.0057 J	0.0083 J	< 0.0011 J	
2-Chlorotoluene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
4-Ethyltoluene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Acetone	100	< 0.018	< 0.018	< 0.02	< 0.02	< 0.0041	< 0.023	< 0.005	< 0.001	< 0.0013	< 0.0013	0.02	0.028	< 0.0016	
Benzene	4.8	< 0.0021	< 0.0021	< 0.0024	< 0.0023	< 0.00049	< 0.0027	< 0.00059	0.0026	0.00031 J	< 0.00025	0.00062 J	0.011	0.21	
Carbon Disulfide	--	< 0.0019	< 0.002	< 0.0022	< 0.0022	< 0.00045	< 0.0025	< 0.00054	< 0.00042	< 0.00052	< 0.00054 J	< 0.00054	< 0.00069	< 0.00064	
Chlorobenzene	500	< 0.0019	< 0.0019	< 0.0022	< 0.0021	< 0.00045	< 0.0024	< 0.00053	NA	NA	NA	NA	NA	NA	
Chloroform	350	< 0.0018	< 0.0019	< 0.0021	< 0.002	< 0.00043	< 0.0024	< 0.00051	NA	NA	NA	NA	NA	NA	
Cyclohexane	--	< 0.0017	< 0.0017	< 0.0019	< 0.0019	< 0.0004	< 0.0022	< 0.00048	< 0.00045	0.00082 J	< 0.00058	< 0.00057	0.0024	0.0046	
Cymene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Ethyl Benzene	41	< 0.0019	< 0.0019	< 0.0021	< 0.0021	< 0.00044	< 0.0024	< 0.00052	< 0.00018	< 0.00022	< 0.00023	< 0.00022	0.0025	0.014	
Isopropylbenzene	--	< 0.0022	< 0.0022	< 0.0025	< 0.0024	< 0.00051	< 0.0028	< 0.00061	< 0.00017	< 0.0002	< 0.00022	0.00027 J	0.0025	0.0063	
Methylcyclohexane	--	< 0.0022	< 0.0022	< 0.0025	< 0.0025	< 0.00052	< 0.0028	< 0.00062	< 0.00049	0.005	< 0.00063	< 0.00062	0.01	0.023	
m/p-Xylenes	--	< 0.0046	< 0.0046	< 0.0051	< 0.0051	< 0.0011	< 0.0058	< 0.0013	0.00037 J	< 0.00013 J	< 0.00014	< 0.00014 J	0.0051 J	0.022 J	
n-Butylbenzene	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
n-Propylbenzene	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
o-Xylene	--	< 0.002	< 0.002	< 0.0023	< 0.0023	< 0.00047	< 0.0026	< 0.00057	0.00017 J	< 0.00019	< 0.0002	< 0.0002	0.016	0.045	
Sec-Butylbenzene	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Styrene	--	< 0.0024	< 0.0024	< 0.0027	< 0.0027	< 0.00057	< 0.0031	< 0.00068	< 0.00015	< 0.00018	< 0.00019	< 0.00019	0.0006 J	< 0.00022	
T-Butylbenzene	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Toluene	100	< 0.0021	< 0.0022	< 0.0024	< 0.0024	< 0.0005	< 0.0027	< 0.0006	0.00043 J	< 0.00023	< 0.00024	< 0.00024	0.00048 J	0.00093 J	
Total VOCs	--	< 0.019	< 0.019	< 0.021	< 0.021	< 0.0044	< 0.024	< 0.0053	0.00432	0.00626	< 0.0028	0.02659	0.1184	0.32583	
Detected SVOCs															
1,1-Biphenyl	--	< 0.057	< 0.11	< 0.063	< 0.063	< 0.066	< 0.072	< 0.078	< 0.031	1 J	0.039 J	0.04 J	0.054 J	0.045 J	
2-Methylnaphthalene	--	< 0.058	< 0.12	< 0.064	< 0.064	< 0.067	< 0.073	< 0.079	0.097 J	4.8 J	0.18 J	0.22 J	0.2 J	0.28 J	
3 & 4 Methylphenol (m- & p-Cresol)	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Acenaphthene	100	< 0.062	< 0.12	0.24 J	< 0.068	< 0.071	< 0.078	< 0.084	0.068 J	15	0.28 J	0.13 J	0.14 J	0.21 J	
Acenaphthylene	100	< 0.056	< 0.11	0.097 J	< 0.062	< 0.065	< 0.071	< 0.077	0.045 J	< 0.21	< 0.011	0.049 J	< 0.012	< 0.012	
Acetophenone	--	< 0.051	< 0.1	< 0.056	< 0.056	< 0.059	< 0.064	< 0.069	< 0.008	< 0.18	< 0.0095	< 0.009	< 0.01	< 0.01	
Anthracene	100	< 0.052	< 0.1	0.68	0.11 J	< 0.061	< 0.066	< 0.071	0.2 J	40	0.35 J	0.27 J	0.91	0.32 J	
Benzo(a)anthracene	1	0.21 J	0.52 J	1.1	0.32 J	0.12 J	0.11 J	0.15 J	0.68	38	0.51	0.5	1.3	0.25	
Benzo(a)pyrene	1	0.14 J	0.58 J	0.94	0.41	0.16 J	0.12 J	0.21 J	0.79	30	0.58	0.6	0.88	0.27	
Benzo(b)fluoranthene	1	0.31 J	0.91	1.2	0.43	0.21 J	0.15 J	0.22 J	0.88	39	0.64	0.6	0.93	0.28	
Benzo(g,h,i)perylene	100	0.13 J	0.31 J	0.45	0.18 J	0.091 J	< 0.072	0.11 J	0.46	17	0.36 J	0.33 J	0.33 J	0.17 J	
Benzo(k)fluoranthene	3.9	< 0.076	< 0.15	0.25 J	0.094 J	< 0.088	< 0.096	< 0.1	0.37	13	0.3	0.26	0.37	0.11	
Benzyl alcohol	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
bis(2-Ethylhexyl)phthalate	--	< 0.066	< 0.13	1.4	< 0.074	< 0.077	< 0.084	< 0.091	1.3	< 0.32	< 0.017	0.1 J	< 0.019	< 0.018	
Butylbenzylphthalate	--	< 0.056	< 0.11	< 0.062	< 0.062	< 0.065	< 0.071	< 0.077	0.45	< 0.25	< 0.014	< 0.013	< 0.015	< 0.015	
Carbazole	--	< 0.053	< 0.11	0.2 J	< 0.059	< 0.061	< 0.067	< 0.072	0.056 J	10	< 0.011	0.043 J	0.13 J	0.047 J	
Chrysene	3.9	0.19 J	0.47 J	0.98	0.3 J	0.11 J	0.086 J	0.13 J	0.71	40	0.51	0.54	1.3	0.27 J	
Dibenz(a,h)anthracene	0.33	< 0.043	< 0.087	0.13 J	0.068 J	< 0.05	< 0.055	< 0.059	0.17	4.7	0.1	0.13	0.14	0.057	
Dibenzofuran	59	< 0.057	< 0.11	0.12 J	< 0.063	< 0.066	< 0.072	< 0.078	0.055 J	14	< 0.013	0.07 J	0.11 J	< 0.014	
Di-N-Butyl Phthalate	--	< 0.053	< 0.11	< 0.059	< 0.058	< 0.061	< 0.067	< 0.072	NA	NA	NA	NA	NA	NA	
Fluoranthene	100	< 0.051	0.89	2.1	0.33 J	0.087 J	0.092 J	0.14 J	1.1	92	0.59	0.7	2.1	0.41 J	
Fluorene	100	< 0.058	< 0.12	0.26 J	< 0.065	< 0.068	< 0.074	< 0.08	0.083 J	20	< 0.0095	0.1 J	0.27 J	0.2 J	
Indeno(1,2,3-cd)pyrene	0.5	0.096 J	0.26 J	0.32 J	0.11 J	0.072 J	< 0.056	0.073 J	0.54	18	0.37	0.38	0.41	0.18	
Naphthalene	100	< 0.059	< 0.12	< 0.066	< 0.066	< 0.069	< 0.075	< 0.081	0.29 J	4.9 J	0.28 J	0.4 J	0.39 J	0.51	
Phenanthrene	100	0.18 J	0.27 J	1.8	0.25 J	< 0.064	< 0.07	0.1 J	0.62	140	0.33 J	0.61	2.8	2.2	
Phenol	500	< 0.052	< 0.1	< 0.058	< 0.058	< 0.061	< 0.066	< 0.072	NA	NA	NA	NA	NA	NA	
Pyrene	100	< 0.061	0.97	2	0.44	0.1 J	0.098 J	0.19 J	1	96	0.84	0.78	2.3	0.5	
Total SVOCs	--	1.256	5.18	14.267	3.042	0.95	0.656	1.323	9.964	637.4	6.259	6.852	15.064	6.309	



Table 1  
Soil Analytical Results (ppm)

Site Management Plan  
Consolidated Edison Company of New York, Inc.  
Former West 18th Street Gas Works  
550 West 20th Street, New York NY

Location ID:	6 NYCRR Part 375 -	SB-90	SB-91				SB-92			SB-300		SB-301			
Depth Interval (feet bgs):	Restricted Use	4 - 5	4 - 5	8 - 11	11 - 15	0 - 1	3	9 - 13	5 - 6	16.5 - 17	4.5 - 5	6 - 7	17.5 - 18	18.5 - 19	
Date Collected:	SCOs	11/04/05	11/04/05	11/04/05	11/04/05	11/04/05	11/04/05	11/04/05	11/18/15	11/18/15	11/09/15	11/18/15	11/18/15	11/18/15	
Detected Inorganics															
Aluminum	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Antimony	--	< 0.35	< 0.35	0.48 J	3.5 J	< 0.4	< 0.44	< 0.47	NA	NA	NA	NA	NA	NA	
Arsenic	16	2.8	1.9	0.0021	4.6	5.1	2.2	7.2	NA	NA	NA	NA	NA	NA	
Barium	400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Beryllium	72	0.2 J	0.22 J	0.23 J	0.42 J	0.4 J	0.49 J	0.53 J	NA	NA	NA	NA	NA	NA	
Cadmium	9.3	< 0.03	< 0.03	< 0.04	< 0.04	< 0.04	< 0.04	< 0.05	NA	NA	NA	NA	NA	NA	
Calcium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Chromium	--	16.5	15.3	12.5	16.8	19.2	20	22	NA	NA	NA	NA	NA	NA	
Cobalt	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Copper	270	16.1	16.2	17.1	26.9	54.5	98.7	33.2	NA	NA	NA	NA	NA	NA	
Cyanide	27	< 0.526	1.59	< 0.593	< 0.59	< 0.614	< 0.678	< 0.736	NA	NA	NA	NA	NA	NA	
Iron	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Lead	400	27.2	25.6	114	361	349	219	162	NA	NA	NA	NA	NA	NA	
Magnesium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Manganese	10,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Mercury	0.81	0.103	0.046	0.209	0.273	1.9	1.3	0.608	NA	NA	NA	NA	NA	NA	
Nickel	310	14.4	34	19.1	16.3	15.7	19.4	21.5	NA	NA	NA	NA	NA	NA	
Potassium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Selenium	1,500	< 0.36	< 0.36	< 0.4	< 0.39	< 0.41	< 0.45	< 0.49	NA	NA	NA	NA	NA	NA	
Silver	180	0.36 J	0.37 J	0.33 J	0.89 J	0.91 J	1.4	1.1 J	NA	NA	NA	NA	NA	NA	
Sodium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Thallium	--	< 0.55	< 0.56	< 0.63	< 0.61	< 0.64	< 0.7	< 0.76	NA	NA	NA	NA	NA	NA	
Vanadium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Zinc	10,000	124	47.8	58.8	138	133	172	80.9	NA	NA	NA	NA	NA	NA	



**Table 1**  
**Soil Analytical Results (ppm)**

Site Management Plan  
Consolidated Edison Company of New York, Inc.  
Former West 18th Street Gas Works  
550 West 20th Street, New York NY

Location ID:	6 NYCRR Part 375 -	SB-302A	SB-303				SB-304			SB-305		
Depth Interval (feet bgs):	Restricted Use	1.5 - 2	3.25 - 3.75	17.5 - 18	19 - 19.5	4.5 - 5	9 - 9.5	21.5 - 22	4 - 4.5	8.5 - 9	16 - 16.5	
Date Collected:	SCOs	11/13/15	11/12/15	11/16/15	11/16/15	11/11/15	11/17/15	11/17/15	11/16/15	11/16/15	11/16/15	
Detected VOCs												
PCB 1254	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Total PCBs	1	--	--	--	--	--	--	--	--	--	--	
Detected VOCs												
1,2,4,5-Tetramethylbenzene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,2,4-Trimethylbenzene	190	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,3,5-Trimethylbenzene	190	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,4-Diethyl Benzene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
2-Butanone	100	0.0084	0.0037 J	0.013	0.041	< 0.00084	< 0.00079 J	< 0.001 J	< 0.0012	0.015	0.018	
2-Chlorotoluene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
4-Ethyltoluene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Acetone	100	0.021	0.011	0.032 J	0.13 J	< 0.0012	0.005 J	< 0.0014	0.015 J	0.04 J	0.051 J	
Benzene	4.8	0.0013 J	0.0063	0.0065 J	0.0034	< 0.00022	< 0.0002	0.00045 J	0.0041	0.0084	0.06	
Carbon Disulfide	--	0.00075 J	< 0.00054	0.0017 J	0.0023	< 0.00047	0.00085 J	< 0.00057	0.0021	0.0013 J	0.001 J	
Chlorobenzene	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Chloroform	350	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Cyclohexane	--	0.00091 J	< 0.00057	< 0.00082	< 0.00087	< 0.0005	< 0.00047	< 0.00061	< 0.00069	< 0.00065	< 0.00071	
Cymene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Ethyl Benzene	41	< 0.00025	0.00024 J	0.0061	0.084	< 0.0002	< 0.00018	< 0.00024	< 0.00027	0.00048 J	0.0081	
Isopropylbenzene	--	0.00099 J	< 0.00021	0.019	0.11	< 0.00019	< 0.00017	< 0.00022	< 0.00026	< 0.00024	0.0059	
Methylcyclohexane	--	0.0055	< 0.00062	< 0.00089	< 0.00095	< 0.00055	< 0.00051	< 0.00066	< 0.00075	< 0.0007	< 0.00077	
m/p-Xylenes	--	0.00041 J	0.00028 J	0.0031 J	0.082	< 0.00012	< 0.00011	< 0.00015	< 0.00017	0.00051 J	0.013	
n-Butylbenzene	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
n-Propylbenzene	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
o-Xylene	--	0.00033 J	< 0.0002	0.023	0.099	< 0.00018	< 0.00016	< 0.00021	< 0.00024	< 0.00022	0.014	
Sec-Butylbenzene	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Styrene	--	< 0.00021	< 0.00019	< 0.00027	< 0.00029	< 0.00016	< 0.00015	< 0.0002	< 0.00023	< 0.00023	< 0.00023	
T-Butylbenzene	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Toluene	100	0.00046 J	< 0.00024	0.0004 J	0.0075	0.00021	< 0.00019	< 0.00025	0.00063 J	0.00095 J	0.0007 J	
Total VOCs	--	0.04005	0.02152	0.09895	0.5592	0.00021	0.005	0.00145	0.02183	0.06664	0.1717	
Detected SVOCs												
1,1-Biphenyl	--	< 0.039	0.082 J	< 0.044	0.82 J	< 0.029	< 0.033	< 0.038 J	< 0.029	0.11 J	0.17 J	
2-Methylnaphthalene	--	0.82	0.26 J	0.12 J	9.6 J	< 0.0076	< 0.0084	0.063 J	0.009 J	0.38 J	0.63	
3 & 4 Methylphenol (m- & p-Cresol)	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Acenaphthene	100	0.6	0.44	0.091 J	2.5 J	< 0.0083	0.03 J	0.15 J	< 0.0082	0.77 J	0.49	
Acenaphthylene	100	< 0.012	0.11 J	0.025 J	< 0.14 J	< 0.0088	< 0.0098	< 0.011	0.011 J	0.15 J	< 0.013	
Acetophenone	--	0.016 J	0.054 J	< 0.011	< 0.12 J	< 0.0075	< 0.0083	0.011 J	< 0.0074	0.038 J	< 0.011	
Anthracene	100	0.62	0.76	0.23 J	7 J	< 0.033	0.053 J	0.32 J	0.043 J	1.7	0.45 J	
Benzo(a)anthracene	1	2.4	3.9	0.44	4.1 J	0.035	0.2	0.61 J	0.24	6.9	0.53	
Benzo(a)pyrene	1	2.9	6.6	0.38	2.3 J	0.039	0.2 J	0.56 J	0.17	10	0.46	
Benzo(b)fluoranthene	1	3	6.1	0.44	2.8 J	0.055	0.24	0.69	0.3	10	0.51	
Benzo(g,h,i)perylene	100	2.7	6.2	0.2 J	0.83 J	0.031 J	0.15 J	0.36 J	0.13 J	7.5	0.28 J	
Benzo(k)fluoranthene	3.9	1.2	2.9	0.19	1.1 J	0.026 J	0.1	0.27	0.11	4.6	0.21	
Benzyl alcohol	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
bis(2-Ethylhexyl)phthalate	--	0.43 J	0.16 J	< 0.02	< 0.21 J	0.05 J	0.19 J	0.038 J	0.86	0.51 J	0.14 J	
Butylbenzylphthalate	--	< 0.014	0.017 J	< 0.016	< 0.16 J	< 0.011	< 0.012	< 0.014	0.33 J	< 0.026	< 0.015	
Carbazole	--	< 0.011	0.24 J	< 0.013	0.34 J	< 0.0085	< 0.0095	0.13 J	0.014 J	0.6 J	0.23 J	
Chrysene	3.9	2.5	4.3	0.48 J	5 J	0.038 J	0.21 J	0.66	0.27 J	7.3	0.56	
Dibenz(a,h)anthracene	0.33	0.57	1.5	0.08	0.44 J	< 0.018	0.05	0.12	0.045	2.1	0.11	
Dibenzofuran	59	< 0.014	0.24 J	0.044 J	1.1 J	< 0.01	0.026 J	0.075 J	< 0.01	0.46 J	0.29 J	
Di-N-Butyl Phthalate	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Fluoranthene	100	2.9	3.7	0.49 J	5.7 J	0.026 J	0.4	1.3 J	0.41	7.6	0.78	
Fluorene	100	0.82	0.31 J	0.086 J	4.3 J	< 0.0075	0.016 J	0.17 J	< 0.0074	0.67 J	0.59	
Indeno(1,2,3-cd)pyrene	0.5	2.4	6.5	0.22	1 J	0.033 J	0.17	0.43	0.14	8.9	0.3	
Naphthalene	100	0.65	2.7	0.48 J	4.6 J	< 0.0087	0.11 J	0.27 J	0.011 J	1.8	1.8	
Phenanthrene	100	3.7	2.1	0.59	45 J	0.012 J	0.1 J	1.4 J	0.31 J	4.4	2.3	
Phenol	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Pyrene	100	3	3.8	0.69	10 J	0.031 J	0.5	1.4 J	0.46	9.1	1.1	
Total SVOCs	--	31,226	52,973	5,276	108.53	0.376	2,745	9,027	3,863	85,588	11,93	



**Table 1**  
**Soil Analytical Results (ppm)**

Site Management Plan  
Consolidated Edison Company of New York, Inc.  
Former West 18th Street Gas Works  
550 West 20th Street, New York NY

Location ID:	6 NYCRR Part 375 -	SB-302A	SB-303				SB-304			SB-305		
Depth Interval (feet bgs):	Restricted Use	1.5 - 2	3.25 - 3.75	17.5 - 18	19 - 19.5	4.5 - 5	9 - 9.5	21.5 - 22	4 - 4.5	8.5 - 9	16 - 16.5	
Date Collected:	SCOs	11/13/15	11/12/15	11/16/15	11/16/15	11/11/15	11/17/15	11/17/15	11/16/15	11/16/15	11/16/15	
Detected Inorganics												
Aluminum	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Antimony	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Arsenic	16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Barium	400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Beryllium	72	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Cadmium	9.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Calcium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Chromium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Cobalt	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Copper	270	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Cyanide	27	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Iron	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Lead	400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Magnesium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Manganese	10,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Mercury	0.81	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Nickel	310	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Potassium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Selenium	1,500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Silver	180	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Sodium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Thallium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Vanadium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Zinc	10,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	



**Table 1**  
**Soil Analytical Results (ppm)**

Site Management Plan  
 Consolidated Edison Company of New York, Inc.  
 Former West 18th Street Gas Works  
 550 West 20th Street, New York NY

Location ID:	6 NYCRR Part 375 -	SB-306			SB-307			SB-308		
Depth Interval (feet bgs):	Restricted Use	4.5 - 5	7.5 - 8	18.5 - 19	4.5 - 5	8.5 - 9	15 - 15.5	4 - 4.5	18 - 18.5	16.5 - 17
Date Collected:	SCOs	11/10/15	11/17/15	11/17/15	11/10/15	11/17/15	11/17/15	11/12/15	11/13/15	11/13/15
<b>Detected VOCs</b>										
PCB 1254	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PCBs	1	--	--	--	--	--	--	--	--	--
<b>Detected VOCs</b>										
1,2,4,5-Tetramethylbenzene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	190	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	190	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Diethyl Benzene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	100	< 0.00077	< 0.001 J	< 0.00095 J [ $\leq$ 0.00076 J]	< 0.00094	< 0.0011 J	< 0.00082	0.011 [0.013]	0.012	0.012
2-Chlorotoluene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Ethyltoluene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	100	< 0.0011	0.0094	< 0.0013 [0.006]	0.0013	0.0057	< 0.0011 J	0.046 [0.049]	0.032	0.034
Benzene	4.8	< 0.0002	0.0017	0.057 J [0.012 J]	< 0.00024	0.0045	0.0051	< 0.00032 [ $\leq$ 0.00031]	0.028	0.0016
Carbon Disulfide	--	< 0.00043	< 0.00056	< 0.00053 [ $\leq$ 0.00042]	0.00052	0.0011	0.00051 J	0.0007 J [ $\leq$ 0.00067]	< 0.00079	< 0.00059
Chlorobenzene	500	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	350	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	--	< 0.00046	< 0.0006	< 0.00057 [ $\leq$ 0.00045]	< 0.00056	< 0.00064	< 0.00049	< 0.00073 [ $\leq$ 0.00072]	< 0.00085	< 0.00063
Cymene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Benzene	41	< 0.00018	< 0.00024	< 0.00022 [ $\leq$ 0.00018]	< 0.00022	< 0.00025	< 0.00019	< 0.00028 [ $\leq$ 0.00028]	0.16	0.001 J
Isopropylbenzene	--	< 0.00017	< 0.00022	< 0.00021 [ $\leq$ 0.00017]	< 0.00021	0.0031	< 0.00018	< 0.00027 [ $\leq$ 0.00027]	0.13	0.0088
Methylcyclohexane	--	< 0.0005	< 0.00066	< 0.00061 [ $\leq$ 0.00049]	< 0.00061	< 0.0007	< 0.00053	< 0.00079 [ $\leq$ 0.00078]	< 0.00092	< 0.00069
m/p-Xylenes	--	< 0.00011	< 0.00014	< 0.00014 [ $\leq$ 0.00011]	< 0.00013	< 0.00015	< 0.00012	< 0.00017 [ $\leq$ 0.00017]	0.22	0.00099 J
n-Butylbenzene	500	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	500	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	--	< 0.00016	< 0.00021	< 0.0002 [ $\leq$ 0.00016]	< 0.00019	< 0.00022	< 0.00017	< 0.00025 [ $\leq$ 0.00025]	0.18	0.013
Sec-Butylbenzene	500	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	--	< 0.00015	< 0.0002	< 0.00018 [ $\leq$ 0.00015]	< 0.00018	< 0.00021	< 0.00016	< 0.00024 [ $\leq$ 0.00023]	< 0.00028	< 0.00021
T-Butylbenzene	500	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	100	< 0.00019	< 0.00025	< 0.00023 [ $\leq$ 0.00019]	< 0.00023	0.0008 J	< 0.0002 J	< 0.0003 [ $\leq$ 0.0003]	0.0097	0.00039 J
Total VOCs	--	< 0.0022	0.0111	0.057 [0.018]	0.00182	0.0158	0.0051	0.057 [0.062]	0.7717	0.07178
<b>Detected SVOCs</b>										
1,1-Biphenyl	--	< 0.029	< 0.071	< 0.036 [ $\leq$ 0.034]	< 0.035	0.084 J	< 0.035	< 0.047 [ $\leq$ 0.038]	0.55 J	< 0.041
2-Methylnaphthalene	--	< 0.0076	0.15 J	< 0.0093 [ $\leq$ 0.0089]	0.063 J	0.95	< 0.009	0.2 J [0.1 J]	6.6	0.21 J
3 & 4 Methylphenol (m- & p-Cresol)	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	100	< 0.0083	0.28 J	< 0.01 [ $\leq$ 0.0098]	0.44 J	0.13 J	< 0.0099	0.17 J [0.094 J]	1.4	0.2 J
Acenaphthylene	100	< 0.0088	0.046 J	< 0.011 [ $\leq$ 0.01]	0.034 J	0.089 J	< 0.011	0.047 J [0.016 J]	< 0.027	0.033 J
Acetophenone	--	< 0.0075	< 0.018	< 0.0091 [ $\leq$ 0.0088]	< 0.009	< 0.011	< 0.0089	< 0.012 [ $\leq$ 0.0097]	< 0.023	< 0.01
Anthracene	100	< 0.033	1.1	< 0.04 [ $\leq$ 0.038]	1.1 J	0.052 J	< 0.039	0.56 [0.18 J]	1.4	0.2 J
Benzo(a)anthracene	1	< 0.029	6.8	< 0.035 [ $\leq$ 0.034]	2.6 J	0.11	< 0.034	0.64 J [0.23 J]	0.22	0.21
Benzo(a)pyrene	1	0.02 J	9.1 J	< 0.013 [ $\leq$ 0.012]	2.7 J	0.11 J	0.021 J	0.53 J [0.17 J]	0.086 J	0.19
Benzo(b)fluoranthene	1	0.031 J	10	< 0.016 [ $\leq$ 0.016]	3.4 J	0.23	0.024 J	0.5 J [0.21 J]	< 0.042	0.2
Benzo(g,h,i)perylene	100	< 0.02	7.5	< 0.024 [ $\leq$ 0.023]	1.7 J	0.15 J	< 0.024	0.29 J [0.1 J]	< 0.061	0.16 J
Benzo(k)fluoranthene	3.9	< 0.015	3.8	< 0.018 [ $\leq$ 0.018]	1.5	0.075	< 0.018	0.17 [0.082]	< 0.046	0.08
Benzyl alcohol	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	--	< 0.013	< 0.033	0.13 J [0.077 J]	0.11 J	0.082 J	0.29 J	< 0.021 [0.2 J]	< 0.042	0.055 J
Butylbenzylphthalate	--	0.18 J	< 0.026	0.022 J [ $\leq$ 0.012]	0.041 J	< 0.016	< 0.013	< 0.017 [ $\leq$ 0.014]	< 0.033	< 0.015
Carbazole	--	< 0.0085	0.41 J	< 0.01 [ $\leq$ 0.01]	0.37 J	< 0.013	< 0.01	0.031 J [0.012 J]	0.11 J	0.036 J
Chrysene	3.9	0.022 J	6.8	< 0.011 [ $\leq$ 0.011]	2.9 J	0.1 J	0.017 J	0.8 [0.24 J]	0.29 J	0.25 J
Dibenz(a,h)anthracene	0.33	< 0.018	2.5	< 0.022 [ $\leq$ 0.021]	0.44	0.066	< 0.021	0.15 [0.05]	< 0.055	0.063
Dibenzofuran	59	< 0.01	0.17 J	< 0.013 [ $\leq$ 0.012]	0.21 J	0.04 J	< 0.012	< 0.017 [0.023 J]	< 0.032	< 0.014
Di-N-Butyl Phthalate	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	100	0.03 J	6.1	0.022 J [ $\leq$ 0.012]	5.4 J	0.2 J	0.019 J	0.86 [0.3 J]	0.59 J	0.28 J
Fluorene	100	< 0.0075	0.24 J	< 0.0091 [ $\leq$ 0.0088]	0.23 J	0.036 J	< 0.0089	0.13 J [0.068 J]	1.5	0.1 J
Indeno(1,2,3-cd)pyrene	0.5	< 0.023	8.5	< 0.028 [ $\leq$ 0.027]	1.8	0.16	< 0.027	0.37 J [0.11 J]	< 0.071	0.12
Naphthalene	100	< 0.0087	0.34 J	0.12 J [0.033 J]	0.11 J	1.3	0.057 J	0.33 J [0.16 J]	4.2	0.54
Phenanthrene	100	< 0.0091	3.3	0.032 J [0.014 J]	4.9 J	0.16 J	0.013 J	3.6 J [0.99 J]	15	1.2
Phenol	500	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	100	0.039 J	6.3	0.021 J [ $\leq$ 0.018]	5.8 J	0.18 J	0.022 J	0.91 [0.46]	0.72 J	0.44 J
Total SVOCs	--	0.322	73.436	0.347 [0.124]	35.848	4.304	0.463	10.288 [3.795]	32.666	4.567



**Table 1**  
**Soil Analytical Results (ppm)**

Site Management Plan  
Consolidated Edison Company of New York, Inc.  
Former West 18th Street Gas Works  
550 West 20th Street, New York NY

Location ID:	6 NYCRR Part 375 -	SB-306			SB-307			SB-308		
Depth Interval (feet bgs):	Restricted Use	4.5 - 5	7.5 - 8	18.5 - 19	4.5 - 5	8.5 - 9	15 - 15.5	4 - 4.5	18 - 18.5	16.5 - 17
Date Collected:	SCOs	11/10/15	11/17/15	11/17/15	11/10/15	11/17/15	11/17/15	11/12/15	11/13/15	11/13/15
<b>Detected Inorganics</b>										
Aluminum	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	16	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	400	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	72	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	9.3	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	270	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	27	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	400	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	10,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.81	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	310	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	1,500	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	180	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	10,000	NA	NA	NA	NA	NA	NA	NA	NA	NA



Table 1  
Soil Analytical Results (ppm)

Site Management Plan  
Consolidated Edison Company of New York, Inc.  
Former West 18th Street Gas Works  
550 West 20th Street, New York NY

Location ID: 6 NYCRR Part 375 -		SB-01			SB-02		SB-03		SB-05	SB-06		
Depth Interval (feet bgs):	Restricted Use	1.5-2.5	9-10	12-13	2-3	8-9	1-2	9-10	1-2	3-4	10-12	15-16
Date Collected:	SCOs	11/08/18	11/08/18	11/08/18	11/06/18	11/06/18	11/07/18	11/07/18	11/08/18	11/05/18	11/05/18	11/05/18
<b>Detected VOCs</b>												
PCB 1254	--	< 0.0396	< 0.0403	NA	0.00596 J	0.00958 J	< 0.0346 [ $\leq$ 0.0352]	< 0.0417	< 0.056	< 0.0441	NA	< 0.0381
Total PCBs	1	< 0.0396	< 0.0403	NA	0.00596 J	0.00958 J	< 0.0346 [ $\leq$ 0.0352]	< 0.0417	< 0.056	< 0.0441	NA	< 0.0381
<b>Detected VOCs</b>												
1,2,4,5-Tetramethylbenzene	--	< 0.0019	1.3	0.26	0.023 J	4.5	< 0.0022 [ $\leq$ 0.0021]	< 0.0022	< 0.0032	< 0.0023	0.026	0.0022
1,2,4-Trimethylbenzene	190	< 0.0019	0.16 J	0.093 J	0.019 J	< 0.19	< 0.0022 [ $\leq$ 0.0021]	< 0.0022	< 0.0032	0.00072 J	0.0021	0.00076 J
1,3,5-Trimethylbenzene	190	< 0.0019	0.057 J	0.05 J	< 0.11	< 0.19	< 0.0022 [ $\leq$ 0.0021]	< 0.0022	< 0.0032	< 0.0023	< 0.0021	< 0.002
1,4-Diethyl Benzene	--	< 0.0019	0.44 J	0.073 J	0.01 J	0.87	< 0.0022 [ $\leq$ 0.0021]	< 0.0022	< 0.0032	< 0.0023	< 0.0021	< 0.002
2-Butanone	100	< 0.0096	< 2.4	< 0.8	< 0.57	< 0.93	< 0.011 [ $\leq$ 0.011]	< 0.011	< 0.016	< 0.012	< 0.011	< 0.0099
2-Chlorotoluene	--	< 0.0019	0.18 J	< 0.16	< 0.11	< 0.19	< 0.0022 [ $\leq$ 0.0021]	< 0.0022	< 0.0032	< 0.0023	< 0.0021	< 0.002
4-Ethyltoluene	--	< 0.0019	0.17 J	0.059 J	< 0.11	< 0.19	< 0.0022 [ $\leq$ 0.0021]	< 0.0022	< 0.0032	< 0.0023	< 0.0021	0.00042 J
Acetone	100	0.02	< 2.4	< 0.8	< 0.57	< 0.93	0.014 [0.013]	0.25	0.022	0.013	0.016	0.096
Benzene	4.8	< 0.00048	2	1	0.37	< 0.046	< 0.00055 [0.00043 J]	< 0.00055	0.00041 J	< 0.00058	0.016	0.0026
Carbon Disulfide	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	500	< 0.00048	< 0.12	0.037 J	< 0.028	< 0.046	< 0.00055 [ $\leq$ 0.00054]	< 0.00055	< 0.00079	< 0.00058	< 0.00053	< 0.00049
Chloroform	350	0.00033 J	< 0.37	< 0.12	0.01 J	0.017 J	0.00022 J [0.00023 J]	0.00026 J	0.0013 J	< 0.0018	0.00048 J	< 0.0015
Cyclohexane	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cymene	--	< 0.00096	< 0.24	0.02 J	< 0.057	< 0.093	< 0.0011 [ $\leq$ 0.0011]	< 0.0011	< 0.0016	< 0.0012	< 0.0011	< 0.00099
Ethyl Benzene	41	< 0.00096	0.28	0.12	0.076	< 0.093	< 0.0011 [ $\leq$ 0.0011]	< 0.0011	< 0.0016	< 0.0012	0.0021	0.00047 J
Isopropylbenzene	--	< 0.00096	1.1	0.35	< 0.062	0.12	< 0.0011 [ $\leq$ 0.0011]	< 0.0011	< 0.0016	< 0.0012	0.011	0.00056 J
Methylcyclohexane	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m/p-Xylenes	--	< 0.0019	0.38 J	0.25	0.082 J	< 0.19	< 0.0022 [ $\leq$ 0.0021]	< 0.0022	< 0.0032	< 0.0023	0.0042	0.00085 J
n-Butylbenzene	500	< 0.00096	0.82	0.11	0.0095 J	1	< 0.0011 [ $\leq$ 0.0011]	< 0.0011	< 0.0016	< 0.0012	< 0.0011	< 0.00099
n-Propylbenzene	500	< 0.00096	0.94	0.17	< 0.057	0.13	< 0.0011 [ $\leq$ 0.0011]	< 0.0011	< 0.0016	< 0.0012	< 0.0011	< 0.00099
o-Xylene	--	< 0.00096	< 0.24	0.084	0.031 J	< 0.093	< 0.0011 [ $\leq$ 0.0011]	< 0.0011	< 0.0016	< 0.0012	0.0013	< 0.00099
Sec-Butylbenzene	500	< 0.00096	1.4	0.28	< 0.057	1.4	< 0.0011 [ $\leq$ 0.0011]	< 0.0011	< 0.0016	< 0.0012	0.043	0.0023
Styrene	--	< 0.00096	< 0.24	< 0.08	< 0.057	< 0.093	< 0.0011 [ $\leq$ 0.0011]	< 0.0011	< 0.0016	< 0.0012	< 0.0011	0.00022 J
T-Butylbenzene	500	< 0.0019	0.16 J	0.066 J	< 0.11	0.081 J	< 0.0022 [ $\leq$ 0.0021]	< 0.0022	< 0.0032	< 0.0023	0.0082	0.00045 J
Toluene	100	< 0.00096	0.27	0.1	0.053 J	< 0.093	< 0.0011 [ $\leq$ 0.0011]	< 0.0011	< 0.0016	< 0.0012	0.0065	0.0012
Total VOCs	--	0.02033	9.657	3.122	0.6835	8.118	0.01422 [0.1323]	0.25026	0.02371	0.01372	0.13688	0.10803
<b>Detected SVOCs</b>												
1,1-Biphenyl	--	< 0.46	< 0.46	0.096 J	< 0.45	< 0.58	< 0.4 [ $\leq$ 0.4]	< 0.48	< 0.62	< 0.5	< 0.5	< 0.44
2-Methylnaphthalene	--	0.057 J	0.057 J	0.73	0.031 J	< 0.3	< 0.21 [ $\leq$ 0.21]	0.051 J	< 0.33	< 0.26	0.083 J	0.06 J
3 & 4 Methylphenol (m- & p-Cresol)	--	< 0.29	< 0.29	0.11 J	< 0.28	< 0.36	< 0.25 [ $\leq$ 0.25]	< 0.3	< 0.39	< 0.32	< 0.31	< 0.28
Acenaphthene	100	0.044 J	0.11 J	0.3	0.034 J	0.92	< 0.14 [ $\leq$ 0.14]	0.037 J	0.041 J	< 0.18	0.071 J	0.095 J
Acenaphthylene	100	0.045 J	0.18	0.12 J	< 0.16	< 0.2	< 0.14 [0.044 J]	0.042 J	< 0.22	< 0.18	0.044 J	0.037 J
Acetophenone	--	0.068 J	< 0.2	< 0.22	< 0.2	< 0.25	< 0.17 [ $\leq$ 0.18]	0.065 J	< 0.27	< 0.22	< 0.22	< 0.19
Anthracene	100	0.11 J	0.4	0.4	0.062 J	0.55	< 0.1 [0.042 J]	0.089 J	0.085 J	0.055 J	0.099 J	0.08 J
Benzo(a)anthracene	1	0.96	2.7	0.8	0.14	0.97	0.13 [0.31]	0.48	0.86	0.41	0.53	0.37
Benzo(a)pyrene	1	1.7	3.1	0.99	0.19	1.2	0.12 J [0.37]	0.72	1.1	0.5	0.91	0.6
Benzo(b)fluoranthene	1	1.8	3.7	1.1	0.19	1.4	0.17 [0.5]	0.83	1.1	0.64	0.92	0.6
Benzo(g,h,i)perylene	100	0.96	1.7	0.62	0.12 J	0.71	0.074 J [0.25]	0.42	0.47	0.35	0.52	0.39
Benzo(k)fluoranthene	3.9	0.57	1.2	0.38	0.064 J	0.48	0.058 J [0.16]	0.28	0.38	0.2	0.32	0.21
Benzyl alcohol	--	< 0.2	< 0.2	< 0.22	0.99	< 0.25	< 0.17 [ $\leq$ 0.18]	< 0.21	< 0.27	< 0.22	< 0.22	< 0.19
bis(2-Ethylhexyl)phthalate	--	0.085 J	< 0.2	0.2 J	21	< 0.25	< 0.17 [0.067 J]	0.1 J	0.14 J	< 0.22	< 0.22	< 0.19
Butylbenzylphthalate	--	0.22	0.11 J	24	36	< 0.25	< 0.17 [ $\leq$ 0.18]	< 0.21	< 0.27	< 0.22	< 0.22	< 0.19
Carbazole	--	0.057 J	0.11 J	0.12 J	< 0.2	< 0.25	< 0.17 [0.02 J]	0.041 J	< 0.27	0.021 J	0.082 J	0.047 J
Chrysene	3.9	0.88	2.5	0.71	0.13	1	0.13 [0.34]	0.47	0.74	0.38	0.48	0.32
Dibenz(a,h)anthracene	0.33	0.32	0.48	0.17	0.037 J	0.15	0.024 J [0.067 J]	0.13	0.18	0.1 J	0.18	0.13
Dibenzofuran	59	0.043 J	0.065 J	0.22	< 0.2	0.38	< 0.17 [ $\leq$ 0.18]	0.038 J	< 0.27	< 0.22	0.053 J	0.042 J
Di-N-Butyl Phthalate	--	< 0.2	< 0.2	0.12 J	0.21	< 0.25	< 0.17 [ $\leq$ 0.18]	< 0.21	< 0.27	< 0.22	< 0.22	< 0.19
Fluoranthene	100	0.69	4.4	1.2	0.18	1.3	0.26 [0.55]	0.54	0.6	0.52	0.44	0.28
Fluorene	100	0.026 J	0.19 J	0.35	0.026 J	0.92	< 0.17 [ $\leq$ 0.18]	0.029 J	< 0.27	< 0.22	0.08 J	0.081 J
Indeno(1,2,3-cd)pyrene	0.5	1.1	2.1	0.67	0.14 J	0.77	0.083 J [0.28]	0.48	0.56	0.4	0.62	0.43
Naphthalene	100	0.41	0.22	3.1	0.1 J	0.2 J	< 0.17 [0.032 J]	0.48	0.063 J	0.056 J	0.6	0.75
Phenanthrene	100	0.34	1.6	1	0.17	1.8	0.16 [0.26]	0.29	0.22	0.21	0.21	0.15
Phenol	500	< 0.2	< 0.2	0.058 J	< 0.2	< 0.25	< 0.17 [ $\leq$ 0.18]	< 0.21	< 0.27	< 0.22	< 0.22	< 0.19
Pyrene	100	0.67	3.8	1.1	0.18	1.6	0.22 [0.48]	0.52	0.6	0.44	0.43	0.27
Total SVOCs	--	11.155	28.722	38.664	59.994	14.35	1.429 [3.772]	6.132	7.139	4.282	6.672	4.942



**Table 1**  
**Soil Analytical Results (ppm)**

Site Management Plan  
Consolidated Edison Company of New York, Inc.  
Former West 18th Street Gas Works  
550 West 20th Street, New York NY

Location ID: 6 NYCRR Part 375 -		SB-01			SB-02		SB-03		SB-05	SB-06		
Depth Interval (feet bgs):	Restricted Use	1.5-2.5	9-10	12-13	2-3	8-9	1-2	9-10	1-2	3-4	10-12	15-16
Date Collected:	SCOs	11/08/18	11/08/18	11/08/18	11/06/18	11/06/18	11/07/18	11/07/18	11/08/18	11/05/18	11/05/18	11/05/18
<b>Detected Inorganics</b>												
Aluminum	--	8,360	5,360	NA	4,210	6,440	2,400 [3,640]	9,000	9,280	8,650	NA	3,220
Antimony	--	< 4.79	< 4.84	NA	< 4.78	< 5.95	< 4.28 [< 4.22]	< 4.92	< 6.44	0.685 J	NA	< 4.41
Arsenic	16	7.17	5.88	NA	1.07	2.45	2.24 [5.81]	7.46	7.2	5.13	NA	1.6
Barium	400	59.4	104	NA	193	55.7	33.2 [70.4]	82.6	122	84.9	NA	29.2
Beryllium	72	0.364 J	0.164 J	NA	0.077 J	0.357 J	0.146 J [0.194 J]	0.482 J	0.451 J	0.352 J	NA	0.15 J
Cadmium	9.3	0.422 J	0.493 J	NA	< 0.956	0.143 J	< 0.856 [< 0.844]	< 0.984	0.476 J	0.393 J	NA	0.141 J
Calcium	--	7,550	17,800	NA	45,900	4,000	1,130 [16,200]	3,770	13,400	25,000	NA	8,340
Chromium	--	15.9	11.6	NA	13.7	16.8	6.51 [24.7]	20.2	16.1	16	NA	8.81
Cobalt	--	7.14	5.53	NA	2.85	5.71	3.02 [4.5]	8.46	6.12	7.16	NA	5.84
Copper	270	22.4	40	NA	5.48	23.8	12.3 [49.3]	33.2	48	29	NA	30.5
Cyanide	27	< 1.1	1.8	NA	0.67 J	< 1.5	< 1 [< 1.1]	< 1.2	< 1.5	0.38 J	NA	< 1.1
Iron	--	19,200	15,800	NA	5,600	12,400	6,650 [9,040]	21,000	19,200	19,200	NA	9,930
Lead	400	97	608	NA	5.19	22.5	9.07 [83.5]	243	1,170	92.2	NA	47.4
Magnesium	--	3,650	2,470	NA	2,230	3,070	1,560 [2,140]	4,440	3,020	4,440	NA	2,070
Manganese	10,000	431	244	NA	116	179	226 [162]	341	338	403	NA	184
Mercury	0.81	0.775	0.619	NA	0.168	0.029 J	< 0.067 [< 0.067]	0.436	0.842	0.472	NA	< 0.074
Nickel	310	15.4	11.3	NA	5.73	21	8.63 [17.4]	18.8	13.8	16	NA	9.83
Potassium	--	1,240	782	NA	481	925	555 [543]	1540	1,100	1,920	NA	751
Selenium	1,500	0.45 J	0.774 J	NA	0.249 J	< 2.38	< 1.71 [< 1.69]	< 1.97	1.28 J	0.705 J	NA	0.414 J
Silver	180	< 0.958	< 0.967	NA	< 0.956	< 1.19	< 0.856 [< 0.844]	< 0.984	1 J	< 1.01	NA	< 0.882
Sodium	--	480	316	NA	351	172 J	128 J [228]	623	282	957	NA	635
Thallium	--	< 1.92	< 1.93	NA	< 1.91	< 2.38	< 1.71 [< 1.69]	< 1.97	< 2.58	< 2.01	NA	< 1.76
Vanadium	--	22.2	14.5	NA	7.19	21	11 [20.2]	25.8	25	20.4	NA	13.3
Zinc	10,000	77.3	164	NA	7.47	29.7	21 [168]	145	80.9	85.7	NA	17.7



**Table 1**  
**Soil Analytical Results (ppm)**

Site Management Plan  
Consolidated Edison Company of New York, Inc.  
Former West 18th Street Gas Works  
550 West 20th Street, New York NY

Location ID: 6 NYCRR Part 375 -		SB-07			SB-08		SB-09	SB-10			SB-11	
Depth Interval (feet bgs):	Restricted Use	3-4	9-10	24-25	2-3	21-22	1-2	1-2	6-7	24-25	2-3	24-25
Date Collected:	SCOs	11/05/18	11/05/18	11/06/18	11/06/18	11/06/18	11/09/18	11/08/18	11/08/18	11/08/18	11/06/18	11/06/18
<b>Detected VOCs</b>												
PCB 1254	--	< 0.0392	NA	< 0.0466	0.00809 J	0.0063 J	NA	< 0.0337	< 0.0442	< 0.0489	0.00506 J	0.00691 J
Total PCBs	1	< 0.0392	NA	< 0.0466	0.00809 J	0.0063 J	NA	< 0.0337	< 0.0442	< 0.0489	0.00506 J	0.00691 J
<b>Detected VOCs</b>												
1,2,4,5-Tetramethylbenzene	--	< 0.0022	< 0.23	< 0.18	< 0.0027	< 0.0022	< 0.0028	< 0.003	< 0.0023	0.0014 J	< 0.002	< 0.13
1,2,4-Trimethylbenzene	190	0.00056 J	0.096 J	0.067 J	< 0.0027	< 0.0022	0.00067 J	< 0.003	< 0.0023	0.0028 J	< 0.002	< 0.13
1,3,5-Trimethylbenzene	190	< 0.0022	0.025 J	0.034 J	< 0.0027	< 0.0022	0.0003 J	< 0.003	< 0.0023	0.0029	< 0.002	< 0.13
1,4-Diethyl Benzene	--	< 0.0022	0.025 J	0.02 J	< 0.0027	< 0.0022	0.00048 J	< 0.003	< 0.0023	0.0038	< 0.002	< 0.13
2-Butanone	100	< 0.011	< 1.2	< 0.9	< 0.014	< 0.011	< 0.014	< 0.015	0.007 J	0.025	< 0.0098	< 0.63
2-Chlorotoluene	--	< 0.0022	< 0.23	< 0.18	< 0.0027	< 0.0022	< 0.0028	< 0.003	< 0.0023	< 0.0029	< 0.002	< 0.13
4-Ethyltoluene	--	< 0.0022	0.066 J	0.04 J	< 0.0027	< 0.0022	0.0013 J	< 0.003	< 0.0023	0.0019 J	< 0.002	< 0.13
Acetone	100	0.012	< 1.2	< 0.9	0.02	0.019	0.012 J	0.018	0.07	0.31	0.22	< 0.63
Benzene	4.8	< 0.00055	2.8	1.5	< 0.00068	0.0023	< 0.0007	< 0.00076	0.002	< 0.00073	< 0.00049	0.046
Carbon Disulfide	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	500	< 0.00055	< 0.058	< 0.045	< 0.00068	< 0.00055	< 0.0007	< 0.00076	< 0.00057	< 0.00073	< 0.00049	< 0.032
Chloroform	350	< 0.0016	< 0.17	< 0.14	0.00019 J	0.00024 J	0.0015 J	0.00039 J	0.00025 J	0.00031 J	0.00017 J	< 0.095
Cyclohexane	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cymene	--	< 0.0011	< 0.12	0.012 J	< 0.0014	< 0.0011	0.00075 J	< 0.0015	< 0.0011	0.00037 J	< 0.00098	< 0.063
Ethyl Benzene	41	< 0.0011	0.25	0.2	< 0.0014	0.00018 J	< 0.0014	< 0.0015	< 0.0011	0.00078 J	< 0.00098	< 0.063
Isopropylbenzene	--	< 0.0011	0.015 J	0.019 J	< 0.0014	< 0.0011	< 0.0014	< 0.0015	< 0.0011	0.0016	< 0.00098	< 0.063
Methylcyclohexane	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m/p-Xylenes	--	< 0.0022	0.33	0.16 J	< 0.0027	< 0.0022	0.00089 J	< 0.003	< 0.0023	0.0022 J	< 0.002	< 0.13
n-Butylbenzene	500	< 0.0011	< 0.12	< 0.09	< 0.0014	< 0.0011	< 0.0014	< 0.0015	< 0.0011	< 0.0014	< 0.00098	< 0.063
n-Propylbenzene	500	< 0.0011	< 0.12	< 0.09	< 0.0014	< 0.0011	< 0.0014	< 0.0015	< 0.0011	< 0.0014	< 0.00098	< 0.063
o-Xylene	--	< 0.0011	0.13	0.072 J	< 0.0014	< 0.0011	0.00054 J	< 0.0015	< 0.0011	0.0018	< 0.00098	< 0.063
Sec-Butylbenzene	500	< 0.0011	< 0.12	< 0.09	< 0.0014	< 0.0011	< 0.0014	< 0.0015	< 0.0011	< 0.0014	< 0.00098	< 0.063
Styrene	--	< 0.0011	< 0.12	< 0.09	< 0.0014	< 0.0011	< 0.0014	< 0.0015	< 0.0011	< 0.0014	< 0.00098	< 0.063
T-Butylbenzene	500	< 0.0022	< 0.23	< 0.18	< 0.0027	< 0.0022	< 0.0028	< 0.003	< 0.0023	< 0.0029	< 0.002	< 0.13
Toluene	100	< 0.0011	0.42	< 0.09	< 0.0014	< 0.0011	< 0.0014	0.0015	< 0.0011	< 0.0014	< 0.00098	< 0.063
Total VOCs	--	0.01256	4.157	2.124	0.02019	0.02172	0.01843	0.01989	0.07925	0.35486	0.22017	0.046
<b>Detected SVOCs</b>												
1,1-Biphenyl	--	< 0.46	< 0.5	< 0.54	< 0.78	< 0.44	< 1.4	< 0.39	< 0.5	< 0.57	< 0.39	< 0.48
2-Methylnaphthalene	--	< 0.24	0.1 J	0.22 J	0.067 J	< 0.23	0.097 J	0.027 J	0.1 J	< 0.3	< 0.2	0.049 J
3 & 4 Methylphenol (m- & p-Cresol)	--	< 0.29	0.077 J	< 0.34	< 0.49	< 0.28	< 0.87	< 0.24	0.081 J	< 0.36	< 0.25	0.033 J
Acenaphthene	100	< 0.16	0.12 J	0.079 J	0.26 J	0.024 J	< 0.48	0.092 J	0.27	< 0.2	0.057 J	0.6
Acenaphthylene	100	< 0.16	0.043 J	< 0.19	0.1 J	< 0.15	< 0.48	< 0.14	0.77	< 0.2	0.04 J	0.48
Acetophenone	--	< 0.2	< 0.22	< 0.24	< 0.34	< 0.19	< 0.6	< 0.17	< 0.22	< 0.25	< 0.17	< 0.21
Anthracene	100	< 0.12	0.16	0.05 J	0.47	< 0.12	< 0.36	0.18	1.4	< 0.15	0.14	1
Benzo(a)anthracene	1	0.14	0.83	0.065 J	1.4	0.058 J	0.46	0.44	6.2	0.048 J	0.6	3.4
Benzo(a)pyrene	1	0.15 J	1.4	0.11 J	1	0.062 J	0.83	0.32	7.6	0.062 J	0.54	3
Benzo(b)fluoranthene	1	0.19	1.4	0.1 J	1.4	0.073 J	1.1	0.41	6.5	0.059 J	0.74	3.8
Benzo(g,h,i)perylene	100	0.1 J	1	0.066 J	0.68	0.032 J	0.73	0.25	4.1	0.033 J	0.32	1.5
Benzo(k)fluoranthene	3.9	0.051 J	0.54	0.039 J	0.49	< 0.12	0.4	0.17	2.8	< 0.15	0.22	1.2
Benzyl alcohol	--	< 0.2	< 0.22	< 0.24	< 0.34	< 0.19	< 0.6	1.8	0.13 J	< 0.25	< 0.17	< 0.21
bis(2-Ethylhexyl)phthalate	--	0.094 J	< 0.22	< 0.24	7.7	2.1	0.3 J	0.55	< 0.22	< 0.25	< 0.17	3.7
Butylbenzylphthalate	--	0.054 J	< 0.22	< 0.24	5.5	19	< 0.6	31	26	< 0.25	< 0.17	1.4
Carbazole	--	< 0.2	0.1 J	0.11 J	0.19 J	< 0.19	< 0.6	0.074 J	0.45	< 0.25	0.061 J	0.16 J
Chrysene	3.9	0.13	0.78	0.066 J	1.2	0.06 J	0.41	0.39	6.7	0.055 J	0.58	3.3
Dibenz(a,h)anthracene	0.33	0.028 J	0.28	< 0.14	0.18 J	< 0.12	0.21 J	0.065 J	1.1	< 0.15	0.078 J	0.39
Dibenzofuran	59	< 0.2	0.044 J	0.052 J	0.11 J	< 0.19	< 0.6	0.038 J	0.31	< 0.25	0.017 J	0.29
Di-N-Butyl Phthalate	--	< 0.2	< 0.22	< 0.24	< 0.34	< 0.14	< 0.6	0.17	0.11 J	< 0.25	< 0.17	< 0.21
Fluoranthene	100	0.2	0.62	0.1 J	2.6	0.16	0.28 J	0.75	9.6	0.044 J	1.3	8.1
Fluorene	100	< 0.2	0.077 J	0.087 J	0.18 J	< 0.19	< 0.6	0.1 J	0.68	< 0.25	0.032 J	0.32
Indeno(1,2,3-cd)pyrene	0.5	0.11 J	1	0.067 J	0.75	0.034 J	0.82	0.26	5	0.037 J	0.35	1.7
Naphthalene	100	0.038 J	1.3	1	0.067 J	< 0.19	0.18 J	0.05 J	0.28	< 0.25	< 0.17	0.19 J
Phenanthrene	100	0.1 J	0.4	0.21	2.2	0.079 J	0.21 J	1	7.8	< 0.15	0.8	1.9
Phenol	500	< 0.2	< 0.22	< 0.24	< 0.34	< 0.19	< 0.6	< 0.17	0.047 J	< 0.25	< 0.17	< 0.21
Pyrene	100	0.19	0.68	0.1 J	2.2	0.13	0.32 J	0.66	8.4	0.049 J	1.2	6.8
Total SVOCs	--	1.575	10.951	2.521	28.744	21.952	6.347	38.796	96.428	0.387	7.075	43.312



**Table 1**  
**Soil Analytical Results (ppm)**

Site Management Plan  
Consolidated Edison Company of New York, Inc.  
Former West 18th Street Gas Works  
550 West 20th Street, New York NY

Location ID:	6 NYCRR Part 375 -	SB-07			SB-08		SB-09	SB-10			SB-11	
Depth Interval (feet bgs):	Restricted Use	3-4	9-10	24-25	2-3	21-22	1-2	1-2	6-7	24-25	2-3	24-25
Date Collected:	SCOs	11/05/18	11/05/18	11/05/18	11/06/18	11/06/18	11/09/18	11/08/18	11/08/18	11/08/18	11/06/18	11/06/18
Detected Inorganics												
Aluminum	--	8,790	NA	10,900	3,320	4,590	7,860	5,470	8,850	7,860	1,950	3,710
Antimony	--	0.449 J	NA	< 5.59	0.755 J	< 4.47	1.12 J	< 4.15	< 5.24	< 5.89	< 4	< 5.12
Arsenic	16	7.23	NA	8.27	7.58	2.29	5.32	2.44	8.91	8.11	0.584 J	1.76
Barium	400	72.5	NA	35.3	171	37.5	71.2	159	82.2	60.3	26.6	41.4
Beryllium	72	0.356 J	NA	0.481 J	0.244 J	0.206 J	0.4 J	0.091 J	0.335 J	0.306 J	0.144 J	0.164 J
Cadmium	9.3	0.402 J	NA	0.414 J	1.08	0.116 J	< 0.977	0.166 J	0.545 J	0.353 J	< 0.8	0.143 J
Calcium	--	16,300	NA	4,280	26,100	6,050	3,730	48,300	21,600	3,620	2,810	6,270
Chromium	--	16.2	NA	19.8	17.7	9.65	19.6	11.2	16.1	14.4	5.88	8.42
Cobalt	--	8.62	NA	8.88	5.62	4.27	8.4	3.19	7.3	6.23	2.58	3.5
Copper	270	28.6	NA	16.9	92.9	22.6	78.3	14.30	30.2	17.6	6.4	14.5
Cyanide	27	< 1.1	NA	< 1.4	< 0.96	< 1.1	NA	< 0.96	0.59 J	< 1.4	< 1	< 1.3
Iron	--	22,200	NA	23,400	11,400	9,900	19,400	7,270	22,000	17,000	5,700	8,560
Lead	400	198	NA	56.7	175	89.7	158	20.4	241	108	13.4	71.4
Magnesium	--	4,060	NA	5,110	4,650	3,470	3,150	3,400	3,970	3,470	1,600	2,080
Manganese	10,000	541	NA	717	610	229	300	280	422	498	233	213
Mercury	0.81	0.314	NA	0.193	0.212	0.112	0.835	0.031 J	0.46	0.198	< 0.066	0.209
Nickel	310	18.8	NA	18.6	41.3	9.33	17	10.7	15.4	13.1	6.39	9.12
Potassium	--	1,690	NA	1,840	615	515	1,180	848	1,370	1,320	525	448
Selenium	1,500	1.03 J	NA	1.36 J	0.382 J	< 1.79	1.51 J	0.373 J	0.912 J	0.99 J	< 1.6	< 2.05
Silver	180	< 0.936	NA	< 1.12	0.325 J	< 0.895	< 0.977	< 0.83	< 1.05	< 1.18	< 0.8	< 1.02
Sodium	--	815	NA	1,090	649	178 J	481	494	371	579	530	160 J
Thallium	--	0.515 J	NA	0.581 J	< 1.62	< 1.79	< 1.95	< 1.66	< 2.1	< 2.36	< 1.6	< 2.05
Vanadium	--	21	NA	25.9	15.7	18.9	25.9	11.1	22.4	19.7	8.72	10.1
Zinc	10,000	113	NA	61.7	463	35.4	169	41.8	145	93.2	13.6	55.4



Table 1  
Soil Analytical Results (ppm)

Site Management Plan  
Consolidated Edison Company of New York, Inc.  
Former West 18th Street Gas Works  
550 West 20th Street, New York NY

Location ID: 6 NYCRR Part 375 -		SB-12			SB-13		
Depth Interval (feet bgs):	Restricted Use	3-4	18-19	19-20	7-8	18-19	29-30
Date Collected:	SCOs	11/09/18	11/09/18	11/09/18	11/14/18	11/14/18	11/14/18
<b>Detected VOCs</b>							
PCB 1254	--	< 0.0518	< 0.0494	< 0.051	< 0.043	< 0.0495	< 0.0529 [ $\leq$ 0.0495]
Total PCBs	1	< 0.0518	< 0.0494	< 0.051	< 0.043	< 0.0495	< 0.0529 [ $\leq$ 0.0495]
<b>Detected VOCs</b>							
1,2,4,5-Tetramethylbenzene	--	< 0.0029	0.23 J	< 0.23	< 0.15	0.54	< 0.0032 [ $\leq$ 0.0035]
1,2,4-Trimethylbenzene	190	< 0.0029	2.6	0.41	0.025 J	0.26	< 0.0032 [ $\leq$ 0.0035]
1,3,5-Trimethylbenzene	190	< 0.0029	0.64	< 0.23	< 0.15	0.31	< 0.0032 [ $\leq$ 0.0035]
1,4-Diethyl Benzene	--	< 0.0029	0.27 J	< 0.23	< 0.15	0.66	< 0.0032 [ $\leq$ 0.0035]
2-Butanone	100	0.012 J	< 2.1	< 1.1	< 0.76	< 1.1	0.0095 J [0.01 J]
2-Chlorotoluene	--	< 0.0029	< 0.42	< 0.23	< 0.15	< 0.23	< 0.0032 [ $\leq$ 0.0035]
4-Ethyltoluene	--	< 0.0029	10	0.22 J	< 0.15	0.18 J	< 0.0032 [ $\leq$ 0.0035]
Acetone	100	0.1	< 2.1	< 1.1	< 0.76	< 1.1	0.39 [0.1]
Benzene	4.8	< 0.00072	0.07 J	< 0.057	0.83	0.22	< 0.00081 [ $\leq$ 0.00087]
Carbon Disulfide	--	NA	NA	NA	NA	NA	NA
Chlorobenzene	500	< 0.00072	< 0.11	< 0.057	< 0.038	< 0.057	< 0.00081 [ $\leq$ 0.00087]
Chloroform	350	0.00024 J	0.04 J	0.021 J	< 0.11	< 0.17	< 0.0024 [ $\leq$ 0.0026]
Cyclohexane	--	NA	NA	NA	NA	NA	NA
Cymene	--	< 0.0014	2	0.035 J	< 0.076	0.12	< 0.0016 [ $\leq$ 0.0017]
Ethyl Benzene	41	< 0.0014	1.8	0.87	0.18	0.06 J	< 0.0016 [ $\leq$ 0.0017]
Isopropylbenzene	--	< 0.0014	1.7	0.46	< 0.076	0.18	< 0.0016 [ $\leq$ 0.0017]
Methylcyclohexane	--	NA	NA	NA	NA	NA	NA
m/p-Xylenes	--	< 0.0029	3.2	0.3	0.19	0.14 J	< 0.0032 [ $\leq$ 0.0035]
n-Butylbenzene	500	< 0.0014	< 0.21	< 0.11	< 0.076	0.049 J	< 0.0016 [ $\leq$ 0.0017]
n-Propylbenzene	500	< 0.0014	0.17 J	< 0.11	< 0.076	0.036 J	< 0.0016 [ $\leq$ 0.0017]
o-Xylene	--	< 0.0014	1.6	0.88	0.082	0.037 J	< 0.0016 [ $\leq$ 0.0017]
Sec-Butylbenzene	500	< 0.0014	0.042 J	< 0.11	< 0.076	0.02 J	< 0.0016 [ $\leq$ 0.0017]
Styrene	--	< 0.0014	< 0.21	< 0.11	< 0.076	< 0.11	< 0.0016 [ $\leq$ 0.0017]
T-Butylbenzene	500	< 0.0029	< 0.42	< 0.23	< 0.15	< 0.23	< 0.0032 [ $\leq$ 0.0035]
Toluene	100	< 0.0014	< 0.21	< 0.11	0.073 J	< 0.11	< 0.0016 [ $\leq$ 0.0017]
Total VOCs	--	0.11224	24.362	3.196	1.38	2.812	0.3995 [0.11]
<b>Detected SVOCs</b>							
1,1-Biphenyl	--	< 1.7	1.2 J	< 3.1	< 0.5	2.7 J	< 0.62 [ $\leq$ 0.56]
2-Methylnaphthalene	--	0.29 J	25	1 J	0.16 J	18	0.089 J [0.047 J]
3 & 4 Methylphenol (m- & p-Cresol)	--	0.19 J	< 1.9	< 2	0.18 J	0.39 J	< 0.39 [ $\leq$ 0.36]
Acenaphthene	100	0.15 J	4.2	0.21 J	0.08 J	8.7	< 0.22 [ $\leq$ 0.21]
Acenaphthylene	100	0.13 J	1.1	< 1.1	0.09 J	4	< 0.22 [ $\leq$ 0.21]
Acetophenone	--	< 0.75	< 1.3	< 1.4	< 0.22	< 1.3	< 0.27 [ $\leq$ 0.25]
Anthracene	100	0.48	4.8	< 0.82	0.27	13	< 0.16 [ $\leq$ 0.15]
Benzo(a)anthracene	1	1.4	2.8	< 0.82	0.66	10	< 0.16 [ $\leq$ 0.15]
Benzo(a)pyrene	1	2	1.2	< 1.1	0.75	7.7	< 0.22 [ $\leq$ 0.21]
Benzo(b)fluoranthene	1	2.3	1.1	< 0.82	0.78	8.1	< 0.16 [ $\leq$ 0.15]
Benzo(g,h,i)perylene	100	1.8	0.34 J	1.1	0.37	2.8	< 0.22 [ $\leq$ 0.21]
Benzo(k)fluoranthene	3.9	0.82	0.36 J	0.82	0.3	2.5	< 0.16 [ $\leq$ 0.15]
Benzyl alcohol	--	< 0.75	< 1.3	< 1.4	< 0.22	< 1.3	< 0.27 [ $\leq$ 0.25]
bis(2-Ethylhexyl)phthalate	--	< 0.75	< 1.3	< 1.4	< 0.22	< 1.3	< 0.27 [ $\leq$ 0.25]
Butylbenzylphthalate	--	< 0.75	< 1.3	< 1.4	< 0.22	< 1.3	< 0.27 [ $\leq$ 0.25]
Carbazole	--	0.074 J	0.14 J	< 1.4	0.043 J	4.1	< 0.27 [ $\leq$ 0.25]
Chrysene	3.9	1.3	3.1	< 0.82	0.62	8.7	< 0.16 [ $\leq$ 0.15]
Dibenz(a,h)anthracene	0.33	0.38 J	0.26 J	< 0.82	0.12 J	0.95	< 0.16 [ $\leq$ 0.15]
Dibenzofuran	59	0.11 J	< 1.3	< 1.4	0.073 J	7.2	< 0.27 [ $\leq$ 0.25]
Di-N-Butyl Phthalate	--	< 0.75	< 1.3	< 1.4	< 0.22	< 1.3	< 0.27 [ $\leq$ 0.25]
Fluoranthene	100	2.4	4.8	< 0.82	0.71	20	< 0.16 [ $\leq$ 0.15]
Fluorene	100	0.18 J	3.2	< 1.4	0.12 J	14	< 0.27 [ $\leq$ 0.25]
Indeno(1,2,3-cd)pyrene	0.5	1.8	0.39 J	< 1.1	0.43	3.1	< 0.22 [ $\leq$ 0.21]
Naphthalene	100	0.72 J	21	4.4	0.44	17	0.21 J [0.19 J]
Phenanthrene	100	1.1	38	0.38 J	0.52	38	0.066 J [0.034 J]
Phenol	500	< 0.75	< 1.3	< 1.4	< 0.22	< 1.3	< 0.27 [ $\leq$ 0.25]
Pyrene	100	2.3	6.4	< 0.82	0.74	21	< 0.16 [ $\leq$ 0.15]
Total SVOCs	--	19.924	119.39	7.91	7.456	211.94	0.365 [0.271]



**Table 1**  
**Soil Analytical Results (ppm)**

Site Management Plan  
Consolidated Edison Company of New York, Inc.  
Former West 18th Street Gas Works  
550 West 20th Street, New York NY

Location ID:	6 NYCRR Part 375 -	SB-12			SB-13		
Depth Interval (feet bgs):	Restricted Use	3-4	18-19	19-20	7-8	18-19	29-30
Date Collected:	SCOs	11/09/18	11/09/18	11/09/18	11/14/18	11/14/18	11/14/18
<b>Detected Inorganics</b>							
Aluminum	--	9,910	11,800	11,400	6,770	10,100	9,750 [8,440]
Antimony	--	0.662 J	< 6.05	< 6.1	0.566 J	< 6.03	< 6.17 [ < 5.97]
Arsenic	16	9.92	8.28	8.78	4.91	6.97	8.16 [6.23]
Barium	400	77.9	31	27.7	50.9	34.5	21.5 [18.8]
Beryllium	72	0.491 J	0.593 J	0.586 J	0.323 J	0.543 J	0.53 J [0.454 J]
Cadmium	9.3	< 1.23	< 1.21	< 1.22	0.313 J	0.47 J	0.469 J [0.43 J]
Calcium	--	11,700	3,080	3,620	32,600	3,400	5,200 [6,300]
Chromium	--	21.4	22.6	21.8	13.4	19.7	19.3 [16.6]
Cobalt	--	9.23	9.95	9.91	5.77	8.88	8.8 [8.15]
Copper	270	29.1	20.7	18.1	22.8	19.5	12.4 [10.3]
Cyanide	27	0.94 J	< 1.4	< 1.5	0.5 J	< 1.5	< 1.6 [ < 1.4]
Iron	--	32,300	25,400	24,900	15,600	22,100	23,000 [19,500]
Lead	400	442	32.4	24.8	91.4	47.5	14.3 [10.1]
Magnesium	--	4,790	5,580	5,460	3,130	4,940	5,270 [4,660]
Manganese	10,000	519	716	963	398	515	618 [449]
Mercury	0.81	0.443	0.208	0.132	0.388	0.482	0.072 J [0.03 J]
Nickel	310	18.4	20.2	19.7	12.7	19.4	19.1 [17.5]
Potassium	--	1,610	2,110	2,040	1,560	1,760	1,780 [1,540]
Selenium	1,500	0.601 J	0.689 J	0.842 J	< 2.02	0.712 J	< 2.47 [ < 2.39]
Silver	180	< 1.23	< 1.21	< 1.22	< 1.01	< 1.21	< 1.23 [ < 1.19]
Sodium	--	341	2,450	2,380	459	1,000	2,870 [2,510]
Thallium	--	< 2.45	< 2.42	< 2.44	< 2.02	< 2.41	< 2.47 [ < 2.39]
Vanadium	--	25.8	29	28.3	20.2	26	25.1 [22.3]
Zinc	10,000	85.4	64.7	62.7	47	69.4	55.8 [49.7]



**Table 1**  
**Soil Analytical Results (ppm)**

**Site Management Plan**  
**Consolidated Edison Company of New York, Inc.**  
**Former West 18th Street Gas Works**  
**550 West 20th Street, New York NY**

**Notes:**

1. Samples were collected by the following on the dates indicated:
  - TRC Environmental Corporation on November 4, 2005
  - Arcadis of New York, Inc. during November 2015.
  - Langan Engineering and Environmental Services, Inc. in November 2018.
2. November 2005 samples were analyzed by Chemtech Laboratories of Mountainside, New Jersey for the following:
  - Volatile Organic Compounds (VOCs) using United States Environmental Protection Agency (USEPA) SW-846 Method 8260B.
  - Semivolatile Organic Compounds (SVOCs) using USEPA SW-846 Method 8260C.
  - Priority pollutant metals using USEPA SW-846 Methods 6010B and 7471A.
  - Total and amenable cyanide using USEPA SW-846 Method 9012A.
3. November 2015 samples were analyzed by TestAmerica Laboratories, Inc. of Edison, New Jersey for the following:
  - Volatile Organic Compounds (VOCs) using United States Environmental Protection Agency (USEPA) SW-846 Method 8260B.
  - Semivolatile Organic Compounds (SVOCs) using USEPA SW-846 Method 8260C.
4. Data qualifiers are defined as follows:
  - < = constituent not detected at a concentration above the reported detection limit.
  - B = an estimated value between the instrument detection limit and the Reporting Limit (RL).
  - J = the associated numerical value is an estimated concentration.
  - NA = not analyzed.
5. Shading indicates the result exceeds Title 6 of the New York Codes, Rules, and Regulations (6 NYCRR) Part 375-6.8(b) - Restricted Residential-Use Soil Cleanup Objectives (SCOs).
6. -- = No 6 NYCRR Part 375 - Restricted Residential SCOs listed.
7. All concentrations reported in parts per million (ppm), which is equivalent to milligrams per kilogram (mg/kg).
8. Priority pollutant metals include Antimony, Arsenic, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Silver, Thallium and Zinc, as identified in Title 40 of the Code of Federal Regulations Part 423, Appendix A.
9. The data has been validated in accordance with USEPA Standard Operating Procedures HW-2, HW-22, and HW-24.
10. Field duplicate sample results are presented in brackets.



**Table 2**  
**Groundwater Analytical Results (ppb)**

Site Management Plan  
Consolidated Edison Company of New York, Inc.  
Former West 18th Street Gas Works  
550 West 20th Street, New York NY

Location ID:	Standards/ Guidance	MW-31A	MW-34A	MW-40A	MW-01	MW-02	MW-03	MW-05	MW-10
Date Collected:	Values	10/11/05	10/11/05	10/11/05	11/09/18	11/09/18	11/12/18	11/09/18	11/12/18
<b>Polychlorinated Biphenyls</b>									
Total PCBs	0.09	NA	NA	NA	< 0.083 [ $\leq$ 0.083]	< 0.083	< 0.083	< 0.083	< 0.083
<b>Detected VOCs</b>									
1,2,4,5-Tetramethylbenzene	5	NA	NA	NA	5.7 [6.3]	11	< 2	< 2	< 2
1,2,4-Trimethylbenzene	5	NA	NA	NA	0.81 J [0.78 J]	< 2.5	< 2.5	< 2.5	< 2.5
1,4-Diethyl Benzene	--	NA	NA	NA	0.97 J [1 J]	1.6 J	< 2	< 2	< 2
Acetone	50	< 2.3	76	< 2.3	5.3 [5]	2.1 J	1.8 J	< 5	10
Benzene	1	< 0.39	< 0.39	< 0.39	25 [25]	0.19 J	< 0.5	12	0.42 J
Bromodichloromethane	50	< 0.33	< 0.33	< 0.33	< 0.5 [ $\leq$ 0.5]	< 0.5	0.73	< 0.5	< 0.5
Chloroform	7	< 0.33	< 0.33	< 0.33	< 2.5 [ $\leq$ 2.5]	< 2.5	10	< 2.5	< 2.5
Ethylbenzene	5	< 0.45	< 0.45	< 0.45	0.86 J [0.95 J]	< 2.5	< 2.5	< 2.5	< 2.5
Isopropylbenzene	5	< 0.44	< 0.44	< 0.44	18 [21]	0.89 J	< 2.5	< 2.5	< 2.5
M,P-Xylene	5	< 1.2	< 1.2	< 1.2	2.3 J [2.6]	< 2.5	< 2.5	< 2.5	< 2.5
Naphthalene	10	NA	NA	NA	1.9 J [2.1 J]	1.6 J	< 2.5	4.0	< 2.5
n-Butylbenzene	5	NA	NA	NA	1.5 J [1.6 J]	1.7 J	< 2.5	< 2.5	< 2.5
n-Propylbenzene	5	NA	NA	NA	5.4 [6]	1 J	< 2.5	< 2.5	< 2.5
o-Xylene	5	< 0.46	< 0.46	< 0.46	0.73 J [0.76 J]	< 2.5	< 2.5	< 2.5	< 2.5
Sec-Butylbenzene	5	NA	NA	NA	7.4 [7.3]	2.9	< 2.5	< 2.5	< 2.5
T-Butylbenzene	5	NA	NA	NA	1.6 J [1.6 J]	< 2.5	< 2.5	< 2.5	< 2.5
Toluene	5	< 0.36	< 0.36	< 0.36	1.8 J [2 J]	< 2.5	< 2.5	< 2.5	< 2.5
Total VOCs	--	< 2.3	76	< 2.3	79.27 [83.99]	23.0	12.5	16	10.4
<b>Detected SVOCs</b>									
1,1-Biphenyl	5	< 1.4	1.7 J	< 1.4	NA	NA	NA	NA	NA
2-Methylnaphthalene	--	< 1.1	13	< 1.1	0.25 [0.19]	< 0.1	< 0.1	0.06 J	0.04 J
Acenaphthene	20	2.2 J	< 1.4	< 1.4	1.1 [0.94]	8.3	0.09 J	8.5	0.3
Acenaphthylene	--	< 1.3	< 1.3	< 1.3	0.08 J [0.07 J]	0.74	< 0.1	0.09 J	0.06 J
Anthracene	50	< 1.4	< 1.4	< 1.4	0.18 [0.12]	0.48	0.04 J	0.79	0.11
Benzo(a)anthracene	0.002	< 1.1	< 1.1	< 1.1	0.38 [0.24]	0.05 J	< 0.1	0.06 J	0.21
Benzo(a)pyrene	ND	< 1.2	< 1.2	< 1.2	0.4 [0.26]	0.03 J	0.03 J	0.04 J	0.24
Benzo(b)fluoranthene	0.002	< 0.76	< 0.76	< 0.76	0.51 [0.33]	0.04 J	0.03 J	0.04 J	0.32
Benzo(g,h,i)perylene	--	< 1.1	< 1.1	< 1.1	0.23 [0.14]	0.01 J	< 0.1	0.02 J	0.16
Benzo(k)fluoranthene	0.002	< 1.9	< 1.9	< 1.9	0.18 [0.11]	0.02 J	< 0.1	0.02 J	0.11
Benzoic Acid	--	NA	NA	NA	37 J [30 J]	40 J	< 50	< 50	< 50
Benzyl Alcohol	--	NA	NA	NA	12 [8.2]	16	< 2	< 2	1.7 J
Benzyl Butyl Phthalate	50	< 1.5	< 1.4	< 1.4	44 [32]	3.4 J	< 5	< 5	3 J
Chrysene	0.002	< 1.7	< 1.7	< 1.7	0.31 [0.2]	0.05 J	< 0.1	0.05 J	0.24
Dibenz(a,h)anthracene	--	< 0.88	< 0.87	< 0.87	0.08 J [0.04 J]	< 0.1	< 0.1	< 0.1	0.04 J
Dibenzofuran	--	< 1.3	< 1.3	< 1.3	< 2 [ $\leq$ 2]	1.6 J	< 2	1.9 J	< 2
Di-n-butylphthalate	50	12 B	15 B	10 B	0.77 J [0.57 J]	< 5	< 5	< 5	< 5
Fluoranthene	50	< 1.2	< 1.2	< 1.2	0.67 [0.44]	0.66	0.12	1.4	0.48
Fluorene	50	< 1.4	< 1.4	< 1.4	0.29 [0.2]	3.8	0.06 J	0.89	0.14
Indeno(1,2,3-cd)pyrene	0.002	< 0.84	< 0.84	< 0.84	0.29 [0.19]	0.02 J	< 0.1	0.03 J	0.2
Naphthalene	10	< 1.4	11	< 1.4	1.6 [1.2]	0.47	< 0.1	3.1	0.09 J
N-Nitrosodiphenylamine	50	< 1.3	1.3 J	< 1.3	NA	NA	NA	NA	NA
Pentachlorophenol	1	< 1.6	< 1.6	< 1.6	< 0.8 [ $\leq$ 0.8]	0.1 J	< 0.8	< 0.8	< 0.8
Phenanthrene	50	< 1.4	< 1.4	< 1.4	0.54 [0.35]	3	0.12	0.73	0.51
Pyrene	50	< 1.5	< 1.5	< 1.5	0.6 [0.4]	0.67	0.12	1.1	0.45
Total SVOCs	--	14	42	10	101.46 [76.19]	79.44	0.61	18.82	8.4
<b>Detected Inorganics</b>									
Aluminum	--	NA	NA	NA	6,140 [14,800]	1,520	198	63.8	5,800
Aluminum (Dissolved)	--	NA	NA	NA	11.2 [12.9]	12.9	8.96 J	58.9	20.1
Antimony	3	< 3.2	< 3.2	< 3.2	3.34 J [4.08]	< 4	0.84 J	< 4	3.26 J
Antimony (Dissolved)	--	NA	NA	NA	1.92 J [2.1 J]	< 4	0.63 J	1.62 J	3 J
Arsenic	25	< 3.3	7.5 J	< 3.3	14.16 [28.36]	3.34	2.32	0.84	20.72
Arsenic (Dissolved)	--	NA	NA	NA	4.68 [4.66]	1.97	2.34	0.88	8.09
Barium	1,000	NA	NA	NA	363.4 [716.6]	261.2	16.63	169.9	278.4
Barium (Dissolved)	--	NA	NA	NA	151.6 [156.5]	240.7	13.64	185.8	88.17
Beryllium	3	< 0.09	< 0.09	< 0.09	0.42 J [1.12]	0.12 J	< 0.5	< 0.5	0.72
Cadmium	5	< 0.33	< 0.33	< 0.33	0.76 [1.63]	< 0.2	< 0.2	< 0.2	0.51
Cadmium (Dissolved)	--	NA	NA	NA	< 0.2 [ $\leq$ 0.2]	< 0.2	< 0.2	0.06 J	< 0.2
Calcium	--	NA	NA	NA	137,000 [157,000]	249,000	38,800	112,000	265,000
Calcium (Dissolved)	--	NA	NA	NA	101,000 [104,000]	213,000	36,200	102,000	174,000
Chromium	50	0.55 J	1.7 J	4.3 J	18 [45.57]	3.62	0.67 J	0.48 J	16.11
Chromium (Dissolved)	--	NA	NA	NA	0.54 J [0.45 J]	0.34 J	0.25 J	0.59 J	0.7 J
Cobalt	--	NA	NA	NA	7.19 [19.54]	1.4	0.2 J	0.3 J	14.34
Cobalt (Dissolved)	--	NA	NA	NA	< 0.5 [0.19 J]	0.21 J	< 0.5	0.71	3.74
Copper	200	9.6 J	16.9 J	32.2	119.5 [370.9]	7.79	2.88	< 1	44.52
Copper (Dissolved)	--	NA	NA	NA	< 1 [ $\leq$ 1]	< 1	1.07	2.95	0.9 J
Cyanide	200	16	< 10	< 10	45 [30]	30	1 J	7	41
Iron	300	NA	NA	NA	21,200 [67,500]	3,530	623	531	26,600



**Table 2**  
**Groundwater Analytical Results (ppb)**

Site Management Plan  
Consolidated Edison Company of New York, Inc.  
Former West 18th Street Gas Works  
550 West 20th Street, New York NY

Location ID:	Standards/ Guidance	MW-31A	MW-34A	MW-40A	MW-01	MW-02	MW-03	MW-05	MW-10
Date Collected:	Values	10/11/05	10/11/05	10/11/05	11/09/18	11/09/18	11/12/18	11/09/18	11/12/18
<b>Detected Inorganics (con't)</b>									
Iron (Dissolved)	--	NA	NA	NA	129 [132]	1,010	39.6 J	333	477
Lead	25	14.6	3.3 J	< 2.8	1,710 [4,445]	48.32	7.92	2.26	1,983
Lead (Dissolved)	--	NA	NA	NA	< 1 [< 1]	< 1	< 1	2.56	1.99
Magnesium	35,000	NA	NA	NA	50,100 [52,000]	68,000	5,330	25,600	121,000
Magnesium (Dissolved)	--	NA	NA	NA	48,100 [49,300]	69,700	4,970	26,300	114,000
Manganese	300	NA	NA	NA	467.9 [1,108]	906.7	119.7	215.4	3,176
Manganese (Dissolved)	--	NA	NA	NA	131.8 [132]	800	112.3	208.5	1,204
Mercury	0.7	< 0.03	0.08 J	0.06 J	0.86 [2.35]	0.08 J	< 0.2	< 0.2	0.82
Nickel	100	4.4 J	2.3 J	2.2 J	16.28 [41.42]	3.2	0.7 J	0.7 J	37.68
Nickel (Dissolved)	--	NA	NA	NA	< 2 [0.73 J]	< 2	< 2	0.95 J	9.15
Potassium	--	NA	NA	NA	32,800 [32,100]	34,400	4,380	23,100	94,400
Potassium (Dissolved)	--	NA	NA	NA	27,700 [27,900]	31,100	4,010	21,000	84,300
Selenium	10	< 3.0	< 3.0	3.1 J	< 5.0 [4.34 J]	< 5.0	< 5.0	< 5	3.02 J
Silver	50	< 1.6	< 1.6	< 1.6	1.5 [2.71]	< 0.4	< 0.4	< 0.4	0.3 J
Sodium	20,000	NA	NA	NA	505,000 [505,000]	376,000	24,800	201,000	539,000
Sodium (Dissolved)	--	NA	NA	NA	502,000 [475,000]	400,000	28,400	208,000	511,000
Thallium	0.5	< 3.1	< 3.1	< 3.1	< 0.5 [0.25 J]	< 0.5	< 0.5	< 0.5	0.25 J
Thallium (Dissolved)	--	NA	NA	NA	< 0.5 [< 0.5]	< 0.5	< 0.5	0.26 J	< 0.5
Vanadium	--	NA	NA	NA	19.08 [49.76]	5.98	2.01 J	5.78	25.37
Vanadium (Dissolved)	--	NA	NA	NA	< 5 [< 5]	< 5	< 5	5.26	4.1 J
Zinc	2,000	46.4	10.5 J	71.4	282.8 [803.8]	18.07	5.93 J	< 10	309.2
Zinc (Dissolved)	--	NA	NA	NA	< 10 [< 10]	< 10	< 10	22.8	4.18 J

**Notes:**

- Samples were collected by the following:
  - TRC Environmental Corporation in October 2005.
  - Langan Engineering and Environmental Services, Inc. in November 2018.
- Samples collected in October 2005 were analyzed by Chemtech Laboratories of Mountainside, NJ for the following:
  - Volatile Organic Compounds (VOCs) using United States Environmental Protection Agency (USEPA) SW-846 Method 8260B.
  - Semivolatile Organic Compounds (SVOCs) using USEPA SW-846 Method 8260C.
  - Inorganics and priority pollutant metals using USEPA SW-846 Methods 6010B and 7471A.
  - Total and amenable cyanide using USEPA SW-846 Method 9012A.
- The laboratory and analytical methods for samples collected in November 2015 are not available.
- Data qualifiers are defined as follows:
  - < = Constituent not detected at a concentration above the reported detection limit.
  - B = The analyte was found in the laboratory blank as well as the sample. This indicates possible laboratory contamination of the environmental sample.
  - J = The associated numerical value is an estimated concentration.
- New York State Department of Environmental Conservation (NYSDEC) groundwater standard/guidance values are from the NYSDEC Division of Water, Technical and Operational Guidance Series (TOGS) document titled "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations" (TOGS 1.1.1) dated June 1998, revised April 2000 and June 2004.
- Shading indicates the result exceeds the TOGS 1.1.1 Standard/Guidance Value identified in TOGS 1.1.1.
- = No TOGS 1.1.1 Water Quality Standard/Guidance Value listed.
- All concentrations reported in parts per billion (ppb), which is equivalent to micrograms per liter (ug/L).
- The 2005 data has been validated in accordance with USEPA Standard Operating Procedures HW-2, HW-22, and HW-24.
- Priority pollutant metals include Antimony, Arsenic, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Silver, Thallium and Zinc, as identified in Title 40 of the Code of Federal Regulations Part 423, Appendix A.
- Field duplicate sample results are presented in brackets.
- NA = not analyzed.



Table 3  
Air Analytical Results (ug/m3)

DRAFT



Site Management Plan  
Consolidated Edison Company of New York, Inc.  
Former West 18th Street Gas Works  
550 West 20th Street, New York NY

Location: Sample Name: Date Collected:	NYSDOH 90th Percentile Indoor Air Concentration	Visitor's Screening Area		Cafeteria Area (co-located)		Boiler Room Office (Basement)		Pump Pit Area (Basement)		Alley Way South	20th Street	Heller Lot	SV-01	SV-02	SV-03	SV-04	SV-05	AA-01
		HS-1	IA-1	IA-2	IA-5	IA-3	SG-3	IA-4	SG-4	SG-1	AA-North	AA-South						
		09/15/05	09/15/05	09/15/05	09/15/05	09/15/05	09/15/05	09/15/05	09/15/05	09/15/05	09/15/05	09/15/05						
TO-15 - Possibly MGP Related																		
Styrene	1.3	6.6 J	1.4 J	2.1 J	1.4 J	< 0.88	2.2 J	< 0.81	< 4	< 4	< 0.81	< 0.73	*	*	*	*	*	*
Indane	--	5	< 4.5	< 4.2	< 4.3	< 5	< 4.1	< 4.6	< 22	< 22	< 4.6	< 4.1	*	*	*	*	*	*
Benzene	15	3.7	1.8	2.2	1.4	3.7	1.1	1.3	< 3	< 3	1.8	1.3	< 0.639	< 0.639	1.26	< 0.639	1.75	0.882
Carbon Disulfide	--	< 2.8	< 2.9	20 J	< 2.8	< 3.2	< 2.6	30	< 14	< 14	13	< 2.7	0.691	0.701	< 0.623	< 0.623	< 0.623	< 0.623
Cyclohexane	9.1	< 3.1	< 3.2	< 3	< 3.1	6.4	< 2.9	< 3.3	< 16	< 16	< 3.3	< 2.9	< 0.688	< 0.688	1.09	< 0.688	< 0.688	< 0.688
Ethylbenzene	7.3	16	1.6	1.8	1.2	3.4	5	0.86	5.4	4.9	1	0.74	1.46	< 0.869	4.6	< 0.869	1.27	< 0.869
1-Methyl-4-ethylbenzene	--	26	< 4.6	< 4.3	< 4.4	8	11	< 4.7	< 23	< 23	< 4.7	< 4.2	*	*	*	*	*	*
n-Heptane	--	3.3	< 3.3	< 3.1	< 3.2	6.4	< 3	< 3.4	< 16	< 16	< 3.4	< 3	< 0.82	< 0.82	2.54	< 0.82	2.94	< 0.82
n-Hexane	--	< 3.7	< 3.8	< 3.6	< 3.7	9.8	< 3.4	< 3.9	< 19	< 19	< 3.9	< 3.5	< 0.705	< 0.705	1.11	< 0.705	1.67	0.775
Isopentane	--	9.8 J	13 J	21 J	14 J	8 J	4.3 J	4.1 J	< 14	< 14	6.2 J	4.1 J	*	*	*	*	*	*
2-Methylpentane	--	< 3.2	< 3.3	< 3.1	< 3.2	4.5	< 3	< 3.4	< 16	< 16	< 3.4	< 3	*	*	*	*	*	*
1,3,5-Trimethylbenzene	3.8	7	1.1	1.4	< 0.88	3	3.1	< 0.94	< 4.6	< 4.6	< 0.94	< 0.84	< 0.983	< 0.983	1.17	< 0.983	< 0.983	< 0.983
1,2,4-Trimethylbenzene	11	20	3.8	5.2 J	3 J	9.6	12	1.7	17	15	1.8	0.89	1.24	< 0.983	3.33	< 0.983	1.7	< 0.983
Toluene	59	98	5.3	6.9	4.5	21	28	4.3	29	27	4.2	3.3	3.41	< 0.754	11	1.29	5.28	1.7
m-Xylene & p-Xylene	12	62	5.5	6.4	4	14	20	2.8	22	21	3.4	2.2	3.76	< 1.74	11.1	< 1.74	5.17	< 1.74
o-Xylene	7.9	17	1.8	2.2	1.3	4.8	5.9	1	7.4	6.8	1	0.77	1.87	< 0.869	6.39	< 0.869	1.76	< 0.869
TO-15 - Not MGP Related																		
Acetone	110	< 24 L	< 19 L	< 28 L	< 18 L	54	< 26 L	< 18 L	< 12 L	< 18 L	< 11 L	< 24 L	24.7	< 2.38	8.67	< 2.38	55.8	4.49
Bromomethane	0.58	< 0.71	< 0.73	1	< 0.7	< 0.8	< 0.65	< 0.74	< 3.6	< 3.6	< 0.74	< 0.66	*	*	*	*	*	*
Bromodichloromethane	--	< 6.1	< 6.3	< 5.9 U	< 6	< 6.9	12	< 6.4	< 31	< 31	< 6.4	< 5.7	*	*	*	*	*	*
2-Butanone	14	4	3.5	4.9	3.1	7	3.4	< 2.8	< 14	< 14	< 2.8	2.9	3.63	< 1.47	< 1.47	< 1.47	4.25	< 1.47
Chloroform	1.4	15	4.5	4.4	2.8	11	180	4.7	44	< 4.6	< 0.93	< 0.83	36.9	1.88	< 0.977	1.25	1.73	< 0.977
Chloromethane	3.3	1.6	1.2	1.4	1	1.2	< 0.35	1	< 1.9	< 1.9	0.88	0.92	< 0.413	< 0.413	0.56	< 0.413	0.595	0.911
1,3-Dichlorobenzene	0.6	*	*	*	*	*	*	*	*	*	*	*	2.1	< 1.2	1.29	< 1.2	< 1.2	< 1.2
1,4-Dichlorobenzene	1.3	< 1.1	1.8	2.4	1.5	2.2	< 1	2.1	< 5.6	< 5.6	1.2	0.99 J	*	*	*	*	*	*
Ethanol	--	47 J	42 J	43 J	< 28 J	36 J	6.1 J	12 J	< 8.8	< 8.8	9.6 J	7.7 J	16.5	< 9.42	< 9.42	< 9.42	1430	< 9.42
Tetrahydrofuran	3.3	*	*	*	*	*	*	*	*	*	*	*	< 1.47	< 1.47	41.6	< 1.47	< 1.47	< 1.47
Trichloroethene	0.48	*	*	*	*	*	*	*	*	*	*	*	< 1.07	< 1.07	< 1.07	< 1.07	1.47	< 1.07
Trichlorofluoromethane	--	2.3	1.9	2.4	1.9	3.1	2.3	1.6	< 5.2	< 5.2	2.3	1.6	1.69	1.26	1.26	1.26	2.11	1.3
Dichlorodifluoromethane	--	4.2	3.4	3.6	2.4	3.2	3.3	3	< 4.6	< 4.6	2.9	2.8	3.06	2.39	2.57	2.59	3.03	2.54
2-Propanol	--	35	130	200 J	120	16	2.4	7.3	< 11	< 11	< 2.3	< 2.1	1.64	< 1.23	35.9	< 1.23	56.5	1.83
Propylene	--	1.8	< 1.6	2.3	< 1.5	2	< 1.4	< 1.6	< 8	< 8	< 1.6	< 1.5	*	*	*	*	*	*
Tetrachloroethene	2.9	< 1.2	< 1.3	< 1.2	< 1.2	1.3 J	20	< 1.3	< 6.3	< 6.3	< 1.3	< 1.2	2.18	< 1.36	12.1	< 1.36	35.9	< 1.36
Miscellaneous																		
2,2,4-Trimethylpentane	--	*	*	*	*	*	*	*	*	*	*	*	< 0.934	< 0.934	3.04	< 0.934	< 0.934	< 0.934
4-Ethyltoluene	--	*	*	*	*	*	*	*	*	*	*	*	< 0.983	< 0.983	1.13	< 0.983	< 0.983	< 0.983
Ethyl Acetate	--	*	*	*	*	*	*	*	*	*	*	*	< 1.8	< 1.8	< 1.8	< 1.8	3.26	< 1.8
Tert-Butyl Alcohol	--	*	*	*	*	*	*	*	*	*	*	*	< 1.52	< 1.52	< 1.52	< 1.52	2.35	< 1.52

**Notes:**

- Samples were collected by the following:
  - TRC Environmental Corporation in September 2005.
  - Langan Engineering and Environmental Services, Inc. in November 2018.
- Data qualifiers are defined as follows:
  - < = constituent not detected at a concentration above the reported detection limit.
  - L = constituent qualified as not detected due to trip blank contamination.
  - J = the associated numerical value is an estimated concentration.
- New York State Department of Health (NYSDOH) 90th Percentile Indoor Air Levels are the 90th percentile of indoor air values identified by the NYSDOH in the *Summary of Indoor and Outdoor Levels of Volatile Organic Compounds from Fuel Oil Heated Homes in NYS* (NYSDOH, November 2004).
- Shading indicates the result exceeds NYSDOH 90th percentile indoor air concentration. NYSDOH 90th percentile indoor air concentrations are only applicable to indoor air samples and only these results are compared to the criteria.
- All concentrations reported in micrograms per cubic meter (ug/m3).
- HS = head/crawl space sample.
- IA = indoor air sample.
- AA = ambient air sample.
- SG = sub-slab gas sample.
- SV = soil vapor.
- = No NYSDOH 90th Percentile Indoor Air Concentration listed.
- \* = constituent was not detected or not analyzed.
- September 2005 results have been validated in accordance with USEPA National Functional Guidelines of October 1999.



**Table 4**  
**Monitoring Well Construction Details**

**Site Management Plan**  
**Consolidated Edison Company of New York, Inc.**  
**Former West 18th Street Gas Works**  
**550 West 20th Street, New York NY**

Location ID	Material Screened/ Location	Date Completed	Northing Coordinate	Easting Coordinate	Ground Surface Elev.	Ground Water Elev.	Well Diameter	Casing/Screen Type	Screen Slot Size	Screen Length	Depth to Screened Interval (ft. bgs)		Well Depth
					ft. NAVD 88	ft. bgs	in.		in.	ft.	Top	Bottom	ft. bgs
MW-31A	Silt and sand, some gravel, brick fragments and wood fibers	10/9/04	2011201.96	982301.26	6.48	7.5	2.0	PVC	0.02	10.0	4	14	14
MW-34A	Clayey silt and fine sand, some gravel, brick and coal fragments and wood fibers	5/22/04	211065.59	982132.59	5.83	5.0	2.0	PVC	0.02	10.0	2	12	12.5
MW-40A	Sand, silt, some gravel, trace cobbles	7/26/04	211159.34	981912.10	6.96	6.0	2.0	PVC	0.02	10.0	5	15	17

**Notes:**

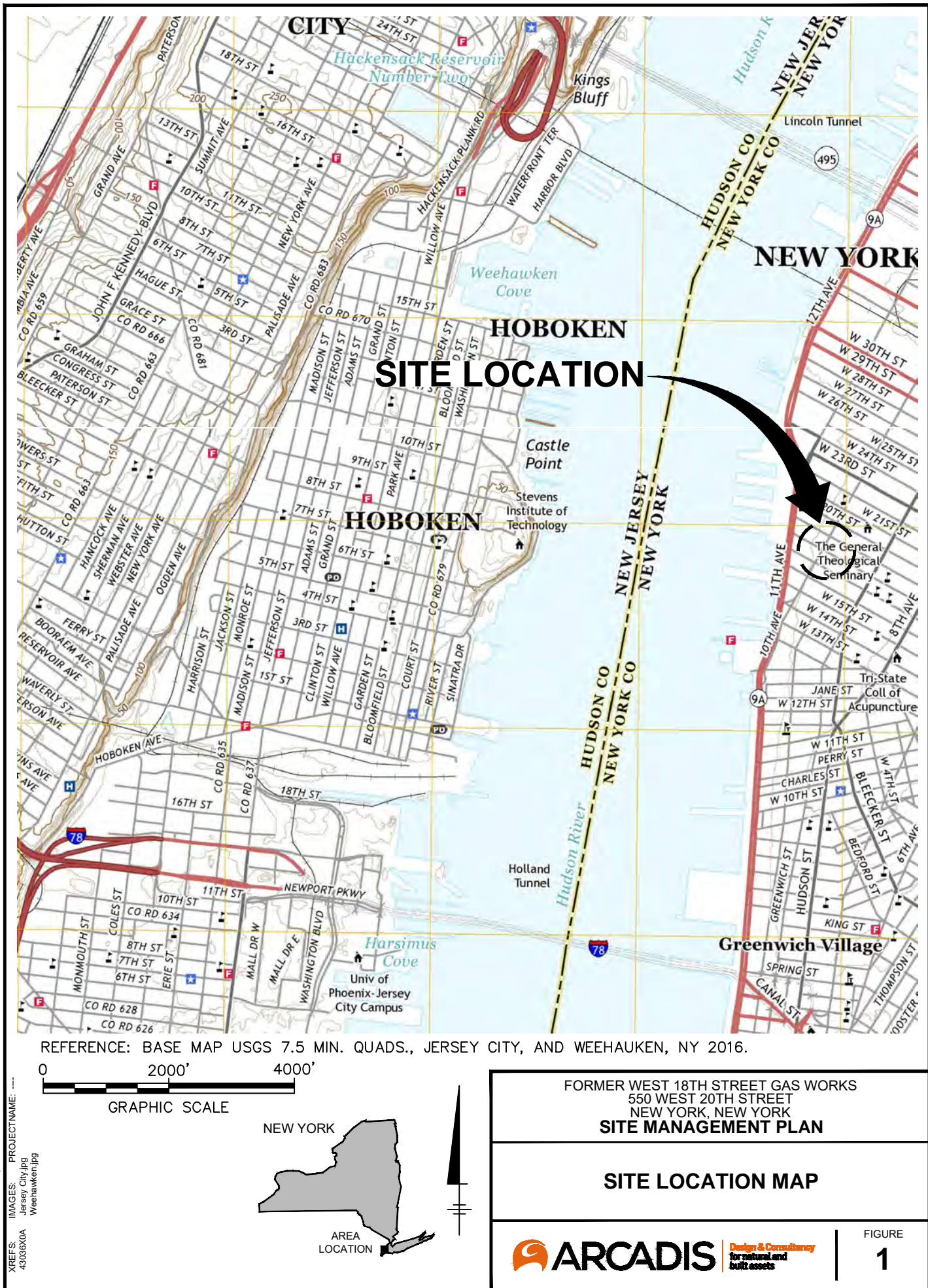
1. NAVD 88 = North American Vertical Datum (NAVD) of 1988, based on NGS Station S-34, elevation 405.340 feet.
2. bgs = below ground surface.
3. PVC = polyvinyl chloride.
4. Monitoring well construction details for MW-01, MW-02, MW-03, MW-05, and MW-10 are not available.



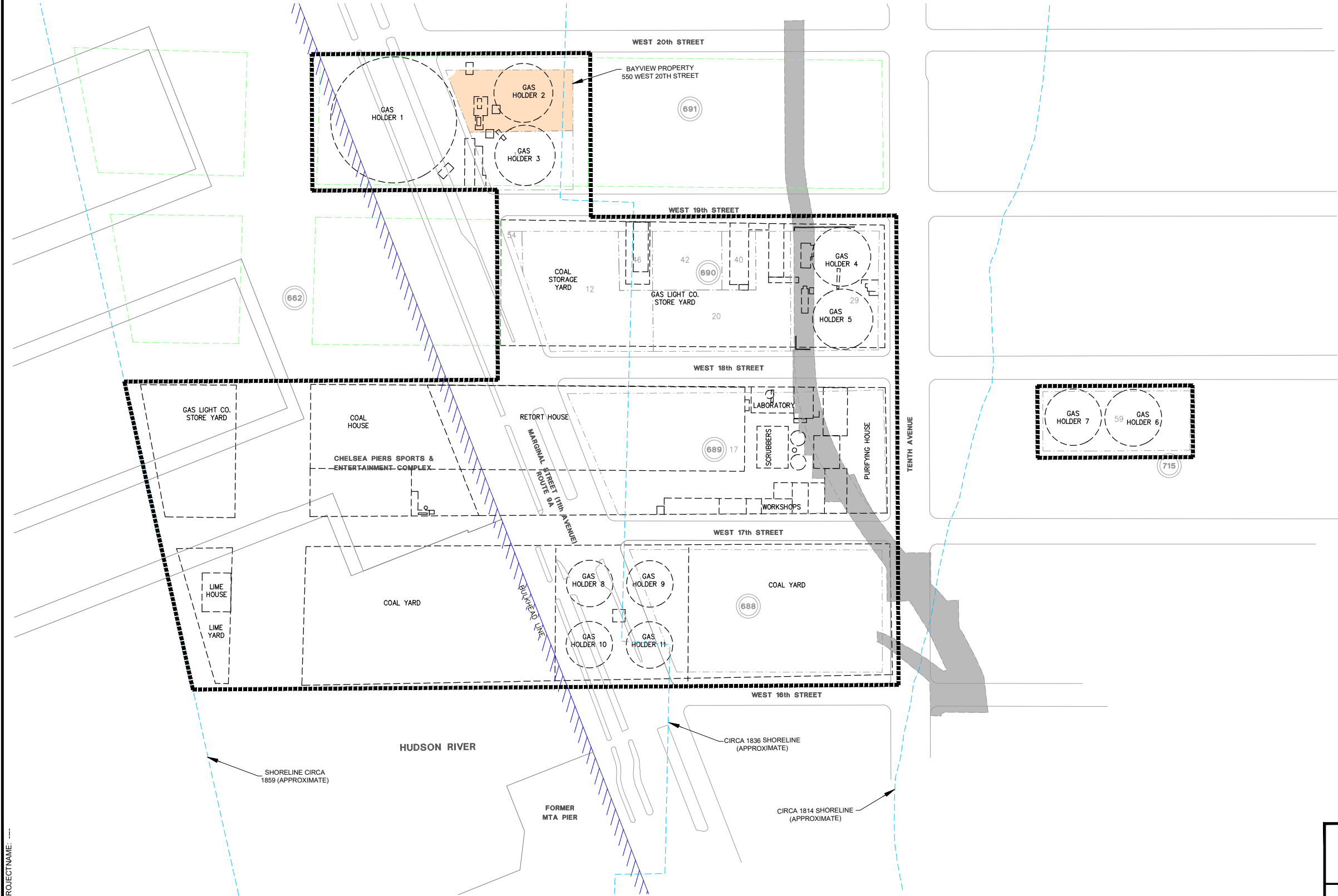
Figures





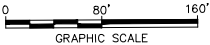






- LEGEND:**
- BAYVIEW PROPERTY
  - LOT BOUNDARY
  - HISTORICAL FEATURE
  - BLOCK ID
  - LOT ID
  - LIMITS OF FORMER GAS WORKS
  - BULKHEAD
  - HIGH LINE

- NOTES:**
1. BLOCK AND LOT ID AND PROPERTY LINE INFORMATION WAS OBTAINED FROM NEW YORK CITY DEPARTMENT OF FINANCE AUTOMATED CITY REGISTER INFORMATION SYSTEM (ACRIS).
  2. CURBING AND STREET BOUNDARIES TAKEN FROM MUNOZ ENGINEERING DRAWING ENTITLED "MONITORING WELLS AND BORINGS LOCATION SURVEY" DATED 11/24/2008 AND TRC DRAWING ENTITLED "PROPOSED REMEDIAL INVESTIGATION SAMPLE LOCATIONS" DATE UNKNOWN.
  3. BUILDING LOCATIONS ARE APPROXIMATE.
  4. HISTORICAL SHORELINES DIGITIZED FROM W BRIDGES, 1814, COLTON, 1836, AND PERRIS, 1859.
  5. FORMER MANUFACTURED GAS PLANT (MGP) STRUCTURES ARE FROM THE CONSOLIDATED GAS COMPANY PLANT, AS SHOWN ON SANBORN MAPPING DATED 1895.



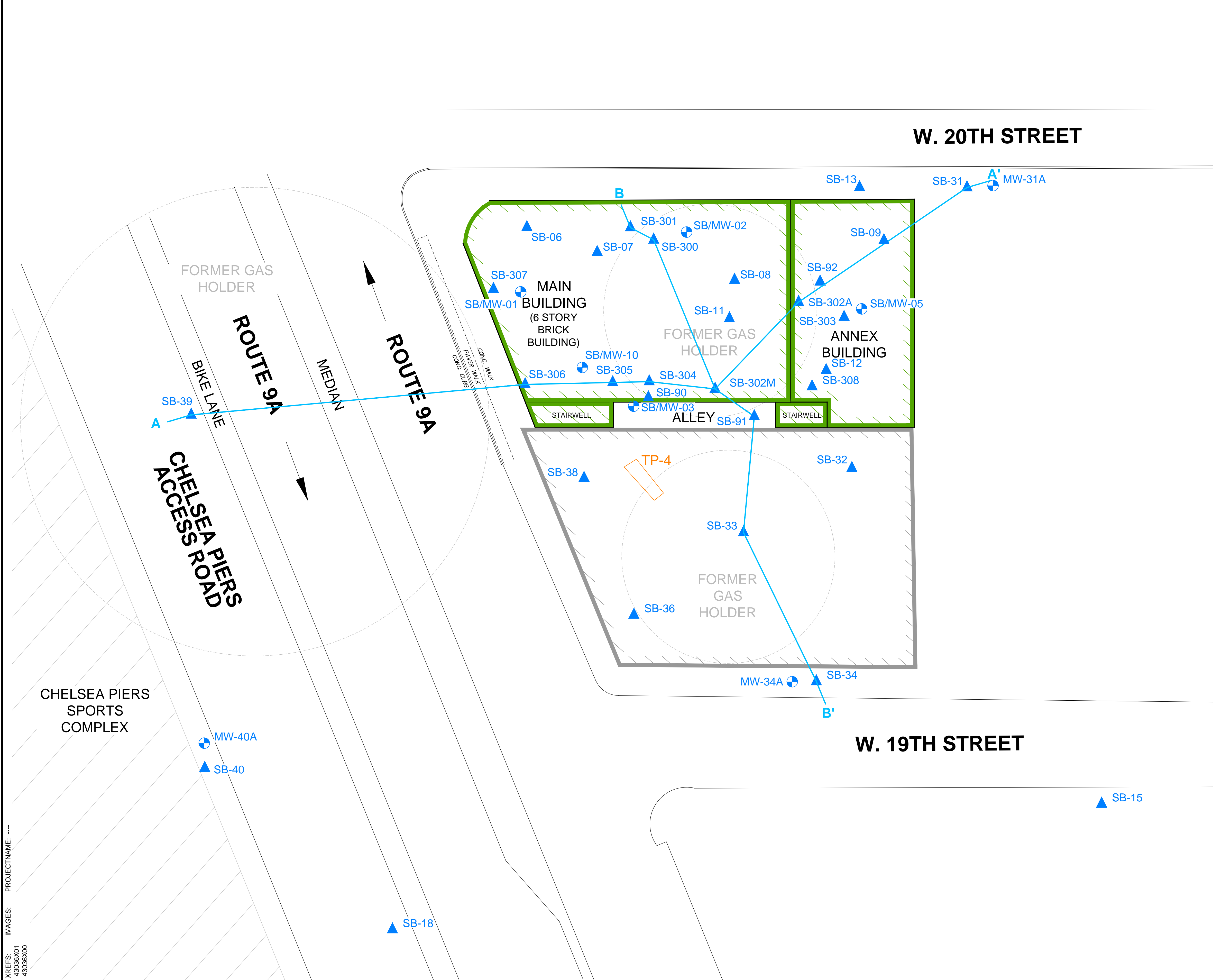
FORMER WEST 18TH STREET GAS WORKS  
550 WEST 20TH STREET  
NEW YORK, NEW YORK  
**SITE MANAGEMENT PLAN**

**SITE LAYOUT AND  
HISTORICAL FEATURES**



CITY: MINNEAPOLIS, MN DIV/GROUP: ENV/CAD DB: R. OBERLANDER LD: R. OBERLANDER PIC: (Opt) PM: (Reqd) TM: (Opt) LXR: (Opt) ON: "OFF" = REF:  
C:\BIMOneDrive - ARCADIS\BIM 360 Docs\ANA - CON EDISON\Former West 18th Street Gas Works\2019\B0043036.000\10-DWG\SMP - Fig 3 - Cross Section Loc Map.dwg LAYOUT: 3 SAVED: 5/23/2019 2:27 PM ACADVER: 21.0S (LMS TECH) PAGES: 1 OF 1 PLOTSTYLETABLE: ..... PLOTTED:  
5/24/2019 8:55 AM BY: KRAHMER, ERIC

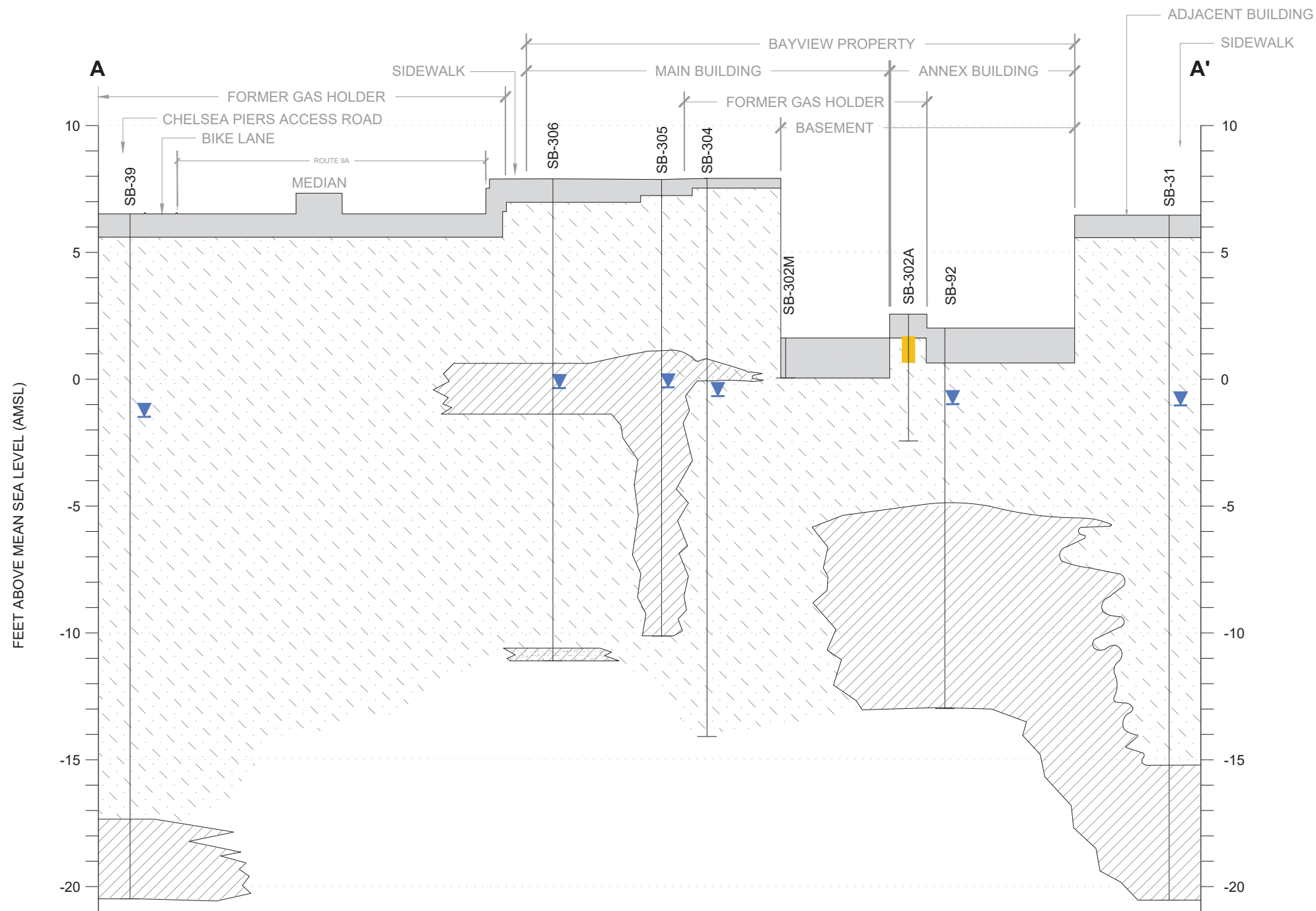
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43036X01  
43036X00



FORMER WEST 18TH STREET GAS WORKS 550 WEST 20TH STREET NEW YORK, NEW YORK <b>SITE MANAGEMENT PLAN</b>	
<b>PREVIOUS SOIL INVESTIGATION SAMPLING LOCATIONS AND CROSS SECTION LOCATION MAP</b>	
 <b>ARCADIS</b> Design & Consultancy for natural and built assets	FIGURE <b>3</b>



CITY: MINNEAPOLIS, MN DIV/GROUP: ENV/CAD DR: R. OBERLANDER LD: R. OBERLANDER PIC: (Opt) TM: (Opt) LYR: (Opt) ON: "OFF" = "REF"  
C:\Users\roberlan\OneDrive - ARCADIS\BIM 360 Docs\CON EDISON\Former West 18th Street Gas Works\2017\B0043036.000101-DWG\SMP - Fig 4 - Cross Section A-A.dwg LAYOUT: 4 SAVED: 12/18/2017 3:44 PM ACADVER: 20.1S (LMS TECH) PAGES: 4 PLOTSTYLE: TABLE: PLOTTED:  
12/18/2017 3:44 PM BY: OBERLANDER, ROSEANNE  
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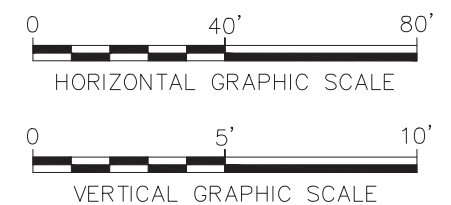
- ASPHALT / CONCRETE
- FILL - SAND/SILTY SAND WITH GRAVEL AND/OR WOOD/BRICK DEBRIS
- SAND
- SILTY CLAY / CLAYEY, SANDY SILT
- GROUNDWATER ELEVATION

SOIL BORING CONSTRUCTION:

- SB-302 SOIL BORING IDENTIFICATION
- EXISTING GROUND SURFACE
- BOREHOLE
- STAINING/SHEEN
- END OF BOREHOLE

NOTE:

BASE MAP AND SOIL BORING INFORMATION FROM ELECTRONIC FILE PROVIDED BY DPK LAND SURVEYING, FILENAME: 15-7026MW00.DWG, DATED: 1/30/15, AT A SCALE OF 1" = 30'.



FORMER WEST 18TH STREET GAS WORKS  
550 WEST 20TH STREET  
NEW YORK, NEW YORK  
**SITE MANAGEMENT PLAN**

**CROSS SECTION A-A'**



CITY: MINNEAPOLIS, MN DIV/GROUP: ENV/CAD DR: R. OBERLANDER LD: R. OBERLANDER PIC/OP: PM/RECD TM/OP: LYE/OP/ON\*OFF=REF\*  
C:\Users\roberlan\OneDrive - ARCADIS\BIM 360 Docs\CON EDISON\Former West 18th Street Gas Works\2017\B0043036.000101-DWG\SMP - Fig 5 - Cross Section B-B.dwg LAYOUT: 5 SAVED: 12/18/2017 3:47 PM ACADVER: 20.1S (LMS TECH) PAGES: 5 PLOTSTYLETABLE: ---- PLOTTED: 12/18/2017 3:47 PM BY: OBERLANDER, ROSEANNE  
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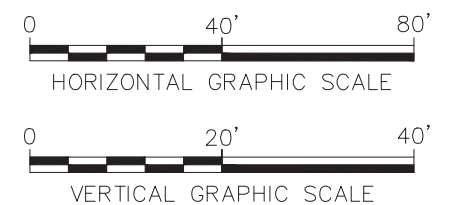


LEGEND:

- ASPHALT / CONCRETE
- FILL - SAND/SILTY SAND WITH GRAVEL AND/OR WOOD/BRICK DEBRIS
- SILTY CLAY
- INTERBEDDED SILTY SAND AND CLAYEY SILT WITH GRAVEL
- APPROXIMATE LIMIT OF SOIL EXCAVATION

SOIL BORING CONSTRUCTION:

- SB-302 — SOIL BORING IDENTIFICATION
- EXISTING GROUND SURFACE
- BOREHOLE
- END OF BOREHOLE



NOTE:

BASE MAP AND SOIL BORING INFORMATION FROM ELECTRONIC FILE PROVIDED BY DPK LAND SURVEYING, FILENAME: 15-7026MW00.DWG, DATED: 1/30/15, AT A SCALE OF 1" = 30'.

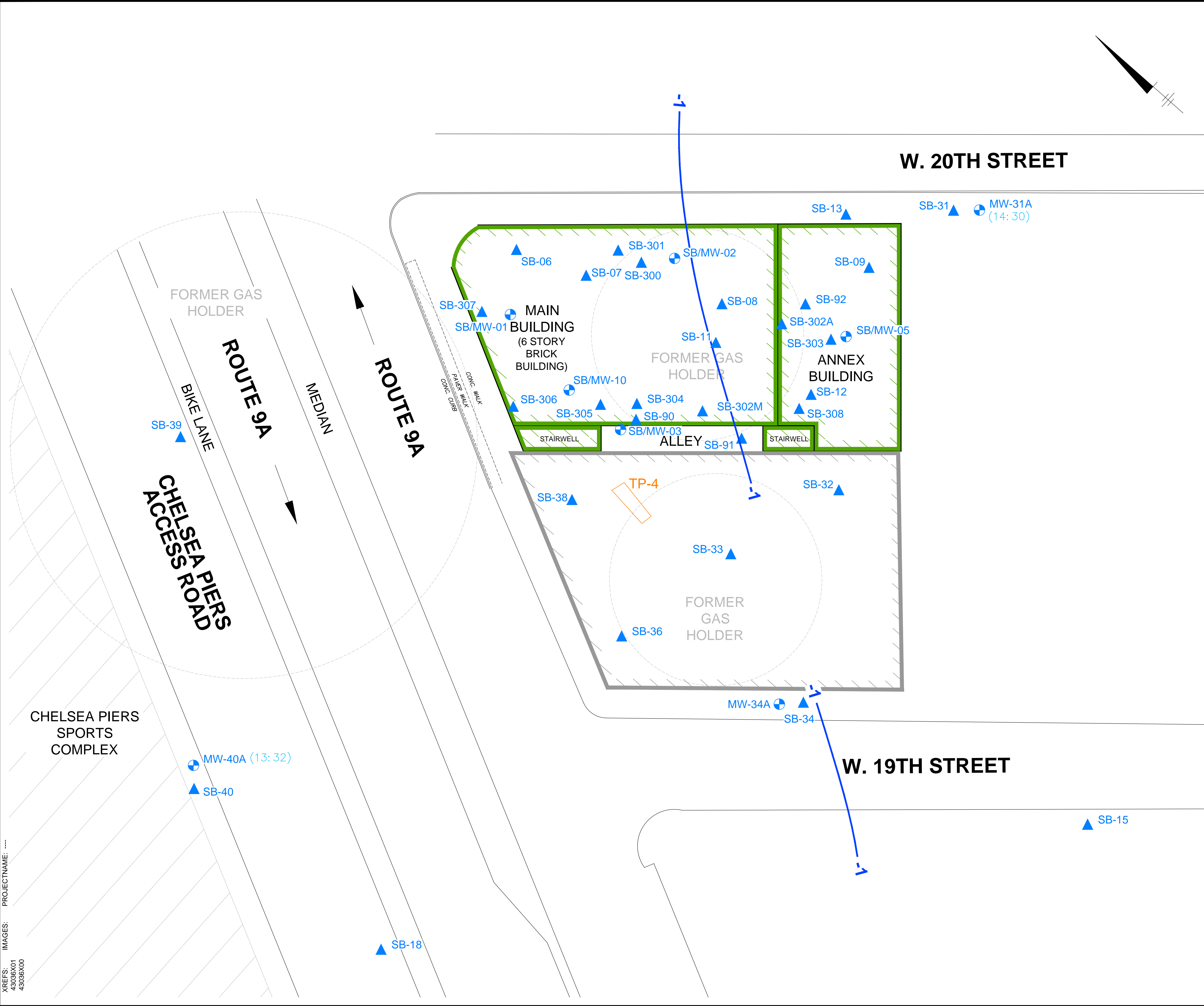
FORMER WEST 18TH STREET GAS WORKS  
550 WEST 20TH STREET  
NEW YORK, NEW YORK  
**SITE MANAGEMENT PLAN**

**CROSS SECTION B-B'**



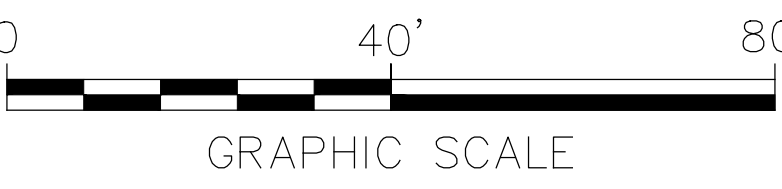


CITY: MINNEAPOLIS, MN DIV/GROUP: ENV/CAD DB: R. OBERLANDER LD: R. OBERLANDER PIC/OP: PM/RECD TM/OP: LXR/OP/ON--OFF=REF-  
C:\BIM\OneDrive - ARCADIS\GIS\1360 Docs\IANA - CON EDISON\Former West 18th Street Gas Works\2019\B043036.000\10+DW\GSMP - Fig 6 - Water Table Map - SGW - Jan 21 2009.dwg LAYOUT: 6 SAVED: 5/23/2019 2:26 PM ACAD/VER: 21.0S (LMS TECH) PAGES/SETUP: ---- PLOTSTYLE/TABLE: ----  
PLOTED: 5/23/2019 2:26 PM BY: KRAHMER, ERIC  
XREFS: IMAGES: PROJECTNAME: ----  
43036X01  
43036X00




- LEGEND:
- ▲ SOIL BORING LOCATION
  - MONITORING WELL LOCATION
  - HISTORICAL FEATURE
  - ▨ EXISTING BUILDING
  - ▩ REMEDIATED PROPERTY
  - TEST PIT LOCATION
  - (14:05) TIME GROUNDWATER ELEVATION WAS MEASURED
  - GROUNDWATER CONTOUR (DASHED WHERE INFERRED)
  - - - - - CLOSED DEPRESSION

- NOTES:
1. BASE MAP AND SOIL BORING INFORMATION FROM ELECTRONIC FILE PROVIDED BY DPK LAND SURVEYING, FILENAME: 15-7026MW00.DWG, DATED: 1/30/15, AT A SCALE OF 1" = 30'. ADDITIONAL SOIL BORING AND MONITORING WELL LOCATIONS WERE PROVIDED BY A PDF SAMPLE LOCATION PLAN BY LANGAN, NY. PROJECT NUMBER 170452801 - THE WOMEN'S BUILDING, DATED: 11/27/2018.
  2. LIMITS OF REMEDIATED PROPERTY ARE APPROXIMATE.
  3. SOIL BORINGS WERE SURVEYED TO THE NORTH AMERICAN DATUM OF 1983.
  4. SURVEY CONTROL WAS TAKEN FROM SITE WIDE BASE SURVEY PREPARED BY MUNOZ ENGINEERING, P.C. DATED APRIL 2007.
  5. ELEVATIONS REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.
  6. GROUNDWATER ELEVATIONS SHOWN ON THIS FIGURE ARE WITHIN 10 FEET OF THE SCREEN.
  7. HUDSON RIVER SURFACE ELEVATION IS FROM A NOAA MEASUREMENT LOCATIONS AT THE BATTERY, NEW YORK CITY AT 13:48 EST ON JANUARY 21, 2009. THE ELEVATION IS REFERENCED TO THE NAVD OF 1988.
  8. THE LOCATIONS OF SOIL BORINGS AND MONITORING WELLS COMPLETED IN NOVEMBER 2018 ARE APPROXIMATE.



FORMER WEST 18TH STREET GAS WORKS  
550 WEST 20TH STREET  
NEW YORK, NEW YORK  
**SITE MANAGEMENT PLAN**

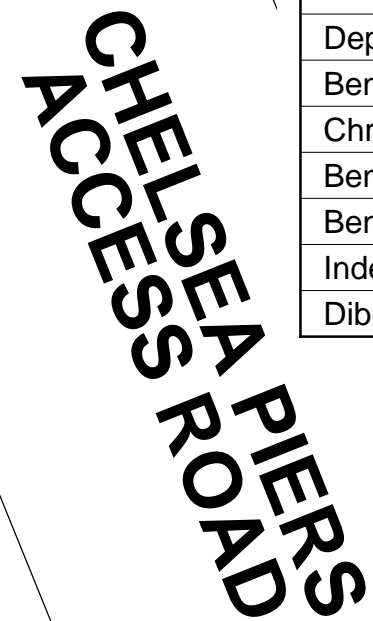
**WATER TABLE MAP FOR SHALLOW  
GROUNDWATER SURFACE -  
JANUARY 21, 2009**



Design & Consultancy  
for natural and  
built assets


FIGURE  
**6**



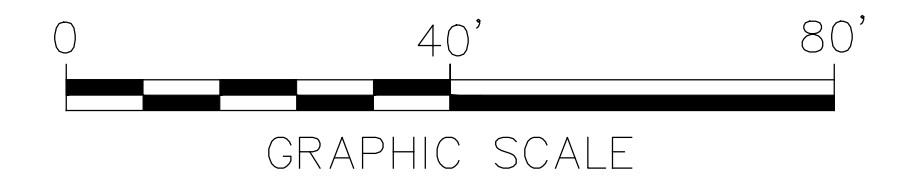


MW-40A  
SB-40

**W. 19TH STREET**



1. BASE MAP AND SOIL BORING INFORMATION FROM ELECTRONIC FILE PROVIDED BY DPK LAND SURVEYING, FILENAME: 15-7026MW00.DWG, DATED: 1/30/15, AT A SCALE OF 1" = 30'. ADDITIONAL SOIL BORING AND MONITORING WELL LOCATIONS WERE PROVIDED BY A PDF SAMPLE LOCATION PLAN BY LANGAN, NY. PROJECT NUMBER 170452801 - THE WOMEN'S BUILDING, DATED: 11/27/2018.
2. LIMITS OF REMEDIATED PROPERTY ARE APPROXIMATE.
3. SOIL BORINGS WERE SURVEYED TO THE NORTH AMERICAN DATUM OF 1983.
4. RESULTS ARE COMPARED TO TITLE 6 OF THE NEW YORK CODES, RULES AND REGULATIONS (NYCRR) PART 375-6.8(B) RESTRICTED RESIDENTIAL-USE SOIL CLEANUP OBJECTIVES (SCOs), DATED DECEMBER 14, 2006.
5. FIGURE SHOWS SOIL ANALYTICAL RESULTS FOR SAMPLING LOCATIONS WHERE ONE OR MORE CONSTITUENTS WERE IDENTIFIED AT CONCENTRATIONS EXCEEDING THE RESTRICTED RESIDENTIAL-USE SCOs.
6. SHADING INDICATES THE VALUE EXCEEDS THE 6 NYCRR PART 375 RESTRICTED RESIDENTIAL-USE SCOs.
7. ALL CONCENTRATIONS ARE PRESENTED IN PARTS PER MILLION (ppm), WHICH IS EQUIVALENT TO MILLIGRAMS PER KILOGRAM (mg/kg).
8. FIELD DUPLICATE VALUES ARE PRESENTED IN BRACKETS [ ].
9. < = CONSTITUENT NOT DETECTED AT A CONCENTRATION ABOVE THE REPORTED DETECTION LIMIT.
10. J = THE ASSOCIATED NUMERICAL VALUE IS AN ESTIMATED CONCENTRATION.
11. THE LOCATIONS OF SOIL BORINGS AND MONITORING WELLS COMPLETED IN NOVEMBER 2018 ARE APPROXIMATE.



## DISTRIBUTION OF VOCs, SVOCs, AND SHEEN IN SOIL



MW-01	
Date	11/09/18
1,2,4,5-Tetramethylbenzene	5.7 [6.3]
Benzene	25 [25]
Isopropylbenzene	18 [21]
n-Propylbenzene	5.4 [6]
Sec-Butylbenzene	7.4 [7.3]
Benzo(a)anthracene	0.38 [0.24]
Benzo(a)pyrene	0.4 [0.26]
Benzo(b)fluoranthene	0.51 [0.33]
Benzo(k)fluoranthene	0.18 [0.11]
Chrysene	0.31 [0.2]
Indeno(1,2,3-cd)pyrene	0.29 [0.19]

MW-02	
Date	11/09/18
1,2,4,5-Tetramethylbenzene	11
Benzo(a)anthracene	0.05 J
Benzo(a)pyrene	0.03 J
Benzo(b)fluoranthene	0.04 J
Benzo(k)fluoranthene	0.02 J
Chrysene	0.05 J
Indeno(1,2,3-cd)pyrene	0.02 J

MW-10	
Date	11/12/18
Benzo(a)anthracene	0.21
Benzo(a)pyrene	0.24
Benzo(b)fluoranthene	0.32
Benzo(k)fluoranthene	0.11
Chrysene	0.24
Indeno(1,2,3-cd)pyrene	0.2

MW-03	
Date	11/12/18
Chloroform	10
Benzo(a)pyrene	0.03 J
Benzo(b)fluoranthene	0.03 J

MW-34A	
Date	10/11/15
Acetone	76
Naphthalene	11

MW-05	
Date	11/09/18
Benzene	12
Benzo(a)anthracene	0.06 J
Benzo(a)pyrene	0.04 J
Benzo(b)fluoranthene	0.04 J
Benzo(k)fluoranthene	0.02 J
Chrysene	0.05 J
Indeno(1,2,3-cd)pyrene	0.03 J

LEGEND

- SOIL BORING LOCATION
- MONITORING WELL LOCATION

TEST PIT LOCATION

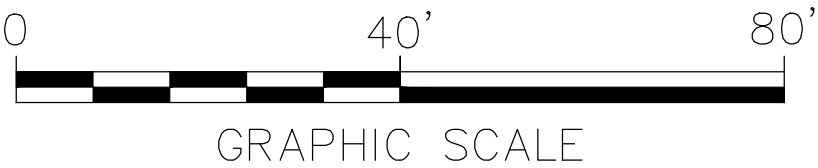
HISTORICAL FEATURE

EXISTING BUILDING

REMEDIED PROPERTY

NOTES:

- BASE MAP AND SOIL BORING INFORMATION FROM ELECTRONIC FILE PROVIDED BY DPK LAND SURVEYING, FILENAME: 15-7026MW0.DWG, DATED: 1/30/15, AT A SCALE OF 1" = 30'. ADDITIONAL SOIL BORING AND MONITORING WELL LOCATIONS WERE PROVIDED BY A PDF SAMPLE LOCATION PLAN BY LANGAN, NY. PROJECT NUMBER 170452801 - THE WOMEN'S BUILDING, DATED: 11/27/2018.
- LIMITS OF REMEDIATED PROPERTY ARE APPROXIMATE.
- SOIL BORINGS WERE SURVEYED TO THE NORTH AMERICAN DATUM OF 1983.
- RESULTS ARE COMPARED TO CLASS GA GROUNDWATER STANDARDS/GUIDANCE VALUES PRESENTED IN THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NYSDEC) TECHNICAL AND OPERATIONAL GUIDANCE SERIES (TOGS) 1.1.1, DATED JUNE 1998, UPDATED APRIL 2000 AND JUNE 2004.
- FIGURE SHOWS GROUNDWATER ANALYTICAL RESULTS FOR SAMPLING LOCATIONS WHERE ONE OR MORE CONSTITUENTS WERE IDENTIFIED AT CONCENTRATIONS EXCEEDING THE TOGS 1.1.1 STANDARDS/GUIDANCE VALUE.
- SHADING INDICATES THE VALUE EXCEEDS THE TOGS 1.1.1 STANDARDS/GUIDANCE VALUE.
- ALL CONCENTRATIONS ARE PRESENTED IN PARTS PER BILLION (ppb), WHICH IS EQUIVALENT TO MICROGRAMS PER KILOGRAM (µg/kg).
- FIELD DUPLICATE VALUES ARE PRESENTED IN BRACKETS [ ].
- < = CONSTITUENT NOT DETECTED AT A CONCENTRATION ABOVE THE REPORTED DETECTION LIMIT.
- J = THE ASSOCIATED NUMERICAL VALUE IS AN ESTIMATED CONCENTRATION.
- THE LOCATIONS OF SOIL BORINGS AND MONITORING WELLS COMPLETED IN NOVEMBER 2018 ARE APPROXIMATE.

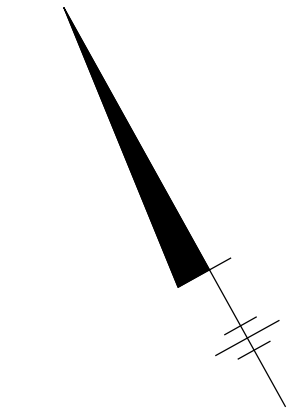


FORMER WEST 18TH STREET GAS WORKS  
550 WEST 20TH STREET  
NEW YORK, NEW YORK  
SITE MANAGEMENT PLAN

DISTRIBUTION OF VOCs AND SVOCs  
IN GROUNDWATER





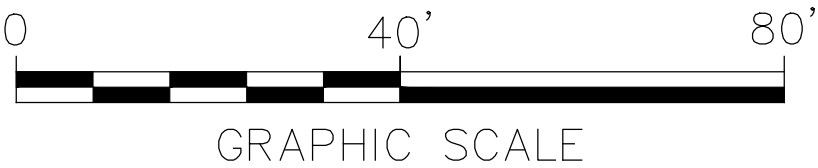


LEGEND

- MONITORING WELL LOCATION
- PARCEL
- PROPERTY BOUNDARY
- SURFACE COVER TYPE:
  - EXISTING BUILDING
  - CONCRETE / PAVERS
  - REMEDIATED PROPERTY

NOTES:

- BASE MAP INFORMATION:
  - BASE MAP INFORMATION FROM ELECTRONIC FILE PROVIDED BY DPK LAND SURVEYING, FILENAME: 15-7026MW00.DWG, DATED: 1/30/15, AT A SCALE OF 1" = 30'.
  - LOT INFORMATION PROVIDED BY NYC DEPARTMENT OF CITY PLANNING; DEPT. OF FINANCE DIGITAL TAX MAP (DTM), MANHATTAN. (nyc.gov/site/planning/data maps).
  - BUILDING DETAILS FROM "ADMINISTRATION/ HOUSING, BLDG. 1 & 2; BAYVIEW CF, FACILITY SURVEY DATE: 10/07" BY OGS - NYS OFFICE OF GENERAL SERVICES, REV. DATE: JAN. 24, 2013.
- LIMITS OF REMEDIATED PROPERTY ARE APPROXIMATE.



FORMER WEST 18TH STREET GAS WORKS  
550 WEST 20TH STREET  
NEW YORK, NEW YORK  
**SITE MANAGEMENT PLAN**

**EXISTING SOIL COVER LIMITS**

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for natural and  
built assets

FIGURE  
**9**



Appendix A – Excavation Work Plan





# **APPENDIX A – EXCAVATION WORK PLAN**

## **A-1 NOTIFICATION**

### **Property Owner Notification Requirements**

The Property Owner must notify Consolidated Edison Company of New York, Inc. (Con Ed) at least two weeks prior to starting any non-emergency work with the potential to breach the soil cover system and/or encounter or disturb remaining subsurface soil or groundwater containing site residuals. For emergency work, notification to Con Ed should be made as soon as practicable, but within 48 hours. This work may include, but is not limited to, drilling, excavations, building foundation work, etc.

The notification from the Property Owner to Con Ed will include (but not necessarily be limited to):

- A detailed description of the work to be performed, including the location and areal extent, plans for re-grading, intrusive elements to be installed below the soil cover system, estimated volumes of impacted soil to be excavated, and any work that may adversely affect the soil cover system.
- A schedule for the work, detailing the start and completion of all intrusive work and demolition (if any) of existing structures.
- A summary of the applicable components of this Excavation Work Plan (EWP) (including restoration of the soil cover system).
- A statement that the work will be performed in compliance with this EWP and Title 29 of the Code of Federal Regulations (29 CFR) 1910.120.
- A copy of the contractor's health and safety plan (HASP), in electronic format. The contractor may use the HASP provided in Appendix D of the Site Management Plan (SMP) as a reference/template; however, the contractor must have a qualified safety professional prepare their task-specific HASP and verify



current compliance with Occupational Safety and Health Act requirements and protocols.

- Identification of proposed disposal facilities for potential waste streams.
- Identification of proposed sources of any anticipated backfill, along with all required chemical testing results.

Currently, this notification to Con Ed by the property owner will be made to:

**Con Ed Project Manager:** Ms. Kathleen Gibson

Address:

Consolidated Edison Company of New York, Inc.

MGP Remediation Group

3101 20<sup>th</sup> Avenue

Building 136, 2<sup>nd</sup> Floor

Long Island City, New York

Telephone: (718) 204-4219

[gibsonk@coned.com](mailto:gibsonk@coned.com)

### **NYSDEC Notification**

At least 7 days prior to the start of any activity that is anticipated to encounter remaining subsurface soil and groundwater containing site residuals, Con Ed or its representative will notify the New York State Department of Environmental Conservation (NYSDEC).

Currently, this notification will be made to:

**NYSDEC Project Manager:** Mr. Douglas MacNeal

Remedial Bureau C, 11<sup>th</sup> Floor

New York State Department of Environmental Conservation

625 Broadway

Albany, New York 12233-7014



Telephone: (518) 402-9662

douglas.macneal@dec.ny.gov

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent of excavation, plans/drawings for site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of soil containing site residuals to be excavated and any work that may impact an engineering control.
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of constituents of concern, potential presence of grossly impacted media, and plans for any pre-construction sampling.
- A schedule for the work, detailing the start and completion of all intrusive work.
- A summary of the applicable components of this EWP.
- A statement that the work will be performed in compliance with this EWP and 29 Code of Federal Regulations (CFR) 1910.120.
- A copy of the contractor's HASP, in electronic format, if it differs from the HASP provided in Appendix D of this SMP.
- Identification of disposal facilities for potential waste streams.
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

## **A-2 SOIL SCREENING METHODS**

Visual, olfactory and instrument-based (e.g. photoionization detector) soil screening will be performed by a qualified environmental professional during all excavations into known to contain or potentially to contain site residuals. Soil screening will be performed when the invasive work is done and will include all excavation and



invasive work performed during development, such as excavations for foundations and utility work, after issuance of the Certificate of Completion.

Soils will be segregated, based on previous environmental data and screening results, into material that requires off-site disposal and material that requires testing to determine if the material can be reused on-site as soil beneath a cover or if the material can be used as cover soil. Soil potentially suitable for reuse that is stockpiled will be sampled and analyzed as described in Section A-7 of this EWP to evaluate whether it can be replaced or requires disposal offsite.

### **A-3 SOIL STAGING METHODS**

Soil stockpiles will, at minimum, be placed on top of polyethylene sheeting (minimum 10 mil thickness) adjacent to the excavation area to temporarily stage excavated subsurface soils. Stockpiles will be covered using polyethylene sheeting as needed to reduce potential infiltration of precipitation, migration of wind-blown dust, and direct contact exposures. Stockpiles will be routinely inspected and damaged polyethylene sheeting will be promptly replaced. The stockpiles will be kept covered, except when excavation is taking place and material is being added to the stockpile.

During all soil disturbance activities, erosion and sediment controls will be employed in accordance with this EWP (see [for example] Section A-11) and in conformance with applicable laws and regulations (good work practices that require erosion and sediment controls are not limited to potentially impacted areas). Proven soil conservation practices will be incorporated in any such plans to mitigate soil erosion, off-site sediment migration, and water pollution from erosion. Appropriate temporary erosion control measures (e.g., silt fence, hay bales, etc.) will be implemented and maintained as needed near catch basins, surface waters and other discharge points, as well as around impacted and potentially impacted soil stockpiles and un-vegetated soil surfaces. Such stockpiles will be graded and compacted as necessary for positive surface water run-off and dust control.



Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Property and available for inspection by NYSDEC.

#### **A-4 MATERIALS EXCAVATION AND LOAD OUT**

A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the Property and remedial party (if applicable) and its contractors are responsible for safe execution of all invasive and other work performed under this EWP.

The presence of utilities and easements on the Property will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the Property.

To the extent practicable, queuing of trucks will be performed on-site or at authorized commercial or industrial locations in order to minimize public disturbance. Loaded vehicles leaving the site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and New York State Department of Transportation (NYSDOT) requirements (and all other applicable transportation requirements). All dump trailers, dump truck boxes, and roll-off waste containers (collectively referred to as “waste transport containers”) used to transport material containing site residuals for off-site treatment/disposal will be lined with polyethylene sheeting (covered inside the entire container) prior to waste loading. The ground surface of any truck loading area will be covered in 6 mil (minimum thickness) polyethylene sheeting to protect the area from incidental spilling. In addition, plastic tarps equipped with shepherd hooks placed over the side of the waste transport container will be used while loading to minimize contact of materials containing sites residuals with the outsides of the containers.

Truck drivers will not be permitted to walk over waste material without the proper training or personal protective equipment (PPE).



A truck wash will be operated on-site, as appropriate. The qualified environmental professional will be responsible for ensuring that all outbound trucks (at least the truck wheels/tires) will be washed at the truck wash before leaving the site until the activities performed under this section are complete. Truck wash waters will be collected and disposed of off-site in an appropriate manner.

Locations where vehicles enter or exit the site shall be inspected daily for evidence of off-site soil tracking.

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the Property are clean of dirt and other materials derived from the Property during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials.

#### **A-5 MATERIALS TRANSPORT OFF-SITE**

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including Title 6 of the New York Codes, Rules, and Regulations (NYCRR) Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Material transported by trucks exiting the Property will be secured with tight-fitting covers, and polyethylene sheeting will be used to line the inside of the entire container prior to waste loading. In addition, each waste transport container must have a watertight tailgate. Loose-fitting canvas-type truck covers will be prohibited.

All truck wheels/tires will be washed prior to leaving the Property. As identified in Section A-4, truck wash waters will be collected and disposed of off-site in an appropriate manner.

All trucks loaded with site materials will travel to the designated disposal facility taking into account: (a) limiting transport through residential areas and past sensitive sites; (b) using city mapped truck routes; (c) prohibiting off-site queuing of trucks



entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) providing for overall safety in transport.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project site.

Egress points for truck and equipment transport from the Property will be kept clean of dirt and other materials during Property remediation and development.

To the extent practicable, queuing of trucks will be performed on-site or at authorized commercial or industrial locations in order to minimize public disturbance.

#### **A-6 MATERIALS DISPOSAL OFF-SITE**

All material excavated and removed from the Property will be treated as impacted and regulated material and will be transported and disposed in accordance with all local, State (including 6 NYCRR Part 360) and Federal regulations. Characterization sampling will be performed as needed and will follow the guidelines presented in Division of Environmental Remediation (DER) *Technical Guidance for Site Investigation and Remediation* (DER-10) (NYSDEC, 2010) and the requirements of the receiving treatment/disposal facility. If disposal of material from this Property is proposed for unregulated off-site disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated off-site management of materials from this Property will not occur without formal NYSDEC approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate (i.e., hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, construction and demolition debris recycling facility, etc.). Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.



Non-hazardous historic fill and soils containing site residuals that are taken off-site will be handled, at minimum, as a Municipal Solid Waste per 6 NYCRR Part 360-1.2. Material that does not meet Unrestricted Soil Cleanup Objectives (SCOs) is prohibited from being taken to a New York State recycling facility (6 NYCRR Part 360-16 Registration Facility).

## **A-7 MATERIALS REUSE ON-SITE**

It is anticipated that much of the soils excavated from the Property for future redevelopment, construction, or maintenance may be re-used on-site provided there is sufficient subsurface space for backfilling with soil and the criteria below are met:

- Soil excavated from within previous excavations that were backfilled with imported clean material can be re-used anywhere on-site (as surface or subsurface fill) provided there is no non-aqueous phase liquid (NAPL), staining, or odor that would suggest potential impacts.
- Soil excavated from within previous excavations that were backfilled with “re-use” soils can be used on-site only as subsurface fill with a demarcation layer placed above it (provided there is no visible NAPL or staining) or it may be transported offsite for treatment/disposal.
- Soil excavated from within the Property will be subject to the characterization approach presented below. This soil may be re-used as subsurface fill provided that: (1) it does not exhibit visible NAPL; and (2) meets the groundwater protection SCOs as presented in 6 NYCRR Part 375-6.8(b), for each organic constituent identified in groundwater at the site at concentrations exceeding the groundwater quality standards presented in NYSDEC Division of Water, Technical and Operational Guidance Series document titled “Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations” (TOGS 1.1.1), dated June 1998 (last revised June 2004); and (3) can be compacted to achieve minimum compaction requirements. Soil samples will be collected to characterize this soil (from stockpiles) at a frequency of one per approximately 500 cubic yards (cy) for: (1) visual characterization; (2) field-



screening using a photoionization detector (PID); and (3) laboratory analysis for polychlorinated biphenyls (PCBs), pesticides, Target Compound List (TCL) Volatile Organic Compounds (VOCs), TCL Semi-Volatile Organic Compounds (SVOCs), and Target Analyte List (TAL) inorganic constituents. Samples for VOC analysis will be discrete grab samples, and the sample for the remaining analyses will be a composite sample.

Chemical criteria (groundwater protection SCOs) for on-site reuse of material have been approved by NYSDEC and are listed in 6 NYCRR Part 375-6.8(b). The qualified environmental professional will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain on-site. On-site material that contains site residuals and/or historic fill and is acceptable for re-use on-site will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

Any demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the Property will not be reused on-site.

## **A-8 FLUIDS MANAGEMENT**

Efforts will be made to minimize the amount of water that could enter the excavation (e.g., installing a berm around the excavation or covering the excavation to prevent runoff from entering during precipitation). Water accumulated in excavations within the site will be pumped out during or after precipitation events (as appropriate), containerized, and characterized as discussed below.

At a minimum, water encountered in excavations will be sampled and analyzed for the constituents of concern known to be in the area as determined by previous analytical results, which may include VOCs, SVOCs, and/or inorganic constituents.



Results will be compared to the groundwater standards/guidance values set forth in NYSDEC Division of Water, TOGS 1.1.1.

Water will be transported offsite for proper disposal, or treated on-site via a treatment system that has been approved by the NYSDEC, as appropriate. Runoff from surface discharges (if any) will be controlled. If large scale wastewater is likely to be generated, a water treatment system may be installed on-site, and the treated water may be discharged to the municipal wastewater treatment plant (if authorized).

All liquids to be removed from the Property, including but not limited to, excavation dewatering, decontamination waters, and groundwater monitoring well purge and development waters, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the Property, and will be managed off-site, unless prior approval is obtained from NYSDEC.

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

#### **A-9 SOIL COVER SYSTEM RESTORATION**

After the completion of soil removal and any other invasive activities the soil cover system will be restored in a manner that complies with the decision document (when issued). The existing cover system is generally comprised of concrete/brick covered sidewalks and a brick building. If the type of cover system changes from that which exists prior to the excavation (e.g., a soil cover is replaced by asphalt), this will constitute a modification of the existing cover element and the upper surface of the area of remaining site residuals. A figure showing the modified surface will be included in the subsequent Periodic Review Report and in any updates to the SMP.

#### **A-10 BACKFILL FROM OFF-SITE SOURCES**

Offsite soil sources will be documented as having originated from locations having no evidence of disposal or release of hazardous, toxic or radioactive substances,



wastes or petroleum products. Offsite borrow soils cannot otherwise be defined as a solid waste in accordance with 6 NYCRR Part 360-1.2(a). If an offsite source is designated as “virgin” soil, it will be further documented in writing to be native soil material from areas not having supported any known prior industrial or commercial development or agricultural use. All soil brought on-site must meet the lower of either the restricted commercial use SCOs or the protection of groundwater values presented in 6 NYCRR Part 375-6.8(b) for subsurface fill or a soil cover layer. At least one sample from each backfill source will be required, with a sampling frequency as follows:

- For material being imported from a virgin mine/pit, one representative characterization sample will be required for each backfill type to be obtained from the mine/pit.
- For material sources other than a virgin mine/pit, characterization samples will be required for each backfill type to be obtained from the mine/pit. The characterization sampling frequency will be in accordance with Section 5.4 (e) of DER-10.

A characterization sample includes: (1) one composite sample analyzed for SVOCs, inorganic constituents (including cyanide), PCBs, and pesticides; and (2) one discrete sample analyzed for VOCs.

All materials proposed for import onto the site will be approved by the qualified environmental professional and will be in compliance with provisions in this SMP prior to receipt at the site. A Request to Import/Reuse Fill or Soil form, which can be found at <http://www.dec.ny.gov/regulations/67386.html>, will be prepared and submitted to the NYSDEC project manager allowing a minimum of 5 business days for review.

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the site.

All imported soils will meet the backfill and cover soil quality standards established in 6 NYCRR 375-6.7(d). Soils that meet ‘exempt’ fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this Property, will



not be imported onto the site without prior approval by NYSDEC. Solid waste will not be imported onto the Property.

Trucks entering the site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

#### **A-11 STORMWATER POLLUTION PREVENTION**

All erosion and sediment controls will be installed and maintained in accordance with the New York Standards and Specifications for Erosion and Sediment Control prepared for the NYSDEC by the New York State Soil and Water Conservation Society (NYS Standards and Specifications) (NYSDEC 2016), unless otherwise noted. Additional erosion and sediment control measures beyond those described below may need to be provided to achieve the stormwater management objectives.

Refer to the NYS Standards and Specifications and the Design Drawings for additional information pertaining to material and installation requirements for the following erosion and sediment controls. Minimum requirements under the Stormwater Pollution Protection Plan (SWPPP) include:

- Barriers and hay bale checks will be installed around the perimeter of the construction area and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Property and available for inspection by the NYSDEC. All necessary repairs shall be made immediately.
- Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.
- All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials.
- Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.



- Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.
- Catch basin inlet protection will be installed and maintained around existing catch basins that have the potential for receiving construction-related stormwater until alternative precautions (e.g., grouting, plugging, or otherwise sealing prior to abandonment/removal) are in-place to reduce the potential loss of sediment-laden water through the existing storm sewer system.
- Excavated materials will be staged and covered with polyethylene tarps to reduce the potential for migration of stockpiled excavation materials (i.e., via stormwater runoff) to clean areas of the Property and/or offsite areas. Stormwater runoff from stockpiled excavation materials will be collected in sumps, located within the material staging/containment areas, and will be sampled and managed in accordance with Section A-8 – Fluids Management.
- Decontamination Areas will be used for the decontamination of personnel and equipment prior to entering clean areas of the Property and/or offsite areas.
- Stabilized Construction Entrances/Exits will be constructed to minimize the potential for tracking of sediments onto offsite areas.
- Dust Controls will be implemented to reduce the potential for the generation of fugitive dust. Appropriate dust controls will be implemented on an as needed basis, throughout the duration of the work, in accordance with the procedures outlined in Appendix E (Community Air Monitoring Plan [CAMP]) of the SMP, and Section A-15 – Dust Control Plan of the EWP.
- Good housekeeping practices will be implemented at the site to reduce the potential for construction materials from becoming entrained in stormwater discharges from the Property. Throughout construction, the Property will be maintained in a neat and orderly condition.



## **A-12 CONTINGENCY PLAN**

If underground tanks or other previously unidentified impacted sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for full a full list of analytes (TAL metals; TCL VOCs and SVOCs, TCL pesticides and PCBs), unless the site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected impacted media identified by screening during invasive site work will be promptly communicated by phone to NYSDEC's Project Manager (identified in Section A-1 of this EWP). Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the Periodic Review Report.

## **A-13 COMMUNITY AIR MONITORING PLAN**

Air monitoring will be performed during future intrusive activities at the Property in accordance with the generic CAMP (included as Appendix E to the SMP) or an updated project-specific CAMP, as appropriate. This will involve real-time monitoring for organic vapors and particulate matter less than 10 micrometers in diameter (PM<sub>10</sub>). Monitoring will be performed at one upwind and two downwind locations and at the nearest occupied building. The air monitoring locations will be adjusted on a daily or more frequent basis based on actual wind directions.

Exceedances of action levels listed in the CAMP will be reported to NYSDEC and New York State Department of Health (NYSDOH) Project Managers.



#### **A-14 ODOR CONTROL PLAN**

This odor control plan is capable of controlling emissions of nuisance odors on- and off-site. Specific odor control methods to be used on a routine basis will include water/BioSolve<sup>®</sup> spray, polyethylene sheeting (for covering excavation faces, material stockpiles, etc.), a perimeter misting system (e.g., Piion Flexi-Fog system), and/or vapor suppression foam. These products will be used on a routine basis as needed. In addition, steps will be taken to minimize the excavation surface area exposed at any one time. If nuisance odors are identified at the Property boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the Property Owner's qualified environmental professional, and any measures that are implemented will be discussed in the subsequent Periodic Review Report.

All necessary means will be employed to prevent on- and off-site nuisances. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (a) direct load-out of soils to trucks for off-site disposal; (b) use of chemical odorants in spray or misting systems; and (c) use of staff to monitor odors in surrounding neighborhoods.

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

#### **A-15 DUST CONTROL PLAN**

Dust monitoring will be performed in accordance with Section A-13 of this Appendix and the project-specific CAMP. A dust suppression plan that addresses dust management during invasive on-site work will include, at a minimum, the items listed below:



- Dust suppression will be achieved through the use of dedicated on-site equipment (i.e., water truck) for wetting roads, excavation faces, and stockpiles.
- Gravel will be used on roadways to provide a clean and dust-free road surface.
- On-site roads will be limited in total area to minimize the area required for water truck sprinkling.
- Travel speeds over haul roads will be limited.
- The number and size of excavation areas open at one time will be limited.
- Excavations and materials in on-site staging areas will be covered using UV-resistant polyethylene sheeting.

#### **A-16 OTHER NUISANCES**

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



**Appendix B – Environmental Easement**





Environmental Easement to be Provided with  
Final Site Management Plan







**Appendix C – Monitoring Well Boring and Construction Logs**









# **BORING LOG**

<b>JOB NAME/ CLIENT</b> W18th St MGP SCS/Con Edison	<b>PROJECT NO.</b> 41318-0700-10000	<b>AREA OF SITE</b> East of Gas Holder #5	
<b>ADDRESS</b> Southern sidewalk on 20th St between 10th and 11th Ave	<b>ELEVATION/DATUM</b> 6.48/NAVD 88		
<b>DRILLING CONTRACTOR</b> ADT	<b>DRILLER</b> Lloyd Adams	<b>TRC INSPECTOR</b> Jessica Elliott	
<b>DRILLING RIG</b> CME-LC60	<b>TYPE/SIZE BIT</b> 4.25" Hollow Stem Auger	<b>START DATE</b> 10/9/2004	<b>END DATE</b> 10/9/2004
<b>SAMPLER TYPE</b>	<b>HAMMER WEIGHT/DROP</b>	<b>TOTAL DEPTH</b> (feet below ground surface (ft bgs))	<b>WATER LEVEL (ft bgs)</b>
2" Split Spoon	140 lbs./30"	14'	7.5'

WELL	CONSTRUCTION	SAMPLES			DEPTH	WATER	DESCRIPTION OF SOILS	REMARKS  (PID, STAINING, ODORS, ETC.)
		NUMBER	RECOVERY IN FEET	BLOWS PER 6"				
							<div>f - fine    m - medium    c - coarse lt - light    dk - dark    tr - trace    ltl - little    sl - slight</div>	<div>N/S = No Staining N/O = No odors</div>
							0.0'-0.5': CONCRETE	<div>1'-2': N/O, N/S  PID = 0.2 ppm max.</div> <div>2'-3': N/O, N/S  PID = 0.2 ppm max.</div> <div>3'-4': N/O, N/S  PID = 0.3 ppm max.</div> <div>4'-5': N/O, N/S  PID = 0.1 ppm max.</div> <div>5'-7': N/O, N/S  PID = 0.1 ppm max.</div> <div>7'-9': SI sewage odor, N/S  PID = 3.5 ppm max.</div> <div>9'-11': SI sewage odor, N/S  PID = 2.1 ppm max.</div> <div>11'-13': SI sewage odor  PID = 0.6 ppm max. in shoe</div> <div>14.0': Well set at 14.0' bgs. Screen Interval: 14.0'-4.0' bgs.</div> <div><div> Sand</div><div> Bentonite Chips</div><div> Concrete</div><div> Well Screen</div></div>
							0.5'-9.0': Fill-Dk brown SILT, f to c SAND, some gravel, brick fragments and wood fibers.	
				</				

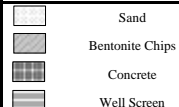
	Sand
	Bentonite Chips
	Concrete
	Well Screen



## BORING LOG

JOB NAME/ CLIENT	PROJECT NO.	AREA OF SITE	
W18th St MGP SCS/Con Edison	41318-0700-10000	South of Gas Holder #6 and north of Gas Light Co. Store Yard	
ADDRESS	ELEVATION/DATUM		
Northern sidewalk on 19th St near West Side Highway	5.83/NAVD 88		
DRILLING CONTRACTOR	DRILLER	TRC INSPECTOR	
ADT	Sean Miller	Scott Fischer	
DRILLING RIG	TYPE/SIZE BIT	START DATE	END DATE
Mobile B-61	4.25" Hollow Stem Auger	5/22/2004	5/22/2004
SAMPLER TYPE	HAMMER WEIGHT/DROP	TOTAL DEPTH	WATER LEVEL (ft bgs)
		(feet below ground surface (ft bgs))	
2" Split Spoon	140 lbs./30"	12.5'	5.0'

WELL	CONSTRUCTION	SAMPLES			DEPTH	WATER	DESCRIPTION OF SOILS	REMARKS  (PID, STAINING, ODORS, ETC.)
		NUMBER	RECOVERY IN FEET	BLOWS PER 6"				
							<div>f - fine lt - light</div> <div>m - medium dk - dark</div> <div>c - coarse tr - trace</div> <div>ltl - little sl - slight</div>	<div>N/S = No Staining N/O = No odors</div>
					1		0.0'-0.5': CONCRETE	1'-2': N/O, N/S  PID = 4.1 ppm max.
					3		0.5'-3.0': Fill-Dk brown SILT, f to c SAND, GRAVEL, tr wood fibers, brick fragments and coal fragments.	2'-3': Sl petroleum odor, N/S  PID = 0.0 ppm max.
					5	▼	3.0-7.0': Fill-Dk gray clayey SILT, f SAND, some m to c sand, some brick and coal fragments and tr wood fibers.	3'-4': N/O, N/S  PID = 0.0 ppm max.
					7		Sample collected: W18STMGP-B34-45	4'-5': N/O, N/S  PID = 0.0 ppm max.
					9			5'-6': N/O, N/S  PID = 0.5 ppm max.
					11		7.0'-15.0': Fill-Black clayey SILT and GRAVEL and ltl to some sand.	5'-6': N/O, N/S  PID = 0.6 ppm max.
					13			7'-9': N/O, N/S  PID = 0.0 ppm max.
					15			9'-11': N/O, N/S  PID = 0.0 ppm max.
					17			11'-13': N/O, N/S  PID = 0.0 ppm max.
							Well set at 12.5' bgs.	
							Screen interval from 12.0' to 2.0' bgs with 6" sump from 12.5' to 12.0' bgs.	<div><div></div>Sand</div> <div><div></div>Bentonite Chips</div> <div><div></div>Concrete</div> <div><div></div>Well Screen</div>

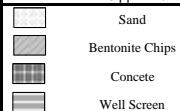




**BORING LOG**

<b>JOB NAME/ CLIENT</b> W18th St MGP SCS/Con Edison	<b>PROJECT NO.</b> 41318-0700-10000	<b>AREA OF SITE</b> Southwest of Gas Holder #7
<b>ADDRESS</b> In the western sidewalk along the cobblestone road at Chelsea Piers	<b>ELEVATION/DATUM</b> 6.96/NAVD 88	
<b>DRILLING CONTRACTOR</b> ADT	<b>DRILLER</b> Sean Miller	<b>TRC INSPECTOR</b> Morgan Evans
<b>DRILLING RIG</b> Mobile B-60	<b>TYPE/SIZE BIT</b> 3.25" Hollow Stem Auger	<b>START DATE</b> 7/26/2004
		<b>END DATE</b> 7/26/2004
<b>SAMPLER TYPE</b> 2" Split Spoon	<b>HAMMER WEIGHT/DROP</b> 140 lbs./30"	<b>TOTAL DEPTH</b> (feet below ground surface (ft bgs)) 19'
		<b>WATER LEVEL (ft bgs)</b> 6'

WELL	CONSTRUCTION	SAMPLES			DEPTH	WATER	DESCRIPTION OF SOILS	REMARKS  (PID, STAINING, ODORS, ETC.)
		NUMBER	RECOVERY IN FEET	BLOWS PER 6"				
							<div>f - fine lt - light</div> <div>m - medium dk - dark</div> <div>c - coarse trl - little</div> <div>sl - slight</div>	<div>N/S = No Staining N/O = No odors</div>
							0.0'-0.5': CONCRETE and rebar	1'-2': N/O, N/S
							0.5'-2.4': Fill-Bedded angular GRAVEL (approx. 0.1'-0.2' diameter) in f to m sand matrix.	PID = 0.0 ppm max.
							2.4': Thick black nylon sheeting beneath the bedded gravel.	2'-3': N/O, N/S
							2.4'-5.2': Fill-Medium brown f to m SAND, tr silt, c sand, angular gravel, brick fragments, coal fragments and roots.	PID = 0.0 ppm max.
							Sample collected: W18STMGP-MW40A-45	3'-4': N/O, N/S
								PID = 0.0 ppm max.
								4'-5': N/O, N/S
								PID = 0.0 ppm max.
								5'-6': N/O, N/S
								PID = 0.0 ppm max.
							6.0'-12.0': Fill-Medium brown v f to c SAND, some silt, ltl gravel and tr cobbles.	6'-8': N/O, N/S
								PID = 0.0 ppm max.





<b>JOB NAME/ CLIENT</b>	<b>PROJECT NO.</b>	<b>AREA OF SITE</b>	
W18th St MGP SCS/Con Edison	41318-0700-10000	Southwest of Gas Holder #7	
<b>ADDRESS</b>	<b>ELEVATION/DATUM</b>		
In the western sidewalk along the cobblestone road at Chelsea Piers	6.96/NAVD 88		
<b>DRILLING CONTRACTOR</b>	<b>DRILLER</b>	<b>TRC INSPECTOR</b>	
ADT	Sean Miller	Morgan Evans	
<b>DRILLING RIG</b>	<b>TYPE/SIZE BIT</b>	<b>START DATE</b>	<b>END DATE</b>
Mobile B-60	3.25" Hollow Stem Auger	7/26/2004	7/26/2004
<b>SAMPLER TYPE</b>	<b>HAMMER WEIGHT/DROP</b>	<b>TOTAL DEPTH</b>	<b>WATER LEVEL (ft bgs)</b>
		<b>(feet below ground surface (ft bgs))</b>	
2" Split Spoon	140 lbs./30"	19'	6'

**TRC**



Appendix D – Health and Safety Plan





**Consolidated Edison Company of New  
York, Incorporated**

**Environmental Health and Safety  
Plan (E-HASP)**

West 18<sup>th</sup> Street Gas Works

May 2009





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Designated H&S Plan Writer

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**Environmental Health and  
Safety Plan (E-HASP)**

West 18<sup>th</sup> Street Gas Works

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B0043011.0000

Date:  
May 2009

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## **1. Introduction**

All work on this project will be carried out in compliance with ARCADIS' Health and Safety policies and procedures, and the Occupational Safety and Health Administration's Hazardous Waste Operations and Emergency Response regulation 29 CFR 1910.120. The design of this health and safety plan (HASP) conforms to the requirements of the ARC HSFS010 (HASP H&S Procedure). Specific health and safety information for the project is contained in this HASP. All personnel working on hazardous operations or in the area of hazardous operations shall read and be familiar with this HASP before doing any work. All project personnel shall sign the certification page acknowledging that they have read and understand this HASP.

Changes in the scope of the project or introduction of new hazards to the project shall require revision of the HASP by the HASP writer and reviewer, and approval by the Project Manager. The HASP Addendum Form and log table are included as Appendix A.



## 2. Project Site History and Requirements

### 2.1 Site Background

The Site is located in the Chelsea section of the borough of Manhattan, New York, NY. The footprint of the former West 18th Street manufactured gas plant (MGP) site covers portions of five modern city blocks, parts of 11th Avenue/Marginal Street/Route 9A, and parts of the Chelsea Piers. Specifically, the former MGP includes:

- Block 688, Tax Lot 7501 (entire block bounded by West 16th Street, West 17th Street, 10th Avenue and 11th Avenue/Route 9A);
- Block 689, Tax Lot 17 (entire block bounded by West 17th Street, West 18th Street, 10th Avenue and 11th Avenue/Route 9A);
- Block 690, Tax Lots 12, 20, 29, 40, 42, and 54 (entire block [except Tax Lot 46] bounded by West 18th Street, West 19th Street, 10th Avenue and 11th Avenue/Route 9A);
- Block 691, Tax Lots 1 and 11 (western end of block bounded by West 19th Street, West 20th Street, 10th Avenue and 11th Avenue/Route 9A);
- Block 715, Tax Lot 59 (northwestern area of block bounded by West 17th Street, West 18th Street, 9th Avenue and 10th Avenue);
- The line of 11th Avenue, Route 9A, and Marginal Street between West 16th Street and West 20th Street (formerly parts of Blocks 688, 689, 690 and 691); and
- Portions of the Chelsea Piers (Piers 59, 60, 61 and 62) designated Block 662, (formerly part of Blocks 666, 688, and 689).

### 2.2 Site Description

**Site Type: (Check as many as applicable)**

X	Active		Secure		Industrial		Landfill		Service station
	Inactive		Unsecured	X	Commercial		Well field	X	Water work
		X	Uncontrolled	X	Residential		Railroad		Undeveloped
Other specify:									



### **2.3 List of Project Tasks and Scope of Work**

The current site layout contains a number of properties, each of which are owned by third parties. Site use includes a mix of commercial and residential uses.

- Surface features on the Site include:
- Single- and multi-level commercial buildings;
- Residential buildings;
- Correctional facility;
- Paved parking areas;
- Concrete and cobblestone streets;
- Concrete sidewalks;
- Former abandoned overhead rail line, now active pedestrian walkway;
- Light poles;
- Entertainment complex; and
- Surface water.

### **2.4 List of Project Tasks and Scope of Work**

The objective of site activities is to conduct soil sampling activities at the Consolidated Edison Company of New York, Inc. (Con Edison) former West 18th Street Manufactured Gas Plant (MGP) site (Site), located in Manhattan, NY. This Health and Safety Plan (HASP) has been written to address activities performed at the site.

Activities at the site are expected to include the following tasks:

- Mobilization/Site Reconnaissance;
- Subsurface utility location and clearance;
- Installation of soil borings, soil sampling;
- Management of investigation derived waste (IDW);
- Equipment decontamination;
- Demobilization; and
- Dense Non-Aqueous Phase Liquid (DNAPL) Recovery Pilot System Construction and Operation and Maintenance (O&M)



The objective of this HASP is to provide a mechanism for establishing safe working conditions at the site. The safety organization, procedures, and protective equipment have been established based on an analysis of potential physical, chemical, and environmental hazards. Specific hazard control methodologies have been evaluated and selected to minimize the potential of injury, illness, or other incident.

**Task 1: Mobilization/site reconnaissance;**

As part of the mobilization activities, project personnel will walk the site to confirm the existence of anticipated hazards, and identify safety and health issues that may have arisen since the writing of this plan. Site mobilization will also include establishing work areas and sampling locations. A break area will be established outside the regulated work area (i.e., in the support zone).

**Task 2: Subsurface utility location and clearance;**

All utility clearance activities will be performed in accordance to the Con Edison Utility Clearance Process for Intrusive Activities Revision 1, dated October 8, 2003 (Con Edison, October 2003). As part of the utility clearance activities, an initial geophysical survey followed by a removal of surface covers and excavation of a minimum of 5 feet of soil/fill at boring locations will be performed. The geophysical survey will include the use of ground penetrating radar (GPR) and electromagnetic utility locating instruments. The Con Edison Utility Clearance Process Checklist as well as ARCADIS' Underground/Overhead Utility Checklist shall be used to document that nearby utilities have been marked on the ground, and that the drill site has been cleared. Each checklist shall be in the possession of the SS prior to commencement of the intrusive investigation at that point of the site.

The surface cover removal will consist of using power tools to remove concrete and/or asphalt surface covers to expose underlying soil/fill material. Soil/fill material will be removed manually utilizing a decontaminated hand auger or post-hole digger in tandem with a non-conductive probe rod, which can be used to confirm the absence of underground utilities to a minimum depth of 5 feet below the bottom of the interior concrete slab, or vacuum excavation methods.

*Hazards* – Transport and operation of GPR and electromagnetic utility locating equipment and trips/slips/falls are the main hazards associated with the geophysical investigation. The primary physical hazards for this activity are associated with the use of concrete cutting equipment, lifting and awkward posture/repetitive motion,



slips/trips/falls and potential exposure to COCs. Inhalation and absorption of COCs and/or dust, and proximity of operations to the breathing zone are the primary routes of entry associated with manual excavation of potentially impacted subsurface soils. The hazards directly associated with manual hand auguring include strains, sprains, pinching, and potential eye hazards.

Environmental hazards include plants, such as poison ivy and poison oak; aggressive fauna, such as ticks, fleas, mosquitoes, wasps, spiders, rats, and snakes; weather, such as sunburn, lightning, rain, heat and cold-related illnesses; and pathogens, such as rabies, Lyme disease, and blood-borne pathogens.

*Control* – Initially Level D protection will be worn during utility clearance activities. If COCs are encountered, personnel will upgrade to Modified Level D protection to control dermal exposure. If necessary, based on field observations and site conditions, air monitoring may be conducted during utility clearance activities to assess the potential for exposure to airborne COCs. If the results of air monitoring indicate the presence of organic vapors in a concentration causing concern, personnel will upgrade to Level C protection. Section 6.1, Air Monitoring, describes air monitoring requirements and action levels. Each level of PPE is described in Section 5, Personal Protective Equipment. Control procedures for environmental and general hazards are discussed in Section 4, General Safety Practices.

Saw cutting or coring of concrete or asphalt surfacing will not be conducted directly above any dielectric feeder cables (a.k.a. “pipe-type” feeders), regardless of the dielectric feeder cable depth. Vacuum excavation, for utility clearance test pitting purposes, will be accomplished with vacuum excavation equipment that is equipped with a manual (“butterfly” valve) or remote (immediate) electronic vacuum cut-off control that is operational.

### **Task 3: Field Sampling**

Field sampling activities conducted at the site will include the following:

- Soil borings;
- Soil sampling;
- Monitoring / Recovery well install / development;
- Ground water sampling;
- Indoor air, ambient air, sub-slab gaseous sampling; and



- Soil vapor sampling.

### **Task 3.1: Installation of soil borings;**

Hollow stem auger (HSA), direct push, and rotasonic (Sonic) drilling methods will be used to facilitate the collection of subsurface soil samples.

### **Task 3.2: Soil sampling;**

Soil samples will be collected for subsequent analysis and evaluation of potential impact by COCs.

### **Task 3.3: Groundwater Sampling/Monitoring Well Development**

Groundwater sampling will involve uncapping, purging (pumping water out of the well), sampling, and monitoring new or existing monitoring wells. A mechanical pump may be used to purge the wells; the pump may be hand-, gas-, or electric-operated. Water samples taken from the wells are then placed in containers and shipped to an analytical laboratory for analysis. The physical hazards of these operations are primarily associated with the sample collection methods and procedures used.

### **Task 3.4: Soil vapor sampling;**

Soil vapor sampling will include the collection of indoor air, ambient air, and sub-slab gaseous samples. The physical hazards of these operations are primarily associated with the sample collection methods and procedures utilized.

### **Task 4: Management of investigation derived waste (IDW);**

Most sampling activities will generate waste that will be managed in 55-gallon steel drums or roll-off dumpsters. Types of waste will include drill cuttings, decontamination fluids, groundwater development and liquids, sampling material, personal protective equipment (PPE) and general work-related refuse. The physical hazards of these operations are primarily associated with moving and storing the steel drums. In addition, personnel may be exposed to hazards associated with working near heavy equipment and exposure to COCs during disposal characterization sampling. Disposal of IDW by Con Edison-approved vendors will occur on an as-needed basis, based on available storage space and work location. IDW pickups will be conducted at least



once per week for waste stored on the New York City Housing Authority property. Vendors transporting waste from the site will either transport the materials directly to the disposal facility or to a permitted temporary storage facility prior to final disposal. Contaminated soil and groundwater will be characterized using composite sampling at a frequency that is acceptable to the IDW disposal vendor prior to off-site disposal.

**Task 5: Equipment decontamination;**

Equipment/materials decontamination will be performed to control the transfer of COCs from the site. Equipment will be decontaminated by either scrubbing with a mild detergent/citrus solvent or a high pressure steam/wash to remove visible dirt and dust.

**Task 6: Field Demobilization;**

Demobilization involves removing all tools, equipment, supplies, and vehicles brought to the site. The hazards of this phase of activity are associated with heavy equipment operation and manual materials handling.

**Task 7: Land Surveying;**

Land surveying will include the location and measurement of the ground surface and other objects within the investigation area.

**Task 8: Dense Non-Aqueous Phase Liquid (DNAPL) Recovery Pilot System Construction and Operation and Maintenance (O&M)**

A temporary pilot NAPL recovery system will be installed in one well and operated for one month. The system will consist of one pneumatic NAPL recovery pump installed in a well and operated in a semi-automatic (as described below) fashion to pump accumulated NAPL from the well on a weekly basis during the one-month pilot study period.

The specified pilot NAPL recovery pump is a QED Pulse Pump Model LP1301, designed for dense NAPL (DNAPL) recovery in harsh environments. This bottom-loading, gas-displacement type pump will be installed near the bottom of the well, and is capable of pumping NAPL at a rate of up to 2 gallons per minute (GPM). A custom well cap with the appropriate compression fittings will be installed in the pilot recovery well to allow proper installation of the pump and associated air supply and pump discharge tubing. Valves and connection fittings will be installed in the tubing at the



well head to allow periodic operation of the pump using a portable compressed air cylinder. A pneumatic pump controller will be used in the supply air tubing (between the air cylinder and the well head) to provide the proper pulsing of compressed air required for pump operation.

NAPL recovered from the pilot recovery well will be pumped to a portable 55-gallon drum for collection and storage. On a weekly basis during the pilot study period, operating personnel will transport the portable compressed air cylinder, NAPL collection drum, and pump controller (with appropriate tubing and fittings) to the well location. Operating personnel will make the proper connections between the compressed air cylinder, the pump controller and the air supply tubing at the well head, and between the drum and the pump discharge tubing at the well head. The compressed air supply will be turned on, and accumulated NAPL will be pumped from the well into the collection drum until operating personnel observe water being pumped from the well. The collection drum, compressed air cylinder, and pump controller will be properly stored between weekly NAPL removal events during the pilot study period.

## **2.5 Applicable Con Edison Environmental, Health and Safety (EH&S) Policy Guidelines**

A completed Con Edison EH&S Hazard Analysis for Contractor Work and EH&S Hazard Analysis for Contractor Work are provided in Attachment G. The Con Edison Work Plan Guides that are applicable to the planned RI activities are also provided in Attachment G. These work plan guides will be reviewed by site personnel prior to the commencement of site activities covered by the guides.



### **3. ARCADIS Organization and Responsibilities**

#### **3.1 Project Manager/Task Manager**

In planning and preparation of this project, the project manager and/or task manager has completed the project-specific H&S Stewardship Checklist & Project Hazard Analysis Worksheet. The project Hazard Analysis Worksheet was completed using the Hazard Analysis Risk Control (HARC) ranking process (ARCADIS H&S Procedure ARC HSMS002) (see Section 4 of this HASP). Additional responsibilities of the project manager and task manager are as follows:

- Review all applicable H&S Procedures, and ensure that project activities conform to all requirements.
- Obtain client-specific health and safety information and communicate with the client on health and safety issues.
- Communicate with the Site Safety Officer (SSO) on health and safety issues.
- Allocate resources for correction of identified unsafe work conditions.
- Ensure ARCADIS site workers have all training necessary for the project.
- Report all injuries, illnesses and near-misses to the Client H&S Resource or Project H&S Manager (PHSM), lead incident investigations, and ensure that any recommendations made are implemented.

#### **3.2 Other Project Team Responsibilities**

Additional personnel designated to carry out H&S job functions for the project, and their responsibilities are listed below. The same person may fill more than one role:



ARCADIS Project Team	Responsibility and Tasks
Craig Massaro	<p><b>SSO</b></p> <ul style="list-style-type: none"> <li>• Reviews and works in accordance with the components of this HASP.</li> <li>• Ensures that this HASP is available to and reviewed by all site personnel including subcontractors.</li> <li>• Ensures that necessary site-specific training is performed (both initial and “tailgate” safety briefings).</li> <li>• Ensures site visitors have been informed of the hazards related to ARCADIS work, and have signed the Site Visitors Log.</li> <li>• Ensures that work is performed in a safe manner and has authority to stop work when necessary to protect workers and/or the public.</li> <li>• Coordinates activities during emergency situations.</li> <li>• Ensures that all necessary permits and safety information provided by the client is disseminated to other site personnel and is maintained in an organized manner.</li> <li>• Communicates with the PM, Client H&amp;S Resource and/or the PHSM on health and safety issues.</li> <li>• Reports all injuries, illnesses and near-misses to the PM, Client H&amp;S Resource and PHSM.</li> <li>• Ensures that necessary safety equipment is maintained and used at the site.</li> <li>• Contacts a health and safety professional for assistance in establishing the respiratory cartridge change schedule as required.</li> </ul>
Craig Massaro, Rolando Arco, Jeremy Cuccuini, Greg Pintauro	<p><b>Site Workers</b></p> <ul style="list-style-type: none"> <li>• Reads and works in accordance with the components of this HASP.</li> <li>• Reports all unsafe working conditions to the SSO.</li> <li>• Reports all injuries, no matter how minor, to the SSO.</li> <li>• Works in a safe manner.</li> <li>• Signs the HASP acceptance log in Appendix E.</li> </ul>



ARCADIS Project Team	Responsibility and Tasks
Chuck Webster	<p><b>Project Health and Safety Manager (PHSM)</b></p> <p>The PHSM oversees all aspects of the site safety program, and prepares site-specific health and safety guidance documents or addenda to this plan. The PHSM does not report to the Project Manager, and is separately accountable to the ARCADIS project team for site health and safety. The PHSM acts as the sole contact to regulatory agencies on matters of safety and health. Other responsibilities include:</p> <ul style="list-style-type: none"> <li>• Overall authority for health and safety compliance and HASP conformance for the project.</li> <li>• General health and safety program administration.</li> <li>• Conducts project health and safety audits as warranted.</li> <li>• Determines the level of personal protection required.</li> <li>• Updates equipment or procedures based on information obtained during site operations.</li> <li>• Establishes air-monitoring parameters based on expected contaminants.</li> <li>• Assists in injury, illness and near-miss investigations and follow-up.</li> </ul>
Chuck Webster	<p><b>Client Health and Safety Resource</b></p> <p>The designated Client H&amp;S Resource is responsible for :</p> <ul style="list-style-type: none"> <li>• Assisting the SSO in issues as they arise.</li> <li>• Performing site audits and assessments.</li> <li>• Assisting with near-miss/incident investigations.</li> <li>• Serves as the liaison with corporate during H&amp;S regulatory issues as they may arise.</li> </ul>



## 4. Hazard Control

### 4.1 Project Hazard Analysis Worksheet

Preparation of the Project Hazard Analysis Worksheet in Appendix B is critical in determining the hazards associated with the scope(s) of work at this project site. The project team should identify and document the general tasks to be completed at the project site (i.e., groundwater monitoring and sampling, soil sampling, monitoring well installation, excavation, remediation system operation and maintenance, etc.) on the “Hazard Analysis” tab of the worksheet. Using the HARC-Risk Assessment Matrix (Figure 1) as a guide, the project development team should evaluate the hazards associated with each scope of work, document controls for each hazard and combine them on the “Hazard Analysis” tab of the worksheet.

Figure 1. HARC- Risk Assessment Matrix (H&S Procedure ARC HSMS002)

Risk Assessment Matrix		Likelihood Ratings**				
Consequences Ratings*		A	B	C	D	E
People	Property	Never heard of in the world	Heard of incident in industry	Incident has occurred in ARCADIS Group	Happens several times a year in ARCADIS OpCo	Happens several times a year at ARCADIS Worksite
0 - No health effect	0 - No damage	Low	Low	Low	Low	Low
1 - Slight health effect	1 - Slight damage	Low	Low	Low	Low	Low
2 - Minor health effect	2 - Minor damage	Low	Low	Low	Medium	Medium
3 - Major health effect	3 - Local damage	Low	Low	Medium	Medium	High
4 - PTD or 1 fatality	4 - Major damage	Low	Medium	Medium	High	High
5 - Multiple fatalities	5 - Extensive damage	Medium	Medium	High	High	High

### 4.2 Job Loss Analyses (JLAs), H&S Procedures and PPE

A JLA has been completed for each safety critical task, and are included in Appendix C. Hazards identified on the Project Hazard Analysis Worksheet are addressed in the JLAs as well as control methods to protect employees and property from hazards. The JLA also lists the type of personal protective equipment (PPE) required for the completion of the project. A detailed list of PPE for the project is located in Appendix D.



ARCADIS H&S Procedures applicable to this project are listed below. These procedures should be reviewed by the project manager, task manager and site personnel. The Client H&S Resource should be contacted with any questions concerning the procedures.

- ARC HSFS019 – Utility Location
- ARC HSCS005 – Excavation and Trenching
- ARC HSIH003 – Benzene

#### **4.3 Field Health & Safety Handbook**

The Field H&S Handbook is an ARCADIS document containing information about topic-specific health and safety requirements for the field. This handbook contains relevant general topics and is used as part of the overall HASP process. To aid in the consistency of the HASP process the handbook will be used as an informational source in conjunction with this HASP. The following four (4) handbook sections are minimally required reading for this project:

- Section III-F. General Housekeeping, Personal Hygiene and Field Sanitation
- Section III-G. Site Security, Work Zone and Decontamination for HAZWOPER Sites
- Section III-GG. HAZWOPER and HAZMAT Response
- Section III-II. Drums and other Material Handling
- Section II-G. Near-miss reporting
- Section II-H. Stop Work Authority
- Section II-M. WorkCare
- Section III-A. Daily Safety Meetings
- Section III-K. Hazard Communication



- Section III-L. Noise
- Section III-M. Heat and Cold Stress
- Section III-N. Biological
- Section III-R. Personal Protective Equipment
- Section III-T. Vehicle Safety Inspection
- Section III-U. Driving
- Section III-Z. Control of Hazardous Energy
- Section III-AA. Electrical Safety (ARC HSF006)
- Section III-CC. Hand and Power Tools
- Section III-HH. Compressed Gas Cylinder Handling, Storage, and Use
- Section III-JJ. Ladders (Portable/Fixed)
- Section III-MM. Utility Location (ARC HSFS017)
- Section III-NN. Backing Safety
- Section IV-D. Excavation/Trenching (ARC HSCS005)
- Section IV-E. Heavy Equipment
- Section IV-Q. Permit to Work



## 5. Hazard Communication (HazCom)

All project required chemicals must be handled in accordance with OSHA 29 CFR 1910.1200, ARCADIS-HazCom Procedure (ARC HSGE007), and the requirements outlined in the Field H&S Handbook. Table 1 lists all chemicals that will be brought and stored on the site. Material Safety Data Sheets (MSDS) for chemicals brought on site are included in Appendix E.

**Table 1. Master Chemical and Storage List**

Chemical Name	Estimated Quantity	Chemical Storage Location
HCL	TBD	Sample containers in coolers
H <sub>2</sub> SO <sub>4</sub>	TBD	Sample containers in coolers
HNO <sub>3</sub>	TBD	Sample containers in coolers
Isopropyl Alcohol	TBD	Decontamination equipment storage area
Degreasers [Simple Green]	TBD	Decontamination equipment storage area

### 5.1 Chemical Hazards

Air monitoring will be conducted as outlined in this HASP to collect exposure data for chemicals of concern (COC) or for chemicals brought onsite for use. Table 2 lists the properties of chemicals that will be encountered at the site.



Table 2. Chemical Hazard Information

Substance [CAS Number]	IP (eV)	Odor Thresh old (ppm)	Route	Symptoms of Exposure	TWA <sup>1</sup>	STEL	Source <sup>2</sup>	IDLH (NIOSH)
Arsenic and soluble inorganic compounds (as As)  [7740-38-2]	NA	NA	Inh  Abs  Ing  Con	Ulceration of nasal septum; dermatitis; gastrointestinal disturbances; hyperpigmentation of skin (carcinogenic); peripheral neuropathy; respiratory irritation	0.01 mg/m <sup>3</sup>   (Ca-29 CFR 1910.101 8)	NE	PEL/TLV	Ca  (5 mg/m <sup>3</sup> )
Benzene   71-43-2	9.24	1.5-5	Inh  Abs  Ing  Con	Irritated eyes, skin, nose, respiratory system; giddiness; headache, nausea, staggered gait; fatigue, anorexia, lassitude; dermatitis; bone marrow depression; <b>carcinogenic</b>	0.5 ppm	2.5 ppm	TLV	500 ppm
Benzo[a]pyrene  (Coal tar pitch volatiles)  50-32-8	NA	NA	Inh  Ing	Irritated eyes, skin, respiratory tract; skin irritation with burning sensation, rash, and redness, dermatitis - <b>carcinogenic</b>	0.2 mg/m <sup>3</sup> *  *Benzene soluble frac.  **Cyclohexane extractable frac.	NE	PEL	80 mg/m <sup>3</sup>



Substance [CAS Number]	IP (eV)	Odor Thresh old (ppm)	Route	Symptoms of Exposure	TWA <sup>1</sup>	STEL	Source <sup>2</sup>	IDLH (NIOSH)
Cadmium dust (as Cd)  [7440-43-9]	NA	NA	Inh  Ing	Pulmonary edema, dyspnea, cough, chest tightness, substernal pain; headache; chills, muscular aches; nausea, vomiting, diarrhea; anosmia, emphysema, proteinuria, mild anemia – carcinogenic	0.005 mg/m <sup>3</sup>	NA	PEL	9 mg/m <sup>3</sup>
Chromium metal (as Cr)  [7440-47-3]	NA	NA	Inh  Ing	Histologic fibrosis of lungs	0.5 mg/m <sup>3</sup>	NA	TLV	250 mg/m <sup>3</sup>
Cyanides: calcium, potassium, and sodium  [592-01-8; 151- 50-8; 143-33-9]	NA	ND	Inh  Abs  Ing  Con	Asphyxiation and death can occur; weakness, headache, and confusion; nausea and vomiting; increased respiratory rate; slow respiratory gasping; irritated eyes and skin	5 mg/m <sup>3</sup>	C5 mg/m <sup>3</sup> *  *10 min	PEL/TLV	50 mg/m <sup>3</sup>
Fluorene  [86-73-7]			Inh  Con	It is irritating to the skin, eyes, and respiratory tract.	NE	NA	NA	NA
Ethylbenzene  [100-41-4]	8.76	0.09-0.6	Inh  Ing  Con	Irritated eyes, mucous membranes; headache; dermatitis; narcosis, coma	100 ppm	125 ppm	PEL/TLV	800 ppm



Substance [CAS Number]	IP (eV)	Odor Thresh old (ppm)	Route	Symptoms of Exposure	TWA <sup>1</sup>	STEL	Source <sup>2</sup>	IDLH (NIOSH)
Lead, inorganic dusts and fumes (as Pb)  [7439-92-1]	NA	NA	Inh  Ing  Con	Weakness, lassitude, insomnia; facial pallor; eye pallor; anorexia, low weight, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremors; wrist and ankle paralysis; brain damage; kidney damage; irritated eyes; hypotension	0.05 mg/m <sup>3</sup>  See 29 CFR 1910.102 5	NA	PEL/TLV	100 mg/m <sup>3</sup>
Mercury vapor  [7439-97-6]	ND	ND	Inh  Abs  Con	Coughing, chest pain, dyspnea, bronchial pneumonitis; tremors, insomnia; irritability, indecision; headache; fatigue, weakness, stomatitis, salivation; gastrointestinal disturbance, anorexia, low weight; proteinuria; irritated eyes and skin	0.025 mg/m <sup>3</sup>	C0.1 ppm	TLV	2 mg/m <sup>3</sup>
Naphthalene  [91-203]	8.12	ND	Inh  Abs  Ing  Con	Irritated eyes; headache; confusion, excitement, malaise; nausea, vomiting, abdominal pain; irritated bladder, profuse sweating; jaundice, renal shutdown; dermatitis	10 ppm	15 ppm	PEL/TLV	250 ppm
Toluene	8.82	0.16-37	Inh  Abs	Fatigue, weakness; confusion, euphoria, dizziness; headache; dilated pupils, lacrimation;	20 ppm	300 ppm	TLV	500 ppm



Substance [CAS Number]	IP (eV)	Odor Thresh old (ppm)	Route	Symptoms of Exposure	TWA <sup>1</sup>	STEL	Source <sup>2</sup>	IDLH (NIOSH)
[108-88-3]			Ing Con	nervousness, muscular fatigue, insomnia; paralysis; dermatitis				
Xylene (o-, m-, and p-isomers)  [1330-20-7; 95- 47-6; 108-38-3; 106-42-3]	8.56  8.56  8.44	1.1-20	Inh  Abs  Ing Con	Dizziness, excitement, drowsiness, in coordination, staggering gait; irritated eyes, nose, throat; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis	100 ppm	150 ppm	PEL/TLV	900 ppm
Sulfuric acid	NE	0.15 ppm	Inh	Irritated eyes, skin, nose, throat; pulmonary edema; bronchitis emphysema; conjunctivitis; somatis; dental erosion; tracheobronchitis, eye and skin burns	0.2	NA	TLV	PEL
Hydrogen chloride	12.74	0.25- 10.06 ppm	Inh	Irritated nose, throat and larynx; cough, choking, dermatitis; eye and skin burns; liquid frostbite; in animals: lar spasm; pulmonary edema	NA	C 2 ppm (ACGIH)	NA	50 ppm
Nitric Acid	11.95	NA	Inh, Ing, Con	Irritation eyes, skin, mucous membrane; delayed pulmonary edema, pneumonitis, bronchitis; dental erosion	2 ppm	4 ppm	PEL/TLV	25 ppm



Substance [CAS Number]	IP (eV)	Odor Thresh old (ppm)	Route	Symptoms of Exposure	TWA <sup>1</sup>	STEL	Source <sup>2</sup>	IDLH (NIOSH)
Isopropyl Alcohol	10.10	NA	Inh, Ing, Con	Irritation eyes, nose, throat; drowsiness, dizziness, headache; dry cracking skin; in animals: narcosis	400	NA	PEL	2000 (10% LEL)

<sup>1</sup>The TLV (Threshold Limit Value) from the American Conference of Governmental Industrial Hygienists (ACGIH) is listed unless the PEL (Permissible Exposure Limit), designated by OSHA, is lower.

<sup>2</sup>Source = Indicates the source of the TWA

Abs = absorption

C = ceiling limit

Ca = carcinogen

Con = skin and/or eye contact

eV = electron voltage

Ing = ingestion

Inh = inhalation

LEL = lower explosive limit

NA = not available

NE = not established

ppm = parts per million

TWA = time-weighted average

STEL = short-term exposure limit

IDLH = immediately dangerous to life and health

See Section 7 for information on air monitoring requirements.



## **6. Tailgate Meetings**

Tailgate safety briefings will be conducted at least daily at the beginning of the work day, or as tasks/hazards change. Each tailgate safety briefing will be documented on the form included in Appendix E.



## 7. Personal Exposure Monitoring and Respiratory Protection

Personal and area exposure monitoring will be documented on the Real Time Exposure Monitoring Data Form provided in Appendix E. All monitoring equipment will be maintained and calibrated in accordance with manufacturer's recommendations. All pertinent monitoring data will be logged on the form and maintained on site for the duration of project activities. Calibration of all monitoring equipment will be conducted daily and logged on the same form.

Table 3 lists exposure monitoring requirements and associated action levels for site exposure hazards (e.g. chemical, noise, radiation, etc).

**Table 3. Exposure Monitoring Requirements**

<p>TASKS 1, 2, 4, 5, 6, 7, and 10 – Field mobilization/site reconnaissance, Subsurface utility location and clearance; Management of investigation derived waste (IDW); Equipment decontamination; Demobilization; and Land surveying respectively.</p> <p>Is exposure monitoring required for the completion of this project?</p> <p><input type="checkbox"/> YES <input checked="" type="checkbox"/> NO If yes, complete the following:</p>				
Exposure Hazard	Monitoring Equipment	Monitoring Frequency	Action Level	Required Action

<p>TASKS 3.1, 3.2, 3.3, 3.4, 8 – Installation of soil borings; Soil sampling; Groundwater sampling/Monitoring well development; Soil vapor sampling; Dense Non-Aqueous Phase Liquid (DNAPL) Recovery Pilot System Construction and Operation and Maintenance (O&amp;M); respectively.</p> <p>Is exposure monitoring required for the completion of this project?</p> <p><input checked="" type="checkbox"/> YES <input type="checkbox"/> NO If yes, complete the following:</p>				
Exposure Hazard	Monitoring Equipment	Monitoring Frequency	Action Level	Required Action



<p>TASKS 3.1, 3.2, 3.3, 3.4, 8 – Installation of soil borings; Soil sampling; Groundwater sampling/Monitoring well development; Soil vapor sampling; Dense Non-Aqueous Phase Liquid (DNAPL) Recovery Pilot System Construction and Operation and Maintenance (O&amp;M); respectively.</p> <p>Is exposure monitoring required for the completion of this project?</p> <p><input checked="" type="checkbox"/> YES <input type="checkbox"/> NO If yes, complete the following:</p>				
Exposure Hazard	Monitoring Equipment	Monitoring Frequency	Action Level	Required Action
Total Hydrocarbons	Photo ionization detector (11.7 eV lamp required)	Continuous in breathing zone	<p>Background <math>\leq</math> 0.5 ppm</p> <p>&gt; 0.5 ppm, <math>\leq</math> 20 ppm</p> <p>&gt; 20 ppm</p> <p>&gt; 200 ppm</p>	<p>Normal operations</p> <p>Begin Monitoring for benzene with colorimetric tubes (If benzene is not detected continue normal operations)</p> <p>Upgrade to level C PPE</p> <p>Stop work and investigate cause of reading; contact ARCADIS PHSM</p>
Benzene	Colorimetric Tubes	<p>As dictated by total hydrocarbons action level above</p> <p>(Every 15 minutes while Total Hydrocarbons &gt; 0.5 ppm, <math>\leq</math> 20 ppm)</p>	<p>Background <math>\leq</math> 0.5 ppm</p> <p>&gt; 0.5 ppm, &lt;5.0 ppm</p> <p><math>\geq</math> 5.0 ppm</p>	<p>Normal operations</p> <p>Upgrade to level C PPE (a full-face respirator with combination organic vapor and HEPA cartridges will be used.)</p> <p>Stop work and investigate cause of reading; contact ARCADIS PHSM</p>



In addition to the task specific air monitoring requirements identified above excavation/trenching activities, as part of Task 2, will require the following additional air monitoring.

Exposure Hazard	Monitoring Equipment	Monitoring Frequency	Action Level	Required Action
Dust	Particulate Monitor	Continuous	Contact PHSM if excavation/trenching activities are required	Contact PHSM if excavation/trenching activities are required
Flammable Vapors (LEL)	MultiRAE Plus	Continuous during trenching	< 10% LEL > 10% LEL	Normal operations Stop work, ventilate area, investigate source of vapors
Oxygen	MultiRAE Plus	Continuous during trenching	> 19.5%, < 23.5% < 19.5%, > 23.5%	Acceptable Condition, Normal Operations Stop work; evacuate area
Hydrogen Sulfide	MultiRAE Plus	Continuous during trenching	< 5 ppm > 5 ppm	Normal operations, acceptable conditions Stop work; evacuate area; investigate source of vapors
Carbon Monoxide	MultiRAE Plus	Continuous during trenching	< 25 ppm > 25 ppm	Normal operations, acceptable condition Stop work; evacuate area; investigate source of vapors



## 7.1 Community Air Monitoring Plan

ARCADIS has prepared a Community Air Monitoring Plan (Attachment H) which fulfills the requirements set forth by the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan, dated June 2000 (Attachment H, Appendix A). The intent of this CAMP is to provide for a measure of protection of the downwind communities from potential airborne releases of constituents of concern during RI activities. As such, this CAMP specifies the potential air emissions, as well as the air monitoring methods, action levels, and abatement measures that will be implemented during RI activities at the site.

As required by the NYSDOH CAMP, ambient air monitoring will be implemented at the site for total volatile organic compounds (VOCs) and particulate matter less than 10 microns in diameter (PM10). Air monitoring will occur during any site activity that may generate dust emissions. Total VOCs and PM10 levels in ambient air will be continuously measured in real-time using portable instruments. The sample location rationale, sample methods, action levels, and abatement procedures are discussed below.

### Sampling Location Selection

One upwind and one downwind air monitoring sample location will be selected based on the established work zone area, proximity to potential community receptors, and the prevailing wind direction. In general the initial air monitoring stations will be located along the perimeter of the work zone as defined in the site health and safety plan (HASP). If VOC or PM10 action levels (discussed below) are exceeded at the downwind work zone perimeter, then the downwind air monitoring location will be moved to the nearest downwind community receptor.

Note that the upwind and downwind air monitoring locations may change throughout the day based on changes in wind direction and work zone areas.

### Sampling Methods

Total VOCs in ambient air will be monitored and recorded using a portable organic vapor analyzer (OVA) equipped with a photoionization detector (PID) with data-logging capabilities (MiniRae2000 or equivalent). The OVA-PID will be housed in a watertight shelter attached to a tripod and set at a height of approximately five feet above the



ground. Total VOC levels will be measured continuously and recorded at 15-minute average intervals.

PM10 levels in ambient air will be monitored and recorded using a portable dust monitor capable of particle size fractionization of less than 10 microns in diameter (TSI Dust TRAK or equivalent). The dust monitor will be housed with the OVA-PID in a watertight shelter attached to a tripod and set at a height of approximately five feet above the ground. PM10 levels will be measured continuously and recorded at 15-minute average intervals.

On-site personnel will monitor the total VOC and PM10 levels within the work zone as part of health and safety plan. If VOC or PM10 levels within the work zone increase then the upwind and downwind perimeter air monitoring stations will be checked at 15-minute intervals to determine if the VOC levels or PM10 are increasing at the work zone perimeter. If the downwind levels are greater than the upwind levels then it will be assumed that the emissions are the result of work zone activities. If the difference between the downwind and upwind VOC or PM10 level is greater than their respective action level (discussed below), monitoring will commence at the nearest downwind community receptor.

#### Action Levels

The action levels provided below are based on the values provided in the NYSDOH generic CAMP and will be used to initiate response actions, if necessary, based on real-time monitoring.

##### 7.1.1 Total VOC Action Levels

The following total VOC action levels and responses, based on the NYSDOH generic CAMP, will be implemented during any RI activity that may generate emissions.

- If the ambient air concentration of total VOCs exceeds 5 parts per million (ppm) above the background (upwind location) for the 15-minute average, intrusive site activities will be temporarily halted while monitoring continues. If the total VOC concentration readily decreases (through observation of instantaneous readings) below 5 ppm above background, then intrusive site activities will resume with continuous monitoring.



- If the ambient air concentrations of total VOCs persist at levels in excess of 5 ppm above background but less than 25 ppm above background, intrusive site work activities will be halted, the source of the elevated VOC concentrations identified, corrective actions to reduce or abate the emissions undertaken, and air monitoring will continue. Once these actions have been implemented, intrusive site work activities will resume provided the following two conditions are met.
  - The 15-minute average VOC concentrations remain below 5 ppm above background; and
  - The VOC level 200 feet downwind of the sample location or half the distance to the nearest potential receptor or residential/commercial structure (whichever is less but in no case less than 20 feet) is below 5 ppm over background for the 15-minute average.
- If the ambient air concentrations of total VOCs are above 25 ppm above background, intrusive site activities will stop and emission control measures will be implemented.

#### 7.1.2 PM10 Action Levels

The following PM10 action levels and responses, based on the NYSDOH generic CAMP, will be implemented during any RI activity that may generate emissions.

- If the average ambient air concentration of PM10 at any one (or more) of the sampling locations is noted at levels in excess of 100 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) above the background (upwind location) for the 15 minute interval, or if airborne dust is observed leaving the work area, intrusive site activities will be temporarily halted. The source of the elevated PM10 concentration is to be identified, corrective actions to reduce or abate the emissions will be undertaken, and air monitoring will continue. Work may continue following the implementation of dust suppression techniques provided the PM10 levels do not exceed 150  $\mu\text{g}/\text{m}^3$  above background, provided no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, PM10 levels are greater than 150  $\mu\text{g}/\text{m}^3$  above background, work will stop and site activities will be re-evaluated. Work will only resume after dust suppression measures and other controls are implemented and PM10 levels are less than 150  $\mu\text{g}/\text{m}^3$  above background and no visible dust is migrating from the work area.



### Emission Control Measures

The following emission control measures may be used if action levels are exceeded during RI activities:

- Apply water to exposed soil/material piles.
- Cover excavated soil/material piles with polypropylene sheeting or other appropriate material.
- Reduce surface area of exposed material/soil area.
- Containerize excavated material/drill cuttings.
- Stop drilling and cover borehole.
- Implement whatever methods are necessary to eliminate continuing emissions that could occur after site work ceases.

### Meteorological Monitoring

Wind direction and wind speed be monitored and recorded at least once per hour during intrusive sampling activities. Wind direction will be determined using a windsock, wind vane, multi-purpose wind meter, or other appropriate equipment. Wind speed will be determined using a handheld wind speed meter.

### Instrument Calibration

Calibration of the VOC and PM10 instrumentation will occur in accordance with each of the equipment manufacturer's calibration and quality assurance requirements. The VOC and PM10 monitors will be calibrated at least daily, and calibrations will be recorded in the field activity logbook.

### 7.2 Respirator Cartridge Change Schedule

With the exception of protection against particulates\*, if the action plan outlined above calls for an upgrade to an air-purifying respirator (for protection against organic vapors and other gaseous chemicals), the following will apply:

- The respirator cartridge will be equipped with an end-of-service-life indicator (ESLI) certified by NIOSH for the contaminant; or



- If there is no ESLI appropriate for a contaminant, the project will implement a change schedule for cartridges to ensure that they are changed before the end of their service life.

In general, air-purifying respirator cartridges must be replaced at the expiration of its service life or at the end of each shift, whichever comes first. If an exposure to any one of the organic vapors and other gaseous chemicals is in excess of their respective PEL and the cartridge is not equipped with an ESLI, then a Cartridge Change Schedule must be developed. The project's SSO must contact the Client H&S Resource to develop the schedule.

\*Note – A Cartridge Change Schedule is not necessary for cartridges used in the protection against particulates provided that the cartridges are changed out when there is a perceived resistance in breathing experienced by the user.



## **8. Medical Surveillance**

Medical surveillance requirements for the project are provided on the Project Manager/Task Manager H&S Stewardship Checklist & Project Hazard Analysis Worksheet (Appendix B). All medical surveillance requirements as indicated on the worksheet must be completed and site personnel medically cleared before being permitted on the project site.



## 9. General Site Access and Control

The SSO will coordinate access and control security at the work site. As the work dictates, the SSO will establish a work area perimeter. The size of the perimeter will be based on the daily task activities and will be discussed with all project personnel during the tailgate meeting and then documented on the tailgate meeting form. Control zones for Level C or above will be demarcated by either visual or physical devices and will be monitored for effectiveness by the SSO.

Only authorized personnel will be allowed beyond the perimeter. Other site workers and visitors to the site should be kept out of the work site. If visitors need access to the site, the SSO will escort the visitor at all times. All visitors will log in and out with the SSO. The visitor log sheet is included in Appendix E.



## 10. Decontamination Control Zones and Procedures

Part of required reading for this HASP includes reviewing the Field H&S Handbook, Section III-G Site Security, Work Zones and Decontamination for HAZWOPER site zones. The decontamination procedures outlined in the Field H&S Handbook are provided for typical Level D and Level C ensembles.

The zones for Level C and above will be designated by traffic cones, barricades, signs, caution tape, or other means effective in identifying the different areas. The SSO will establish control boundaries for the exclusion zone, contamination reduction zone, and the support zone. The zones will be identified by the SSO during tailgate meetings and documented on the meeting form. Entrance and exit to the exclusion zone will only be through controlled access points established for each work area.



## **11. Emergency Action Plan (EAP)**

In the event that an injury, over-exposure or spill has occurred, an EAP will be implemented. Appendix F provides the EAP and notifications for the project. All employees working on this project must be shown the location and proper use of all emergency equipment prior to beginning work on the project.



## **12. Client-Specific Health and Safety Requirements**

ARCADIS project personnel must comply with the client's specific H&S requirements at all times. To meet this requirement ARCADIS has completed Con Edison EH&S Hazard Analyses for Contractor Work and EH&S Hazard Analysis for Contractor Work. These are provided in Attachment G. The Con Edison Work Plan Guides that are applicable to the planned RI activities are also provided in Attachment A. These work plan guides will be reviewed by site personnel prior to the commencement of site activities covered by the guides.



### **13. Department of Transportation (DOT) Dangerous Goods Shipping Requirements**

ARCADIS has policies in place for transporting small quantities of hazardous materials and for offering for shipping via ground or air. These policies are designed to meet the applicable requirements. As such, only ARCADIS staff that have been trained in the proper methods to prepare and ship hazardous materials are authorized to do so. Tasks associated with the packaging, labeling, marking, and preparation of hazardous materials for shipping or transport must have all appropriate and applicable training.

#### **13.1 Materials of Trade (MOT)**

DOT allows for a small amount of hazardous materials that are used in or an inherent part of our work to be transported in company vehicles. This includes things like gasoline, paint, small compressed gas cylinders, calibration gas, etc. To transport these:

- Staff will complete Materials of Trade training.
- Vehicles used in transportation to and from off-site work locations will be in conformance with ARCADIS vehicle safety procedures.

Hazardous materials will be transported as described above as a result of the activities covered in this HASP. Site personnel who transport materials mentioned above will complete the Hazardous Materials Transportation Form included in Appendix E.

#### **13.2 Department of Transportation**

Staff who collect, prepare, package, mark, label, complete shipping declarations, offer shipments to a transporter, directly transport or are engaged in other activities associated with the transportation of Hazardous Materials (referred to as Dangerous Goods in Canada and by the International Air Transport Association [IATA]) will have appropriate and applicable training. DOT requires all individuals who participate in hazmat shipping including activities such as completing the paperwork (but not signing it), filling a container with a hazardous material (including filling a drum with drill cuttings or purge water), marking, labeling, and packaging the hazardous material, etc., have awareness level training on the DOT requirements. DOT requires additional job function training for those who conduct specific activities including:



- Staff who have to sign shipping papers or manifests, are listed as the 24-hour emergency contacts on shipping and have the responsibility for identifying, classifying, packaging, marking, and labeling HazMat packages, and/or are directing or overseeing others who do these tasks will become certified through the completion of additional training.
- The above training allows the offering employee to ship only by ground. If the shipment is to be offered for air transport, additional training is required.

Shipments as described above will be made as a result of the activities covered in this HASP. Site personnel shipping hazardous materials will complete the Hazardous Materials Shipment Form included in Appendix E.



#### 14. Loss Prevention System™ (LPSTM) and Loss Prevention Observations (LPOs)

As part of any project, no matter how simple or complex, LPOs should be conducted when practical and when able to integrate into normal business activities. LPOs should be scheduled based on the risk of the tasks being performed, and should be conducted for different tasks and at different times. Completion of LPOs should be documented on the tailgate meeting form.

Identified Task for LPO	Schedule Date	Observer Name	Observee Name	Feedback Supervisor Name



## 15. Subcontractors

A copy of this HASP is to be provided to all subcontractors prior to the start of work so that the subcontractor is informed of the hazards at the site. While the ARCADIS HASP will be the minimum health and safety requirements for the work completed by ARCADIS and its subcontractors, each subcontractor, in coordination with ARCADIS health and safety personnel, is expected to perform its operations in accordance with its own HASP, policies and procedures unique to the subcontractor's work to ensure that hazards associated with the performance of the work activities are properly controlled. Copies of any required safety documentation for a subcontractor's work activities will be provided to ARCADIS for review prior to the start of on-site activities.

In the event that the subcontractor's procedures/requirements conflict with requirements specified in this HASP, the more stringent guidance will be adopted after discussion and agreement between the subcontractor and ARCADIS project health and safety personnel. Hazards not listed in this HASP, but known to the subcontractor or known to be associated with the subcontractor's services, must be identified and addressed to the ARCADIS project or task manager and SSO prior to beginning work operations.

If the subcontractor prefers to adopt this HASP, the **"Subcontractor Acknowledgement Memo" must be signed and dated by the subcontractor's management and placed in the project file.** Once the signed memo is received by the project manager, an electronic version of our HASP can be submitted to the subcontractor to use as their own. Subcontractors working at the site will need to have this plan with them, and will also need to sign the Subcontractor HASP receipt signature page of the ARCADIS HASP (Appendix E). Subcontractors are responsible for the H&S of their employees at all times, and have the authority to halt work if unsafe conditions arise.

The Project/Task Manager and SSO (or authorized representative) has the authority to halt the subcontractor's operations and to remove the subcontractor or subcontractor's employee(s) from the site for failure to comply with established health and safety procedures or for operating in an unsafe manner.

All site project personnel will sign the certification signature page provided in Appendix E of this HASP.



### 15.1 Loose Paint

Prior to cutting painted surfaces, the proposed cutting location will be wrapped with a heavy-duty tape (i.e., duct tape or similar). The cut will be performed, and the tape, paint chips, and cuttings will be appropriately disposed of at a Con Edison-approved off-site facility. This procedure provides controls to reduce airborne dust generation and dispersal of paint chips in the work area, to the extent feasible.

Potential health risks associated with loose paint include exposure to lead, polychlorinated biphenyls (PCBs), cadmium and chromium. Unless otherwise determined through characterization sampling, paint chips resulting from cutting work will be handled as hazardous waste. Personnel involved with loose paint handling will use Modified Level D personal protective equipment.

The Con Edison Work Plan Guides for lead and PCB management and welding and burning are included as part of this attachment.



**Appendix A**

HASP Addendum Pages and Log  
Table





### **Addendum Page**

This form should be completed for new tasks associated with the project. The project manager and/or task manager should revise the Project Hazard Analysis Worksheet with the new task information and attach to this addendum sheet. JLAS should be developed for any new tasks and attached as well.

Review the addendum with all site staff, including subcontractors, during the daily tailgate briefing, and complete the tailgate briefing form as required. Attach a copy of the addendum to all copies of the HASP including the site copy, and log in the Addendum Log Table A-1 on the next page.

Addendum Number: \_\_\_\_\_ Project Number: \_\_\_\_\_

Date of Changed Conditions: \_\_\_\_\_ Date of Addendum: \_\_\_\_\_

#### **Description of Change that Results in Modifications to HASP:**

Signed: \_\_\_\_\_  
Project Manager

Signed: \_\_\_\_\_  
Site Safety Officer

Signed: \_\_\_\_\_  
H&S Plan Writer

Signed: \_\_\_\_\_  
H&S Plan Reviewer





### Addendum Log Table

Addendums are to be added to every copy of the HASP, and logged on Table A-1 to verify that all copies of the HASP are current:

Table A-1 Addendum Log Table

Addendum Number	Date of Addendum	Reason for Addendum	Person Completing Addendum
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			



Appendix **B**

Project Hazard Analysis Worksheet



# ARCADIS US Project Manager and Task Manager/Principal-In-Charge H&S Stewardship Checklist

## Project Hazard Analysis Page

<b>Project Name:</b>	<b>West 18th Street Gas Works</b>	<b>Project Number:</b>	<b>B0043011.0000</b>
<b>Client:</b>	<b>Consolidated Edison Company of New York, Inc.</b>	<b>Principal-In Charge:</b>	<b>Margaret Carrillo-Sheridan</b>
<b>Project / Task Manager:</b>	<b>Craig Massaro</b>	<b>Completed By:</b>	<b>Craig Massaro</b>
		<b>Date:</b>	<b>1-May-09</b>

## ARCADIS Project Hazard Analysis Worksheet

### TRACK

### Recognize and Assess the Hazards for the Project

For each potential hazard, determine the worst case conditions for the entire project and all of the tasks and assess them using High (H), Medium (M), Low (L). Use the drop down list in each "Assess" cell. If a hazard is not expected on the site, leave the "Assess" box blank.

Physical Hazards:	Recognize the Hazards	Assess	Recognize the Hazards	Assess	List Types of other Physical Hazards Below
	Heat	Medium	Holes/Pits	Low	
	Cold	Low	Ionizing Radiation	Low	
	Noise	Medium	Non-ionizing Radiation	Low	
	Walking/Working surfaces (includes slip/trip/fall & floor/wall openings)	Medium	Electricity	Low	
	Visible Dust	Low	Poor lighting	Low	
	LASER	Low	Severe Weather	Medium	
	Other:		Overhead Hazards	Low	
	Other:		None: Mark with an "X"		

### Control the Hazard: (Briefly describe how the identified hazards will be controlled)

Physical hazards include environmental hazards (weather, heat, etc.), trip and fall, and noise. Physical hazards will be mitigated through thorough hazard identification (proper utility identification and clearance), worker training (id heat related injuries, prevention measures), worker communication (morning tailgate meetings), and procedures (safe distances from trenching, lightning shutdown).



<b>Chemical Hazards:</b>	Flammable/ Combustible	High	Corrosive	Low	<b>List the Names of the Major Chemicals Below</b>
	Compressed gas	Medium	Toxic	High	
	Explosive	Low	Highly toxic	High	
	Organic peroxide	Low	Irritant	Low	
	Oxidizer	Low	Sensitizer	Low	
	Water reactive	Low	Carcinogen	High	
	Unstable reactive	Low	Mutagen	High	
	Dust/Fumes/ Particulates	Low	None: Mark with an "X"		

**C**ontrol the Hazard: (Briefly describe how the identified hazards will be controlled)

Chemical hazards include ingestion and direct contact with coal tar-associated materials. Chemical hazards will be mitigated through

the enforcement of PPE usage, work planning (minimizing worker exposure to contaminated materials), air monitoring, and enforcement of exclusion areas.

<b>Environmental/ Equipment Hazards:</b>	Heavy machinery	Low	Cranes/Hoists/Rigging		<b>List Types of Other Environmental / Equipment Hazards Below</b>
	Trenching/excavation	Medium	Ladders	Low	
	Docks – marine operations	Low	Scaffolding	Low	
	Construction activities	Low	Manlifts	Low	
	Diving operations	Low	Welding	Low	
	Drilling	Low	Gas cylinders	Medium	
	Forklifts	Low	Roadway work	Low	
	Water operations work	Low	Railroad work	Low	
	Heights (fall protection)	Low	Mining work	Low	
	Overhead/ Underground utilities	Low	Energized / Pressurized equip (LO/TO)	Low	
	Confined spaces	Low	Drums and containers	Medium	
	Power tools	Medium	Other		
	Other		None: Mark with an "X"		

**C**ontrol the Hazard: (Briefly describe how the identified hazards will be controlled)

Equipment hazards will include trenching, heavy equipment and vehicle movement at the active parking lot, and the

potential presence of underground utilities. These hazards will be mitigated by following utility clearance procedures, construction planning, mark and maintain safe distances, checking vehicle movement, and equipment inspections.



<b>Biological Hazards</b>	Animal/Human fluids or blood	Low	Contaminated Needles	Low	<b>List Types of Other Biological Hazards Below</b>
	Animal/Human tissue(s)	Low	Live Bacterial Cultures	Low	
	Poisonous/irritating plants	Low	Insects/rodents/snakes	Low	
	Other:		None: Mark with an "X"		
<b>Control the Hazard:</b> (Briefly describe how the identified hazards will be controlled)					
Biological Hazards at the Site are limited to insects. (mosquitoes)					
Worker education and reinforcement at the morning safety meetings is the primary method to control this hazard.					
<b>Ergonomic Hazards</b>	Repetitive motion	Low	Limited movement	Medium	<b>List Types of Other Ergonomic Hazards Below</b>
	Awkward position	Low	Forceful exertions	Low	
	Heavy lifting	Low	Vibration	Low	
	Frequent lifting	Low	Other:		
	Other:		None: Mark with an "X"		
<b>Control the Hazard:</b> (Briefly describe how the identified hazards will be controlled)					
Ergonomic Hazards are primarily limited to the operation of heavy equipment at the Site. Worker education and reinforcement at the morning safety meetings is the primary method to control this hazard.					
<b>Personal Safety/Security</b>	Personal safety	Low	Employees working early/late	Low	<b>List Types of Other Personal Safety / Security Hazards Below</b>
	Security issue	Low	Potentially dangerous wildlife	Low	
	Project site in isolated area	Low	Guard or stray dogs in area	Low	
	Employees working alone	Low	No/limited cell phone service	Low	
	Fatigue	Low	Other:		
	Other		None: Mark with an "X"		
<b>Control the Hazard:</b> (Briefly describe how the identified hazards will be controlled)					
Personal Safety/Security hazards at the Site are related to the potential hostile residents of New York City.					
The hazard will be mitigate by the coordination with worker training, proper sequencing and planning of the work,					
and the use of the buddy system.					



<b>Driving Safety</b>	Driving early/late	Low	City driving	Medium	<b>List Types of Other Driving Hazards Below</b>
	Driving long trips	Low	Pulling a trailer	Medium	
	Driving off-road	Low	ATV driving:	Low	
	Bad weather driving	Medium	Other		
	Other		None: Mark with an "X"		

**Control the Hazard:** (Briefly describe how the identified hazards will be controlled)

Driving hazards at the Site are primarily related to city driving (tight streets and copious civilian and vehicular traffic).

To mitigate the driving hazards we will ensure the ARCADIS employees have received Smith System training. We will discourage employees from traveling to and from the Site very early or very late.

<b>Training Required</b>	40 hour HAZWOPER	Yes	Bloodborne pathogens	No	<b>List Types of Other Training Required Here</b>
	24 hour HAZWOPER	No	Confined space	No	
	HAZWOPER site supervisor	Yes	Lockout/tagout	No	
	OSHA 30 hour Construction	No	Electrical Safety	Yes	
	OSHA 10 hour Construction	No	Fire Extinguishers	Yes	
	PPE	Yes	Fall Protection	No	
	Respiratory protection	No	Noise exposure	No	
	Chemical hygiene	No	Forklifts	No	
	Hazard communication	Yes	Asbestos	No	
	Hazardous waste	Yes	Lead	No	
	First-aid/CPR	Yes	Cadmium	No	
	DOT/IATA hazmat transportation	Yes	SPCC	No	
	MSHA	No	Radiation safety	No	
	Diving	No	Client specific	No	
	FRA	No	None: Mark with an "X"		



<b>Medical Screening</b>	Medical Surveillance Exam (HAZWOPER)	Yes	Other hazardous substance	No	List Types of other Medical Screening Here
	Pulmonary Function Test if wearing respirator and employee not part of HAZWOPER	Yes	Audiometric test if noise is a hazard and employee not part of HAZWOPER	No	
	Client required drug and/or alcohol testing	No	Blood and/or urine screening	No	
	Hepatitis B Immunization (or declination on file)	No	None: Mark with an "X"		

**Keep Safety First In All Things**



Appendix C

JLAs



# Job Loss Analysis

## General

Client Name	GERAGHTY & MILLER
JSA ID	44
Job Name	Environmental-Drilling, soil sampling, well installation
Task Description	drilling with drill rig
Project Number	
Project Name	
PIC Name	
Project Manager	
Status Name	
Creation Date	

## User Roles

Role Name	Employee	Due Date	Completed	Approve	Supervisor	Active Employee	Comments	Comment Date
Created By	T. Altrock	5/15/2009						
Developer								
Developer (Primary Contact)								
HASP Reviewer	C.Webster	5/15/2009						

## Job Steps

Job Step	Job Step Description	Potential Hazard	Critical Action	HSP Reference
1	Set up necessary traffic and public access controls	1 Struck by vehicle due to improper traffic controls	Use a buddy system for placing site control cones and/or signage. Position vehicle so that you are protected from moving traffic. Wear Class II traffic vest	
2	Utility Clearance	1 Potential to encounter underground or aboveground utilities while drilling	Complete utility clearance in accordance with the ARCADIS H&S procedure	ARCADIS H&S Procedure ARCHSFS019
3	General drill rig operation	1 Excessive noise is generated by rig operation.	When the engine is used at high RPMs or soil samples are being collected, use hearing protection.	



		2	During drill rig operation, surfaces will become hot and cause burns if touched, and COCs in the soils more readily vaporize generating airborne contaminates.	Due to friction and lack of a drilling fluid, heat will be produced during this method. Mainly drill augers. Be careful handling split spoons. Wear proper work gloves. When soils and parts become heated, the COC could volatilize. Air monitoring should always be performed in accordance with the HASP.	
		3	Moving parts of the drilling rig can pull you in causing injury. Pinch points on the rig and auger connections can cause pinching or crushing of body parts.	Stay at least 5 feet away from moving parts of the drill rig. Know where the kill switch is, and have the drillers test it to verify that it is working. Do not wear loose clothing, and tie long hair back. Avoid wearing jewelry while drilling. Cone off the work area to keep general public away from the drilling rig.	
		4	Dust and debris can cause eye injury and soil cuttings and/or water could contain COCs.	Wear safety glasses and stay as far away from actual drilling as practicable. Wear appropriate gloves to protect from COCs.	
		5	Drilling equipment laying on the ground (i.e. augers, split spoons, decon equipment, coolers, etc), create a tripping hazard. Water from decon buckets generate mud and cause a slipping hazard.	Keep equipment and trash picked up, and store away from the primary work area.	
		6	The raised derrick can strike overhead utilities, tree limbs or other elevated items	Never move the rig with the derrick up. Ensure there is proper clearance to raise the derrick, and that you are far enough away from overhead power lines. See the Utility Location H&S policy and procedure for guidance.	
4	Mudd rotary drilling	1	The raised derrick can strike overhead utilities, tree limbs or other elevated items	Never move the rig with the derrick up. Ensure there is proper clearance to raise the derrick, and that you are far enough away from overhead power lines. See the Utility Location H&S policy and procedure for guidance.	
		2	This technology uses fluid, which collects with sediments in large basin. Fluid can splash out and cause slipping/mud hazard. Liquid mixture can splash into your eyes.	Wear rubber boots if needed, and keep clear of muddy/wet area as much as practicable. If area becomes excessively muddy, consider mud spikes or covering the area with a material that improves traction. Wear safety glasses.	
5	Hollow stem auger drilling	1	All hazards in step 3 apply. Additionally, The raised derrick can strike overhead utilities, tree limbs or other elevated items	Never move the rig with the derrick up. Ensure there is proper clearance to raise the derrick, and that you are far enough away from overhead power lines. See the Utility Location H&S policy and procedure for guidance.	



6	Air rotary drilling	1	this drilling method works with high air pressure and can generate flying debris that can strike your body or get debris in your eyes.	When the drill rig is being driven into media, it will produce flying debris. The flaps behind the drill rig should stay closed whenever possible to reduce the risk of flying debris. Safety glasses and hard hat should always be worn when the drill rig is operating. When penetrating asphalt protect surrounding cars that may be present to avoid debris damage to paint or windshields.
		2	The raised derrick can strike overhead utilities, tree limbs or other elevated items	Never move the rig with the derrick up. Ensure there is proper clearance to raise the derrick, and that you are far enough away from overhead power lines. See the Utility Location H&S policy and procedure for guidance.
		3	When drilling through bedrock prior to groundwater dust can be produced from pulverization. Inhalation of dusts/powder can occur	Supplemental water should be used to manage dust creation and/or dust masks if necessary.
7	Reverse rotary drilling	1	This method will use fresh water to pump out drill cuttings through the center of the casing. Water/sediment mixture is generated and could cause contact with impacted soils or groundwater	Ensure the pit construction can hold the amount of cuttings that are anticipated. Air monitoring should also be used in pit area
		2	Fire hydrants are often used for water source. Hydrants deliver water at high pressure. Pressurized water can cause flying parts/debris and excessive slipping hazards.	Water usage from fire hydrants should be cleared with local municipalities prior to use. Only persons that know how to use the hydrant should be performing this task. Ensure all connections are tight, and hose line is not run over to cut by traffic. Any leaks from the hydrant should be reported immediately.
		3	Settling pit construction can cause tripping hazard from excavated soils, and plastic sheeting can cause slipping.	Cone off the area to keep the general public/visitors away from the settling pit. Ensure proper sloping of excavation.
		4	The raised derrick can strike overhead utilities, tree limbs or other elevated items	Never move the rig with the derrick up. Ensure there is proper clearance to raise the derrick, and that you are far enough away from overhead power lines. See the Utility Location H&S policy and procedure for guidance.



8	Rotosonic drilling	1 Fire hydrants are often used for water source. Hydrants deliver water at high pressure. Pressurized water can cause flying parts/debris and excessive slipping hazards.	Water usage from fire hydrants should be cleared with local municipalities prior to use. Only persons that know how to use the hydrant should be performing this task. Ensure all connections are tight, and hose line is not run over or cut by traffic. Any leaks from the hydrant should be reported immediately	
		2 This method requires a lot of clearance. The drill head can turn 90 degrees to attach to the next drill flight or casing. This usually requires a large support truck to park directly behind the rig. As the drill head raises the new casing flight is angled down at the same time until it can be turned completely vertical.	Ensure sufficient overhead clearance.	
		3 Heavy lifting of cores can cause muscle strain.	Always use 2 people to move core containers. Use caution moving core samples to layout area. Plan layout area to ensure adequate aisle space between core runs for logging. Keep back straight and use job rotation.	
		4 The rotosonic drill head can move very quickly up and down while working on a borehole. Moving parts can strike someone or catch body parts	The operator and helper must communicate and stay clear of the path of the drill head. The drill utilizes two large hydraulic clamps to continuously hold casings while load/unloading previous casings. Do not wear loose clothing.	
9	Direct push drilling	1 The drill rods will be handled by workers most of the time rather than the rig doing it, therefore pinch points can cause lacerations and crushing of fingers/body parts.	Keep a minimum of 5 feet away from drill rig operation and moving parts.	
		2 The direct push rigs are usually meant to fit in spaces where larger rig can't. Tight spaces can pin workers.	Do not put yourself between the rig and a fixed object. Use Spotters or a tape measure to ensure clearances in tight areas. Pre-plan equipment movement from one location to the next.	
		3 some direct push equipment is controlled by wireless devices. These controls can fail and equipment can strike workers or cause damage to property.	The drill rig should be used in a large open area to test wireless controls prior to moving to boring locations. The operator of the rig will test the kill switch with wireless remote prior to use. Operator will stay in range of rig while moving so that wireless signal will not be too weak and cause errors to the controls.	



		4	Sampling sleeves must be cut to obtain access to soil. Cutting can cause lacerations.	Preferably let the driller cut the sleeves open. Many drillers have holders for the sleeve to allow for stability when cutting. If we cut the sleeves, use a hook blade, change blade regularly, and cut away from the body.	
10	Sample collection and processing	1	Injuries can result from pinch points on sampling equipment, and from breakage of sample containers.	Care should be taken when opening sampling equipment. Look at empty containers before picking them up, and do not over-tighten container caps. Use dividers to store containers in the cooler so they do not break. Wear cut-resistant gloves under nitrile when working with VOA bottles	
		2	lifting heavy coolers can cause back injuries	Use two people to move heavy coolers. Use proper lifting techniques.	
11	Monitoring well installation	1	Same hazards as in Step 3 with general drill rig operation	See step 3	
		2	monitoring well construction materials can clutter the work area causing tripping hazards.	Well construction materials should be picked up during the well installation process.	
		3	Heavy lifting can cause muscle strains, and cutting open bags can cause lacerations.	Well construction materials are usually 50 lbs or greater. Team lift or use drill rig to hoist bags. Always use work gloves while cutting open bags.	
		4	Well pack material (i.e. sand, grout, bentonite) can become airborne and get in your eyes.	Wear safety glasses for protection from airborne sand and dust.	
		5	Cutting the top of the well to size can cause jagged/sharp edges on the top of the well casing.	Wear gloves when working with the top of the well casing, and file any sharp jagged edges that resulted from cutting to size.	
12	Soil cutting and purge water management	1	Moving full drums can cause back injury, or pinching/crushing injury.	Preferably have the drilling contractor move full drums with their equipment. If this is not practicable, use lift assist devices such as drum dollies, lift gates, etc. Employ proper lifting techniques, and perform TRACK to identify pinch/crush points. Wear leather work gloves, and clear all walking and work areas of debris prior to moving a drum.	



**Personal Protective Equipment**

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	nitrile	Required
	work gloves (specify type)	leather and/or cut-resistant	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Required
Miscellaneous PPE	traffic vest--Class II or III		Required
Respiratory Protection	dust mask		Recommended

**Supplies**

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)		Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
Personal	eye wash (specify type)	bottle	Required
Traffic Control	traffic cones		Required



## Job Loss Analysis

### General

<b>Client Name</b>	GERAGHTY & MILLER
<b>JSA ID</b>	32
<b>Job Name</b>	Environmental-Remediation system DNAPL Recovery Piolet System Installation and O&M
<b>Task Description</b>	System Installation and O&M
<b>Project Number</b>	B0043011.0000
<b>Project Name</b>	West 18th Street Gas Works
<b>PIC Name</b>	
<b>Project Manager</b>	
<b>Status Name</b>	
<b>Creation Date</b>	5/13/2009

### User Roles

Role Name	Employee	Due Date	Completed	Approve	Supervisor	Active Employee	Comments	Comment Date
Created By	T. Altrock	5/15/2009						
Developer (Primary Contact)								
HASP Reviewer	C. Webster	5/15/2009						

### Job Steps

Job Step	Job Step Description	Potential Hazard	Critical Action	HSP Reference
1	General Inspection	1 Slips trips and falls on wet	Wear footwear with ankle support and good tread and	
		2 Insect hazards (wasps, poisonous spiders, etc.) in system structures	Be vigilant for and remove/avoid. Never reach into poorly lit and damp places on the system, especially systems locate din buildings.	
2	Installation of pump	1 Electrical hazards associated with system installation	Follow ARCADIS electrical procedures. Ensure lockout tagout procedures are in place and working area is totally de-energized.	ARC Electrical Safety Procedure



		2 Back strain awkward twisting lowering or raising pump.	Plan activity, use mechanical means of lowering pump if available. Use buddy system if weight >51 pounds or cause awkward twisting of body, do not overexert moving, removing, or placing components and don't hurry through activity.	
		3 Contact with site contaminants	Wear safety glasses and gloves.	
3 Installation of tubing, valves, and compression fittings		1 Cuts from cutting tubing	Wear cut-resistant protective gloves, always cut away from your body and others, use the proper cutting tool.	
		2 Pinch points, cuts, scrapes to hands and fingers	Wear protective gloves that maintain dexterity to perform task. Identify and keep hands and fingers away from pinch hazards	
4 Operation and maintenance of system		1 Electrical hazards associated with system	Follow ARCADIS electrical and Lockout/Tagout procedures. Ensure gloves and footwear worn are electrical safety rated.	ARC Electrical Safety Procedure; LO/TO
		2 Compressed air cylinder	Properly store cylinder, secured in an upright position; post proper signage if flammable; only use in well ventilated areas; use cylinder cage for transporting.	
		3 Contact with site contaminants	Wear safety glasses and nitrile gloves.	
		4 Back strain awkward twisting lowering or raising pump.	Plan activity, use mechanical means of lowering pump if available. Use buddy system if weight >51 pounds or cause awkward twisting of body, do not overexert moving, removing, or placing components and don't hurry through activity.	
		5 Pinch points, cuts, scrapes to hands and fingers	Wear protective gloves that maintain dexterity to perform task. Identify and keep hands and fingers away from pinch hazards	
5 Product transfer		1 Fire explosion hazards from static charges	Ensure all components of the transfer system are grounded and bonded.	
		2 Trip hazards over hoses or piping	Avoid running hose or piping across aisle ways, secure from movement or cover, watch for and avoid walking over hoses and piping.	
		3 Slip hazards on spilled product	Keep spill control readily available during transfer activity, promptly clean up all spill no matter how small.	
		4 Skin eye, inhalation exposure to contaminants	Where PPE protective of skin and eyes, avoid breathing vapors and stay upwind, use air monitoring as required by HASP or O&M Plan.	



		5	lifting buckets/containers of product.	Use proper lifting techniques, if buckets used to collect drips, replace bucket prior to the bucket becoming full to reduce weight needing to be lifted.	
6	Drum handling and management	1	Pinch / crush hazards to hands from drum rings and lids	Wear leather gloves with good grip capability, use drum dollies or automated methods to move full drums, space drums in staging areas where aisle maintained and sufficient space between drums to permit safe ring removal, ease drums into position slowly using buddy system to extent practical. Identify ring and lid hazard during removal, placement and keep hands/fingers clear.	
		2	Foot crush hazards from drum movement	Steel toe boot with good tread and ankle support required., watch foot placement during drum lowering/placement activities. Maintain adequate aisle space so worker can move freely when handling drums maintain good illumination and visibility of floor surface.	
		3	Injury from empty drum lid removal when drum under pressure from temperature changes/lid may blow off	Empty drums under pressure if subject to wide temperature ranges, test for and bleed off any pressure by carefully loosening a bung prior to opening	
		4	muscle strain from moving drums (empty or full)	Keep back straight when shifting drums full drums into position or rotating. Use buddy system to shift, rotate full drums. If automated methods are available take the time to use the method instead of a quick manual movement.	



**Personal Protective Equipment**

Type	Personal Protective Equipment	Description	Required
Dermal Protection	chemical protective suit (specify type)		Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	nitrile	Required
	work gloves (specify type)	leather and/or cut-resistant	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Recommended

**Supplies**

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
	Other	flashlights/lighting	Required
	Spill kit		Required
Personal	eye wash (specify type)		Required



# Job Loss Analysis

## General

Client Name	GERAGHTY & MILLER
JSA ID	38
Job Name	General Industry-Surveying - land
Task Description	land surveying
Project Number	
Project Name	
PIC Name	
Project Manager	
Status Name	
Creation Date	

## User Roles

Role Name	Employee	Due Date	Completed	Approve	Supervisor	Active Employee	Comments	Comment Date
Created By	T. Altrock	5/15/2009						
Developer (Primary Contact)								
HASP Reviewer	C. Webster	5/15/2009						

## Job Steps

Job Step	Job Step Description	Potential Hazard	Critical Action	HSP Reference
1	Site reconnaissance and walk-around	1 Slips/trips/falls can occur from walking on uneven ground surface.	Survey the site upon arrival. Note any site conditions that may pose a potential hazard.	
		2 Site workers or equipment can be struck by site vehicular traffic	Wear Class II traffic vest and cone off the work area. Follow the JLA and Field H&S Handbook for roadway work.	
2	Deployment and retrieval of traffic control devices during roadway work	1 Stuck by vehicles	Face traffic and use spotter if not facing traffic, stay off the travelled roadway to extent practical, wear Class II (minimum) traffic vest. Familiarize yourself with work zone control layout prior to deploying devices.	



		2	Slips trips and falls on uneven road or land surfaces	Do not carry objects that obscure visibility of ground surface when walking, wear footgear with ankle support and good tread, use buddy system when carrying large bulky objects.	
		3	Lifting heavy or bulky signage or traffic channeling device	Break down load to manageable size. Do not over reach to grab cones from the interior of the project vehicle. Use proper lifting techniques, maintain good vehicle housekeeping to easily retrieve control devices. Use buddy system to move heavy objects like barrels.	
		4	Pinch points to hands on folding components of sign stands	Wear leather gloves or other suitable glove. Watch for hazard and avoid placing hands in pinch areas. Do not hurry through setup/take down task.	
6	Removal of manhole covers	1	Pinch points and scrape hazards when removing MH cover.	Do not place fingers under lid during removal, use shovels, pry bars, etc to place under lid edge to lift. Wear sturdy work glove. Wear steel toe boot, do not purposely drop lids.	
		2	Back/neck/arm/shoulder strains and hand blisters could occur from over lifting, or not lifting properly.	Use proper lifting techniques, keep back straight, lift with legs, use "J" Hook or pry bar, Buddy System required	
7	Equipment set-up, calibration and survey of target area	1	Slips/trips/falls can occur from walking on uneven ground surface.	Watch for uneven ground, debris, and trip hazards. If possible clear area of trip hazards. Wear gloves and heavy denim work pants to avoid cuts when working in heavy brush/briers. Use buddy system to spot for uneven ground while surveying.	
8	Placement of stakes	1	Hands/fingers/arms can get struck by hammer/mallet. Splinters and lacerations can occur if stake splinters during hammering.	Wear leather work gloves and safety glasses when placing stakes.	
9	Placement of monuments	1	Back strain from digging holes or mixing concrete	Use proper shoveling techniques and keep back straight, Use right tool for the job.	
		2	Exposure to concrete can cause skin irritation or illness	Wear impermeable glove during mixing and concrete placement, promptly wash exposed skin. Do not use bare hands to mix, place, or finish concrete.	
		3	Inhalation of concrete dust during mixing	Keep face away from concrete when poured out of bag, Promptly wet concrete to be mixed.	



**Personal Protective Equipment**

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	work gloves (specify type)	leather	Required
Head Protection	hard hat		Required
Traffic Protection	Safety vest	Class II	Required

**Supplies**

Type	Supply	Description	Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
Personal	water/fluid replacement		Required
Traffic Control	traffic cones	for roadway surveying	Required



# Job Loss Analysis

## General

Client Name	GERAGHTY & MILLER
JSA ID	45
Job Name	Environmental-Groundwater Sampling
Task Description	groundwater sampling
Project Number	
Project Name	
PIC Name	
Project Manager	
Status Name	
Creation Date	

## User Roles

Role Name	Employee	Due Date	Completed	Approve	Supervisor	Active Employee	Comments	Comment Date
Created By	T. Altrock	5/15/2009						
Developer (Primary Contact)								
HASP Reviewer	C. Webster	5/15/2009						

## Job Steps

Job Step	Job Step Description	Potential Hazard	Critical Action	HSP Reference
1	Stage at pre-determined sampling location and set up work zone and sampling equipment	1 personnel could be hit by vehicular traffic.	Set-up cones and establish work area. Position vehicle so that field crew is protected from site traffic. Unload as close to work area as safely possible.	
		2 Sampling equipment, tools and monitoring well covers can cause tripping hazard.	Keep equipment picked up and use TRACK to assess and changes	
2	Open wells to equilibrate and gauge wells	1 When squatting down, personnel can be difficult to see by vehicular traffic.	Wear Class II traffic vest if wells are located proximal to vehicular traffic. Use tall cones and the buddy system if practicable.	
		2 pinchpoints on well vault can pinch or lacerate fingers	Use correct tools to open well vault/cap. Wear leather gloves when removing well vault lids, and chemical protective gloves while guaging. Wear proper PPE including safety boots, knee pads and safety glasses.	



		3 Lifting sampling equipment can cause muscle strain	Unload as close to work area as safely possible; use proper lifting and reaching techniques and body positioning; don't carry more than you can handle, and get help moving heavy or awkward objects.	
		4 Pressure can build up inside well causing cap to release under pressure	Keep head away from well cap when removing. If pressure relief valves are on well use prior to opening well.	
3	Begin Purging Well and Collecting Parameter Measurements	1 Electrical shock can occur when connecting/disconnecting pump from the battery.	Make sure equipment is turned off when connecting/disconnecting. Wear leather gloves. Use GFCIs when using powered tools and pumps. Do not use in the rain or run electrical cords through wet areas.	
		2 purge water can spill or leak from equipment	Stop purging activities immediately, stop leakage and block any drainage grate with sorbent pads. Call PM to notify them of any reportable spill.	
		3 Water spilling on the ground can cause muddy/slippery conditions	Be careful walking in work area when using plastic around well to protect from spillage	
		4 lacerations can occur when cutting materials such as plastic tubing	When cutting tubing, use tubing cutter. No open fixed blades should ever be used. When possible wear work gloves, leather type.	
		5 purge water can splash into eyes	Pour water slowly into buckets/drums to minimize splashing. Wear safety glasses	
4	Collect GW	1 Working with bailer rope can cause rope burns on hands.	Slowly raise and lower the rope or string for the bailer. Wear appropriate gloves for the task.	
		2 Sample containers could break or leak preservative	Discard any broken sampleware or glass properly. Do not overtighten sample containers. Wear chemical protective gloves	
5	Staging of Well Purge water and/or Free Product	1 Muscle strains can occur when moving purge water or drums	If using buckets, do not fill buckets up to the top. Always keep lid on buckets when traveling or moving them to another location. Only half fill buckets so when dumping	

#### Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)		Required
	work gloves (specify type)	leather	Required
Traffic Protection	traffic vest	Class II	Required
Head Protection	hard hat		Required



Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)		Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
Personal	eye wash (specify type)	bottle	Required
Traffic Control	traffic cones		Required



Appendix **D**

PPE Equipment List



## PPE CHECKLIST

**R** = Equipment required to be present on the site. **O** = Optional equipment. Subcontractors must have the same equipment listed here as a minimum.

Description (Put Specific Material or Type in Box)	Level Of Protection		
	D	C	B
<b>Body</b>			
Coveralls	O	o	
Chemical Protective Suit			
Splash Apron			
Rain Suit			
Traffic Safety Vest (reflective)	R	R	
<b>Head</b>			
Hard Hat (if does not create other hazard)	R	R	
Head Warmer (depends on temperature and	O	O	
<b>Eyes &amp; Face</b>			
Safety Glasses (incorporate sun protection as	R		
Goggles (based on hazard)			
Splash Guard (based on hazard)			
<b>Ears</b>			
Ear Plugs	R	R	
Ear Muffs			
<b>Hands and Arms</b>			
Outer Chemical Resistant Gloves	R	R	
Inner Chemical Resistant Gloves	O	O	
Insulated Gloves	O	O	
Work Gloves*	R	R	
<b>Foot</b>			
Safety Boots (steel toe and shank)			
Rubber, Chemical Resistant Boots			
Rubber Boots			
Disposable Boot Covers			
<b>Respiratory Protection</b>			
1/2 Mask APR			
Full Face APR (combination organic vapor cartridge and HEPA filters)			
Dust Protection			
Powered APR			
SCBA			
Air Line			



Appendix E

Forms and MSDSs





## SITE ACTIVITIES TAILGATE HEALTH & SAFETY BRIEFING FORM

This briefing form documents the tailgate briefing conducted in accordance with the HASP. Personnel who perform work operations on site are required to attend each briefing and to acknowledge receipt of each briefing, at least daily.

Project Number:		Project Name:	
Date:	Time:	Briefing Conducted by:	
Company:		Signature/Title:	

### TRACKING the Tailgate Briefing

**T**hink through the Tasks (list the tasks for the day):

1 _____	3 _____	5 _____	
2 _____	4 _____	6 _____	

**R**ecognize the hazards (check all those that are discussed) and **A**ssess the Risks (Low, Medium, High-circle risk level)

<input type="checkbox"/> Confined Space (L M H) <input type="checkbox"/> Walking/Working surfaces (L M H) <input type="checkbox"/> Thermal Stress (Hot/Cold) (L M H) <input type="checkbox"/> Severe Weather (L M H) <input type="checkbox"/> Hazardous Energy (L M H) <input type="checkbox"/> Ergonomic (L M H) <input type="checkbox"/> Client/Other Site Activities <u>List</u> _____ (L M H) _____ (L M H) _____ (L M H)	<input type="checkbox"/> Buried/Overhead Utilities (L M H) <input type="checkbox"/> Chemical Exposure (L M H) <input type="checkbox"/> Overhead Hazards (L M H) <input type="checkbox"/> Chemical Usage (L M H) <input type="checkbox"/> Heavy Machinery (L M H) <input type="checkbox"/> Personal Safety/Security (L M H) <input type="checkbox"/> Chemical Exposure <u>List</u> _____ (L M H) _____ (L M H) _____ (L M H)	<input type="checkbox"/> Excavation (L M H) <input type="checkbox"/> Noise (L M H) <input type="checkbox"/> Traffic/Roadway/Railway (L M H) <input type="checkbox"/> Elevated work (L M H) <input type="checkbox"/> Biological/Animals (L M H) <input type="checkbox"/> Mining (L M H) <input type="checkbox"/> Other <u>Specify</u> _____ (L M H) _____ (L M H) _____ (L M H)	
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**C**ontrol the hazards (Check all those methods to control the hazards that apply):

<input checked="" type="checkbox"/> <b>STOP WORK AUTHORITY</b> (Must be addressed in every Tailgate meeting-See <i>H&amp;S Handbook</i> for definition)		
<input type="checkbox"/> General PPE Usage <input type="checkbox"/> Personal Hygiene <input type="checkbox"/> Emergency Action Plan <input type="checkbox"/> JSA to be developed/used ( <u>specify</u> ) _____ _____ _____	<input type="checkbox"/> Hearing Conservation <input type="checkbox"/> Exposure Guidelines <input type="checkbox"/> Fall Protection <input type="checkbox"/> LPO conducted ( <u>specify job/JSA</u> ) _____ _____ _____	<input type="checkbox"/> Respiratory Protection <input type="checkbox"/> Decon Procedures <input type="checkbox"/> Work Zones/Site Control <input type="checkbox"/> Other ( <u>specify</u> ) _____ _____ _____

#### Personnel Sign-in List

Printed Name	Signature

### Keep H&S 1<sup>st</sup> in all things

Use the back to add comments such as recent near misses, injuries or property damage, visitors to the site, etc



## SITE ACTIVITIES TAILGATE HEALTH & SAFETY BRIEFING FORM

**Additional Comments:**

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**Discussion of recent results of LPOs conducted on the project:**

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**Discussion of recent Near-miss, injuries, and/or property damage on the project:**

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**List Visitors to Site Today:**

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## Real Time Exposure Monitoring Data Collection Form

Document all air monitoring conducted on the Site below. Keep this form with the project file.

Site Name: \_\_\_\_\_ Date: \_\_\_\_\_

Instrument: \_\_\_\_\_ Model: \_\_\_\_\_ Serial #: \_\_\_\_\_

Calibration Method: (Material used settings, etc.)	
Calibration Results:	
Calibrated By:	

Activity Being Monitored	Compounds/Hazards Monitored	Time	Reading	Action Required? Y/N

**Describe Any Actions Taken as a Result of this Air Monitoring and Why (does it match Table 5-1):**

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## Employee Signature Form

I certify that I have read, understand, and will abide by the safety requirements outlined in this HASP.

[illegible]



### Subcontractor Acknowledgement: Receipt of HASP Signature Form

ARCADIS claims no responsibility for the use of this HASP by others although subcontractors working at the site may use this HASP as a guidance document. In any event, ARCADIS does not guarantee the health and/or safety of any person entering this site. Strict adherence to the health and safety guidelines provided herein will reduce, but not eliminate, the potential for injury at this site. To this end, health and safety becomes the inherent responsibility of personnel working at the site.

[illegible]



## Visitor Acknowledgement and Acceptance of HASP Signature Form

By signing below, I waive, release and discharge the owner of the site and ARCADIS and their employees from any future claims for bodily and personal injuries which may result from my presence at, entering, or leaving the site and in any way arising from or related to any and all known and unknown conditions on the site.

[illegible]



### Hazardous Materials Transportation Form

	Vehicle (place X in box)	Type (pick-up, car, box truck, etc.)
Personal		
Rental		
ARCADIS owned/leased		
Government owned		
Trailer		
Materials Transported	Quantity	Storage/Transport Container

List Trained Drivers:

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**Hazardous Materials Shipment Form**

Material Description and Proper Shipping Name (per DOT or IATA)	Shipment Quantity	DOT Hazard Classification	Shipment Method (air/ground)

List Shipper (i.e., who we are offering the shipment to):

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List Trained Employee(s):

---

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Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

54/60

**Material Name:** Unleaded Petrol

**CAS Number:** 8006-61-9

**Chemical Formula:** Mixture of hydrocarbons

**EINECS Number:** 232-349-1

**ACX Number:** X1003056-5

**Synonyms:** AUTOMOTIVE GASOLINE, LEAD-FREE; GASOLINE; MOTOR FUEL; MOTOR SPIRITS; NATURAL GASOLINE; PETROL; UNLEADED PETROL

**General Use:** Lead free motor fuel for internal combustion engines, 2-stroke and 4-stroke.

## Section 2 - Composition / Information on Ingredients

Name	CAS	%
gasoline	8006-61-9	>90
benzene	71-43-2	5 max.

**OSHA PEL**

**NIOSH REL**

**OSHA PEL Vacated 1989 Limits**

TWA: 300 ppm; 900 mg/m<sup>3</sup>;

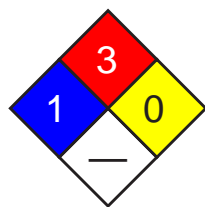
STEL: 500 ppm; 1500 mg/m<sup>3</sup>.

**ACGIH TLV**

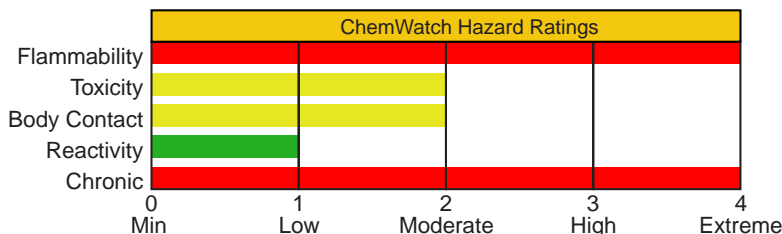
TWA: 300 ppm, 890 mg/m<sup>3</sup>;

STEL: 500 ppm, 1480 mg/m<sup>3</sup>.

## Section 3 - Hazards Identification



Fire Diamond



**ANSI Signal Word**

**Danger!**

HMIS	
2	Health
3	Flammability
1	Reactivity



Flammable

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear liquid; distinctive odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: dizziness, drunkenness, unconsciousness. Chronic Effects: dermatitis. Possible cancer hazard. Flammable.

### Potential Health Effects

**Target Organs:** skin, eye, respiratory system, central nervous system (CNS)

**Primary Entry Routes:** inhalation, ingestion, skin contact



**Acute Effects**

**Inhalation:** The vapor is discomforting to the upper respiratory tract and may be harmful if exposure is prolonged. Inhalation hazard is increased at higher temperatures. Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination. If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.

**WARNING:** Intentional misuse by concentrating/inhaling contents may be lethal. High inhaled concentrations of mixed hydrocarbons may produce narcosis characterized by nausea, vomiting and lightheadedness. Inhalation of aerosols may produce severe pulmonary edema, pneumonitis and pulmonary hemorrhage. Inhalation of petroleum hydrocarbons consisting substantially of low molecular weight species may produce irritation of mucous membranes, incoordination, giddiness, nausea, vertigo, confusion, headache, appetite loss, drowsiness, tremors and anesthetic stupor. Massive exposures may produce central nervous system depression with sudden collapse and deep coma; fatalities have been recorded. Irritation of the brain and/or apneic anoxia may produce convulsions. Although recovery following overexposure is generally complete, cerebral micro- hemorrhage of focal post-inflammatory scarring may produce eleptiform seizures some months after the exposure. Pulmonary episodes may include chemical pneumonitis with edema and hemorrhage. The lighter hydrocarbons may produce kidney and neurotoxic effects. Liquid paraffins may produce anesthesia and depressant actions leading to weakness, dizziness, slow and shallow respiration, unconsciousness, convulsions and death. C<sub>5-7</sub> paraffins may also produce polyneuropathy. Aromatic hydrocarbons accumulate in lipid-rich tissues (typically the brain, spinal cord and peripheral nerves) and may produce functional impairment manifested by nonspecific symptoms such as nausea, weakness, fatigue, vertigo; severe exposures may produce inebriation or unconsciousness. Many of the petroleum hydrocarbons are cardiac sensitizers and may cause ventricular fibrillations.

**Eye:** The liquid may produce eye discomfort and is capable of causing temporary impairment of vision and/or transient eye inflammation, ulceration. The vapor is discomforting to the eyes. Petroleum hydrocarbons may produce pain after direct contact with the eyes. Slight, but transient, disturbances of the corneal epithelium may also result. The aromatic fraction may produce irritation and lachrymation. The material may produce moderate eye irritation leading to inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

**Skin:** The material is moderately discomforting to the skin if exposure is prolonged. The material contains a component that may be absorbed through the skin and may cause drying of the skin, which may lead to dermatitis from repeated exposures over long periods. Toxic effects may result from skin absorption. Open cuts, abraded or irritated skin should not be exposed to this material. The material may accentuate any pre-existing dermatitis condition.

**Ingestion:** Considered an unlikely route of entry in commercial/industrial environments. The liquid may produce gastrointestinal discomfort and may be harmful if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis. Ingestion of petroleum hydrocarbons may produce irritation of the pharynx, esophagus, stomach and small intestine with edema and mucosal ulceration. Resulting symptoms include a burning sensation in the mouth and throat. Large amounts may produce narcosis with nausea and vomiting, weakness or dizziness, slow and shallow respiration, swelling of the abdomen, unconsciousness and convulsions. Myocardial injury may produce arrhythmias, ventricular fibrillation and electrocardiographic changes. Central nervous system depression may also occur. Light aromatic hydrocarbons produce a warm, sharp, tingling sensation on contact with taste buds and may anesthetize the tongue. Aspiration into the lungs may produce coughing, gagging, and a chemical pneumonitis with pulmonary edema and hemorrhage.

**Carcinogenicity:** NTP - Not listed; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Class A3, Animal carcinogen; EPA - Not listed; MAK - Not listed.

**Chronic Effects:** Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes. Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following. Chronic poisoning may occur from vapor inhalation or skin absorption. The most significant toxic effect is insidious and irreversible injury to the blood-forming tissue by benzene. Leukemia may develop. Chronic exposure may cause headache, fatigue, loss of appetite and lassitude with incipient blood effects including anemia and blood changes. Gasoline "sniffing" has caused severe nerve damage. Repeated or prolonged exposure to mixed hydrocarbons may produce narcosis with dizziness, weakness, irritability, concentration and/or memory loss, tremor in the fingers and tongue, vertigo, olfactory disorders, constriction of visual field, paresthesias of the extremities, weight loss and anemia and degenerative changes in the liver and kidney. Chronic exposure by petroleum workers to the lighter hydrocarbons has been associated with visual disturbances, damage to the central nervous system, peripheral neuropathies (including numbness and paresthesias), psychological and neurophysiological deficits, bone marrow toxicities (including hypoplasia, possibly due to benzene) and hepatic and renal involvement. Chronic dermal exposure to petroleum hydrocarbons may result in defatting which produces localized dermatoses. Surface cracking and erosion may also increase susceptibility to infection by microorganisms.



## Section 4 - First Aid Measures

**Inhalation:** Remove to fresh air. Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital, or doctor.

**Eye Contact:** Immediately hold the eyes open and wash continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**Skin Contact:** Immediately remove all contaminated clothing, including footwear (after rinsing with water). Wash affected areas thoroughly with water (and soap if available). Seek medical attention in event of irritation.

**Ingestion:** Contact a Poison Control Center. If swallowed, do NOT induce vomiting. Give a glass of water.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** For acute or short term repeated exposures to petroleum distillates or related hydrocarbons:

1. Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.
  2. Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases ( $pO_2 < 50$  mm Hg or  $pCO_2 > 50$  mm Hg) should be intubated.
  3. Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
  4. A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
  5. Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
- Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
6. Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.

See  
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## Section 5 - Fire-Fighting Measures

**Flash Point:** -43 °C

**Autoignition Temperature:** 280 °C

**LEL:** 1.4% v/v

**UEL:** 7.6% v/v

**Extinguishing Media:** Foam. Dry chemical powder.

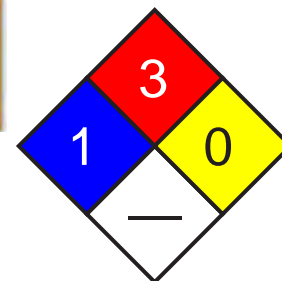
Bromochlorodifluoromethane (BCF) (where regulations permit). Carbon dioxide.

**General Fire Hazards/Hazardous Combustion Products:** Liquid and vapor are highly flammable. Severe fire hazard when exposed to heat, flame and/or oxidizers. Vapor forms an explosive mixture with air. Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition. Heating may cause expansion/decomposition with violent rupture of containers. On combustion, may emit toxic fumes of carbon monoxide (CO).

**Fire Incompatibility:** Avoid contamination with oxidizing agents, i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc., as ignition may result.

**Fire-Fighting Instructions:** Alert fire department and tell them location and nature of hazard. May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or water ways. If safe, switch off electrical equipment until vapour fire hazard removed. Use water delivered as a fine spray to control fire and cool adjacent area. Avoid spraying water onto liquid pools. Do not approach containers suspected to be hot. Cool fire exposed containers with water spray from a protected location. If safe to do so, remove containers from path of fire.

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DOT  
ERG



Fire Diamond

## Section 6 - Accidental Release Measures

**Small Spills:** Remove all ignition sources. Clean up all spills immediately. Avoid breathing vapors and contact with skin and eyes. Control personal contact by using protective equipment. Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

**Large Spills:** Clear area of personnel and move upwind. Alert fire department and tell them location and nature of hazard. May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or water ways. No smoking, naked lights or ignition sources. Increase ventilation. Stop leak if safe to do so.

Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite. Use only

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ERG



spark-free shovels and explosion proof equipment. Collect recoverable product into labeled containers for recycling. Absorb remaining product with sand, earth or vermiculite. Collect solid residues and seal in labelled drums for disposal. Wash area and prevent runoff into drains.

If contamination of drains or waterways occurs, advise emergency services.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

## Section 7 - Handling and Storage

**Handling Precautions:** Avoid generating and breathing mist. Avoid all personal contact, including inhalation. Wear protective clothing when risk of exposure occurs. Use in a well-ventilated area. Prevent concentration in hollows and sumps. DO NOT enter confined spaces until atmosphere has been checked. Avoid smoking, bare lights, heat or ignition sources. When handling, DO NOT eat, drink or smoke. Vapor may ignite on pumping or pouring due to static electricity. DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling. Avoid contact with incompatible materials. Keep containers securely sealed. Avoid physical damage to containers. Always wash hands with soap and water after handling. Work clothes should be laundered separately. Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

**Recommended Storage Methods:** Metal can, metal drum. Packing as recommended by manufacturer. Check all containers are clearly labeled and free from leaks.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear. Use in a well-ventilated area. If inhalation risk of overexposure exists, wear a NIOSH approved organic-vapor respirator. Correct respirator fit is essential to obtain adequate protection. In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus. Provide adequate ventilation in warehouse or closed storage areas.

### Personal Protective Clothing/Equipment:

**Eyes:** Safety glasses with side shields; or as required, chemical goggles.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

**Hands/Feet:** Barrier cream with polyethylene gloves or PVC gloves. Safety footwear. Do NOT use this product to clean the skin.

### Respiratory Protection:

Exposure Range >300 to 1000 ppm: Air Purifying, Negative Pressure, Half Mask

Exposure Range >1000 to 15,000 ppm: Air Purifying, Negative Pressure, Full Face

Exposure Range >15,000 to 300,000 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face

Exposure Range >300,000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Cartridge Color: black

**Other:** Overalls. Ensure that there is ready access to eye wash unit. Ensure there is ready access to an emergency shower.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Purple, highly flammable, volatile liquid with characteristic sharp odor. Floats on water.

Consists of a complex mixture of hydrocarbons with small amounts of residual benzene from the refining operations.

**Physical State:** Liquid

**Vapor Pressure (kPa):** 53.33 at 20 °C

**Vapor Density (Air=1):** > 2

**Formula Weight:** Not applicable.

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 0.72-0.735 at 15 °C

**Evaporation Rate:** Fast

**pH:** Not applicable

**pH (1% Solution):** Not applicable.

**Boiling Point:** 38.89 °C (102 °F)

**Freezing/Melting Point:** Not available

**Volatile Component (% Vol):** 100

**Decomposition Temperature (°C):** Not available.

**Water Solubility:** Insoluble

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Presence of incompatible materials. Product is considered stable.

Hazardous polymerization will not occur.

**Storage Incompatibilities:** Avoid storage with oxidizers.



**Section 11 - Toxicological Information****Toxicity**Oral (rat) LD<sub>50</sub>: 18800 mg/kg**Irritation**

Skin (rabbit): 500 mg/24h mild

**Section 12 - Ecological Information****Environmental Fate:** No data found.**Ecotoxicity:** No data found.**Biochemical Oxygen Demand (BOD):** 8%, 5 days**Section 13 - Disposal Considerations****Disposal:** Consult manufacturer for recycling options and recycle where possible. Follow all applicable federal, state, and local laws. Incinerate residue at an approved site. Recycle containers where possible, or dispose of in an authorized landfill.

BEWARE: Empty solvent, paint, lacquer and flammable liquid drums present a severe explosion hazard if cut by flame torch or welded. Even when thoroughly cleaned or reconditioned, the drum seams may retain sufficient solvent to generate an explosive atmosphere in the drum.

**Section 14 - Transport Information****DOT Hazardous Materials Table Data (49 CFR 172.101):****Shipping Name and Description:** Gasoline**ID:** UN1203**Hazard Class:** 3 - Flammable and combustible liquid**Packing Group:** II - Medium Danger**Symbols:****Label Codes:** 3 - Flammable Liquid**Special Provisions:** 139, B33, B101, T8**Packaging:** Exceptions: 150 Non-bulk: 202 Bulk: 242**Quantity Limitations:** Passenger aircraft/rail: 5 L Cargo aircraft only: 60 L**Vessel Stowage:** Location: E Other:**Section 15 - Regulatory Information****EPA Regulations:****RCRA 40 CFR:** Not listed**CERCLA 40 CFR 302.4:** Not listed**SARA 40 CFR 372.65:** Not listed**SARA EHS 40 CFR 355:** Not listed**TSCA:** Listed**Section 16 - Other Information****Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

54/60

**Material Name:** Nitric Acid

**CAS Number:** 7697-37-2

**Chemical Formula:** HNO<sub>3</sub>

**Structural Chemical Formula:** HNO<sub>3</sub>

**EINECS Number:** 231-714-2

**ACX Number:** X1002177-5

**Synonyms:** ACIDE NITRIQUE; ACIDO NITRICO; AQUA FORTIS; AZOTIC ACID; AZOTOWY KWAS; ENGRAVER'S ACID; ENGRAVERS ACID; HYDROGEN NITRATE; KYSELINA DUSICNE; NITAL; NITRIC ACID; NITRIC ACID OTHER THAN RED FUMING WITH >70% NITRIC ACID; NITRIC ACID OTHER THAN RED FUMING WITH NOT >70% NITRICACID; NITROUS FUMES; NITRYL HYDROXIDE; RED FUMING NITRIC ACID (RFNA); SALPETERSAURE; SALPETERZUUROPOLOSSINGEN; WHITE FUMING NITRIC ACID (WFNA)

**General Use:** Manufacture of organic and inorganic nitrates and nitro compounds for fertilizers, dye intermediates and many organic chemicals.

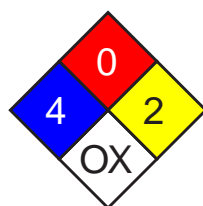
Used for etching and cleaning metals.

Operators should be trained in procedures for safe use of this material.

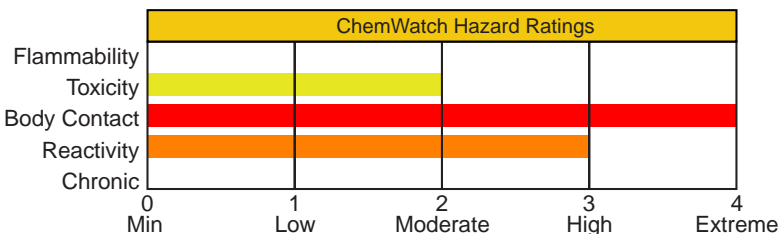
## Section 2 - Composition / Information on Ingredients

Name	CAS	%
nitric acid	7697-37-2	>95
<b>OSHA PEL</b> TWA: 2 ppm; 5 mg/m <sup>3</sup> .	<b>NIOSH REL</b> TWA: 2 ppm, 5 mg/m <sup>3</sup> ; STEL: 4 ppm, 10 mg/m <sup>3</sup> .	<b>DFG (Germany) MAK</b> TWA: 2 ppm; PEAK: 2 ppm.
<b>OSHA PEL Vacated 1989 Limits</b> TWA: 2 ppm; 5 mg/m <sup>3</sup> ; STEL: 4 ppm; 10 mg/m <sup>3</sup> .	<b>IDLH Level</b> 25 ppm.	
<b>ACGIH TLV</b> TWA: 2 ppm; STEL: 4 ppm.		

## Section 3 - Hazards Identification



Fire Diamond



HMIS	
3	Health
0	Flammability
2	Reactivity

ANSI Signal Word

**Danger!**



Corrosive

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear to yellow fuming liquid; acrid, suffocating odor. Corrosive. Other Acute Effects: lung damage. Chronic Effects: tooth erosion, bronchitis. Strong oxidizer.

### Potential Health Effects

**Target Organs:** eyes, skin, respiratory system, teeth

**Primary Entry Routes:** inhalation, ingestion, skin contact, eye contact

#### Acute Effects

**Inhalation:** The vapor is extremely discomforting and corrosive to the upper respiratory tract and lungs and the material presents a hazard from a single acute exposure or from repeated exposures over long periods. Inhalation hazard is increased at higher temperatures.



Reactions may occur following a single acute exposure or may only appear after repeated exposures.

Reactions may not occur on exposure but response may be delayed with symptoms only appearing many hours later. The material may produce respiratory tract irritation which produces an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system. Unlike most organs the lung can respond to a chemical insult or agent by first trying to remove or neutralize the irritant and then repairing the damage. The repair process, which initially developed to protect mammalian lungs from foreign matter and antigens, may however, cause further damage the lungs when activated by hazardous chemicals. The result is often the impairment of gas exchange, the primary function of the lungs.

Inhalation of nitric acid mist or fumes at 2 to 25 ppm over an 8 hour period may cause pulmonary irritation and symptoms of lung damage.

Only several minutes of exposure to concentrated atmosphere i.e. 200 ppm may cause severe pulmonary damage and even fatality. Death may be delayed for several days.

Exposure to nitric acid fumes (with concurrent inhalation of nitrogen dioxide and nitric oxide) may elicit prompt irritation of the upper respiratory tract leading to coughing, gagging, chest pain, dyspnea, cyanosis if concentrations are sufficiently high and duration of exposure sufficiently long, pulmonary edema.

**Eye:** The liquid is extremely corrosive to the eyes and contact may cause rapid tissue destruction and is capable of causing severe damage with loss of sight.

The vapor is extremely discomforting to the eyes and is capable of causing pain and severe conjunctivitis.

Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.

The material may produce moderate eye irritation leading to inflammation.

Repeated or prolonged exposure to irritants may produce conjunctivitis.

Eye contact with concentrated acid may give no pain, whilst diluted solution causes intense pain and both can cause permanent eye damage or blindness. Burns may result in shrinkage of the eyeball, symblepharon (adhesions between tarsal and bulbar conjunctivae), permanent corneal opacification, and visual impairment leading to blindness.

**Skin:** The liquid is extremely corrosive to the skin and contact may cause tissue destruction with severe burns.

Bare unprotected skin should not be exposed to this material.

The vapor is highly discomforting to the skin.

The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Skin contact causes yellow discoloration of the skin, blisters and scars that may not heal. The skin may be stained bright-yellow or yellowish brown due to the formation of xanthoproteic acid. Dilute solutions may harden the epithelium without producing overt corrosion.

**Ingestion:** Considered an unlikely route of entry in commercial/industrial environments.

The material is extremely corrosive if swallowed and is capable of causing burns to mouth, throat, esophagus, with extreme discomfort, pain and may be fatal.

Even a small amount causes severe corrosion of the stomach, burning pain, vomiting and shock, possibly causing non-healing scarring of the gastrointestinal tract and stomach. Death may be delayed 12 hours to 14 days or to several months. Such late fatalities are attributed to a chemical lobular pneumonitis secondary to aspiration. Survivors show stricture of the gastric mucosa and subsequent pernicious anemia.

**Carcinogenicity:** NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

**Chronic Effects:** Prolonged or repeated overexposure to low concentrations of vapor may cause chronic bronchitis, corrosion of teeth, even chemical pneumonitis.

## Section 4 - First Aid Measures

**Inhalation:** Remove to fresh air.

Lay patient down. Keep warm and rested.

If available, administer medical oxygen by trained personnel.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

**Eye Contact:** Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Immediately transport to hospital or doctor. DO NOT delay.

**Skin Contact:** Immediately flush body and clothes with large amounts of water, using safety shower if available.

Quickly remove all contaminated clothing, including footwear.

Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor. DO NOT delay.

**Ingestion:** Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

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ERG



Immediately transport to hospital or doctor. DO NOT delay.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** For acute or short-term repeated exposures to strong acids:

1. Airway problems may arise from laryngeal edema and inhalation exposure.

Treat with 100% oxygen initially.

2. Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling.

3. Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.

4. Strong acids produce a coagulation necrosis characterized by formation of a coagulum (eschar) as a result of the desiccating action of the acid on proteins in specific tissues.

#### INGESTION:

1. Immediate dilution (milk or water) within 30 minutes post-ingestion is recommended.

2. Do not attempt to neutralize the acid since exothermic reaction may extend the corrosive injury.

3. Be careful to avoid further vomiting since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.

4. Charcoal has no place in acid management.

5. Some authors suggest the use of lavage within 1 hour of ingestion.

#### SKIN:

1. Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.

2. Deep second-degree burns may benefit from topical silver sulfadiazine.

#### EYE:

1. Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjunctival cul-de-sacs. Irrigation should last at least 20-30 minutes. Do not use neutralizing agents or any other additives. Several liters of saline are required.

2. Cycloplegic drops (1% cyclopentolate for short-term use or 5% homatropine for longer term use), antibiotic drops, vasoconstrictive agents, or artificial tears may be indicated dependent on the severity of the injury.

3. Steroid eye drops should only be administered with the approval of a consulting ophthalmologist.

## Section 5 - Fire-Fighting Measures

**Flash Point:** Nonflammable

**Autoignition Temperature:** Not applicable

**LEL:** Not applicable

**UEL:** Not applicable

**Extinguishing Media:** Water spray or fog; foam, dry chemical powder, or BCF (where regulations permit).

Carbon dioxide.

**General Fire Hazards/Hazardous Combustion Products:** Will not burn but increases intensity of fire.

Heating may cause expansion or decomposition leading to violent rupture of containers.

Heat affected containers remain hazardous.

Contact with combustibles such as wood, paper, oil or finely divided metal may cause ignition, combustion or violent decomposition.

May emit irritating, poisonous or corrosive fumes.

Decomposes on heating and produces toxic fumes of nitrogen oxides (NO<sub>x</sub>) and nitric acid.

**Fire Incompatibility:** Oxidizing agents as a class are not necessarily combustible themselves, but can increase the risk and intensity of fire in many other substances.

Reacts vigorously with water and alkali.

Avoid reaction with organic materials/compounds, powdered metals, reducing agents and hydrogen sulfide (H<sub>2</sub>S) as ignition may result.

Reacts with metals producing flammable/explosive hydrogen gas.

**Fire-Fighting Instructions:** Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

Fight fire from a safe distance, with adequate cover.

Extinguishers should be used only by trained personnel.

Use water delivered as a fine spray to control fire and cool adjacent area.

Avoid spraying water onto liquid pools.

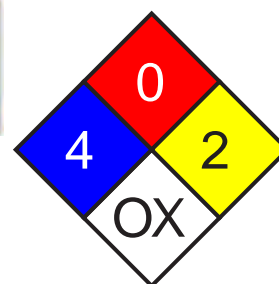
Do not approach containers suspected to be hot.

Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

If fire gets out of control withdraw personnel and warn against entry.

Equipment should be thoroughly decontaminated after use.



Fire Diamond



## Section 6 - Accidental Release Measures

**Small Spills:** Dangerous levels of nitrogen oxides may form during spills of nitric acid.

Wear fully protective PVC clothing and breathing apparatus.

Clean up all spills immediately. No smoking, bare lights, ignition sources.

Avoid all contact with any organic matter including fuel, solvents, sawdust, paper or cloth and other incompatible materials, as ignition may result.

Avoid breathing dust or vapors and all contact with skin and eyes.

Control personal contact by using protective equipment.

Contain and absorb spill with dry sand, earth, inert material or vermiculite. DO NOT use sawdust as fire may result.

Scoop up solid residues and seal in labeled drums for disposal.

Neutralize/decontaminate area.

Use soda ash or slaked lime to neutralize.

**Large Spills:** DO NOT touch the spill material. Restrict access to area.

Clear area of personnel and move upwind. Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

No smoking, flames or ignition sources. Increase ventilation.

Contain spill with sand, earth or other clean, inert materials.

NEVER use organic absorbents such as sawdust, paper, cloth; as fire may result. Avoid any contamination by organic matter.

Use spark-free and explosion-proof equipment.

Collect any recoverable product into labeled containers for possible recycling. DO NOT mix fresh with recovered material.

Collect residues and seal in labeled drums for disposal.

Wash area and prevent runoff into drains. Decontaminate equipment and launder all protective clothing before storage and reuse.

If contamination of drains or waterways occurs advise emergency services.

DO NOT USE WATER OR NEUTRALIZING AGENTS INDISCRIMINATELY ON LARGE SPILLS.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).



## Section 7 - Handling and Storage

**Handling Precautions:** Avoid generating and breathing mist. Do not allow clothing wet with material to stay in contact with skin.

Avoid all personal contact, including inhalation.

Wear protective clothing when risk of exposure occurs.

Use in a well-ventilated area.

**WARNING:** To avoid violent reaction, ALWAYS add material to water and NEVER water to material.

Avoid smoking, bare lights or ignition sources.

Avoid contact with incompatible materials.

When handling, DO NOT eat, drink or smoke.

Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling. Work clothes should be laundered separately.

Launder contaminated clothing before reuse.

Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

**Recommended Storage Methods:** Stainless steel drum. Check that containers are clearly labeled.

Packaging as recommended by manufacturer.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Use in a well-ventilated area.

Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.

If risk of overexposure exists, wear NIOSH-approved respirator.

Correct fit is essential to obtain adequate protection.

In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus.

**Personal Protective Clothing/Equipment:**

**Eyes:** Chemical goggles. Full face shield.

DO NOT wear contact lenses. Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.

**Hands/Feet:** Bare unprotected skin should not be exposed to this material. Impervious, gauntlet length gloves i.e., butyl rubber gloves or Neoprene rubber gloves or wear chemical protective gloves, e.g. PVC.



Wear safety footwear or safety gumboots, e.g. Rubber.

**Respiratory Protection:**

Exposure Range >2 to <25 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask

Exposure Range 25 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

**Other:** Operators should be trained in procedures for safe use of this material.

Acid-resistant overalls or Rubber apron or PVC apron.

Ensure there is ready access to an emergency shower.

Ensure that there is ready access to eye wash unit.

Ensure that there is ready access to breathing apparatus.

**Glove Selection Index:**

BUTYL ..... Best selection

HYPALON ..... Best selection

NEOPRENE..... Best selection

NEOPRENE/NATURAL..... Best selection

PE/EVAL/PE ..... Best selection

SARANEX-23 ..... Best selection

NATURAL RUBBER..... Satisfactory; may degrade after 4 hours continuous immersion

NATURAL+NEOPRENE..... Satisfactory; may degrade after 4 hours continuous immersion

PVC..... Poor to dangerous choice for other than short-term immersion

NITRILE+PVC ..... Poor to dangerous choice for other than short-term immersion

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Clear, colorless to slightly yellow liquid. Sharp strong odor.

**CAUTION:** exothermic dilution hazard.

**HIGHLY CORROSIVE.** Corrosive to most metals. Powerful oxidizing agent.

Darkens to brownish color on aging and exposure to light.

**Physical State:** Liquid

**Vapor Pressure (kPa):** 8.26

**Vapor Density (Air=1):** 1.5

**Formula Weight:** 63.02

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 1.3-1.42

**pH:** < 1

**pH (1% Solution):** 1

**Boiling Point:** 83 °C (181 °F) at 760 mm Hg

**Freezing/Melting Point:** -42 °C (-43.6 °F)

**Volatile Component (% Vol):** 100 (nominal)

**Decomposition Temperature (°C):** Not applicable

**Water Solubility:** Soluble in all proportions

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Presence of heat source and direct sunlight. Storage in unsealed containers. Hazardous polymerization will not occur.

**Storage Incompatibilities:** Segregate from reducing agents, finely divided combustible materials, combustible materials, sawdust, metals and powdered metals.

Avoid contamination of water, foodstuffs, feed or seed.

Segregate from alkalis, oxidizing agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates.

## Section 11 - Toxicological Information

**Toxicity**

Oral (human) LD<sub>50</sub>: 430 mg/kg

Inhalation (rat) LC<sub>50</sub>: 2500 ppm/1 hr

Unreported (man) LD<sub>50</sub>: 110 mg/kg

**Irritation**

Nil reported

See RTECS QU 5775000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** No data found.

**Ecotoxicity:** LC<sub>50</sub> Starfish 100-300 mg/l/48 hr /Aerated water conditions; LC<sub>50</sub> Shore crab 180 mg/l/48 hr /Static, aerated water conditions; LC<sub>50</sub> Cockle 330-1000 mg/l/48 hr /Aerated water conditions

**BCF:** no food chain concentration potential

**Biochemical Oxygen Demand (BOD):** none

## Section 13 - Disposal Considerations

**Disposal:** Recycle wherever possible. Special hazards may exist - specialist advice may be required.



Consult manufacturer for recycling options.  
 Follow applicable federal, state, and local regulations.  
 Treat and neutralize at an approved treatment plant.  
 Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.  
 Puncture containers to prevent reuse and bury at an authorized landfill.

## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Note:** This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

**Shipping Name and Description:** Nitric acid *other than red fuming*, with more than 70 percent nitric acid

**ID:** UN2031

**Hazard Class:** 8 - Corrosive material

**Packing Group:** I - Great Danger

**Symbols:**

**Label Codes:** 8 - Corrosive, 5.1 - Oxidizer

**Special Provisions:** B47, B53, T10, TP2, TP12, TP13

**Packaging:** Exceptions: None      **Non-bulk:** 158      **Bulk:** 243

**Quantity Limitations:** Passenger aircraft/rail: Forbidden      **Cargo aircraft only:** 2.5 L

**Vessel Stowage:** Location: D      **Other:** 44, 66, 89, 90, 110, 111



**Shipping Name and Description:** Nitric acid *other than red fuming*, with not more than 70 percent nitric acid

**ID:** UN2031

**Hazard Class:** 8 - Corrosive material

**Packing Group:** II - Medium Danger

**Symbols:**

**Label Codes:** 8 - Corrosive

**Special Provisions:** B2, B47, B53, IB2, T8, TP2, TP12

**Packaging:** Exceptions: None      **Non-bulk:** 158      **Bulk:** 242

**Quantity Limitations:** Passenger aircraft/rail: Forbidden      **Cargo aircraft only:** 30 L

**Vessel Stowage:** Location: D      **Other:**



**Shipping Name and Description:** Nitric acid, red fuming

**ID:** UN2032

**Hazard Class:** 8 - Corrosive material

**Packing Group:** I - Great Danger

**Symbols:** + - Override definitions

**Label Codes:** 8 - Corrosive, 5.1 - Oxidizer, 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*

**Special Provisions:** 2, B9, B32, B74, T20, TP2, TP12, TP13, TP38, TP45

**Packaging:** Exceptions: None      **Non-bulk:** 227      **Bulk:** 244

**Quantity Limitations:** Passenger aircraft/rail: Forbidden      **Cargo aircraft only:** Forbidden

**Vessel Stowage:** Location: D      **Other:**



## Section 15 - Regulatory Information

### EPA Regulations:

**RCRA 40 CFR:** Not listed

**CERCLA 40 CFR 302.4:** Listed per CWA Section 311(b)(4) 1000 lb (453.5 kg)

**SARA 40 CFR 372.65:** Listed

**SARA EHS 40 CFR 355:** Listed

**RQ:** 1000 lb

**TPQ:** 1000 lb

**TSCA:** Listed

## Section 16 - Other Information

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

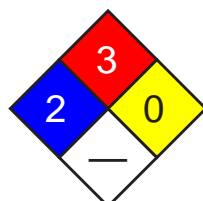
54/60

**Material Name:** Xylene **CAS Number:** 1330-20-7  
**Chemical Formula:** C<sub>8</sub>H<sub>10</sub>  
**Structural Chemical Formula:** C<sub>6</sub>H<sub>4</sub>(CH<sub>3</sub>)<sub>2</sub>  
**EINECS Number:** 215-535-7  
**ACX Number:** X1001166-8  
**Synonyms:** BENZENE,DIMETHYL-; COMPONENT 1 (83%): XYLENES; COMPONENT 2 (17%): ETHYL BENZENE; DIMETHYLBENZENE; DIMETHYLBENZENES; EPA PESTICIDE CHEMICAL CODE 086802; KSYLEN; METHYL TOLUENE; METHYLTOLUENE; VIOLET 3; XILOLI; XYLENE; XYLENEN; XYLOL; XYLOLE  
**General Use:** A strong solvent for general use in the manufacture of paints, varnishes, lacquers, thinners, inks, rubber, pesticides, herbicides and paint strippers.

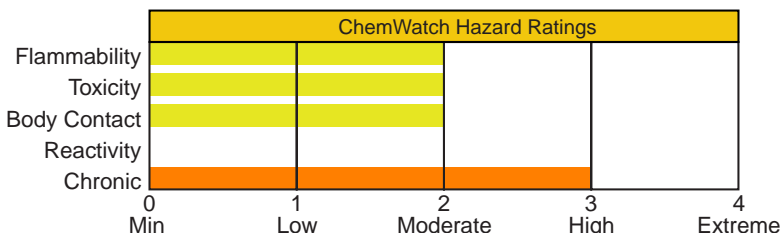
## Section 2 - Composition / Information on Ingredients

Name	CAS	%
xylene	1330-20-7	> 95
<b>OSHA PEL</b> TWA: 100 ppm; 435 mg/m <sup>3</sup> .	<b>NIOSH REL</b> TWA: 100 ppm, 435 mg/m <sup>3</sup> ; STEL: 150 ppm, 655 mg/m <sup>3</sup> .	<b>DFG (Germany) MAK</b> TWA: 100 ppm; PEAK: 200 ppm; skin.
<b>ACGIH TLV</b> TWA: 100 ppm; STEL: 150 ppm.		

## Section 3 - Hazards Identification



Fire Diamond



HMIS	
2	Health
3	Flammability
0	Reactivity

ANSI Signal Word

**Warning!**



Flammable

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear, sweet smelling liquid. Irritating to eyes/skin/respiratory tract. Other Acute Effects: dizziness, nausea, drowsiness. Chronic Effects: dermatitis, kidney/liver/peripheral nerve damage. May cause birth defects (animal data). Flammable.

### Potential Health Effects

**Target Organs:** central nervous system (CNS), eyes, gastrointestinal (GI) tract, liver, kidneys, skin

**Primary Entry Routes:** inhalation, skin absorption (slight), eye contact, ingestion

#### Acute Effects

**Inhalation:** Xylene is a central nervous system depressant. The vapor is discomforting to the upper respiratory tract and may be harmful if inhaled.

Inhalation hazard is increased at higher temperatures.

Toxic effects are increased by consumption of alcohol.

Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.

If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.



Headache, fatigue, lassitude, irritability and gastrointestinal disturbances (e.g., nausea, anorexia and flatulence) are the most common symptoms of xylene overexposure. Injury to the heart, liver, kidneys and nervous system has also been noted among workers. Transient memory loss, renal impairment, temporary confusion and some evidence of disturbance of liver function was reported in three workers overcome by gross exposure to xylene (10000 ppm). One worker died and autopsy revealed pulmonary congestion, edema, and focal alveolar hemorrhage.

Volunteers inhaling xylene at 100 ppm for 5 to 6 hours showed changes in manual coordination, reaction time and slight ataxia. Tolerance developed during the workweek but was lost over the weekend. Physical exercise may antagonize this effect. Xylene body burden in humans exposed to 100 or 200 ppm xylene in air depends on the amount of body fat with 4% to 8% of total absorbed xylene accumulating in human adipose tissues.

**Eye:** The liquid is highly discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration. The vapor is highly discomforting to the eyes.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Corneal changes have been reported in furniture polishers exposed to xylene.

**Skin:** The liquid is highly discomforting to the skin and may cause drying of the skin, which may lead to dermatitis and it is absorbed by the skin.

Toxic effects may result from skin absorption.

Open cuts, abraded or irritated skin should not be exposed to this material.

The material may accentuate any pre-existing skin condition.

The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

**Ingestion:** Considered an unlikely route of entry in commercial/industrial environments.

The liquid may produce gastrointestinal discomfort and may be harmful if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

**Carcinogenicity:** NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

**Chronic Effects:** Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes.

Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following.

Small excess risks of spontaneous abortion and congenital malformation was reported amongst women exposed to xylene in the first trimester of pregnancy. In all cases however the women had also been exposed to other substances.

Evaluation of workers chronically exposed to xylene has demonstrated a lack of genotoxicity. Exposure to xylene has been associated with increased risks of hemopoietic malignancies but, again simultaneous exposure to other substances (including benzene) complicate the picture. A long-term gavage study of mixed xylenes (containing 17% ethyl benzene) found no evidence of carcinogenic activity in rats and mice of either sex.

Exposure to the material for prolonged periods may cause physical defects in the developing embryo (teratogenesis).

## Section 4 - First Aid Measures

**Inhalation:** Remove to fresh air.

Lay patient down. Keep warm and rested.

If available, administer medical oxygen by trained personnel.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

See  
DOT  
ERG

**Eye Contact:** Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**Skin Contact:** Immediately remove all contaminated clothing, including footwear (after rinsing with water).

Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

**Ingestion:** Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** For acute or short-term repeated exposures to xylene:

1. Gastrointestinal absorption is significant with ingestions.

For ingestions exceeding 1-2 mL (xylene)/kg, intubation and lavage with cuffed endotracheal tube is recommended.

The use of charcoal and cathartics is equivocal.

2. Pulmonary absorption is rapid with about 60-65% retained at rest.



3. Primary threat to life from ingestion and/or inhalation is respiratory failure.
4. Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases ( $pO_2 < 50$  mm Hg or  $pCO_2 > 50$  mm Hg) should be intubated.
5. Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
6. A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
7. Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
- Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.

#### BIOLOGICAL EXPOSURE INDEX - BEI

These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

<u>Determinant</u>	<u>Index</u>	<u>Sampling Time</u>	<u>Comments</u>
Methylhippuric acids in urine	1.5 gm/gm creatinine	End of shift	
	2 mg/min	Last 4 hrs of shift.	

### Section 5 - Fire-Fighting Measures

**Flash Point:** 25.6 °C

**Autoignition Temperature:** 241 °C

**LEL:** 1.0% v/v

**UEL:** 7.0% v/v

**Extinguishing Media:** Alcohol stable foam; dry chemical powder; carbon dioxide.

Water spray or fog - Large fires only.

**General Fire Hazards/Hazardous Combustion Products:** Liquid and vapor are flammable.

Moderate fire hazard when exposed to heat or flame.

Vapor forms an explosive mixture with air.

Moderate explosion hazard when exposed to heat or flame.

Vapor may travel a considerable distance to source of ignition.

Heating may cause expansion or decomposition leading to violent rupture of containers.

On combustion, may emit toxic fumes of carbon monoxide (CO).

Other combustion products include carbon dioxide (CO<sub>2</sub>).

**Fire Incompatibility:** Avoid contamination with strong oxidizing agents as ignition may result.

**Fire-Fighting Instructions:** Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

If safe, switch off electrical equipment until vapor fire hazard removed.

Use water delivered as a fine spray to control fire and cool adjacent area.

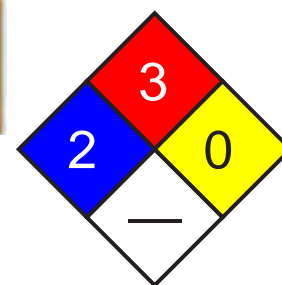
Avoid spraying water onto liquid pools.

Do not approach containers suspected to be hot.

Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

See  
DOT  
ERG



Fire Diamond

### Section 6 - Accidental Release Measures

**Small Spills:** Remove all ignition sources. Clean up all spills immediately.

Avoid breathing vapors and contact with skin and eyes.

Control personal contact by using protective equipment.

Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

**Large Spills:** Clear area of personnel and move upwind.

Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

No smoking, bare lights or ignition sources. Increase ventilation.

Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.

Use only spark-free shovels and explosion proof equipment.

See  
DOT  
ERG



Collect recoverable product into labeled containers for recycling.  
 Absorb remaining product with sand, earth or vermiculite.  
 Collect solid residues and seal in labeled drums for disposal.  
 Wash area and prevent runoff into drains.  
 If contamination of drains or waterways occurs, advise emergency services.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

## Section 7 - Handling and Storage

**Handling Precautions:** Avoid all personal contact, including inhalation.

Wear protective clothing when risk of overexposure occurs.

Use in a well-ventilated area. Prevent concentration in hollows and sumps.

DO NOT enter confined spaces until atmosphere has been checked.

Avoid smoking, bare lights or ignition sources.

Avoid generation of static electricity. DO NOT use plastic buckets.

Ground all lines and equipment. Use spark-free tools when handling.

Avoid contact with incompatible materials.

When handling, DO NOT eat, drink or smoke.

Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling.

Work clothes should be laundered separately.

Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

**Recommended Storage Methods:** Metal can; metal drum. Packing as recommended by manufacturer.

Check all containers are clearly labeled and free from leaks.

Plastic containers may only be used if approved for flammable liquids.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Use in a well-ventilated area. Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.

CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear.

General exhaust is adequate under normal operating conditions.

Local exhaust ventilation may be required in specific circumstances.

If risk of overexposure exists, wear NIOSH-approved respirator.

Correct fit is essential to obtain adequate protection.

Provide adequate ventilation in warehouse or closed storage areas.

In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus.

**Personal Protective Clothing/Equipment:**

**Eyes:** Safety glasses with side shields; or as required, chemical goggles.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

**Hands/Feet:** Barrier cream with polyethylene gloves; Butyl rubber gloves or Neoprene gloves or PVC gloves.

Safety footwear.

Do NOT use this product to clean the skin.

**Other:** Overalls. Impervious protective clothing.

Eyewash unit.

Ensure there is ready access to an emergency shower.

**Glove Selection Index:**

PE/EVAL/PE ..... Best selection

PVA ..... Best selection

VITON ..... Best selection

TEFLON ..... Best selection

PVDC/PE/PVDC ..... Poor to dangerous choice for other than short-term immersion

NATURAL+NEOPRENE..... Poor to dangerous choice for other than short-term immersion

NEOPRENE/NATURAL..... Poor to dangerous choice for other than short-term immersion

NITRILE+PVC ..... Poor to dangerous choice for other than short-term immersion

HYPALON ..... Poor to dangerous choice for other than short-term immersion

NAT+NEOPR+NITRILE ..... Poor to dangerous choice for other than short-term immersion

BUTYL ..... Poor to dangerous choice for other than short-term immersion

BUTYL/NEOPRENE ..... Poor to dangerous choice for other than short-term immersion

NITRILE..... Poor to dangerous choice for other than short-term immersion

NEOPRENE..... Poor to dangerous choice for other than short-term immersion

PVC..... Poor to dangerous choice for other than short-term immersion



## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Clear colorless flammable liquid with a strong aromatic odor; floats on water. Mixes with most organic solvents.

**Physical State:** Liquid

**Vapor Pressure (kPa):** 0.5 at 15 °C

**Vapor Density (Air=1):** 3.66 at 15 °C

**Formula Weight:** 106.18

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 0.87 at 15 °C

**Evaporation Rate:** 0.7 Bu Ac=1

**pH:** Not applicable

**pH (1% Solution):** Not applicable.

**Boiling Point:** 137 °C (279 °F) to 140 °C (284 °F)

**Freezing/Melting Point:** -47 °C (-53 °F)

**Volatile Component (% Vol):** 100

**Water Solubility:** Practically insoluble in water

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Product is considered stable. Hazardous polymerization will not occur.

**Storage Incompatibilities:** Avoid storage with oxidizers.

## Section 11 - Toxicological Information

### Toxicity

Oral (human) LD<sub>50</sub>: 50 mg/kg

Oral (rat) LD<sub>50</sub>: 4300 mg/kg

Inhalation (human) TC<sub>Lo</sub>: 200 ppm

Inhalation (man) LC<sub>Lo</sub>: 10000 ppm/6h

Inhalation (rat) LC<sub>50</sub>: 5000 ppm/4h

Reproductive effector in rats

### Irritation

Skin (rabbit): 500 mg/24h moderate

Eye (human): 200 ppm irritant

Eye (rabbit): 87 mg mild

Eye (rabbit): 5 mg/24h SEVERE

See RTECS ZE 2100000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** Most of the xylenes are released into the atmosphere where they may photochemically degrade by reaction with hydroxyl radicals (half-life 1-18 hr). The dominant removal process in water is volatilization. Xylenes are moderately mobile in soil and may leach into groundwater where they are known to persist for several years, despite some evidence that they biodegrade in both soil and groundwater. Bioconcentration is not expected to be significant.

**Ecotoxicity:** LC<sub>50</sub> Rainbow trout 13.5 mg/l/96 hr /Conditions of bioassay not specified; LD<sub>50</sub> Goldfish 13 mg/l/24 hr /Conditions of bioassay not specified

**Henry's Law Constant:** 0.22

**BCF:** estimated at 2.14 to 2.20

**Octanol/Water Partition Coefficient:** log K<sub>ow</sub> = 3.12 to 3.20

**Soil Sorption Partition Coefficient:** K<sub>oc</sub> = 48 to 68

## Section 13 - Disposal Considerations

**Disposal:** Consult manufacturer for recycling options and recycle where possible.

Follow applicable federal, state, and local regulations.

Incinerate residue at an approved site.

Recycle containers where possible, or dispose of in an authorized landfill.



**Section 14 - Transport Information****DOT Hazardous Materials Table Data (49 CFR 172.101):**

**Note:** This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

**Shipping Name and Description:** Xylenes

**ID:** UN1307

**Hazard Class:** 3 - Flammable and combustible liquid

**Packing Group:** II - Medium Danger

**Symbols:**

**Label Codes:** 3 - Flammable Liquid

**Special Provisions:** IB2, T4, TP1

**Packaging:** Exceptions: 150 **Non-bulk:** 202 **Bulk:** 242

**Quantity Limitations:** Passenger aircraft/rail: 5 L **Cargo aircraft only:** 60 L

**Vessel Stowage:** Location: B **Other:**



**Shipping Name and Description:** Xylenes

**ID:** UN1307

**Hazard Class:** 3 - Flammable and combustible liquid

**Packing Group:** III - Minor Danger

**Symbols:**

**Label Codes:** 3 - Flammable Liquid

**Special Provisions:** B1, IB3, T2, TP1

**Packaging:** Exceptions: 150 **Non-bulk:** 203 **Bulk:** 242

**Quantity Limitations:** Passenger aircraft/rail: 60 L **Cargo aircraft only:** 220 L

**Vessel Stowage:** Location: A **Other:**

**Section 15 - Regulatory Information****EPA Regulations:**

**RCRA 40 CFR:** Listed U239 Ignitable Waste

**CERCLA 40 CFR 302.4:** Listed per CWA Section 311(b)(4), per RCRA Section 3001 100 lb (45.35 kg)

**SARA 40 CFR 372.65:** Listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed

**Section 16 - Other Information**

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Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

51/60

**Material Name:** Chrysene

**CAS Number:** 218-01-9

**Chemical Formula:** C<sub>18</sub>H<sub>12</sub>

**EINECS Number:** 205-923-4

**ACX Number:** X1001743-5

**Synonyms:** BENZO (A) PHENANTHRENE; BENZO[A]PHENANTHRENE; 1,2-BENZOPHENANTHRENE; BENZO(A)PHENANTHRENE; 1,2-BENZPHENANTHRENE; BENZ(A)PHENANTHRENE; CHRYSENE; COAL TAR PITCH VOLATILES: CHRYSENE; 1,2,5,6-DIBENZONAPHTHALENE

**Derivation:** Distilled from coal tar, coal tar pitch. A small amount is produced from the distillation or pyrolysis of many fats and oils. By heating hydrogen and acetylene. Chrysene is not produced commercially in the U.S. (except as a laboratory research chemical).

**General Use:** Used in organic synthesis; as a research chemical. Occurs in cigarette smoke.

## Section 2 - Composition / Information on Ingredients

**Name**

**CAS**

**%**

No data found.

**OSHA PEL**

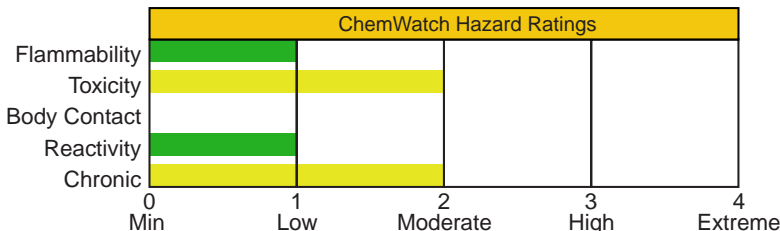
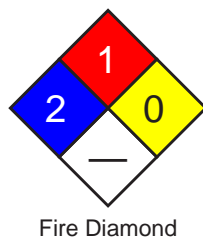
**NIOSH REL**

TWA: 0.2 mg/m<sup>3</sup>.

**ACGIH TLV**

Exposure by all routes should be carefully controlled to levels as low as possible.

## Section 3 - Hazards Identification



HMIS	
2	Health
1	Flammability
0	Reactivity

**ANSI Signal Word**

**Caution**

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless to white crystals with reddish-blue fluorescence. May be irritating to eyes/skin/respiratory tract. Also causes: may be absorbed through skin. May be cancer-causing in humans. Combustible.

### Potential Health Effects

**Target Organs:** Eyes, skin, respiratory system

**Primary Entry Routes:** Skin absorption

**Acute Effects** There is no human evidence available for the acute health effects of chrysene alone. There is, however, considerable data indicating that it is carcinogenic in humans. Based on the chemical properties of chrysene, as a polynuclear aromatic hydrocarbon, the following acute effects may occur.

**Inhalation:** May cause irritation.

**Eye:** . May cause irritation.

**Skin:** May cause irritation or be absorbed.

**Ingestion:** None reported.

**Carcinogenicity:** NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Class A3, Animal carcinogen; EPA - Class B2, Probable human carcinogen based on animal studies; MAK - Class A2, Unmistakably carcinogenic in animal experimentation only.

**Medical Conditions Aggravated by Long-Term Exposure:** None reported.

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**Chronic Effects:** Animal data indicate that chronic exposure to chrysene and other coal tar pitch volatiles probably causes cancer. May also cause respiratory, skin, or eye irritation; cough, bronchitis, photosensitivity, "coal tar warts" (precancerous lesions enhanced by UV light exposure), erythema (skin inflammation), dermal burns, acneiform lesions, hematuria (blood in urine). May alter genetic material. Exposure to PAH's is believed to cause leukoplakia (precancerous patches on the tongue), lip and oral cavity cancers, and bladder cancer.

### Section 4 - First Aid Measures

**Inhalation:** Remove exposed person to fresh air and support breathing as needed.

**Eye Contact:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 min. Consult a physician or ophthalmologist if pain, irritation, swelling, or photophobia persist.

**Skin Contact:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** For high exposures, medical surveillance (skin, mouth, GI tract, respiratory system) may be necessary.

See  
DOT  
ERG

### Section 5 - Fire-Fighting Measures

**Flash Point:** Combustible solid

**Autoignition Temperature:** None reported.

**LEL:** None reported.

**UEL:** None reported.

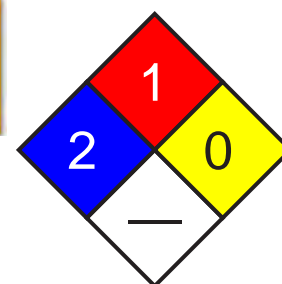
**Flammability Classification:** Combustible solid

**Extinguishing Media:** Use water spray, carbon dioxide, dry chemical powder or appropriate foam.

**General Fire Hazards/Hazardous Combustion Products:** Acrid smoke and fumes, including carbon monoxide and carbon dioxide.

**Fire-Fighting Instructions:** *Do not* release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

See  
DOT  
ERG



Fire Diamond

### Section 6 - Accidental Release Measures

**Spill/Leak Procedures:** Notify safety personnel, evacuate all unnecessary personnel, remove heat and ignition sources. Isolate and ventilate area, deny entry, stay upwind. Tag container as defective and return to supplier. Use spark-proof tools and explosion-proof equipment.

**Small Spills:** *Do not* sweep! Carefully scoop up or vacuum (with a HEPA filter). Absorb liquid spill with an inert, noncombustible absorbent such as sand or vermiculite.

**Large Spills:** Large spills of chrysene are unlikely. *Do not* release into sewers or waterways.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

See  
DOT  
ERG

### Section 7 - Handling and Storage

**Handling Precautions:** Avoid dust inhalation and skin and eye contact. Use only with adequate ventilation to maintain concentrations at nonhazardous levels (see Sec. 2). Wear personal protective clothing and equipment to prevent contact with skin and eyes (see Sec. 8). Practice good personal hygiene procedures to prevent inadvertently ingesting this material.

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

**Recommended Storage Methods:** Store in tightly closed containers in a cool, well-ventilated area away from heat, ignition sources, and incompatibles.

**Regulatory Requirements:** Follow applicable OSHA regulations.

### Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Where feasible, enclose operations to avoid dust dispersion into the work area. Ventilate at the site of chemical release. To prevent static sparks, electrically ground and bond all containers and equipment. Provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PEL (see Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.



**Administrative Controls:** Educate workers about the health and safety hazards associated with this material. Train in work practices which minimize exposure. Consider preplacement and periodic medical exams with emphasis on the skin and lungs.

**Personal Protective Clothing/Equipment:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

**Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Air purifying respirators may be adequate for handling small amounts of chrysene in a laboratory setting. For unlimited exposure ranges, wear a pressure-demand, full-face SCBA. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

**Other:** Separate contaminated work clothes from street clothes. Launder clothing separately before reuse. Remove this material from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Colorless to white rhombic plates with reddish-blue fluorescence.

**Physical State:** Solid

**Vapor Pressure (kPa):**  $6.3 \times 10^{-7}$  mm Hg;  $6.3 \times 10^{-9}$  mm Hg at 68 °F (20 °C)

**Formula Weight:** 228.28

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 1.274 at 20 °C/4 °C

**Refractive Index:** 2610

**Boiling Point:** 838 °F (448 °C); sublimes easily in a vacuum

**Freezing/Melting Point:** 489 °F (254 °C) to 496 °F (258 °C)

**Ionization Potential (eV):** 7.59 +/- 0.2 eV

**Water Solubility:** Insoluble (0.0018 mg/kg)

**Other Solubilities:** Slightly soluble in 95% ethanol, acetone, carbon disulfide, ether, glacial acetic acid. Soluble in hot benzene, toluene.

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Chrysene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Avoid contact with chemical incompatibles, heat and ignition sources.

**Storage Incompatibilities:** Include strong oxidizers.

**Hazardous Decomposition Products:** Thermal oxidative decomposition of chrysene can produce acrid smoke and fumes, including carbon monoxide and carbon dioxide.

## Section 11 - Toxicological Information

### Acute Skin Effects:

Mouse, skin: 192 µmol/kg produced DNA adducts.

Mouse, skin, TD<sub>Lo</sub>: 3600 µg/kg.

### Other Effects:

Tumorigenicity, mouse, skin: 23 mg/kg; toxic effects: tumorigenic - neoplastic by RTECS criteria; skin and appendages - tumors.

Human, lymphocyte: 6 µmol/L produced mutation.

Mouse, intraperitoneal, LD<sub>50</sub>: >320 mg/kg.

Tumorigenic Effects: Mouse, skin, 3600 mg/kg for 30 weeks, intermittent; toxic effects: tumorigenic - equivocal tumorigenic agent by RTECS criteria; skin and appendages - tumors.

Hamster, intraperitoneal: 900 mg/24 hr induced sister chromatid exchange.

Bacteria, *S typhimurium*: 5 mg/plate (-S9) produced mutation.

See RTECS GC0700000, for additional data.



## Section 12 - Ecological Information

**Environmental Fate:** If released to water, it will adsorb very strongly to sediments and particulate matter, but will not hydrolyze or appreciably evaporate. It will bioconcentrate in species which lack microsomal oxidase. Calculated BCF: 4,230.  $K_{ow}$  indicates bioaccumulation, which could cause food-chain contamination. It will not hydrolyze or appreciably evaporate from soils or surfaces. The estimated biodegradation half-life in soil is 7 years. The estimated half-life of any gas phase in the atmosphere is 1.25 hours as a result of reaction with photochemically produced hydroxyl radicals. It will be subject to near-surface, direct photolysis with a half-life of 4.4 hours computed for exposure to sunlight at mid-day in midsummer at latitude 40°N. If released to air, it will be subject to direct photolysis, although adsorption to particulates may affect the rate of this process. If released to soil it will be expected to adsorb very strongly to the soil and will not be expected to leach appreciably to groundwater.

**Ecotoxicity:** *Anabaena flos-aquae* (algae), 2 weeks,  $EC_{35}$  growth:  $\pm 0.002$  mg/L. *Daphnia magna* (crustaceans), 2 hr,  $LC_{50}$ : 1.9 mg/L. *Rana pipiens* (amphibians), 24 hr,  $LC_{50}$ :  $>6.7$  mg/L. *Neanthes arenaceodentata* (fishes), 96 hr,  $LC_{50}$ :  $>1$  mg/L.

**Henry's Law Constant:**  $9.4 \times 10^{-8}$

**Octanol/Water Partition Coefficient:**  $\log K_{ow} = 5.61$  to  $5.91$

## Section 13 - Disposal Considerations

**Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations. One method is to dissolve or mix the material with a combustible solvent and burn in an incinerator equipped with an afterburner and scrubber. Handle empty containers carefully as hazardous residues may still remain. Triple rinse containers and dispose of wash wastewater appropriately.

## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Shipping Name and Description:** Environmentally hazardous substances, solid, n.o.s.

**ID:** UN3077

**Hazard Class:** 9 - Miscellaneous hazardous material

**Packing Group:** III - Minor Danger

**Symbols:** G - Technical Name Required

**Label Codes:** 9 - Class 9

**Special Provisions:** 8, 146, B54, IB8, N20

**Packaging:** Exceptions: 155 Non-bulk: 213 Bulk: 240

**Quantity Limitations:** Passenger aircraft/rail: No limit Cargo aircraft only: No limit

**Vessel Stowage:** Location: A Other:



## Section 15 - Regulatory Information

### EPA Regulations:

**RCRA 40 CFR:** Listed U050 Toxic Waste

**CERCLA 40 CFR 302.4:** Listed per RCRA Section 3001, per CWA Section 307(a) 100 lb (45.35 kg)

**SARA 40 CFR 372.65:** Listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed

## Section 16 - Other Information

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

54/60

**Material Name:** Pyrene **CAS Number:** 129-00-0  
**Chemical Formula:** C<sub>16</sub>H<sub>10</sub>  
**EINECS Number:** 204-927-3  
**ACX Number:** X1001901-7  
**Synonyms:** BENZO(DEF)PHENANTHRENE; BENZO(D,E,F)PHENANTHRENE; COAL TAR PITCH  
**VOLATILES:** PYRENE; PYREN; BETA-PYRENE; PYRENE; PYRENE  
**General Use:** Laboratory reference standard.  
 Occurs in coal tar or in destructive hydrogenation of hard coals.

## Section 2 - Composition / Information on Ingredients

Name	CAS	%
pyrene	129-00-0	>98

### OSHA PEL

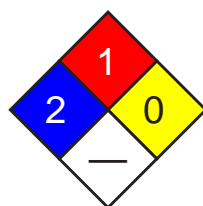
TWA: 0.2 mg/m<sup>3</sup>; as particulate  
 polycyclical aromatic  
 hydrocarbon.

### NIOSH REL

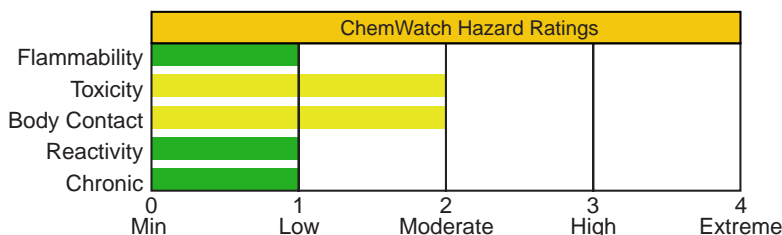
TWA: 0.1 mg/m<sup>3</sup>, cyclohexane-  
 extractable fraction; as particulate  
 polycyclic aromatic hydrocarbon.

### ACGIH TLV

## Section 3 - Hazards Identification



Fire Diamond



HMIS	
2	Health
1	Flammability
0	Reactivity

### ANSI Signal Word

**Caution**

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless solid. Irritating to eyes/skin/respiratory tract. Also causes: conjunctival irritation, dermal irritation, ingestion may irritate and burn esophagus/gastrointestinal tract.

### Potential Health Effects

**Target Organs:** skin, eyes, respiratory system

**Primary Entry Routes:** inhalation, ingestion, skin contact

#### Acute Effects

**Inhalation:** The dust may be discomforting to the upper respiratory tract and may be fatal if inhaled.

Persons with impaired respiratory function, airway diseases, and conditions such as emphysema or chronic bronchitis may incur further disability if excessive concentrations of particulate are inhaled.

Animal inhalation studies have demonstrated hepatic, pulmonary and intragastric pathologic changes. The levels of neutrophil, leukocyte and erythrocytes decreased.

**Eye:** The dust may be discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.

**Skin:** The material may be mildly discomforting to the skin.

Open cuts, abraded or irritated skin should not be exposed to this material.

Toxic effects may result from skin absorption.



The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Skin application resulted in hyperemia (blood engorgement), weight loss and hematopoietic (blood cell development) changes. Contact dermatitis was also evident.

**Ingestion:** The solid/dust is discomforting to the gastrointestinal tract and harmful if swallowed.

Considered an unlikely route of entry in commercial/industrial environments.

**Carcinogenicity:** NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

**Chronic Effects:** Chronic exposure to pyrene results increase in blood leukocytes (leukocytosis).

The so-called polycyclic aromatic hydrocarbons (PAHs) comprise a large family; some members occur in coal tar, tobacco smoke, petroleum and air pollution. Some substituted derivatives have been identified, in animal studies, as amongst the most highly active carcinogens.

Rodent species are sensitive to some PAHs with skin application producing cancerous growths. Injection produces soft tissue tumors (sarcomas) in rats and mice.

Administration of PAHs to Rhesus monkey on the other hand has not yet proved successful in yielding tumors and there is inadequate data to support the proposition that individual PAHs produce cancer in humans. There are however a number of epidemiology and mortality studies that show increased incidence of cancer in humans exposed to mixtures of PAHs. Evidence exists of lung and genito-urinary cancer mortality amongst coke-oven workers and skin tumors in workers exposed to creosote. Exposures to other chemical mixtures containing PAHs such as cigarette smoke, coal tar, coal tar pitch and bitumens, have been associated with increased incidences of lung cancer in humans. Anthracene, the basic unit on which most PAHs are built, is not carcinogenic whereas benz[a]anthracene appears to have weak carcinogenicity. Additions of other benzene rings to select positions on the benz[a]anthracene skeleton results in agents with powerful carcinogenicity (e.g. dibenz[a,h]anthracene and benz[a]pyrene). Further substitution of methyl groups in position on the rings enhances carcinogenicity (7,12 dimethylbenz[a]anthracene is one of the most powerful PAH carcinogens known). Biotransformation to produce soluble metabolites suitable for excretion appears to transform some PAHs to reactive electrophiles (as epoxides) which bind to DNA. Initiation of carcinogenesis is thought to rely upon such interactions.

## Section 4 - First Aid Measures

**Inhalation:** Remove to fresh air.

Encourage patient to blow nose to ensure clear breathing passages. Rinse mouth with water.

Consider drinking water to remove dust from throat.

Lay patient down. Keep warm and rested.

Seek medical attention if irritation or discomfort persist.

**Eye Contact:** Immediately hold the eyes open and flush with fresh running water.

Ensure irrigation under the eyelids by occasionally lifting upper and lower lids. If pain persists or recurs seek medical attention.

Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**Skin Contact:** Immediately remove all contaminated clothing, including footwear (after rinsing with water).

Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

**Ingestion:** Contact a Poison Control Center.

If more than 15 minutes from a hospital, induce vomiting, preferably using Ipecac Syrup APF.

Note: DO NOT INDUCE VOMITING in an unconscious person.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** Treat symptomatically.

See  
DOT  
ERG

## Section 5 - Fire-Fighting Measures

**Flash Point:** Not available; probably combustible

**Extinguishing Media:** Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.

Water spray or fog - Large fires only.

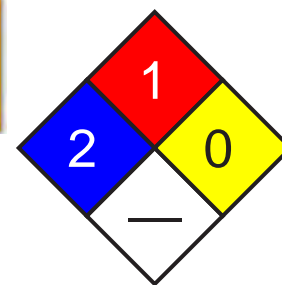
**General Fire Hazards/Hazardous Combustion Products:** Solid which exhibits difficult combustion or is difficult to ignite.

Avoid generating dust, particularly clouds of dust in a confined or unventilated space.

Dust may form an explosive mixture with air, and any source of ignition, i.e. flame or spark, will cause fire or explosion.

Dry dust can be charged electrostatically by turbulence, pneumatic transport, pouring, in exhaust ducts and during transport. Build-up of electrostatic charge may be prevented by bonding and grounding.

See  
DOT  
ERG



Fire Diamond



Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.

**Fire Incompatibility:** Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

**Fire-Fighting Instructions:** Contact fire department and tell them location and nature of hazard.

Wear breathing apparatus plus protective gloves for fire only. Prevent, by any means available, spillage from entering drains or waterways.

Use fire fighting procedures suitable for surrounding area.

Do not approach containers suspected to be hot.

Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

Equipment should be thoroughly decontaminated after use.

## Section 6 - Accidental Release Measures

**Small Spills:** Clean up all spills immediately. Avoid contact with skin and eyes.

Wear protective clothing, gloves, safety glasses and dust respirator.

Use dry clean-up procedures and avoid generating dust.

Vacuum up or sweep up. Place in clean drum then flush area with water.

**Large Spills:** Clear area of personnel and move upwind.

Contact fire department and tell them location and nature of hazard.

Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

No smoking, bare lights or ignition sources. Increase ventilation.

Stop leak if safe to do so.

Water spray or fog may be used to disperse/absorb vapor.

Contain or absorb spill with sand, earth or vermiculite.

Collect recoverable product into labeled containers for recycling.

Collect solid residues and seal in labeled drums for disposal.

Wash area and prevent runoff into drains.

After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.

If contamination of drains or waterways occurs, advise emergency services.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).



See  
DOT  
ERG

## Section 7 - Handling and Storage

**Handling Precautions:** Avoid all personal contact, including inhalation.

Wear protective clothing when risk of overexposure occurs.

Use in a well-ventilated area. Prevent concentration in hollows and sumps.

DO NOT enter confined spaces until atmosphere has been checked.

DO NOT allow material to contact humans, exposed food or food utensils.

Avoid smoking, bare lights or ignition sources. When handling, DO NOT eat, drink or smoke. Avoid contact with incompatible materials.

Keep containers securely sealed when not in used. Avoid physical damage to containers. Always wash hands with soap and water after handling. Working clothes should be laundered separately.

Launder contaminated clothing before reuse.

Use good occupational work practices. Observe manufacturer's storing/handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

**Recommended Storage Methods:** Glass container; plastic container.

Metal can; metal drum. Packing as recommended by manufacturer.

Check all containers are clearly labeled and free from leaks.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Local exhaust ventilation usually required.

If risk of overexposure exists, wear NIOSH-approved respirator.

Correct fit is essential to obtain adequate protection. NIOSH-approved self contained breathing apparatus (SCBA) may be required in some situations.

Provide adequate ventilation in warehouse or closed storage area.

**Personal Protective Clothing/Equipment:**

**Eyes:** Safety glasses with side shields; chemical goggles.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

**Hands/Feet:** Wear chemical protective gloves, eg. PVC. Wear safety footwear.



**Other:** Overalls. PVC apron. PVC protective suit may be required if exposure severe.  
Eyewash unit. Ensure there is ready access to a safety shower.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Colorless crystalline solid when pure. Contamination by tetracene results in slight yellowing. Solid and solutions have slight blue fluorescence.

**Physical State:** Divided solid

**Vapor Pressure (kPa):** Negligible

**Formula Weight:** 202.24

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 1.271

**pH:** Not applicable

**pH (1% Solution):** Not applicable

**Boiling Point:** 393 °C (739 °F) at 760 mm Hg

**Freezing/Melting Point:** 156 °C (312.8 °F)

**Volatile Component (% Vol):** Negligible

**Water Solubility:** 0.135 mg/L (+ or - 0005 mg/L) in water

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Product is considered stable. Hazardous polymerization will not occur.

**Storage Incompatibilities:** Avoid reaction with oxidizing agents.

## Section 11 - Toxicological Information

### Toxicity

Oral (rat) LD<sub>50</sub>: 2700 mg/kg

Inhalation (rat) LC<sub>50</sub>: 170 mg/m<sup>3</sup>

Oral (mouse) LD<sub>50</sub>: 800 mg/kg

Intraperitoneal (mouse) LD<sub>50</sub>: 514 mg/kg

Conjunctival irritation, excitement and muscle contraction recorded.

NOTE: Substance has been shown to be mutagenic in various assays, or belongs to a family of chemicals producing damage or change to cellular DNA.

### Irritation

Skin (rabbit): 500 mg/24h - mild

See RTECS UR 2450000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** Although environmental concentrations are highest near sources, its presence in places distant from primary sources indicates that it is reasonably stable in the atmosphere and capable of long distance transport. When released to air it may be subject to direct photolysis, although adsorption to particulates apparently can retard this process. Half-lives for reaction of vapor phase with atmospheric pollutants are: O<sub>3</sub>, 0.67 days, NO<sub>2</sub>, 14 days; estimated half-life for reaction with photochemically produced hydroxyl radicals is 1.12 days. If released to water, it will adsorb very strongly to sediments and particulate matter, bioconcentrate in aquatic organisms slightly to moderately, but will not hydrolyze. It may be subject to significant biodegradation, and direct photolysis may be important near the surface of waters. Evaporation may be important with a half-life of 4.8 to 39.2 days predicted for evaporation from a river 1 m deep, flowing at 1 m/sec with a wind velocity of 3 m/sec; half-life for evaporation from a model pond was 1176 days. Adsorption to sediments and particulates will limit evaporation. If released to soil it will be expected to adsorb very strongly to the soil and will not be expected to appreciably leach to the groundwater, although its presence in groundwater illustrates that it can be transported there. It will not be expected to hydrolyze or significantly evaporate from soils and surfaces. It may be subject to appreciable biodegradation in soils.

**Ecotoxicity:** TL<sub>m</sub> (Median threshold limit) Mosquito fish 0.0026 mg/l/96 hr at 24-27 °C in a static bioassay

**Henry's Law Constant:** calculated at  $5.42 \times 10^{-5}$

**BCF:** rainbow trout 72

**Octanol/Water Partition Coefficient:** log K<sub>ow</sub> = 4.88

**Soil Sorption Partition Coefficient:** K<sub>oc</sub> = soils 57 to 764

## Section 13 - Disposal Considerations

**Disposal:** Recycle wherever possible or consult manufacturer for recycling options.

Follow applicable federal, state, and local regulations.

Bury residue in an authorized landfill.

Recycle containers where possible, or dispose of in an authorized landfill.



## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Note:** This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

**Shipping Name and Description:** Toxic solids, organic, n.o.s.

**ID:** UN2811

**Hazard Class:** 6.1 - Poisonous materials

**Packing Group:** I - Great Danger

**Symbols:** G - Technical Name Required

**Label Codes:** 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*

**Special Provisions:** IB7

**Packaging:**      **Exceptions:** None      **Non-bulk:** 211      **Bulk:** 242

**Quantity Limitations:**    **Passenger aircraft/rail:** 5 kg      **Cargo aircraft only:** 50 kg

**Vessel Stowage:**      **Location:** B      **Other:**



**Shipping Name and Description:** Toxic solids, organic, n.o.s.

**ID:** UN2811

**Hazard Class:** 6.1 - Poisonous materials

**Packing Group:** II - Medium Danger

**Symbols:** G - Technical Name Required

**Label Codes:** 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*

**Special Provisions:** IB8, IP2, IP4

**Packaging:**      **Exceptions:** None      **Non-bulk:** 212      **Bulk:** 242

**Quantity Limitations:**    **Passenger aircraft/rail:** 25 kg      **Cargo aircraft only:** 100 kg

**Vessel Stowage:**      **Location:** B      **Other:**



**Shipping Name and Description:** Toxic solids, organic, n.o.s.

**ID:** UN2811

**Hazard Class:** 6.1 - Poisonous materials

**Packing Group:** III - Minor Danger

**Symbols:** G - Technical Name Required

**Label Codes:** 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*

**Special Provisions:** IB8, IP3

**Packaging:**      **Exceptions:** 153    **Non-bulk:** 213      **Bulk:** 240

**Quantity Limitations:**    **Passenger aircraft/rail:** 100 kg      **Cargo aircraft only:** 200 kg

**Vessel Stowage:**      **Location:** A      **Other:**



## Section 15 - Regulatory Information

### EPA Regulations:

**RCRA 40 CFR:** Not listed

**CERCLA 40 CFR 302.4:** Listed per CWA Section 307(a)

**SARA 40 CFR 372.65:** Not listed

**SARA EHS 40 CFR 355:** Listed

**RQ:** 5000 lb

**TPQ:** 1000/10000 lb

**TSCA:** Listed

## Section 16 - Other Information

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

44/60

**Material Name:** Anthracene

**CAS Number:** 120-12-7

**Chemical Formula:** C<sub>14</sub>H<sub>10</sub>

**Structural Chemical Formula:** (C<sub>6</sub>H<sub>4</sub>CH)<sub>2</sub>

**EINECS Number:** 204-371-1

**ACX Number:** X1001589-1

**Synonyms:** ANTHRACEN; ANTHRACENE; ANTHRACENE OIL; ANTHRACIN; COAL TAR PITCH  
 VOLATILES: ANTHRACENE; GREEN OIL; P-NAPHTHALENE; PARANAPHTHALENE; PARANAPHTHALENE;  
 TETRA OLIVE N2G

**Derivation:** Occurs naturally in smoke (gasoline, coal, cigarette, etc.), charbroiled foods, and coal tar pitch volatiles. Obtained by distilling crude anthracene oil with alkali carbonate in iron retorts (phenanthrene is removed via carbon disulfide) or by salting out from crude anthracene oil and draining; the crude salts are then purified by pressing and the use of various solvents (phen-anthrene and carbazole are removed).

**General Use:** Used in chemical manufacture (phenanthrene, carbazole, anthraquinone), in calico printing; as a component of dyes, scintillation fluid, smoke screens; and in organic semi-conductor research.

## Section 2 - Composition / Information on Ingredients

Name	CAS	%
Anthracene	120-12-7	ca 90 to 95% wt (commercial grade); 90 to 98% wt (technical grade)

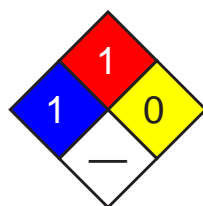
**Trace Impurities:** phenanthrene, carbazole, chrysene, pyridine (0.2%), iron (0.03%)

**OSHA PEL**

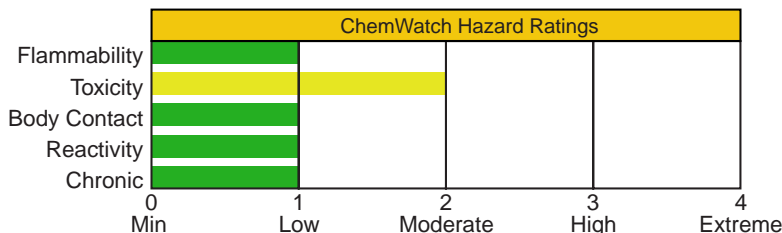
**NIOSH REL**

**ACGIH TLV**

## Section 3 - Hazards Identification



Fire Diamond



HMIS	
1	Health
1	Flammability
0	Reactivity

**ANSI Signal Word**

**Caution**

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless crystals with violet fluorescence (pure) or yellow crystals with green fluorescence. Irritating to eyes/skin/respiratory tract. Other Acute Effects: sun exposure can aggravate skin irritation and cause dermatitis. Combustible.

### Potential Health Effects

**Target Organs:** Eyes, skin, respiratory and digestive tracts.

**Primary Entry Routes:** Inhalation, skin/eye contact

#### Acute Effects

**Inhalation:** Symptoms include irritation of the respiratory tract, headache, nausea and vomiting, loss of appetite, slowed reactions, and adynamia (lack or loss of strength due to disease or other outside agent). Acute symptoms disappear within several days of last exposure.

**Eye:** Irritation of the conjunctiva with burning, itching and watering.

**Skin:** Irritation with burning, itching, and edema (fluid build-up). Volunteers with a 2% crude tar solution applied to the skin showed anthracene absorption via blood tests.



**Ingestion:** Gastrointestinal tract irritation.

**Carcinogenicity:** NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

**Medical Conditions Aggravated by Long-Term Exposure:** Dermatitis.

**Chronic Effects:** Repeated skin contact can cause pigmentation of the skin with cornification of surface layers and telangiectasis (an abnormal dilatation of capillary vessels that often form small, raised, red, wart-like spots).

Sensitization (including photo-sensitization) may also occur. Anthracene appears to concentrate in the fat and liver.

## Section 4 - First Aid Measures

**Inhalation:** Remove exposed person to fresh air and support breathing as needed.

**Eye Contact:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 minutes. Consult an ophthalmologist if pain and irritation persist.

**Skin Contact:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water to dilute. Vomiting may be spontaneous.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** Treatment is symptomatic and supportive.

See  
DOT  
ERG

## Section 5 - Fire-Fighting Measures

**Flash Point:** 250 °F (121 °C), Closed Cup

**Autoignition Temperature:** 1004 °F (540 °C)

**LEL:** 0.6% v/v

**UEL:** Not reported.

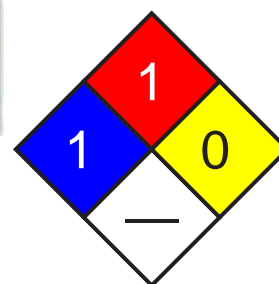
**Flammability Classification:** Combustible

**Extinguishing Media:** Use water spray, carbon dioxide, dry chemical, or foam.

**General Fire Hazards/Hazardous Combustion Products:** Include carbon oxide(s) and irritating, acrid smoke. May explode in air.

**Fire-Fighting Instructions:** Do not release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

See  
DOT  
ERG



Fire Diamond

## Section 6 - Accidental Release Measures

**Spill/Leak Procedures:** Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Cleanup personnel should protect against inhalation and skin/eye contact.

**Small Spills:** Carefully scoop up or vacuum (with appropriate filter) and place in suitable containers for disposal.

**Large Spills:** Use water to flush large spills to containment area for later disposal. Do not release into sewers or waterways. Damp mop any residue.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

See  
DOT  
ERG

## Section 7 - Handling and Storage

**Handling Precautions:** *Do not* use near heat or flame. Wear appropriate PPE.

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using anthracene, especially before eating, drinking, smoking, using the toilet, or applying cosmetics. Skin cleansers (ex. 55% kaolin, 25% neutral soap, 20% bran) are recommended.

**Recommended Storage Methods:** Store in a cool, dry, well-ventilated area away from heat, ignition sources, and incompatibles (Sec. 10).

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** To prevent static sparks, electrically ground and bond equipment used with and around anthracene. Enclosure of equipment and mechanization of processes will aid in exposure control. Provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

**Administrative Controls:** Consider preplacement and periodic medical exams of exposed workers with emphasis on the skin.



**Personal Protective Clothing/Equipment:** Limit work in sunlight as much as possible to prevent photosensitization. Photoprotective creams or pastes must be applied to bare skin regions. Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Polyvinyl chloride is a suitable material for PPE. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

**Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For any detectable concentration, use a SCBA or supplied-air respirator with a full facepiece and operated in pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive-pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

**Other:** Separate contaminated work clothes from street clothes and place in closed containers until laundered. Remove anthracene from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Colorless crystals with a violet fluorescence (pure), yellow crystals with a green fluorescence (due to tetracene and naphthacene).

**Physical State:** Solid

**Vapor Pressure (kPa):** 1mm Hg at 293 °F (145 °C)

**Formula Weight:** 178.22

**Density:** 1.25 g/cm<sup>3</sup> at 80.6 °F (27 °C)

**Boiling Point:** 644 °F (340 °C)

**Freezing/Melting Point:** 423 °F (217 °C)

**Water Solubility:** 1.29 mg/L at 77 °F/25 °C (*distilled water*), 0.6 mg/L at 77 °F/25 °C (*salt water*)

**Other Solubilities:** 1 g in 67 mL absolute alcohol, 70 mL methanol, 62 mL benzene, 85 mL chloroform, 200 mL ether, 31 mL carbon disulfide, 86 mL carbon tetrachloride, and 125 mL toluene. Also soluble in acetone.

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Anthracene darkens upon exposure to sunlight (transformed to *para*-anthracene). Hazardous polymerization *does not* occur. Exposure to heat, ignition sources, sunlight, and incompatibles.

**Storage Incompatibilities:** Include calcium hypochlorite (exothermic), fluorine (explodes), chromic acid, and calcium oxychloride.

**Hazardous Decomposition Products:** Thermal oxidative decomposition of anthracene can produce carbon oxide(s) and acrid, irritating smoke.

## Section 11 - Toxicological Information

### Acute Oral Effects:

Mouse, oral, LD: > 17 g/kg caused fatty liver degeneration.

### Irritation Effects:

Mouse, skin: 118 µg caused mild irritation.

### Other Effects:

Rat, oral: 20 g/kg intermittently for 79 weeks caused liver tumors.

Genetic Effects - Rat, liver cell: 300 µmoL caused DNA damage.

See RTECS CA9350000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** If released to soil, anthracene is expected to absorb strongly and not leach to groundwater. It will not hydrolyze, but may be subject to biodegradation, the rate of which depends on soil type. In water, anthracene is subject to direct photolysis near the surface and undergoes significant biodegradation. Biodegradation in water is faster with increased temperature, increased oxygen, and acclimated microbes. Evaporation may also be significant with an estimated half-life range of 4.3 to 5.9 days from a river 1 m deep, flowing 1 m/sec, with a wind velocity of 3 m/sec. In the air, photolysis and reaction with photochemically-produced hydroxyl radicals (half-life: 1.67 days). Vapor phase anthracene is expected to degrade faster than particle-sorbed anthracene. A  $K_{oc}$  of 26,000 suggests anthracene is relatively immobile in soil and unlikely to leach to groundwater; it will absorb strongly to soil.

**Ecotoxicity:** *Lepomis macrochirus* (bluegill sunfish),  $LC_{50} = 11.9 \mu\text{g/L/96 hr}$ ; *Rana pipiens* (leopard frog),  $LC_{50} = 0.065 \text{ ppm/30 min}$  &  $0.025 \text{ ppm/5 hr}$ . BCF (bioconcentration factor): goldfish (162), rainbow trout (4400-9200).

Bioconcentration occurs most heavily in organisms which lack the enzyme microsomal oxidase. Anthracene can become concentrated on the waxy surface of some plant leaves and fruits.



Octanol/Water Partition Coefficient:  $\log K_{ow} = 4.45$  (calc.)

### Section 13 - Disposal Considerations

**Disposal:** Anthracene is a waste chemical stream constituent which may be subjected to ultimate disposal by controlled incineration. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

### Section 14 - Transport Information

#### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Shipping Name and Description:** Environmentally hazardous substances, solid, n.o.s.

**ID:** UN3077

**Hazard Class:** 9 - Miscellaneous hazardous material

**Packing Group:** III - Minor Danger

**Symbols:** G - Technical Name Required

**Label Codes:** 9 - Class 9

**Special Provisions:** 8, 146, B54, IB8, N20

**Packaging:** Exceptions: 155 **Non-bulk:** 213 **Bulk:** 240

**Quantity Limitations:** Passenger aircraft/rail: No limit Cargo aircraft only: No limit

**Vessel Stowage:** Location: A Other:



### Section 15 - Regulatory Information

**EPA Regulations:**

**RCRA 40 CFR:** Not listed

**CERCLA 40 CFR 302.4:** Listed per CWA Section 307(a) 5000 lb (2268 kg)

**SARA 40 CFR 372.65:** Listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed

### Section 16 - Other Information

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

54/60

**Material Name:** Toluene

**CAS Number:** 108-88-3

**Chemical Formula:** C<sub>7</sub>H<sub>8</sub>

**Structural Chemical Formula:** C<sub>6</sub>H<sub>5</sub>CH<sub>3</sub>

**EINECS Number:** 203-625-9

**ACX Number:** X1001512-0

**Synonyms:** ANTISAL 1A; BENZENE,METHYL-; CP 25; METHACIDE; METHANE,PHENYL-; METHYL BENZENE; METHYL BENZOL; METHYLBENZENE; METHYLBENZOL; PHENYL METHANE; PHENYLMETHANE; TOLUEEN; TOLUEN; TOLUENE; TOLUENO; TOLUOL; TOLUOLO; TOLU-SOL

**General Use:** Used as a solvent for paint, resins, lacquers inks & adhesives. Component of solvent blends and thinners; in gasoline and aviation fuel. Used in the manufacture of chemicals, dyes, explosives, benzoic acid.

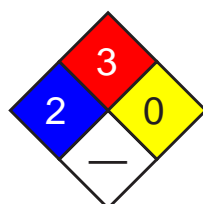
Some grades of toluene may contain traces of xylene and benzene.

Odor threshold: 2 ppm approx. Odor is not a reliable warning property due to olfactory fatigue.

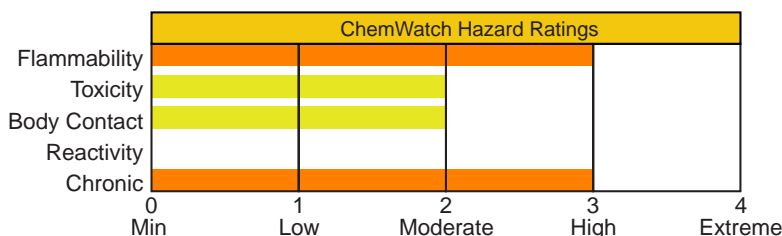
## Section 2 - Composition / Information on Ingredients

Name	CAS	%									
toluene	108-88-3	> 99.5									
<table> <tr> <td> <b>OSHA PEL</b>            TWA: 200 ppm; Ceiling: 300 ppm;            500 ppm, 10-minute maximum            peak.         </td><td> <b>NIOSH REL</b>            TWA: 100 ppm, 375 mg/m<sup>3</sup>;            STEL: 150 ppm, 560 mg/m<sup>3</sup>.         </td><td> <b>DFG (Germany) MAK</b>            TWA: 50 ppm; PEAK: 200 ppm;            skin.         </td></tr> <tr> <td> <b>OSHA PEL Vacated 1989 Limits</b>            TWA: 100 ppm; 375 mg/m<sup>3</sup>;            STEL: 150 ppm; 560 mg/m<sup>3</sup>.         </td><td> <b>IDLH Level</b>            500 ppm.         </td><td></td></tr> <tr> <td> <b>ACGIH TLV</b>            TWA: 50 ppm; skin.         </td><td></td><td></td></tr> </table>			<b>OSHA PEL</b> TWA: 200 ppm; Ceiling: 300 ppm; 500 ppm, 10-minute maximum peak.	<b>NIOSH REL</b> TWA: 100 ppm, 375 mg/m <sup>3</sup> ; STEL: 150 ppm, 560 mg/m <sup>3</sup> .	<b>DFG (Germany) MAK</b> TWA: 50 ppm; PEAK: 200 ppm; skin.	<b>OSHA PEL Vacated 1989 Limits</b> TWA: 100 ppm; 375 mg/m <sup>3</sup> ; STEL: 150 ppm; 560 mg/m <sup>3</sup> .	<b>IDLH Level</b> 500 ppm.		<b>ACGIH TLV</b> TWA: 50 ppm; skin.		
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<b>ACGIH TLV</b> TWA: 50 ppm; skin.											

## Section 3 - Hazards Identification



Fire Diamond



ANSI Signal Word

**Danger!**

HMIS	
2	Health
3	Flammability
0	Reactivity



Flammable

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; sickly, sweet odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: weakness, headache, dizziness, confusion, insomnia. Chronic Effects: liver/kidney damage, may cause birth defects. Flammable.

### Potential Health Effects

**Target Organs:** Skin, liver, kidneys, central nervous system.

**Primary Entry Routes:** Inhalation, skin contact/absorption.

#### Acute Effects

**Inhalation:** The vapor is highly discomforting to the upper respiratory tract.

Inhalation hazard is increased at higher temperatures.



Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.

If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.

Central nervous system (CNS) depression may include nonspecific discomfort, symptoms of giddiness, headache, dizziness, nausea, anesthetic effects, slowed reaction time, slurred speech and may progress to unconsciousness.

Serious poisonings may result in respiratory depression and may be fatal.

**Eye:** The liquid produces a high level of eye discomfort and is capable of causing pain and severe conjunctivitis.

Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.

The vapor is discomforting to the eyes if exposure is prolonged.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

**Skin:** The liquid may produce skin discomfort following prolonged contact.

Defatting and/or drying of the skin may lead to dermatitis and it is absorbed by skin.

Toxic effects may result from skin absorption.

Open cuts, abraded or irritated skin should not be exposed to this material.

The material may accentuate any pre-existing skin condition.

The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

**Ingestion:** Considered an unlikely route of entry in commercial/industrial environments.

The liquid may produce gastrointestinal discomfort and may be harmful if swallowed. Ingestion may result in nausea, pain and vomiting. Vomiting entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

**Carcinogenicity:** NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A4, Not classifiable as a human carcinogen; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

**Chronic Effects:** Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes.

Chronic toluene habituation occurs following intentional abuse (glue-sniffing) or from occupational exposure. Ataxia, incoordination and tremors of the hands and feet (as a consequence of diffuse cerebral atrophy), headache, abnormal speech, transient memory loss, convulsions, coma, drowsiness, reduced color perception, frank blindness, nystagmus (rapid, involuntary eye-movements), decreased hearing leading to deafness and mild dementia have all been associated with chronic abuse.

Peripheral nerve damage, encephalopathy, giant axonopathy, electrolyte disturbances in the cerebrospinal fluid and abnormal computer tomographic (CT) scans are common amongst toluene addicts. Although toluene abuse has been linked with kidney disease, this does not commonly appear in cases of occupational toluene exposures. Cardiac and hematological toxicity are however associated with chronic toluene exposure. Cardiac arrhythmia, multifocal and premature ventricular contractions and supraventricular tachycardia are present in 20% of patients who abused toluene-containing paints.

Previous suggestions that chronic toluene inhalation produced human peripheral neuropathy have largely been discounted. However central nervous system (CNS) depression is well documented where blood toluene levels exceed 2.2 mg%. Toluene abusers can achieve transient circulating concentrations of 6.5 mg%. Amongst workers exposed for a median time of 29 years to toluene no subacute effects on neurasthenic complaints and psychometric test results could be established.

The prenatal toxicity of very high toluene concentrations has been documented for several animal species and man. Malformations indicative of specific teratogenicity have not generally been found. The toxicity described in the literature takes the form of embryo death or delayed fetal growth and delayed skeletal system development. Permanent damage of children has been seen only when mothers had suffered from chronic intoxication as a result of "sniffing".

## Section 4 - First Aid Measures

**Inhalation:** Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

**Eye Contact:** Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**Skin Contact:** Immediately remove all contaminated clothing, including footwear (after rinsing with water).

Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

See  
DOT  
ERG



**Ingestion:** Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

**After first aid, get appropriate in-plant, paramedic, or community medical support.**

**Note to Physicians:** Following acute or short-term repeated exposures to toluene:

1. Toluene is absorbed across to alveolar barrier, the blood/air mixture being 11.2/15.6 (at 37 °C) The order of toluene, in expired breath, is of the order of 18 ppm following sustained exposure to 100 ppm.

The tissue/blood proportion is 1/3 except in adipose where the proportion is 8/10.

2. Metabolism by microsomal mono-oxygenation, results in the production of hippuric acid. This may be detected in the urine in amounts between 0.5 and 2.5 g/24hr which represents, on average 0.8 gm/gm of creatinine.

The biological half life of hippuric acid is in the order of 1-2 hours.

3. Primary threat to life from ingestion and/or inhalation is respiratory failure.

4. Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases ( $pO_2 < 50$  mm Hg or  $pCO_2 > 50$  mm Hg) should be intubated.

5. Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.

6. A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.

7. Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.

Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.

8. Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.

#### BIOLOGICAL EXPOSURE INDEX - BEI

These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

<u>Determinant</u>	<u>Index</u>	<u>Sampling Time</u>	<u>Comments</u>
Hippuric acid in urine	2.5 gm/gm creatinine	End of shift Last 4 hrs of shift	B,NS
Toluene in venous blood	1 mg/L	End of shift	SQ
Toluene in end-exhaled air		End of shift	SQ

NS: Non-specific determinant; also observed after exposure to other material

SQ: Semi-quantitative determinant - Interpretation may be ambiguous; should be used as a screening test or confirmatory test.

B: Background levels occur in specimens collected from subjects NOT exposed.

### Section 5 - Fire-Fighting Measures

**Flash Point:** 4 °C Closed Cup

**Autoignition Temperature:** 480 °C

**LEL:** 1.2% v/v

**UEL:** 7.1% v/v

**Extinguishing Media:** Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.

Water spray or fog - Large fires only.

**General Fire Hazards/Hazardous Combustion Products:** Liquid and vapor are highly flammable.

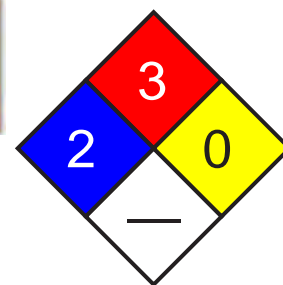
Severe fire hazard when exposed to heat, flame and/or oxidizers.

Vapor forms an explosive mixture with air.

Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.

Heating may cause expansion/decomposition with violent rupture of containers.

On combustion, may emit toxic fumes of carbon monoxide (CO) and carbon dioxide (CO<sub>2</sub>).



Fire Diamond



**Fire Incompatibility:** Avoid contamination with strong oxidizing agents as ignition may result.

Nitric acid with toluene, produces nitrated compounds which are explosive.

**Fire-Fighting Instructions:** Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

Fight fire from a safe distance, with adequate cover.

If safe, switch off electrical equipment until vapor fire hazard removed.

Use water delivered as a fine spray to control the fire and cool adjacent area. Avoid spraying water onto liquid pools.

Do not approach containers suspected to be hot.

Cool fire-exposed containers with water spray from a protective location.

If safe to do so, remove containers from path of fire.

## Section 6 - Accidental Release Measures

**Small Spills:** Remove all ignition sources. Clean up all spills immediately.

Avoid breathing vapors and contact with skin and eyes.

Control personal contact by using protective equipment.

Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

See  
DOT  
ERG

**Large Spills:** Clear area of personnel and move upwind.

Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

No smoking, bare lights or ignition sources. Increase ventilation.

Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.

Use only spark-free shovels and explosion proof equipment.

Collect recoverable product into labeled containers for recycling.

Absorb remaining product with sand, earth or vermiculite.

Collect solid residues and seal in labeled drums for disposal.

Wash area and prevent runoff into drains.

If contamination of drains or waterways occurs, advise emergency services.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

## Section 7 - Handling and Storage

**Handling Precautions:** Avoid all personal contact, including inhalation.

Wear protective clothing when risk of exposure occurs.

Use in a well-ventilated area. Prevent concentration in hollows and sumps.

DO NOT enter confined spaces until atmosphere has been checked.

Avoid smoking, bare lights, heat or ignition sources.

When handling, DO NOT eat, drink or smoke.

Vapor may ignite on pumping or pouring due to static electricity.

DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.

Avoid contact with incompatible materials.

Keep containers securely sealed. Avoid physical damage to containers.

Always wash hands with soap and water after handling.

Work clothes should be laundered separately.

Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

**Recommended Storage Methods:** Metal can; Metal drum; Metal safety cans. Packing as supplied by manufacturer.

Plastic containers may only be used if approved for flammable liquid.

Check that containers are clearly labeled and free from leaks.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Use in a well-ventilated area; local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.

General exhaust is adequate under normal operating conditions.

Local exhaust ventilation may be required in special circumstances.

If risk of overexposure exists, wear NIOSH-approved respirator. Correct fit is essential to ensure adequate protection.

Provide adequate ventilation in warehouses and enclosed storage areas.



In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus.

**Personal Protective Clothing/Equipment:**

**Eyes:** Safety glasses with side shields; chemical goggles. Full face shield.

DO NOT wear contact lenses. Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.

**Hands/Feet:** Wear chemical protective gloves, eg. PVC. Wear safety footwear.

**Respiratory Protection:**

Exposure Range >200 to <500 ppm: Air Purifying, Negative Pressure, Half Mask

Exposure Range 500 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Cartridge Color: black

**Other:** Overalls. Barrier cream. Eyewash unit.

**Glove Selection Index:**

PE/EVAL/PE ..... Best selection

VITON/CHLOROBUTYL ..... Best selection

VITON ..... Best selection

PVA ..... Best selection

TEFLON ..... Satisfactory; may degrade after 4 hours continuous immersion

SARANEX-23 2-PLY ..... Poor to dangerous choice for other than short-term immersion

CPE ..... Poor to dangerous choice for other than short-term immersion

VITON/NEOPRENE ..... Poor to dangerous choice for other than short-term immersion

SARANEX-23 ..... Poor to dangerous choice for other than short-term immersion

NEOPRENE/NATURAL ..... Poor to dangerous choice for other than short-term immersion

NITRILE+PVC ..... Poor to dangerous choice for other than short-term immersion

NITRILE ..... Poor to dangerous choice for other than short-term immersion

BUTYL ..... Poor to dangerous choice for other than short-term immersion

PVC ..... Poor to dangerous choice for other than short-term immersion

NEOPRENE ..... Poor to dangerous choice for other than short-term immersion

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Clear highly flammable liquid with a strong aromatic odor; floats on water. Mixes with most organic solvents.

**Physical State:** Liquid

**pH:** Not applicable

**Vapor Pressure (kPa):** 2.93 at 20 °C

**pH (1% Solution):** Not applicable.

**Vapor Density (Air=1):** 3.2

**Boiling Point:** 111 °C (232 °F) at 760 mm Hg

**Formula Weight:** 92.14

**Freezing/Melting Point:** -95 °C (-139 °F)

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 0.87 at 20 °C

**Volatile Component (% Vol):** 100

**Evaporation Rate:** 2.4 (BuAc=1)

**Water Solubility:** < 1 mg/mL at 18 °C

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Product is considered stable. Hazardous polymerization will not occur.

**Storage Incompatibilities:** Segregate from strong oxidizers.

## Section 11 - Toxicological Information

**Toxicity**

Oral (human) LD<sub>50</sub>: 50 mg/kg

Oral (rat) LD<sub>50</sub>: 636 mg/kg

Inhalation (human) TC<sub>Lo</sub>: 100 ppm

Inhalation (man) TC<sub>Lo</sub>: 200 ppm

Inhalation (rat) LC<sub>50</sub>: > 26700 ppm/1h

Dermal (rabbit) LD<sub>50</sub>: 12124 mg/kg

Reproductive effector in rats

**Irritation**

Skin (rabbit): 20 mg/24h-moderate

Skin (rabbit): 500 mg - moderate

Eye (rabbit): 0.87 mg - mild

Eye (rabbit): 2 mg/24h - SEVERE

Eye (rabbit): 100 mg/30sec - mild

See RTECS XS 5250000, for additional data.



## Section 12 - Ecological Information

**Environmental Fate:** If released to soil, it will be lost by evaporation from near-surface soil and by leaching to the groundwater. Biodegradation occurs both in soil and groundwater, but it is apt to be slow especially at high concentrations, which may be toxic to microorganisms. The presence of acclimated microbial populations may allow rapid biodegradation. It will not significantly hydrolyze in soil or water under normal environmental conditions. If released into water, its concentration will decrease due to evaporation and biodegradation. This removal can be rapid or take several weeks, depending on temperature, mixing conditions, and acclimation of microorganisms. It will not significantly adsorb to sediment or bioconcentrate in aquatic organisms. If released to the atmosphere, it will degrade by reaction with photochemically produced hydroxyl radicals (half-life 3 hr to slightly over 1 day) or be washed out in rain. It will not be subject to direct photolysis.

**Ecotoxicity:** LC<sub>50</sub> Aedes aegypti-4th instar (mosquito larvae) 22 mg/l /Conditions of bioassay not specified; LC<sub>50</sub> Cyprinodon variegatus (sheepshead minnow) 277-485 mg/l 96 hr /Conditions of bioassay not specified; LC<sub>50</sub> Calandra granaria (grain weevil) 210 mg/l /in air; LC<sub>50</sub> Cancer magister (crab larvae stage I) 28 ppm/96 hr /Conditions of bioassay not specified; LC<sub>50</sub> Crangon franciscorum (shrimp) 4.3 ppm 96 hr /Conditions of bioassay not specified; LC<sub>50</sub> Artemia salina (brine shrimp) 33 mg/l 24 hr /Conditions of bioassay not specified; LC<sub>50</sub> Morone saxatilis (striped bass) 7.3 mg/l 96 hr /Conditions of bioassay not specified; LC<sub>50</sub> Pimephales promelas (fathead minnows) 55-72 mg/l (embryos), 25-36 mg/l (1-day posthatch protolaryvae), and 26-31 mg/l (30-day-old minnows)/ 96 hour /Conditions of bioassay not specified

**Henry's Law Constant:** 0.0067

**BCF:** eels 13.2

**Biochemical Oxygen Demand (BOD):** 0%, 5 days

**Octanol/Water Partition Coefficient:** log K<sub>ow</sub> = 2.69

**Soil Sorption Partition Coefficient:** K<sub>oc</sub> = silty loam 37

## Section 13 - Disposal Considerations

**Disposal:** Consult manufacturer for recycling options and recycle where possible.

Follow applicable federal, state, and local regulations.

Incinerate residue at an approved site.

Recycle containers where possible, or dispose of in an authorized landfill.

## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Shipping Name and Description:** Toluene

**ID:** UN1294

**Hazard Class:** 3 - Flammable and combustible liquid

**Packing Group:** II - Medium Danger

**Symbols:**

**Label Codes:** 3 - Flammable Liquid

**Special Provisions:** IB2, T4, TP1

**Packaging:** Exceptions: 150 Non-bulk: 202 Bulk: 242

**Quantity Limitations:** Passenger aircraft/rail: 5 L Cargo aircraft only: 60 L

**Vessel Stowage:** Location: B Other:



## Section 15 - Regulatory Information

### EPA Regulations:

**RCRA 40 CFR:** Listed U220 Toxic Waste

**CERCLA 40 CFR 302.4:** Listed per CWA Section 311(b)(4), per RCRA Section 3001, per CWA Section 307(a) 1000 lb (453.5 kg)

**SARA 40 CFR 372.65:** Listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed

## Section 16 - Other Information

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

54/60

**Material Name:** Styrene

**CAS Number:** 100-42-5

**Chemical Formula:** C<sub>8</sub>H<sub>8</sub>

**Structural Chemical Formula:** C<sub>6</sub>H<sub>5</sub>CH=CH<sub>2</sub>

**EINECS Number:** 202-851-5

**ACX Number:** X1001136-0

**Synonyms:** BENZENE,ETHENYL-; BENZENE,VINYL-; CINNAMENE; CINNAMENOL; CINNAMOL; DIAREX HF 77; ETHENYL BENZENE; ETHENYLBENZENE; ETHYLENE,PHENYL-; PHENETHYLENE; PHENYLETHENE; PHENYLETHYLENE; STIROLO; STYREEN; STYREN; STYRENE; STYRENE MONOMER; STYRENE MONOMER,INHIBITED; STYRENE,MONOMER; STYROL; STYROLE; STYROLENE; STYRON; STYROPOL; STYROPOR; VINYL BENZENE; VINYLBENZEN; VINYLBENZENE; VINYLBENZOL

**General Use:** Widely used in polymer manufacture: polystyrene; SBR, ABS, SAN resins and rubber modified polystyrene for plastics; styrene-butadiene rubber latex.

Styrene polyesters for GRP, FRP molding resins; styrene copolymer resins for coatings; chemical intermediate.

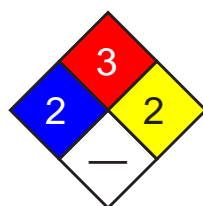
## Section 2 - Composition / Information on Ingredients

Name	CAS	%
styrene	100-42-5	>99

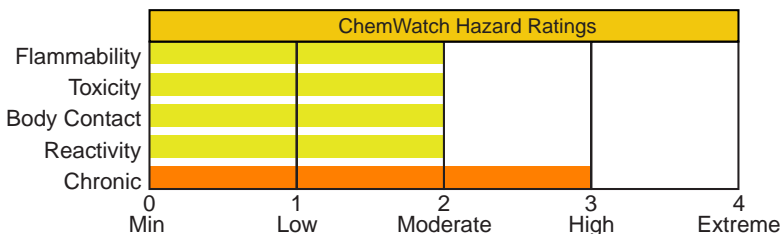
  

<b>OSHA PEL</b> TWA: 100 ppm; Ceiling: 200 ppm; 600 ppm, 5-minute maximum peak in any 3 hours.	<b>NIOSH REL</b> TWA: 50 ppm, 215 mg/m <sup>3</sup> ; STEL: 100 ppm, 425 mg/m <sup>3</sup> .	<b>DFG (Germany) MAK</b> TWA: 20 ppm; PEAK: 40 ppm.
<b>OSHA PEL Vacated 1989 Limits</b> TWA: 50 ppm; 215 mg/m <sup>3</sup> ; STEL: 100 ppm; 425 mg/m <sup>3</sup> .	<b>IDLH Level</b> 700 ppm.	
<b>ACGIH TLV</b> TWA: 20 ppm; STEL: 40 ppm.		

## Section 3 - Hazards Identification



Fire Diamond



HMIS	
2	Health
3	Flammability
2	Reactivity

ANSI Signal Word

**Danger!**



Flammable

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless-yellow, oily liquid; sweet odor. Irritating. Other Acute Effects: difficulty breathing, dizziness. Chronic Effects: dermatitis, nervous system disorders, blood/liver damage, reproductive/teratogenic effects (animal studies). Possible cancer hazard. Flammable.

### Potential Health Effects

**Target Organs:** central nervous system (CNS), eyes, respiratory system, skin

**Primary Entry Routes:** inhalation, skin contact/absorption

#### Acute Effects

**Inhalation:** The vapor is highly discomforting to the upper respiratory tract if inhaled and may be harmful if exposure is prolonged.



Inhalation hazard is increased at higher temperatures.

Acute effects from inhalation of high vapor concentrations may be chest and nasal irritation with coughing, sneezing, headache and even nausea.

If exposure to highly concentrated vapor atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma, and unless resuscitated, death.

Central nervous system (CNS) depression is seen at styrene exposures exceeding 50 ppm, whilst headache, fatigue, nausea and dizziness are reported consistently at exposures of 100 ppm.

Evidence exists that 5% to 10% reductions in sensory nerve conduction occur at 100 ppm and that slowed reaction times occur after exposure to 50 ppm.

Exposure at 376 ppm produces unpleasant subjective symptoms and signs of neurological impairment.

High vapor concentrations may have toxic and anesthetic effects, which may lead to unconsciousness or death.

Exposure at 1000 ppm can rapidly lead to unconsciousness.

Exposure at 10000 ppm may cause death in less than one hour.

Simple reaction times were increased and coordination decreased amongst volunteers inhaling 350 ppm (via mouth tube) for 30 minutes. Controlled inhalation studies with 300 ppm (via mouth tube) for 1 hour found reduced ocular tracking abilities but no changes in balance or coordination.

**Eye:** The liquid is highly discomforting to the eyes and is capable of causing pain and severe conjunctivitis.

Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.

The vapor is highly discomforting to the eyes if exposure is prolonged.

The use of a quantity of material in an unventilated or confined space may result in increased exposure and an irritating atmosphere developing. Before starting consider control of exposure by mechanical ventilation.

The vapor when concentrated has pronounced eye irritation; this gives some warning of high vapor concentrations. If eye irritation occurs seek to reduce exposure with available control measures, or evacuate area.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

**Skin:** The liquid is highly discomforting to the skin if exposure is prolonged and may cause drying of the skin, which may lead to dermatitis.

Toxic effects may result from skin absorption.

Bare unprotected skin should not be exposed to this material.

The material may accentuate any pre-existing dermatitis condition.

The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

**Ingestion:** Considered an unlikely route of entry in commercial/industrial environments.

The liquid is extremely discomforting and moderately toxic if swallowed.

Ingestion may result in nausea, abdominal irritation, pain and vomiting.

**Carcinogenicity:** NTP - Not listed; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

**Chronic Effects:** Neuro-optic pathways have been shown to be particularly vulnerable to organic solvent exposure and studies support the proposition that styrene exposure can induce a dose dependent color vision loss.

Chromosomal abnormalities (micronuclei, chromosome gaps or breaks, nuclear bridges and unscheduled DNA synthesis in peripheral lymphocytes) have been recorded in workers exposed to styrene. Such aberrations however are not always apparent in epidemiological studies and the status of styrene as DNA effector is equivocal.

Deaths due to cancers among workers exposed to styrene is statistically unremarkable.

The dominant first metabolite of styrene is styrene-7,8-oxide which binds covalently to DNA and shows activity in various in-vitro and in-vivo assays for genetic effects where it induces dose-related responses of chromosomal damage at low concentrations. Styrene-7,8-oxide is detected in the blood of workers exposed to styrene. Adducts in hemoglobin and DNA, DNA single-strand breaks/ alkali-labile sites as well as significant increases in the frequency of chromosomal damage has been found in workers exposed to styrene in the reinforced plastics industry.

Exposure to styrene may aggravate C.N.S. disorders, chronic respiratory disease, skin disease, kidney disease and liver disease.

## Section 4 - First Aid Measures

**Inhalation:** Remove to fresh air.

Lay patient down. Keep warm and rested.

If available, administer medical oxygen by trained personnel.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

**Eye Contact:** Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

See  
DOT  
ERG



**Skin Contact:** Quickly but gently, wipe material off skin with a dry, clean cloth.

Immediately remove all contaminated clothing, including footwear.

Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

**Ingestion:** Contact a Poison Control Center. Do NOT induce vomiting. Give a glass of water.

**After first aid, get appropriate in-plant, paramedic, or community medical support.**

**Note to Physicians:** For acute or short-term repeated exposures to styrene:

#### INHALATION:

1. Severe exposures should have cardiac monitoring to detect arrhythmia.
2. Catecholamines, especially epinephrine (adrenalin) should be used cautiously (if at all).
3. Aminophylline and inhaled & beta-two selective bronchodilators (e.g. salbutamol) are the drugs of choice for treatment of bronchospasm.

#### INGESTION:

1. Ipecac syrup should be given for ingestions exceeding 3 mL (styrene)/kg.
2. For patients at risk of aspiration because of obtundation, intubation should precede lavage.
3. Pneumonitis is a significant risk. Watch the patient closely in an upright (alert patient) or left lateral head-down position (obtunded patient) to reduce aspiration potential.

#### BIOLOGICAL EXPOSURE INDEX - BEI

These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

<u>Determinant</u>	<u>Index</u>	<u>Sampling Time</u>	<u>Comments</u>
Mandelic acid in Urine	800 mg/gm creatinine	End of shift	NS
	300 mg/gm creatinine	Prior to next shift	NS
Phenylglyoxylic acid in urine	240 mg/gm creatinine	End of shift	B,NS
	100 mg/gm creatinine	Prior to next shift	
Styrene in venous Blood	0.55 mg/L	End of shift	SQ
	0.02 mg/L	Prior to next shift	SQ

NS: Non-specific determinant; also seen after exposure to other materials.

SQ: Semi-quantitative determinant - Interpretation may be ambiguous; should be used as a screening test or confirmatory test.

B: Background levels occur in specimens collected from subjects NOT exposed.

## Section 5 - Fire-Fighting Measures

**Flash Point:** 34.4 °C Tag Closed Cup

**Autoignition Temperature:** 490 °C

**LEL:** 1.1% v/v

**UEL:** 7.0% v/v

**Extinguishing Media:** Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.

Water spray or fog - Large fires only.

**General Fire Hazards/Hazardous Combustion Products:** Liquid and vapor are flammable.

Moderate fire hazard when exposed to heat or flame.

Vapor forms an explosive mixture with air.

Moderate explosion hazard when exposed to heat or flame.

Vapor may travel a considerable distance to source of ignition.

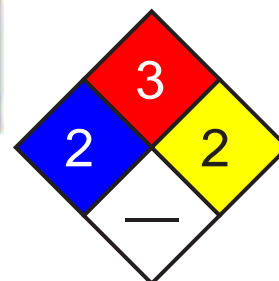
Heating may cause expansion or decomposition leading to violent rupture of containers.

On combustion, may emit toxic fumes of carbon monoxide (CO).

May emit clouds of acrid smoke.

**Fire Incompatibility:** WARNING: May decompose violently or explosively on contact with other substances.

This substance is one of the relatively few compounds which are described as "endothermic" i.e. heat is absorbed into the compound, rather than released from it, during its formation.



Fire Diamond



The majority of endothermic compounds are thermodynamically unstable and may decompose explosively under various circumstances of initiation.

Many but not all endothermic compounds have been involved in decompositions, reactions and explosions and, in general, compounds with significantly positive values of standard heats of formation, may be considered suspect on stability grounds.

Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous. Contamination with polymerization catalysts - peroxides, persulfates, oxidizing agents - also strong acids, strong alkalies, will cause polymerization with exotherm - generation of heat.

Polymerization of large quantities may be violent - even explosive.

Polymerization may occur at elevated temperatures.

Polymerization may be accompanied by generation of heat as exotherm.

Process is self accelerating as heating causes more rapid polymerization.

Exotherm may cause boiling with generation of acrid, toxic and flammable vapor.

Polymerization and exotherm may be violent if contamination with strong acids, amines or catalysts occurs.

Polymerization and exotherm of material in bulk may be uncontrollable and result in rupture of storage tanks.

Polymerization may occur if stabilizing inhibitor becomes depleted by aging.

Stabilizing inhibitor requires dissolved oxygen to be present in liquid for effective action.

Specific storage requirements must be met for stability on ageing and transport.

Contact with alkali solutions or glycols will remove inhibitor and render material unstable on storage.

**Fire-Fighting Instructions:** Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.

Fight fire from a safe distance, with adequate cover.

If safe, switch off electrical equipment until vapor fire hazard removed.

Use water delivered as a fine spray to control the fire and cool adjacent area. Avoid spraying water onto liquid pools.

Do not approach containers suspected to be hot.

Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

## Section 6 - Accidental Release Measures

**Small Spills:** Remove all ignition sources. Clean up all spills immediately.

Avoid breathing vapors and contact with skin and eyes.

Control personal contact by using protective equipment.

Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

**Large Spills:** Clear area of personnel and move upwind.

Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.

No smoking, bare lights or ignition sources. Increase ventilation.

Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor.

Contain spill with sand, earth or vermiculite.

Use only spark-free shovels and explosion proof equipment.

Collect recoverable product into labeled containers for recycling.

Absorb remaining product with sand, earth or vermiculite.

Collect solid residues and seal in labeled drums for disposal.

Wash area and prevent runoff into drains.

If contamination of drains or waterways occurs, advise emergency services.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

See  
DOT  
ERG

## Section 7 - Handling and Storage

**Handling Precautions:** Avoid all personal contact, including inhalation.

Wear protective clothing when risk of overexposure occurs.

Use in a well-ventilated area. Prevent concentration in hollows and sumps.

DO NOT enter confined spaces until atmosphere has been checked.

Avoid smoking, bare lights or ignition sources.

Avoid generation of static electricity. DO NOT use plastic buckets.

Ground all lines and equipment. Use spark-free tools when handling.

Avoid contact with incompatible materials.

When handling, DO NOT eat, drink or smoke.

Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling.



Work clothes should be laundered separately.

Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

**Recommended Storage Methods:** Metal can; metal drum. Packing as recommended by manufacturer.

Check all containers are clearly labeled and free from leaks.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Use in a well-ventilated area. Local exhaust ventilation usually required.

If risk of overexposure exists, wear NIOSH-approved respirator.

Correct fit is essential to obtain adequate protection.

Provide adequate ventilation in warehouse or closed storage area.

**Personal Protective Clothing/Equipment:**

**Eyes:** Chemical goggles. Full face shield.

DO NOT wear contact lenses. Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.

**Hands/Feet:** Butyl rubber gloves. Safety footwear.

**Respiratory Protection:**

Exposure Range >100 to <700 ppm: Air Purifying, Negative Pressure, Half Mask

Exposure Range 700 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Cartridge Color: black

**Other:** Barrier cream. Skin cleansing cream.

Impervious apron.

Overalls.

Eyewash unit.

Ensure there is ready access to a safety shower.

**Glove Selection Index:**

PE/EVAL/PE ..... Best selection

PVA ..... Best selection

TEFLON ..... Best selection

SARANEX-23 ..... Poor to dangerous choice for other than short-term immersion

NITRILE ..... Poor to dangerous choice for other than short-term immersion

NITRILE+PVC ..... Poor to dangerous choice for other than short-term immersion

NATURAL RUBBER ..... Poor to dangerous choice for other than short-term immersion

PVC ..... Poor to dangerous choice for other than short-term immersion

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Colorless flammable liquid; floats on water. Soluble in alcohol and hydrocarbons.

Contains stabilizing Inhibitor. Sweet aromatic odor at low concentrations. Sharp, penetrating odor at high concentrations.

**Physical State:** Liquid

**pH:** Not applicable

**Vapor Pressure (kPa):** 1.27 at 30 °C

**pH (1% Solution):** Not applicable.

**Vapor Density (Air=1):** 3.6

**Boiling Point:** 145 °C (293 °F)

**Formula Weight:** 104.16

**Freezing/Melting Point:** -31 °C (-23.8 °F)

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 0.99 at 25 °C

**Volatile Component (% Vol):** 100

**Evaporation Rate:** 0.49 (BuAc=1)

**Water Solubility:** Sparingly soluble in water

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Material contains a stabilizer/polymerization inhibitor system that provides workable but not indefinite shelf life.

Storage at higher temperatures and long term storage may result in polymerization with solidification. In larger quantities, e.g. 200 liter drums, this may result in generation of heat (exotherm); which may release highly irritating hot styrene vapor. Do not open hot exotherming drums - cool externally with water to avoid vapor release.

Polymerization may occur at elevated temperatures. Polymerization may be accompanied by generation of heat as exotherm. Process is self accelerating as heating causes more rapid polymerization. Exotherm may cause boiling with generation of acrid, toxic and flammable vapor.

Polymerization and exotherm may be violent if contamination with strong acids, amines or catalysts occurs.

Polymerization and exotherm of material in bulk may be uncontrollable and result in rupture of storage tanks.

Polymerization may occur if stabilizing inhibitor becomes depleted by aging.

Stabilizing inhibitor requires dissolved oxygen to be present in liquid for effective action.

Specific storage requirements must be met for stability on ageing and transport.

**Storage Incompatibilities:** WARNING: May decompose violently or explosively on contact with other substances.



This substance is one of the relatively few compounds which are described as "endothermic" i.e. heat is absorbed into the compound, rather than released from it, during its formation.

The majority of endothermic compounds are thermodynamically unstable and may decompose explosively under various circumstances of initiation. Many but not all endothermic compounds have been involved in decompositions, reactions and explosions and, in general, compounds with significantly positive values of standard heats of formation, may be considered suspect on stability grounds. Segregate from strong oxidizers and acids.

DO NOT USE brass or copper containers/stirrers.

Attacks, softens and may dissolve rubber, many plastics, paints and coatings.

## Section 11 - Toxicological Information

### Toxicity

Oral (rat) LD<sub>50</sub>: 5000 mg/kg

Inhalation (human) LC<sub>Lo</sub>: 10000 ppm/30m.

Inhalation (human) TC<sub>Lo</sub>: 0.02 mg/m<sup>3</sup>

Inhalation (human) TC<sub>Lo</sub>: 600 ppm

Inhalation (rat): 24000 mg/m<sup>3</sup>/4h

### Irritation

Skin (human): 500 mg - no skin effects.

Skin (rabbit): 500 mg - mild

Skin (rabbit): 100% - moderate

Eye (rabbit): 18 mg

Eye (rabbit): 100 mg/24h - moderate

See RTECS WL 3765000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** If released to the atmosphere, it will react rapidly with both hydroxyl radicals and ozone with a combined, calculated half-life of about 5 hours. In night-time air, it will degrade rapidly by reaction with atmospheric nitrate radicals. If released to environmental bodies of water, it will volatilize relatively rapidly and biodegrade, but is not expected to hydrolyze. If released to soil it will biodegrade and have a low soil mobility.

**Ecotoxicity:** TL<sub>m</sub> Lepomis macrochirus (bluegill) 25.1 mg/l/96 hr in water hardness of 20 mg/l calcium carbonate /Static bioassay; LC<sub>50</sub> Cyprinodon variegatus (sheepshead minnow) 9.1 mg/l/96 hr, ambient salinity from 10-30 parts per trillion and temp from 25-31 °C /Static bioassay; TL<sub>m</sub> Artemia salina (Brine shrimp) 68 mg/l/24 hr; 52 mg/l/48 hr /Conditions of bioassay not specified

**Henry's Law Constant:** 0.00275

**BCF:** not expected

**Biochemical Oxygen Demand (BOD):** theoretical 18%, 5 days

**Octanol/Water Partition Coefficient:** log K<sub>ow</sub> = 2.95

**Soil Sorption Partition Coefficient:** K<sub>oc</sub> = estimated at 550 to 555

## Section 13 - Disposal Considerations

**Disposal:** Consult manufacturer for recycling options and recycle where possible.

Follow applicable federal, state, and local regulations.

Incinerate residue at an approved site.

Recycle containers where possible, or dispose of in an authorized landfill.

BEWARE: Empty solvent, paint, lacquer and flammable liquid drums present a severe explosion hazard if cut by flame torch or welded. Even when thoroughly cleaned or reconditioned the drum seams may retain sufficient solvent to generate an explosive atmosphere in the drum.

## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Shipping Name and Description:** Styrene monomer, stabilized

**ID:** UN2055

**Hazard Class:** 3 - Flammable and combustible liquid

**Packing Group:** III - Minor Danger

**Symbols:**

**Label Codes:** 3 - Flammable Liquid

**Special Provisions:** B1, IB3, T2, TP1

**Packaging:** Exceptions: 150 Non-bulk: 203 Bulk: 242

**Quantity Limitations:** Passenger aircraft/rail: 60 L Cargo aircraft only: 220 L





Vessel Stowage: Location: A Other:

**Section 15 - Regulatory Information****EPA Regulations:****RCRA 40 CFR:** Not listed**CERCLA 40 CFR 302.4:** Listed per CWA Section 311(b)(4) 1000 lb (453.5 kg)**SARA 40 CFR 372.65:** Listed**SARA EHS 40 CFR 355:** Not listed**TSCA:** Listed**Section 16 - Other Information**

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

54/60

**Material Name:** Ethylbenzene

**CAS Number:** 100-41-4

**Chemical Formula:** C<sub>8</sub>H<sub>10</sub>

**Structural Chemical Formula:** C<sub>6</sub>H<sub>5</sub>•C<sub>2</sub>H<sub>5</sub>

**EINECS Number:** 202-849-4

**ACX Number:** X1003016-1

**Synonyms:** AETHYLBENZOL; BENZENE,ETHYL-; EB; ETHYL BENZENE; ETHYLBENZEEN;  
 ETHYLBENZENE; ETHYLBENZOL; ETILBENZENE; ETYLOBENZEN; PHENYLETHANE

**General Use:** Used in the manufacture of cellulose acetate, styrene and synthetic rubber; solvent or diluent; component of automotive and aviation gasoline.

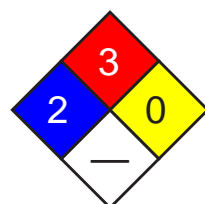
Component of many petroleum hydrocarbon solvents, thinners.

The use of a quantity of material in an unventilated or confined space may result in increased exposure and an irritating atmosphere developing. Before starting consider control of exposure by mechanical ventilation.

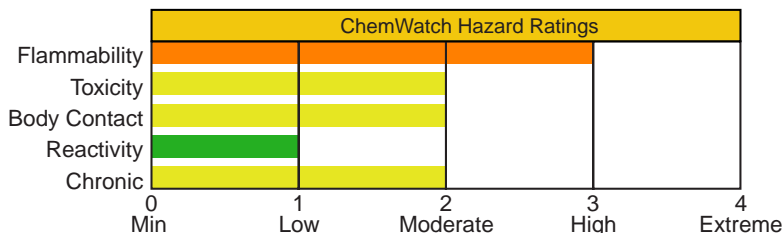
## Section 2 - Composition / Information on Ingredients

Name	CAS	%
ethylbenzene	100-41-4	>95
<b>OSHA PEL</b> TWA: 100 ppm; 435 mg/m <sup>3</sup> .	<b>NIOSH REL</b> TWA: 100 ppm, 435 mg/m <sup>3</sup> ; STEL: 125 ppm, 545 mg/m <sup>3</sup> .	<b>DFG (Germany) MAK</b> Skin.
<b>OSHA PEL Vacated 1989 Limits</b> TWA: 100 ppm; 435 mg/m <sup>3</sup> ; STEL: 125 ppm; 545 mg/m <sup>3</sup> .	<b>IDLH Level</b> 800 ppm (10% LEL).	
<b>ACGIH TLV</b> TWA: 100 ppm; STEL: 125 ppm.		

## Section 3 - Hazards Identification



Fire Diamond



HMIS	
2	Health
3	Flammability
0	Reactivity

ANSI Signal Word

**Warning!**



Flammable

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; pungent odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: chest constriction, vertigo, narcosis, cramps, respiratory paralysis. Chronic Effects: fatigue, sleepiness, headache, blood disorders, lymphocytosis. Flammable.

### Potential Health Effects

**Target Organs:** eyes, respiratory system, skin, central nervous system (CNS), blood

**Primary Entry Routes:** inhalation, skin contact, eye contact

#### Acute Effects

**Inhalation:** The vapor is discomforting to the upper respiratory tract.

Inhalation hazard is increased at higher temperatures.

Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.



If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.

Inhalation of vapor may aggravate a pre-existing respiratory condition such as asthma, bronchitis, emphysema.

When humans were exposed to the 100 and 200 ppm for 8 hours about 45-65% is retained in the body. Only traces of unchanged ethyl benzene are excreted in expired air following termination of inhalation exposure.

Humans exposed to concentrations of 23-85 ppm excreted most of the retained dose in the urine (mainly as metabolites).

Guinea pigs that died from exposure had intense congestion of the lungs and generalized visceral hyperemia. Rats exposed for three days at 8700 mg/m<sup>3</sup> (2000 ppm) showed changes in the levels of dopamine and noradrenaline in various parts of the brain.

**Eye:** The liquid is highly discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.

The vapor is discomforting to the eyes.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Two drops of the material in to the conjunctival sac produced only slight irritation of the conjunctival membrane but no corneal injury.

**Skin:** The liquid is discomforting to the skin if exposure is prolonged and is capable of causing skin reactions which may lead to dermatitis.

The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

The mean rate of absorption of liquid ethyl benzene applied to 17.3 cm<sup>2</sup> area of the forearm of seven volunteers for 10-15 minutes was determined to be 38 mg/cm<sup>2</sup>/hr. Immersion of the whole hand in aqueous solutions of ethyl benzene (112-156 mg/l) for 1 hour yielded mean absorption rates of 118 and 215.7 ug/cm<sup>2</sup>/hr. The rate of absorption is thus greater than that of aniline, benzene, nitrobenzene, carbon disulfide and styrene.

Repeated application of the undiluted product to the abdominal area of rabbits (10-20 applications over 2-4 weeks) resulted in erythema, edema and superficial necrosis. The material did not appear to be absorbed through the skin in sufficient quantity to produce outward signs of toxicity.

**Ingestion:** Considered an unlikely route of entry in commercial/industrial environments.

The liquid may produce considerable gastrointestinal discomfort and may be harmful or toxic if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

**Carcinogenicity:** NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

**Chronic Effects:** Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes.

Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following.

Industrial workers exposed to a maximum level of ethyl benzene of 0.06 mg/l (14 ppm) reported headaches and irritability and tired quickly. Functional nervous system disturbances were found in some workers employed for over 7 years whilst other workers had enlarged livers.

## Section 4 - First Aid Measures

**Inhalation:** Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

**Eye Contact:** Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**Skin Contact:** Immediately remove all contaminated clothing, including footwear (after rinsing with water).

Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

**Ingestion:** Rinse mouth out with plenty of water. DO NOT induce vomiting.

Observe the patient carefully. Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.

Give water (or milk) to rinse out mouth. Then provide liquid slowly and as much as casualty can comfortably drink.

Transport to hospital or doctor without delay.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** For acute or short-term repeated exposures to petroleum distillates or related hydrocarbons:

See  
DOT  
ERG



1. Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.
  2. Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases ( $pO_2 < 50$  mm Hg or  $pCO_2 > 50$  mm Hg) should be intubated.
  3. Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance
  4. A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
  5. Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
- Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
6. Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.

## Section 5 - Fire-Fighting Measures

**Flash Point:** 12.8 °C Closed Cup

**Autoignition Temperature:** 432 °C

**LEL:** 1.6% v/v

**UEL:** 7% v/v

**Extinguishing Media:** Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.

Water spray or fog - Large fires only.

**General Fire Hazards/Hazardous Combustion Products:** Liquid and vapor are flammable.

Moderate fire hazard when exposed to heat or flame.

Vapor forms an explosive mixture with air.

Moderate explosion hazard when exposed to heat or flame.

Vapor may travel a considerable distance to source of ignition.

Heating may cause expansion or decomposition leading to violent rupture of containers.

On combustion, may emit toxic fumes of carbon monoxide (CO).

May emit clouds of acrid smoke.

**Fire Incompatibility:** Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

**Fire-Fighting Instructions:** Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

If safe, switch off electrical equipment until vapor fire hazard removed.

Use water delivered as a fine spray to control fire and cool adjacent area.

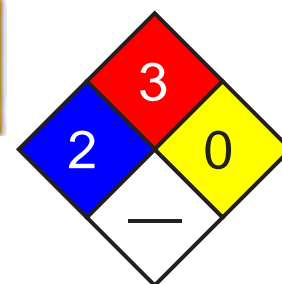
Avoid spraying water onto liquid pools.

Do not approach containers suspected to be hot.

Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

See  
DOT  
ERG



Fire Diamond

## Section 6 - Accidental Release Measures

**Small Spills:** Remove all ignition sources. Clean up all spills immediately.

Avoid breathing vapors and contact with skin and eyes.

Control personal contact by using protective equipment.

Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

**Large Spills:** Clear area of personnel and move upwind.

Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

No smoking, bare lights or ignition sources. Increase ventilation.

Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.

Use only spark-free shovels and explosion proof equipment.

Collect recoverable product into labeled containers for recycling.

Absorb remaining product with sand, earth or vermiculite.

Collect solid residues and seal in labeled drums for disposal.

Wash area and prevent runoff into drains.

If contamination of drains or waterways occurs, advise emergency services.

See  
DOT  
ERG



**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

## Section 7 - Handling and Storage

**Handling Precautions:** Avoid generating and breathing mist. Avoid all personal contact, including inhalation.

Wear protective clothing when risk of exposure occurs.

Use in a well-ventilated area. Prevent concentration in hollows and sumps.

DO NOT enter confined spaces until atmosphere has been checked.

Avoid smoking, bare lights, heat or ignition sources.

When handling, DO NOT eat, drink or smoke.

Vapor may ignite on pumping or pouring due to static electricity.

DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.

Avoid contact with incompatible materials.

Keep containers securely sealed. Avoid physical damage to containers.

Always wash hands with soap and water after handling.

Work clothes should be laundered separately.

Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

**Recommended Storage Methods:** Metal can; metal drum. Packing as recommended by manufacturer.

Check all containers are clearly labeled and free from leaks.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear. Use in a well-ventilated area.

General exhaust is adequate under normal operating conditions.

If risk of overexposure exists, wear NIOSH-approved respirator.

Correct fit is essential to obtain adequate protection.

Provide adequate ventilation in warehouse or closed storage areas.

**Personal Protective Clothing/Equipment:**

**Eyes:** Safety glasses with side shields; or as required, chemical goggles.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

**Hands/Feet:** Barrier cream with polyethylene gloves or Nitrile gloves.

Protective footwear.

**Respiratory Protection:**

Exposure Range >100 to <800 ppm: Air Purifying, Negative Pressure, Half Mask

Exposure Range 800 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Cartridge Color: black

**Other:** Overalls. Eyewash unit.

**Glove Selection Index:**

VITON ..... Best selection

TEFLON ..... Best selection

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Clear highly flammable liquid; floats on water. Aromatic solvent odor. Soluble in alcohol, benzene, carbon tetrachloride and ether.

**Physical State:** Liquid

**Vapor Pressure (kPa):** 1.333 at 25.9 °C

**Vapor Density (Air=1):** 3.66

**Formula Weight:** 106.17

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 0.8670 at 20 °C

**Evaporation Rate:** Fast

**pH:** Not applicable

**pH (1% Solution):** Not applicable.

**Boiling Point:** 136.2 °C (277 °F) at 760 mm Hg

**Freezing/Melting Point:** -95 °C (-139 °F)

**Volatile Component (% Vol):** 100

**Water Solubility:** 0.01% by weight

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Hazardous polymerization will not occur.

**Storage Incompatibilities:** Avoid storage with oxidizers.



## Section 11 - Toxicological Information

### Toxicity

Oral (rat) LD<sub>50</sub>: 3500 mg/kg

Inhalation (human) TC<sub>Lo</sub>: 100 ppm/8h

Inhalation (rat) LC<sub>Lo</sub>: 4000 ppm/4h

Intraperitoneal (mouse) LD<sub>50</sub>: 2642 mg/kg~

Dermal (rabbit) LD<sub>50</sub>: 17800 mg/kg~

Liver changes, uterine tract, effects on fertility, specific developmental abnormalities (musculoskeletal system) recorded.

NOTE: Substance has been shown to be mutagenic in various assays, or belongs to a family of chemicals producing damage or change to cellular DNA.

### Irritation

Skin (rabbit): 15 mg/24h mild

Eye (rabbit): 500 mg - SEVERE

See RTECS DA 0700000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** If released to the atmosphere, it exists predominantly in the vapor phase based on its vapor pressure where it will photochemically degrade by reaction with hydroxyl radicals (half-life 0.5 to 2 days) and partially return to earth in rain. It will not be subject to direct photolysis. Releases into water will decrease in concentration by evaporation and biodegradation. The time for this decrease and the primary loss processes will depend on the season, and the turbulence and microbial populations in the particular body of water. Representative half-lives are several days to 2 weeks. Some may be adsorbed by sediment but significant bioconcentration in fish is not expected to occur based upon its octanol/water partition coefficient. It is only adsorbed moderately by soil. It will not significantly hydrolyze in water or soil.

**Ecotoxicity:** LC<sub>50</sub> Cyprinodon variegatus (sheepshead minnow) 275 mg/l 96 hr in a static unmeasured bioassay; LC<sub>50</sub> Pimephales promelas (fathead minnow) 12.1 mg/l/96 hr (confidence limit 11.5 - 12.7 mg/l), flow-through bioassay with measured concentrations, 26.1 °C, dissolved oxygen 7.0 mg/l, hardness 45.6 mg/l calcium carbonate, alkalinity 43.0 mg/l; Toxicity threshold (cell multiplication inhibition test): Pseudomonas putida (bacteria) 12 mg/l; LC<sub>50</sub> Palaemonetes pugio (grass shrimp, adult) 14,400 ug/l/24 hr in a static unmeasured bioassay; LC<sub>50</sub> Palaemonetes pugio (grass shrimp, larva) 10,200 ug/l/24 hr in a static unmeasured bioassay; Toxicity threshold (cell multiplication inhibition test): Microcystis aeruginosa (algae) 33 mg/l; Scenedesmus quadricauda (green algae) > 160 mg/l

**Henry's Law Constant:** 8.44 x 10<sup>-3</sup>

**BCF:** goldfish 1.9

**Biochemical Oxygen Demand (BOD):** theoretical 2.8%, 5 days

**Octanol/Water Partition Coefficient:** log K<sub>ow</sub> = 3.15

**Soil Sorption Partition Coefficient:** K<sub>oc</sub> = 164

## Section 13 - Disposal Considerations

**Disposal:** Consult manufacturer for recycling options and recycle where possible.

Follow applicable federal, state, and local regulations.

Incinerate residue at an approved site.

Recycle containers where possible, or dispose of in an authorized landfill.

## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Shipping Name and Description:** Ethylbenzene

**ID:** UN1175

**Hazard Class:** 3 - Flammable and combustible liquid

**Packing Group:** II - Medium Danger

**Symbols:**

**Label Codes:** 3 - Flammable Liquid

**Special Provisions:** IB2, T4, TP1

**Packaging:** Exceptions: 150 **Non-bulk:** 202 **Bulk:** 242

**Quantity Limitations:** **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L

**Vessel Stowage:** **Location:** B **Other:**





**Section 15 - Regulatory Information****EPA Regulations:****RCRA 40 CFR:** Not listed**CERCLA 40 CFR 302.4:** Listed per CWA Section 311(b)(4), per CWA Section 307(a) 1000 lb (453.5 kg)**SARA 40 CFR 372.65:** Listed**SARA EHS 40 CFR 355:** Not listed**TSCA:** Listed**Section 16 - Other Information**

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

**50/60**

**Material Name:** Naphthalene

**CAS Number:** 91-20-3

**Chemical Formula:** C<sub>10</sub>H<sub>8</sub>

**EINECS Number:** 202-049-5

**ACX Number:** X1001294-7

**Synonyms:** ALBOCARBON; CAMPHOR TAR; DEZODORATOR; FAULDING NAPHTHALENE FLAKES; MIGHTY 150; MIGHTY RD1; MOTH BALLS; MOTH FLAKES; MOTHBALLS; NAFTALEN; NAPHTHALENE; NAPHTHALIN; NAPHTHALINE; NAPHTHENE; TAR CAMPHOR; WHITE TAR

**Derivation:** From coal tar; from petroleum fractions after various catalytic processing operations.

**General Use:** Used as a moth repellent, an antiseptic, toilet bowl deodorant, heat transfer agent, fungicide, smokeless powder, cutting fluid, lubricant, wood preservative; an intermediate for naphthol, phthalic anhydride, chlorinated naphthalenes, Tertralin, Decalin, naphthyl and naphthol derivatives, and dyes; in synthetic resins, synthetic tanning, textile chemicals, scintillation counters, and emulsion breakers.

## Section 2 - Composition / Information on Ingredients

Name	CAS	%
Naphthalene	91-20-3	ca 100% wt.
Grade - By melting point, 165 °F (74 °C) min (crude) to greater than 174 °F (79 °C) (refined); scintillation 176-177 °F (80-81 °C)		

### OSHA PEL

TWA: 10 ppm; 50 mg/m<sup>3</sup>.

### NIOSH REL

TWA: 10 ppm, 50 mg/m<sup>3</sup>; STEL: 15 ppm, 75 mg/m<sup>3</sup>.

### DFG (Germany) MAK

Skin.

### OSHA PEL Vacated 1989 Limits

TWA: 10 ppm; 50 mg/m<sup>3</sup>; STEL: 15 ppm; 75 mg/m<sup>3</sup>.

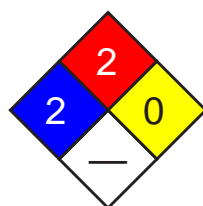
### IDLH Level

250 ppm.

### ACGIH TLV

TWA: 10 ppm; STEL: 15 ppm; skin.

## Section 3 - Hazards Identification



Fire Diamond

	ChemWatch Hazard Ratings				
Flammability	2	1	0	0	0
Toxicity	2	1	0	0	0
Body Contact	2	1	0	0	0
Reactivity	2	1	0	0	0
Chronic	2	1	0	0	0
	0 Min	1 Low	2 Moderate	3 High	4 Extreme

HMIS	
2	Health
2	Flammability
0	Reactivity

### ANSI Signal Word

**Warning!**

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

White crystalline solid; "moth ball" or coal-tar odor. Irritating to eyes/skin/respiratory tract. Toxic by ingestion. Combustible solid. Dust may form explosive mixtures in air.

### Potential Health Effects

**Target Organs:** Blood (red blood cell effects), eyes, skin, central nervous system (CNS), liver and kidneys

**Primary Entry Routes:** Inhalation, skin absorption, skin and/or eye contact

### Acute Effects

**Inhalation:** Vapor inhalation causes headache, confusion, nausea, sometimes vomiting, loss of appetite, extensive sweating, dysuria (painful urination), hematuria (blood in the urine), and hemolysis (destruction of red blood cells).

**Eye:** Irritation, conjunctivitis, and corneal injury upon prolonged contact.

**Skin:** Irritation and hypersensitivity dermatitis.



**Ingestion:** Unlikely. However, ingestion causes irritation of the mouth and stomach, hemolytic anemia with hepatic and renal lesions and vesical congestion, kidney failure, hematuria, jaundice, depression of CNS, nausea, vomiting, abdominal pain, blue face, lips, or hands, rapid and difficult breathing, headache, confusion, excitement, malaise, fever, perspiration, urinary tract pain, dizziness, convulsions, coma, and death. Symptoms may appear 2 to 4 hours after exposure.

**Carcinogenicity:** NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A4, Not classifiable as a human carcinogen; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

**Medical Conditions Aggravated by Long-Term Exposure:** Diseases of the blood, liver and kidneys; individuals with a hereditary deficiency of the enzyme glucose-6-phosphate dehydrogenase in red blood cells are particularly susceptible to the hemolytic properties of naphthalene metabolites.

**Chronic Effects:** May cause optical neuritis, corneal injuries, cataracts, kidney damage. There are two reports of naphthalene crossing the placenta in humans.

## Section 4 - First Aid Measures

**Inhalation:** Remove exposed person to fresh air and support breathing as needed. Contact a physician immediately if symptoms of systemic poisoning are present.

**Eye Contact:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 min. Consult a physician or ophthalmologist if pain, irritation, swelling, or photophobia persist.

**Skin Contact:** Quickly remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area thoroughly with soap and water. For reddened or blistered skin, consult a physician. Contact a physician immediately if symptoms of systemic poisoning are present.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the conscious and alert person drink 1 to 2 glasses of water, then induce vomiting. Contact a physician immediately.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** Obtain baseline CBC, electrolytes, liver and renal function tests, glucose-6-phosphatase dehydrogenase level, urinalysis, and benzidine dipstick to check for hemoglobinuria. Urinary metabolite, 1-naphthol or mercapturic acid, may help confirm the diagnosis.

See  
DOT  
ERG

## Section 5 - Fire-Fighting Measures

**Flash Point:** 174 °F (79 °C) OC; 190 °F (88 °C) CC

**Autoignition Temperature:** 979 °F (526 °C)

**LEL:** 0.9% v/v

**UEL:** 5.9% v/v

**Flammability Classification:** Combustible solid

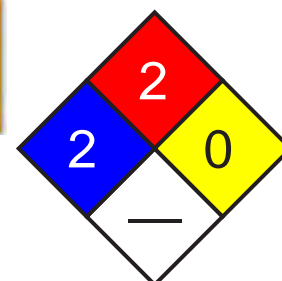
**Extinguishing Media:** Use dry chemical, foam, carbon dioxide (CO<sub>2</sub>), or water spray.

Water or foam may cause frothing. Use water spray to keep fire-exposed containers cool.

**General Fire Hazards/Hazardous Combustion Products:** Toxic vapors including carbon monoxide. Volatile solid that gives off flammable vapors when heated. Dust may explode in air if an ignition source is provided.

**Fire-Fighting Instructions:** Move containers from the fire area if it can be done without risk. Otherwise cool fire-exposed containers until well after the fire is extinguished. Do not release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Wear full protective clothing. Structural clothing is permeable, remain clear of smoke, water fall out, and water run off.

See  
DOT  
ERG



Fire Diamond

## Section 6 - Accidental Release Measures

**Spill/Leak Procedures:** Notify safety personnel, evacuate all unnecessary personnel, remove heat and ignition sources. Isolate and ventilate area, deny entry, stay upwind. Stop leak if you can do it without risk. Use spark-proof tools and explosion proof equipment. Cleanup personnel should wear personal protective equipment to protect against exposure.

**Small Spills:** Do not sweep! Carefully scoop up or vacuum (with a HEPA filter). Absorb liquid spill with an inert, noncombustible absorbent such as sand or vermiculite.

**Large Spills:** For large spills, dike far ahead of liquid spill for later disposal. Do not release into sewers or waterways.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

See  
DOT  
ERG



## Section 7 - Handling and Storage

**Handling Precautions:** To avoid vapor inhalation use only with ventilation sufficient to reduce airborne concentrations to nonhazardous levels. Avoid skin and eye contact. Wear personal protective clothing and equipment to prevent any contact with skin and eyes (see Sec. 8). Practice good personal hygiene procedures to prevent inadvertently ingesting this material.

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

**Recommended Storage Methods:** Store in tightly closed, explosion-proof containers in a cool, well-ventilated area away from heat, ignition sources, and incompatibles (see Sec. 10). May be stored under nitrogen gas. Protect containers against physical damage. Use monitoring equipment to measure the extent of vapor present in any storage facility containing naphthalene because of potential fire and explosion hazards.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Where feasible, enclose operations to avoid vapor and dust dispersion into the work area.

Ventilate at the site of chemical release. During the fractional distillation of naphthalene and in any operation entailing the heating or volatilization of naphthalene, enclosed apparatus should be employed. Provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

**Administrative Controls:** Educate workers about the health and safety hazards associated with naphthalene. Train in work practices which minimize exposure. Consider preplacement and periodic medical exams with emphasis on the eyes, skin, liver, kidneys, CBC (RBC count, WBC count, differential count of a stained smear, hemoglobin, and hematocrit), and urinalysis including at a minimum specific gravity, albumin, glucose, and a microscopic examination on centrifuged sediment.

**Personal Protective Clothing/Equipment:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent skin contact. Teflon is recommended. *Do not* use butyl rubber, natural rubber, neoprene or polyvinyl chloride. Wear chemical dust-proof safety goggles and face shield, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

**Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

**Other:** Separate contaminated work clothes from street clothes. Launder before reuse. Remove naphthalene from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** White volatile flakes, cakes, cubes, spheres, or powder; strong coal-tar or moth ball odor.

**Physical State:** Crystalline solid

**Odor Threshold:** 0.084 ppm to 0.3 ppm

**Vapor Pressure (kPa):** 0.05 mm Hg at 68 °F (20 °C);  
1.0 mm Hg at 127 °F (53 °C)

**Formula Weight:** 128.2

**Density:** 1.145 g/cm<sup>3</sup> at 68 °F (20 °C)

**Boiling Point:** 424 °F (218 °C)

**Freezing/Melting Point:** 176 °F (80.2 °C)

**Water Solubility:** Insoluble [31.7 mg/L at 68 °F (20 °C)]

**Other Solubilities:** Benzene, absolute alcohol; very soluble in ether, chloroform, carbon disulfide, hydronaphthalenes, fixed and volatile oils

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Naphthalene is stable at room temperature in closed containers under normal storage and handling conditions. It volatilizes at room temperature. Hazardous polymerization cannot occur. Exposure to heat and ignition sources, incompatibles.

**Storage Incompatibilities:** Include aluminum chloride, benzoyl chloride, chromic acid, chromium trioxide, oxidizers. Explosive reaction with dinitrogen pentaoxide. Melted naphthalene will attack some forms of plastics.

**Hazardous Decomposition Products:** Thermal oxidative decomposition of naphthalene can produce toxic fumes including carbon monoxide.



## Section 11 - Toxicological Information

### Acute Oral Effects:

Rat, oral, LD<sub>50</sub>: 490 mg/kg.  
 Mouse, oral, LD<sub>50</sub>: 533 mg/kg.  
 Human (child), oral, LD<sub>Lo</sub>: 100 mg/kg.

### Acute Inhalation Effects:

Rat, inhalation, LC<sub>50</sub>: >340 mg/m<sup>3</sup> produced lacrimation and somnolence.

### Irritation Effects:

Rabbit, eye, standard Draize test: 100 mg produced mild irritation.  
 Rabbit, skin, open Draize test: 495 mg produced mild irritation.

### Other Effects:

Rat, oral: 4500 mg/kg administered on gestational days 6-15 produced fetotoxicity and other developmental abnormalities.

Man, unreported, LD<sub>Lo</sub>: 74 mg/kg.

Mouse, inhalation: 30 ppm/6 hr/2 yr administered intermittently produced toxic effects: tumorigenic - neoplastic by RTECS criteria; lungs, thorax, or respiration - tumors.

Hamster, ovary: 15 mg/L induced sister chromatid exchange.

See RTECS QJ0525000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** If released to the atmosphere, naphthalene rapidly photodegrades with a half-life of 3-8 hr. Volatilization, photolysis, adsorption, and biodegradation are important loss mechanisms for naphthalene discharged into water. Depending on local conditions, the half-lives range from a couple of days to a few months. If released on land, it is adsorbed moderately to soil, undergoes biodegradation; but in some cases biodegradation may still occur if conditions are aerobic. Bioconcentration occurs to a moderate extent, but is a temporary problem since depuration and metabolism readily proceed in aquatic organisms.

**Ecotoxicity:** *Oncorhynchus gorbusha* (pink salmon): 1.37 ppm/96 hr at 39 °F (4 °C). *Pimephales promelas* (fathead minnow): 7.76 mg/L/24 hr.

**Octanol/Water Partition Coefficient:** log K<sub>ow</sub> = 3.30

## Section 13 - Disposal Considerations

**Disposal:** Consider rotary kiln or fluidized bed incineration. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations. Handle empty containers carefully as hazardous residues may still remain.

## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Shipping Name and Description:** Naphthalene, crude *or* Naphthalene, refined

**ID:** UN1334

**Hazard Class:** 4.1 - Flammable solid

**Packing Group:** III - Minor Danger

**Symbols:**

**Label Codes:** 4.1 - Flammable Solid

**Special Provisions:** A1, IB8, IP3

**Packaging:** Exceptions: 151 **Non-bulk:** 213 **Bulk:** 240

**Quantity Limitations:** Passenger aircraft/rail: 25 kg **Cargo aircraft only:** 100 kg

**Vessel Stowage:** Location: A **Other:**



## Section 15 - Regulatory Information

### EPA Regulations:

**RCRA 40 CFR:** Listed U165 Toxic Waste

**CERCLA 40 CFR 302.4:** Listed per CWA Section 311(b)(4), per RCRA Section 3001, per CWA Section 307(a) 100 lb (45.35 kg)

**SARA 40 CFR 372.65:** Listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed



**Section 16 - Other Information**

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

44/60

**Material Name:** Phenanthrene

**CAS Number:** 85-01-8

**Chemical Formula:** C<sub>14</sub>H<sub>10</sub>

**Structural Chemical Formula:** (C<sub>6</sub>H<sub>4</sub>CH)<sub>2</sub>

**EINECS Number:** 201-581-5

**ACX Number:** X1001897-8

**Synonyms:** COAL TAR PITCH VOLATILES; PHENANTHRENE; PHENANTHREN; PHENANTHRENE; PHENANTRIN

**Derivation:** A polynuclear aromatic hydrocarbon found as a component of coal tar pitch volatiles (products of bituminous coal distillation). Produced from toluene, bibenzil, 9-methyl fluorene or stilbene by passage through red hot tubes or by diene synthesis of 1-vinyl naphthalene and maleic anhydride.

**General Use:** Used in the manufacture of dyestuffs and explosives; in biological research or drug synthesis.

## Section 2 - Composition / Information on Ingredients

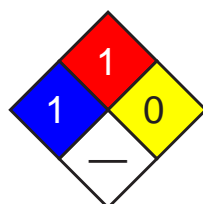
Name	CAS	%
Phenanthrene	85-01-8	ca 100 % wt

**OSHA PEL**

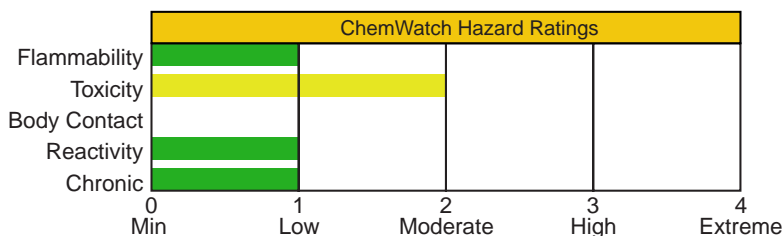
**NIOSH REL**

**ACGIH TLV**

## Section 3 - Hazards Identification



Fire Diamond



HMIS	
①	Health
①	Flammability
①	Reactivity

**ANSI Signal Word**

**Caution**

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Shiny crystals; faint, aromatic odor. Acute Effects: skin photosensitization. Combustible. Reacts dangerously with oxidizers.

### Potential Health Effects

**Target Organs:** Skin.

**Primary Entry Routes:** Skin contact.

**Acute Effects**

**Inhalation:** Effects not reported.

**Eye:** Effects not reported.

**Skin:** Can cause photosensitization of the skin.

**Ingestion:** Effects not reported.

**Carcinogenicity:** NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

**Medical Conditions Aggravated by Long-Term Exposure:** Skin disorders.

**Chronic Effects:** None reported.



## Section 4 - First Aid Measures

**Inhalation:** Remove exposed person to fresh air and support breathing as needed.

**Eye Contact:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

**Skin Contact:** *Quickly* remove contaminated clothing. Rinse exposed area with flooding amounts of water to remove loose material and then move quickly to a soap and water wash. For reddened or blistered skin, consult a physician.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** Treatment is symptomatic and supportive.

See  
DOT  
ERG

## Section 5 - Fire-Fighting Measures

**Flash Point:** 340 °F (171 °C), Open Cup

**LEL:** Not reported.

**UEL:** Not reported.

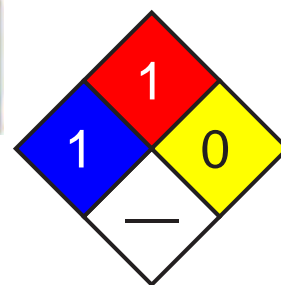
**Flammability Classification:** Class IIIB Combustible liquid

**Extinguishing Media:** Use dry chemical or carbon dioxide; water spray or foam may cause frothing.

**General Fire Hazards/Hazardous Combustion Products:** Carbon oxides (CO<sub>x</sub>) and acrid smoke

**Fire-Fighting Instructions:** Do not release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

See  
DOT  
ERG



Fire Diamond

## Section 6 - Accidental Release Measures

**Spill/Leak Procedures:** Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off ignition sources. Cleanup personnel should protect against skin contact.

**Small Spills:** To avoid dust generation, *do not* sweep! Carefully scoop up or vacuum (with appropriate filter). Damp mop residue.

**Large Spills:** Flush large spill to containment area for later disposal. Do not release into sewers or waterways. Mop up any residue.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

See  
DOT  
ERG

## Section 7 - Handling and Storage

**Handling Precautions:** Use nonsparking tools to open containers.

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

**Recommended Storage Methods:** Prevent physical damage to containers. Store in a cool, dry, well-ventilated area away from heat, ignition sources, and strong oxidizers.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** To prevent static sparks, electrically ground and bond all equipment used with and around phenanthrene. Provide general or local exhaust ventilation systems to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

**Administrative Controls:** Consider preplacement and periodic medical exams of exposed workers with emphasis on the skin.

**Personal Protective Clothing/Equipment:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.



**Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. The following respirator recommendation is for *coal-tar pitch volatiles*: For any detectable concentration, use a SCBA or supplied-air respirator (with auxiliary SCBA) with a full facepiece and operated in pressure-demand or other positive pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

**Other:** Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Colorless, shiny crystals with a faint, aromatic odor.

**Physical State:** Solid

**Vapor Pressure (kPa):** 1 mm Hg at 244.76 °F (118.2 °C); 400 mm Hg at 586.4 (308 °C)

**Formula Weight:** 178.22

**Density:** 1.179 g/L at 77 °F (25 °C)

**Refractive Index:** 1.59427

**Boiling Point:** 644 °F (340 °C)

**Freezing/Melting Point:** 213 °F (101 °C)

**Water Solubility:** 1.6 mg/L at 59 °F (15 °C)

**Other Solubilities:** 1 g in: 2.4 mL toluene, 2.4 mL carbon tetrachloride, 2 mL benzene, 1 mL carbon disulfide, 25 mL absolute alcohol, 60 mL cold 95% alcohol, 10 mL boiling 95% alcohol and 3.3 mL anhydrous ether. Also soluble in glacial acetic acid, chloroform, and hot pyridine.

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Phenanthrene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization does not occur. Phenanthrene dust generation and exposure to heat ignition sources, or oxidizers.

**Storage Incompatibilities:** Strong oxidizers.

**Hazardous Decomposition Products:** Thermal oxidative decomposition of phenanthrene can produce carbon oxide(s).

## Section 11 - Toxicological Information

### Acute Oral Effects:

Mouse, oral, LD<sub>50</sub>: 700 mg/kg.

### Other Effects:

Tumorigenicity, mouse, skin: 71 mg/kg produced tumors at site of application.

Genetic Effects - Rat, liver cell: 3 mmol/L caused DNA damage.

Human, lymphocyte: 100 µmol/L caused mutation.

See RTECS SF7175000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** If released to soil, some phenanthrene may biodegrade but the majority will bind to the soil without much leaching to groundwater. Volatilization is not expected to be significant. In water, it will adhere to particulates and sediment. Photolysis may occur near the surface producing toxic substances.

Photolysis/photooxidation half-life = 8.4 hr. In the air, it will react with photochemically generated hydroxyl radicals (half-life = 1.67 days). Phenanthrene absorbs strongly to soil and sediment in water.

**Ecotoxicity:** *Neanthes arenaceodentata*, TL<sub>m</sub> = 0.6 ppm/96 hr, sea water at 71.6 °F (22 °C)

**Octanol/Water Partition Coefficient:** log K<sub>ow</sub> = 4.57

## Section 13 - Disposal Considerations

**Disposal:** For treatment of phenanthrene contaminated water, the particulate bound portion can be removed by sedimentation, flocculation, and filtration. Chlorination is not recommended as it has been shown to produce mutagenic substances. The dissolved portion requires oxidation for partial removal. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.



**Section 14 - Transport Information****DOT Hazardous Materials Table Data (49 CFR 172.101):**

**Shipping Name and Description:** Environmentally hazardous substances, solid, n.o.s.

**ID:** UN3077

**Hazard Class:** 9 - Miscellaneous hazardous material

**Packing Group:** III - Minor Danger

**Symbols:** G - Technical Name Required

**Label Codes:** 9 - Class 9

**Special Provisions:** 8, 146, B54, IB8, N20

**Packaging:**      **Exceptions:** 155 **Non-bulk:** 213 **Bulk:** 240

**Quantity Limitations:** **Passenger aircraft/rail:** No limit **Cargo aircraft only:** No limit

**Vessel Stowage:**      **Location:** A      **Other:**

**Section 15 - Regulatory Information****EPA Regulations:**

**RCRA 40 CFR:** Not listed

**CERCLA 40 CFR 302.4:** Listed per CWA Section 307(a) 5000 lb (2268 kg)

**SARA 40 CFR 372.65:** Listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed

**Section 16 - Other Information**

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Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

54/60

**Material Name:** Benzene

**CAS Number:** 71-43-2

**Chemical Formula:** C<sub>6</sub>H<sub>6</sub>

**Structural Chemical Formula:** C<sub>6</sub>H<sub>6</sub>

**EINECS Number:** 200-753-7

**ACX Number:** X1001488-9

**Synonyms:** Benzene; BENZENE; (6)ANNULENE; BENZEEN; BENZEN; BENZIN; BENZINE; BENZOL; BENZOL 90; BENZOLE; BENZOLENE; BENZOLO; BICARBURET OF HYDROGEN; CARBON OIL; COAL NAPHTHA; CYCLOHEXATRIENE; EPA PESTICIDE CHEMICAL CODE 008801; FENZEN; MINERAL NAPHTHA; MOTOR BENZOL; NITRATION BENZENE; PHENE; PHENYL HYDRIDE; POLYSTREAM; PYROBENZOL; PYROBENZOLE

**General Use:** Manufacture of chemicals including styrene, dyes, and many other organic chemicals. Has been used in artificial leather, linoleum, oil cloth, airplane dopes, lacquers; as solvent for waxes, resins, oils etc.

May also be a minor component of gasoline, petrol.

Exposure should be minimized by use in closed systems.

Handling procedures and control measures should be evaluated for exposure before commencement of use in plant operations.

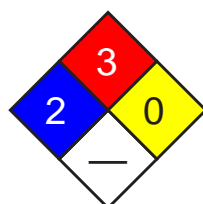
## Section 2 - Composition / Information on Ingredients

Name	CAS	%
benzene	71-43-2	99.9

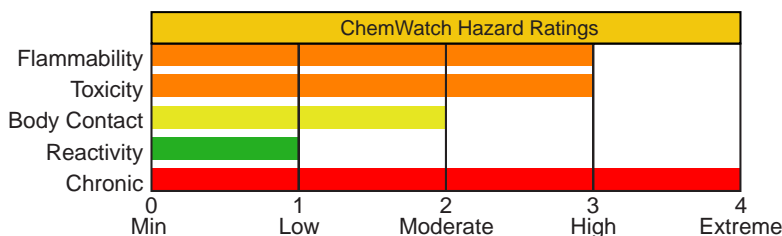
  

<b>OSHA PEL</b> TWA: 1 ppm; STEL: 5 ppm.	<b>NIOSH REL</b> TWA: 0.1 ppm; STEL: 1 ppm.	<b>DFG (Germany) MAK</b> Skin.
<b>ACGIH TLV</b> TWA: 0.5 ppm; STEL: 2.5 ppm; skin.	<b>IDLH Level</b> 500 ppm.	

## Section 3 - Hazards Identification



Fire Diamond



HMIS	
3	Health
3	Flammability
0	Reactivity

ANSI Signal Word

**Danger!**



Flammable

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; sweet odor. Irritating to eyes/skin/respiratory tract. Toxic. Other Acute Effects: headache, dizziness, drowsiness. Absorbed through skin. Chronic Effects: dermatitis, leukemia, bone marrow damage. Carcinogen. Reproductive effects. Flammable.

### Potential Health Effects

**Target Organs:** blood, central nervous system (CNS), bone marrow, eyes, upper respiratory system, skin

**Primary Entry Routes:** inhalation, skin contact

#### Acute Effects

**Inhalation:** The vapor is discomforting to the upper respiratory tract and lungs and may be harmful if inhaled.

If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.



Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.

Inhalation hazard is increased at higher temperatures.

The symptoms of acute exposure to high vapor concentrations include confusion, dizziness, tightening of the leg muscles and pressure over the forehead followed by a period of excitement. If exposure continues the casualty quickly becomes stupefied and lapses into a coma with narcosis.

Effects of inhalation may include nausea, vomiting headache, dizziness, drowsiness, weakness, sometimes preceded by brief periods of exhilaration, or euphoria, irritability, malaise, confusion, ataxia, staggering, weak and rapid pulse, chest pain and tightness with breathlessness, pallor, cyanosis of the lips and fingertips and tinnitus. Severe exposures may produce blurred vision, shallow, rapid breathing, delirium, cardiac arrhythmias, unconsciousness, deep anesthesia, paralysis and coma characterized by motor restlessness, tremors and hyperreflexia (occasionally preceded by convulsions). Polyneuritis and persistent nausea, anorexia, muscular weakness, headache, drowsiness, insomnia and agitation may also occur. Two-three weeks after the exposure, nervous irritability, breathlessness and unsteady gait may still persist; cardiac distress and an unusual discoloration of the skin may be evident for up to four weeks. Hemotoxicity is not normally a feature of acute exposures although anemia, thrombocytopenia, petechial hemorrhage, and spontaneous internal bleeding have been reported. Fatal exposures may result from asphyxia, central nervous system depression, cardiac and respiratory failure and circulatory collapse; sudden ventricular fibrillation may also be fatal.

Death may be sudden or may be delayed for 24 hours. Central nervous system, respiratory or hemorrhagic complications may occur up to five days after the exposure and may be lethal; pathological findings include respiratory inflammation with edema, and lung hemorrhage, renal congestion, cerebral edema and extensive petechial hemorrhage in the brain, pleurae, pericardium, urinary tract, mucous membrane and skin.

Exposure to toxic levels has also produced chromosome damage.

**Eye:** The liquid is highly discomforting to the eyes, may be harmful following absorption and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.

The vapor is moderately discomforting to the eyes.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

**Skin:** The liquid may produce skin discomfort following prolonged contact.

Defatting and/or drying of the skin may lead to dermatitis. Open cuts, abraded or irritated skin should not be exposed to this material.

Toxic effects may result from skin absorption.

The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

**Ingestion:** The liquid is discomforting to the gastrointestinal tract and may be harmful if swallowed.

Ingestion may result in nausea, pain, vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

**Carcinogenicity:** NTP - Class 1, Known to be a carcinogen; IARC - Group 1, Carcinogenic to humans; OSHA - Listed as a carcinogen; NIOSH - Listed as carcinogen; ACGIH - Class A2, Suspected human carcinogen; EPA - Class A, Human carcinogen; MAK - Class A1, Capable of inducing malignant tumors as shown by experience with humans.

**Chronic Effects:** Liquid is an irritant and may cause burning and blistering of skin on prolonged exposure.

Chronic exposure may cause headache, fatigue, loss of appetite and lassitude with incipient blood effects including anemia and blood changes.

Benzene is a myelotoxicant known to suppress bone-marrow cell proliferation and to induce hematologic disorders in humans and animals.

Signs of benzene-induced aplastic anemia include suppression off leukocytes (leukopenia), red cells (anemia), platelets (thrombocytopenia) or all three cell types (pancytopenia). Classic symptoms include weakness, purpura, and hemorrhage. The most significant toxic effect is insidious and often irreversible injury to the blood forming tissue. Leukemia may develop.

## Section 4 - First Aid Measures

**Inhalation:** Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

**Eye Contact:** Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

See  
DOT  
ERG



**Skin Contact:** Immediately remove all contaminated clothing, including footwear (after rinsing with water). Wash affected areas thoroughly with water (and soap if available). Seek medical attention in event of irritation.

**Ingestion:** Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** For acute or short-term repeated exposures to petroleum distillates or related hydrocarbons:

1. Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.
  2. Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases ( $pO_2 < 50$  mm Hg or  $pCO_2 > 50$  mm Hg) should be intubated.
  3. Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
  4. A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
  5. Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
- Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
6. Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients. Consider complete blood count. Evaluate history of exposure.

## Section 5 - Fire-Fighting Measures

**Flash Point:** -11 °C Closed Cup

**Autoignition Temperature:** 562 °C

**LEL:** 1.3% v/v

**UEL:** 7.1% v/v

**Extinguishing Media:** Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.

Water spray or fog - Large fires only.

**General Fire Hazards/Hazardous Combustion Products:** Liquid and vapor are highly flammable.

Severe fire hazard when exposed to heat, flame and/or oxidizers.

Vapor forms an explosive mixture with air.

Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.

Heating may cause expansion/decomposition with violent rupture of containers.

On combustion, may emit toxic fumes of carbon monoxide (CO).

**Fire Incompatibility:** Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

**Fire-Fighting Instructions:** Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

Fight fire from a safe distance, with adequate cover.

If safe, switch off electrical equipment until vapor fire hazard removed.

Use water delivered as a fine spray to control fire and cool adjacent area.

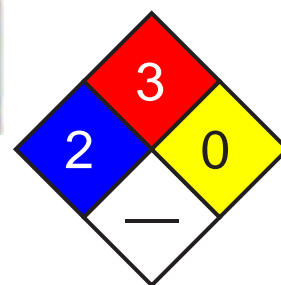
Avoid spraying water onto liquid pools.

Do not approach containers suspected to be hot.

Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

Equipment should be thoroughly decontaminated after use.



Fire Diamond

## Section 6 - Accidental Release Measures

**Small Spills:** Remove all ignition sources. Clean up all spills immediately.

Avoid breathing vapors and contact with skin and eyes.

Control personal contact by using protective equipment.

Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

**Large Spills:** Pollutant - contain spillage. Clear area of personnel and move upwind.

Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.





No smoking, bare lights or ignition sources. Increase ventilation.  
 Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.  
 Use only spark-free shovels and explosion proof equipment.  
 Collect recoverable product into labeled containers for recycling.  
 Absorb remaining product with sand, earth or vermiculite.  
 Collect solid residues and seal in labeled drums for disposal.  
 Wash area and prevent runoff into drains.  
 If contamination of drains or waterways occurs, advise emergency services.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

## Section 7 - Handling and Storage

**Handling Precautions:** Avoid all personal contact, including inhalation.

Wear protective clothing when risk of exposure occurs.  
 Use in a well-ventilated area. Prevent concentration in hollows and sumps.  
 DO NOT enter confined spaces until atmosphere has been checked.  
 Avoid smoking, bare lights, heat or ignition sources.  
 When handling, DO NOT eat, drink or smoke.  
 Vapor may ignite on pumping or pouring due to static electricity.  
 DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.  
 Avoid contact with incompatible materials.  
 Keep containers securely sealed. Avoid physical damage to containers.  
 Always wash hands with soap and water after handling.  
 Work clothes should be laundered separately.  
 Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

**Recommended Storage Methods:** Metal can; metal drum. Packing as recommended by manufacturer.

Check all containers are clearly labeled and free from leaks.

**Storage Requirements:** Store in original containers in approved flame-proof area.

No smoking, bare lights, heat or ignition sources.  
 DO NOT store in pits, depressions, basements or areas where vapors may be trapped. Keep containers securely sealed.  
 Store away from incompatible materials in a cool, dry well ventilated area.  
 Protect containers against physical damage and check regularly for leaks.  
 Observe manufacturer's storing and handling recommendations.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Use in a well-ventilated area. Local exhaust ventilation usually required.

If risk of overexposure exists, wear NIOSH-approved respirator.

Correct fit is essential to obtain adequate protection. NIOSH-approved self contained breathing apparatus (SCBA) may be required in some situations.

Provide adequate ventilation in warehouse or closed storage area.

**Personal Protective Clothing/Equipment:**

**Eyes:** Chemical goggles. Full face shield.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

**Hands/Feet:** Nitrile gloves; Neoprene gloves.

Safety footwear.

Do NOT use this product to clean the skin.

**Respiratory Protection:**

Exposure Range >1 to 10 ppm: Air Purifying, Negative Pressure, Half Mask

Exposure Range >10 to 100 ppm: Air Purifying, Negative Pressure, Full Face

Exposure Range >100 to 1000 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face

Exposure Range >1000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Cartridge Color: black

**Note:** must change cartridge at beginning of each shift

**Other:** Overalls. Eyewash unit. Barrier cream. Skin cleansing cream.

**Glove Selection Index:**

PE/EVAL/PE ..... Best selection

PVA ..... Best selection

TEFLON ..... Best selection

VITON ..... Best selection

VITON/NEOPRENE ..... Best selection



NITRILE+PVC .....	Poor to dangerous choice for other than short-term immersion
BUTYL .....	Poor to dangerous choice for other than short-term immersion
NITRILE .....	Poor to dangerous choice for other than short-term immersion
NEOPRENE.....	Poor to dangerous choice for other than short-term immersion
PVC.....	Poor to dangerous choice for other than short-term immersion
NATURAL RUBBER.....	Poor to dangerous choice for other than short-term immersion
BUTYL/NEOPRENE .....	Poor to dangerous choice for other than short-term immersion

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Clear, highly flammable liquid; floats on water. Characteristic aromatic odor. Highly volatile. Mixes with alcohol, chloroform, ether, carbon disulfide, carbon tetrachloride, glacial acetic acid, acetone and oils.

**Physical State:** Liquid

**pH:** Not applicable

**Vapor Pressure (kPa):** 9.95 at 20 °C

**pH (1% Solution):** Not applicable.

**Vapor Density (Air=1):** 2.77

**Boiling Point:** 80.1 °C (176 °F)

**Formula Weight:** 78.12

**Freezing/Melting Point:** 5.5 °C (41.9 °F)

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 0.879 at 20 °C

**Volatile Component (% Vol):** 100

**Evaporation Rate:** Fast

**Water Solubility:** 0.18 g/100 g of water at 25 °C

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Product is considered stable. Hazardous polymerization will not occur.

**Storage Incompatibilities:** Avoid reaction with oxidizing agents.

## Section 11 - Toxicological Information

### Toxicity

Oral (man) LD<sub>50</sub>: 50 mg/kg

Oral (rat) LD<sub>50</sub>: 930 mg/kg

Inhalation (rat) LC<sub>50</sub>: 10000 ppm/7h

Inhalation (human) LC<sub>50</sub>: 2000 ppm/5m

Inhalation (man) TC<sub>Lo</sub>: 150 ppm/1y - I

Inhalation (human) TC<sub>Lo</sub>: 100 ppm

Reproductive effector in rats

### Irritation

Skin (rabbit): 20 mg/24 hr - mod

Eye (rabbit): 2 mg/24 hr - SEVERE

See RTECS CY 1400000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** If 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. It may be subject to biodegradation based on reported biodegradation of 24% and 47% of the initial 20 ppm in a base-rich para-brownish soil in 1 and 10 weeks, respectively. It may be subject to biodegradation in shallow, aerobic groundwaters, but probably not under anaerobic conditions. If released to water, it will be subject to rapid volatilization; the half-life for evaporation in a wind-wave tank with a moderate wind speed of 7.09 m/sec was 5.23 hours; the estimated half-life for volatilization from a model river one meter deep flowing 1 m/sec with a wind velocity of 3 m/sec is estimated to be 2.7 hours at 20 °C. It will not be expected to significantly adsorb to sediment, bioconcentrate in aquatic organisms or hydrolyze. It may be subject to biodegradation based on a reported biodegradation half-life of 16 days in an aerobic river die-away test. In a marine ecosystem biodegradation occurred in 2 days after an acclimation period of 2 days and 2 weeks in the summer and spring, respectively, whereas no degradation occurred in winter. According to one experiment, it has a half-life of 17 days due to photodegradation which could contribute to removal in situations of cold water, poor nutrients, or other conditions less conducive to microbial degradation. If released to the atmosphere, it will exist predominantly in the vapor phase. Gas-phase will not be subject to direct photolysis but it will react with photochemically produced hydroxyl radicals with a half-life of 13.4 days calculated using an experimental rate constant for the reaction. 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. Products of photooxidation include phenol, nitrophenols, nitrobenzene, formic acid, and peroxyacetyl nitrate. It is fairly soluble in water and is removed from the atmosphere in rain.



**Ecotoxicity:** LC<sub>50</sub> Clawed toad (3-4 wk after hatching) 190 mg/l/48 hr /Conditions of bioassay not specified; LC<sub>50</sub> Morone saxatilis (bass) 5.8 to 10.9 ppm/96 hr /Conditions of bioassay not specified; LC<sub>50</sub> Poecilia reticulata (guppy) 63 ppm/14 days /Conditions of bioassay not specified; LC<sub>50</sub> Salmo trutta (brown trout yearlings) 12 mg/l/1 hr (static bioassay); LD<sub>50</sub> Lepomis macrochirus (bluegill sunfish) 20 mg/l/24 to 48 hr /Conditions of bioassay not specified; LC<sub>100</sub> Tetrahymena pyriformis (ciliate) 12.8 mmole/l/24 hr /Conditions of bioassay not specified; LC<sub>50</sub> Cancer magister (crab larvae) stage 1, 108 ppm/96 hr /Conditions of bioassay not specified; LC<sub>50</sub> Crangon franciscorum (shrimp) 20 ppm/96 hr /Conditions of bioassay not specified

**Henry's Law Constant:**  $5.3 \times 10^{-3}$

**BCF:** eels 3.5

**Biochemical Oxygen Demand (BOD):** 1.2 lb/lb, 10 days

**Octanol/Water Partition Coefficient:**  $\log K_{ow} = 2.13$

**Soil Sorption Partition Coefficient:**  $K_{oc}$  = woodburn silt loam 31 to 143

### Section 13 - Disposal Considerations

**Disposal:** Consult manufacturer for recycling options and recycle where possible.

Follow applicable federal, state, and local regulations.

Incinerate residue at an approved site.

Recycle containers where possible, or dispose of in an authorized landfill.

### Section 14 - Transport Information

#### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Shipping Name and Description:** Benzene

**ID:** UN1114

**Hazard Class:** 3 - Flammable and combustible liquid

**Packing Group:** II - Medium Danger

**Symbols:**

**Label Codes:** 3 - Flammable Liquid

**Special Provisions:** IB2, T4, TP1

**Packaging:** Exceptions: 150 **Non-bulk:** 202 **Bulk:** 242

**Quantity Limitations:** Passenger aircraft/rail: 5 L **Cargo aircraft only:** 60 L

**Vessel Stowage:** Location: B **Other:** 40



### Section 15 - Regulatory Information

#### EPA Regulations:

**RCRA 40 CFR:** Listed U019 Toxic Waste, Ignitable Waste

**CERCLA 40 CFR 302.4:** Listed per CWA Section 311(b)(4), per RCRA Section 3001, per CWA Section 307(a), per CAA Section 112 10 lb (4.535 kg)

**SARA 40 CFR 372.65:** Listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed

### Section 16 - Other Information

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

51/60

**Material Name:** Methanol

**CAS Number:** 67-56-1

**Chemical Formula:** CH<sub>4</sub>O

**Structural Chemical Formula:** CH<sub>3</sub>OH

**EINECS Number:** 200-659-6

**ACX Number:** X1001287-2

**Synonyms:** ALCOHOL,METHYL; ALCOOL METHYLIQUE; ALCOOL METILICO; CARBINOL; X-CIDE 402 INDUSTRIAL BACTERICIDE; COAT-B1400; COLONIAL SPIRIT; COLONIAL SPIRITS; COLUMBIAN SPIRIT; COLUMBIAN SPIRITS; EPA PESTICIDE CHEMICAL CODE 053801; EUREKA PRODUCTS CRIOSINE DISINFECTANT; EUREKA PRODUCTS,CRIOSINE; FREERS ELM ARRESTER; IDEAL CONCENTRATED WOOD PRESERVATIVE; METANOL; METANOLO; METHANOL; METHYL ALCOHOL; METHYL HYDRATE; METHYL HYDROXIDE; METHYLALKOHOL; METHYLOL; METYLOWY ALKOHOL; MONOHYDROXYMETHANE; PMC REJEX-IT F-40ME; PYROLIGNEOUS SPIRIT; PYROXYLIC SPIRIT; PYROXYLIC SPIRITS; SURFLO-B17; WILBUR-ELLIS SMUT-GUARD; WOOD ALCOHOL; WOOD NAPHTHA; WOOD SPIRIT

**Derivation:** Prepared by wood pyrolysis; non-catalytic oxidation of hydrocarbons; as a by-product in the fisher-tropsch synthesis; or by reduction of carbon monoxide.

**General Use:** Used as an industrial solvent; starting material for organic synthesis; antifreeze for windshield washer fluid; in fuel antifreezes; gasoline octane booster; fuel for stoves; extractant for oils; denaturing ethanol; softening agent; food additive; in paint, varnish removers, and embalming fluids; in the manufacture of photographic film, celluloid, textile soap, wood stains, coated fabrics, shatterproof glass, paper coating, waterproofing formulations, artificial leather, dyes.

## Section 2 - Composition / Information on Ingredients

Name	CAS	%
Methanol	67-56-1	ca 100% vol

**Trace Impurities:** (Grade A): Acetone and aldehydes < 30 ppm, acetic acid < 30 ppm

### OSHA PEL

TWA: 200 ppm; 260 mg/m<sup>3</sup>.

### OSHA PEL Vacated 1989 Limits

TWA: 200 ppm; 260 mg/m<sup>3</sup>;  
 STEL: 250 ppm; 325 mg/m<sup>3</sup>.

### ACGIH TLV

TWA: 200 ppm; STEL: 250 ppm;  
 skin.

### NIOSH REL

TWA: 200 ppm, 260 mg/m<sup>3</sup>;  
 STEL: 250 ppm, 325 mg/m<sup>3</sup>;  
 skin.

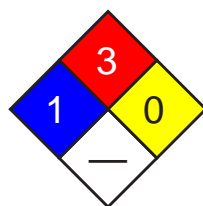
### IDLH Level

6000 ppm.

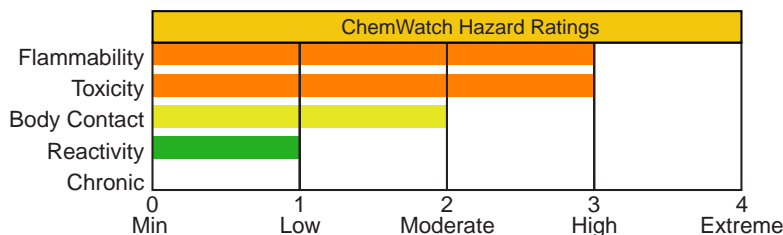
### DFG (Germany) MAK

TWA: 200 ppm; PEAK: 800 ppm;  
 skin.

## Section 3 - Hazards Identification



Fire Diamond



### ANSI Signal Word

**Warning!**

HMIS	
2	Health
3	Flammability
0	Reactivity





☆☆☆☆☆ **Emergency Overview** ☆☆☆☆☆

Colorless liquid; slight alcohol odor when pure or disagreeably pungent odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: headache, visual disturbance, blindness, respiratory failure. Chronic Effects: reproductive effects reported in animal testing. Flammable; moderate explosion hazard.

**Potential Health Effects**

**Target Organs:** Eyes, skin, central nervous system (CNS), gastrointestinal (GI) tract, respiratory system

**Primary Entry Routes:** Inhalation, ingestion, skin and/or eye contact/absorption

**Acute Effects**

**Inhalation:** Irritation, breathing difficulty, headache, drowsiness, vertigo, light-headedness, nausea, vomiting, acidosis (decreased blood alkalinity), visual disturbance, and at high concentrations, CNS damage, convulsions, circulatory collapse, respiratory failure, coma and blindness can result from inhalation of methanol vapor. Concentration  $\geq 200$  ppm may cause headache; 50,000 ppm can cause death within 1-2 hrs.

**Eye:** Contact with liquid may result in irritation, inflamed lids, light sensitization, and superficial lesions.

**Skin:** Contact may cause irritation, dermatitis, swelling, scaling, and systemic effects.

**Ingestion:** GI irritation and systemic effects. Symptoms may be delayed 18-48 hours. Fatal dose - 2 to 8 ounces.

**Carcinogenicity:** NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

**Medical Conditions Aggravated by Long-Term Exposure:** None reported.

**Chronic Effects:** Exposure to methanol vapors has caused conjunctivitis, headache, giddiness, insomnia, GI disturbance, impaired vision. CNS damage is also likely. Methanol is slowly eliminated from the body; exposure is considered cumulative over the short term.

**Section 4 - First Aid Measures**

**Inhalation:** Remove exposed person to fresh air and support breathing as needed.

**Eye Contact:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 minutes. Consult a physician or ophthalmologist if pain or irritation develops.

**Skin Contact:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** Follow emesis with rehydration, correction of acidosis, and folate to enhance formate oxidation. Consider IV administration of ethanol (if blood methanol  $>20$  mg/dL) to show metabolic oxidation of methanol. Assay formic acid in urine, blood pH and plasma bicarbonate.

See  
DOT  
ERG

**Section 5 - Fire-Fighting Measures**

**Flash Point:** 54 °F (12 °C), Closed Cup

**Burning Rate:** 1.7 mm/min

**Autoignition Temperature:** 867 °F (464 °C)

**LEL:** 6.0% v/v

**UEL:** 36% v/v

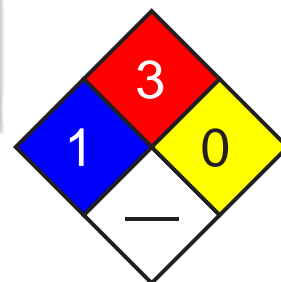
**Flammability Classification:** OSHA Class IB Flammable Liquid.

**Extinguishing Media:** Use dry chemical, carbon dioxide, water spray, fog or alcohol-resistant foam. A water spray may be used to cool fire-exposed containers, and flush spills away from ignition sources.

**General Fire Hazards/Hazardous Combustion Products:** Heating methanol to decomposition can produce carbon oxides (CO<sub>x</sub>), formaldehyde, acrid smoke, and irritating fumes. Can form explosive mixtures in the air. The heavier-than-air vapors of methanol may travel along low-lying surfaces to distant sources of ignition and flash back to the material source. Containers may explode in heat of fire.

**Fire-Fighting Instructions:** *Do not* scatter material with any more water than needed to extinguish fire. *Do not* release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

See  
DOT  
ERG



Fire Diamond



## Section 6 - Accidental Release Measures

**Spill/Leak Procedures:** Isolate spill area for at least 330-660 feet (100-200 m) in all directions. Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire. Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Ground all equipment used when handling this product. *Do not* touch or walk through spilled material. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. A vapor suppressing foam may be used to reduce vapors.



**Small Spills:** Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. Use clean non-sparking tools to collect absorbed material.

**Large Spills:** Dike far ahead of liquid spill for later disposal. *Do not* release into sewers or waterways. Ground all equipment. Use non-sparking tools.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

## Section 7 - Handling and Storage

**Handling Precautions:** Avoid vapor inhalation, and skin and eye contact. Use only with ventilation sufficient to reduce airborne concentrations to non-hazardous levels (see Sec. 2). Wear protective gloves, goggles, and clothing (see Sec. 8). Keep away from heat and ignition sources. Ground and bond all containers during transfers to prevent static sparks. Use non-sparking tools to open and close containers.

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

**Recommended Storage Methods:** Store in tightly closed container in cool, well-ventilated area, away from heat, ignition sources and incompatibles (see Sec. 10). Equip drums with self-closing valves, pressure vacuum bungs, and flame arrestors.

**Regulatory Requirements:** Follow applicable OSHA regulations. Also 29 CFR 1910.106 for Class 1B Flammable Liquids.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations. Provide general or local exhaust ventilation systems to maintain airborne concentrations as low as possible. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

**Administrative Controls:** Enclose operations and/or provide local explosion-proof exhaust ventilation at the site of chemical release. Where possible, transfer methanol from drums or other storage containers to process containers. Minimize sources of ignition in surrounding areas.

**Personal Protective Clothing/Equipment:** Wear chemically protective gloves, boots, aprons, and gauntlets of butyl rubber, Teflon, Viton, Saranex, 4H, Responder, Trelchem HPS, or Tychem 10000 (Breakthrough Time (BT) >8 hr) to prevent skin contact. Natural rubber, neoprene, nitrile rubber, polyethylene, polyvinyl alcohol and CPF 3 may degrade after contact and are not recommended. Wear splash-proof chemical safety goggles, and face shield, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

**Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For concentrations ≤ 2000 ppm, use a supplied air respirator; ≤ 5000 ppm, supplied air (SA) respirator in continuous flow mode; ≤ 6000 ppm, SA respirator with tight-fitting face mask operated in continuous flow mode, or SCBA with full facepiece, or SA respirator with full facepiece; > IDLH/unknown/emergency, SCBA with full facepiece operated in pressure-demand or other positive-pressure mode, or SA respirator with full facepiece operated in pressure-demand or other positive-pressure mode in combination with auxiliary SCBA operated in pressure-demand or other positive-pressure mode. For escape, use an appropriate escape-type SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

**Other:** Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Colorless; slight alcohol odor when pure, disagreeably pungent odor when crude.

**Physical State:** Liquid

**Formula Weight:** 32.04

**Vapor Pressure (kPa):** 127 mm Hg at 77 °F (25 °C)

**Density:** 0.796 g/mL at 59 °F (15 °C)

**Vapor Density (Air=1):** 1.11

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 0.81 at 0 °C/4 °C

**Bulk Density:** 6.59 lbs/gal at 68 F (20 °C)

**Refractive Index:** 1.3292 at 68 °F (20 °C)



**pH:** Slightly acidic  
**Boiling Point:** 148 °F (64.7 °C) at 760 mm Hg  
**Freezing/Melting Point:** -144.04 °F (-97.8 °C)  
**Viscosity:** 0.614 mPa sec  
**Surface Tension:** 22.61 dynes/cm

**Ionization Potential (eV):** 10.84 eV  
**Water Solubility:** Miscible  
**Other Solubilities:** Ethanol, acetone, benzene, chloroform, DMSO, ether, ketones, most organic solvents.

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Methanol is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Vapor inhalation, oxidizers.

**Storage Incompatibilities:** Include beryllium dihydride, metals (potassium, magnesium), oxidants (barium perchlorate, bromine, chlorine, hydrogen peroxide, sodium hypochlorite, phosphorus trioxide), potassium tertbutoxide, carbon tetrachloride and metals, chloroform and heat, diethyl zinc, alkyl aluminum salts, acetyl bromide, chloroform and sodium hydroxide, cyanuric chloride, nitric acid, chromic anhydride, lead perchlorate.

**Hazardous Decomposition Products:** Thermal oxidative decomposition of methanol can produce carbon oxides (CO<sub>x</sub>), formaldehyde, acrid smoke, and irritating fumes.

## Section 11 - Toxicological Information

### Acute Oral Effects:

Rat, oral, LD<sub>50</sub>: 5628 mg/kg.

Human, oral, LD<sub>Lo</sub>: 428 mg/kg produced toxic effects: behavioral - headache; lungs, thorax, or respiration - other changes.

Human, oral, LD<sub>Lo</sub>: 143 mg/kg produced optic nerve neuropathy, dyspnea, nausea or vomiting.

### Acute Inhalation Effects:

Rat, inhalation, LC<sub>50</sub>: 64000 ppm/4 hr.

Human, inhalation, TC<sub>Lo</sub>: 300 ppm produced visual field changes, headache; lungs, thorax, or respiration - other changes.

### Acute Skin Effects:

Rabbit, skin, LD<sub>50</sub>: 15800 mg/kg.

Monkey, skin, LD<sub>Lo</sub>: 393 mg/kg.

### Irritation Effects:

Rabbit, standard Draize test: 100 mg/24 hr resulted in moderate irritation.

Rabbit, standard Draize test: 20 mg/24 hr resulted in moderate irritation.

### Other Effects:

Rat, oral: 10 µmol/kg resulted in DNA damage.

Rat, inhalation: 50 mg/m<sup>3</sup>/12 hr/13 weeks intermittently produced degenerative changes to brain and coverings; muscle contraction or spasticity.

Rat, inhalation: 2610 ppm/6 hr/4 weeks intermittently produced toxic effects: endocrine - changes in spleen weight.

Multiple Dose Toxicity Effects - Rat, oral: 12 g/kg/8 weeks intermittently produced toxic effects: behavioral - ataxia; behavioral - alteration of operant conditioning.

Human, lymphocyte: 300 mmol/L resulted in DNA inhibition.

Rat (female), oral: 7500 mg/kg, administered during gestational days 17-19 produced effects on newborn - behavioral.

Rat (female), oral: 35295 mg/kg administered during gestational days 1-15 produced effects on the fertility index; pre implantation mortality; and post-implantation mortality.

Rat (female), inhalation: 20000 ppm/7 hr, administered during gestational days 1-22 produced specific developmental abnormalities - musculoskeletal system; cardiovascular (circulatory) system; urogenital system.

Rat (male), oral: 200 ppm/20 hr, 78 weeks prior to mating produced paternal effects - testes, epididymis, sperm duct.

See RTECS PC1400000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** Bioconcentration (BCF, estimated at 0.2) is not expected to be significant. Physical removal from air can occur via rainfall. Relatively rapid evaporation from dry surfaces is likely to occur. If released to the atmosphere, it degrades via reaction with photochemically produced hydroxyl radicals with an approximate half-life of 17.8 days. If released to water or soil, biodegradation is expected to occur. A low K<sub>oc</sub> indicates little sorption and high mobility in the soil column.

**Ecotoxicity:** Trout, LC<sub>50</sub>: 8,000 mg/L/48 hr; *Pimephales promelas* (fathead minnow) LC<sub>50</sub>: 29.4 g/L/96 hr.

**Henry's Law Constant:** 4.55 x 10<sup>-6</sup> atm-m<sup>3</sup>/mole at 77 °F (25 °C)

**Octanol/Water Partition Coefficient:** log K<sub>ow</sub> = -0.77

**Soil Sorption Partition Coefficient:** K<sub>oc</sub> = 0.44



## Section 13 - Disposal Considerations

**Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Note:** This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

**Shipping Name and Description:** Methanol

**ID:** UN1230

**Hazard Class:** 3 - Flammable and combustible liquid

**Packing Group:** II - Medium Danger

**Symbols:** + I

**Label Codes:** 3 - Flammable Liquid, 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*

**Special Provisions:** IB2, T7, TP2

**Packaging:** Exceptions: 150 **Non-bulk:** 202 **Bulk:** 242

**Quantity Limitations:** Passenger aircraft/rail: 1 L **Cargo aircraft only:** 60 L

**Vessel Stowage:** Location: B **Other:** 40



**Shipping Name and Description:** Methanol

**ID:** UN1230

**Hazard Class:** 3 - Flammable and combustible liquid

**Packing Group:** II - Medium Danger

**Symbols:** D - Domestic transportation

**Label Codes:** 3 - Flammable Liquid

**Special Provisions:** IB2, T7, TP2

**Packaging:** Exceptions: 150 **Non-bulk:** 202 **Bulk:** 242

**Quantity Limitations:** Passenger aircraft/rail: 1 L **Cargo aircraft only:** 60 L

**Vessel Stowage:** Location: B **Other:**



## Section 15 - Regulatory Information

### EPA Regulations:

**RCRA 40 CFR:** Listed U154 Ignitable Waste

**CERCLA 40 CFR 302.4:** Listed per RCRA Section 3001 5000 lb (2268 kg)

**SARA 40 CFR 372.65:** Listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed

## Section 16 - Other Information

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

54/60

**Material Name:** Cyanide Ion **CAS Number:** 57-12-5  
**Chemical Formula:** CN  
**Structural Chemical Formula:** CN  
**ACX Number:** X1002896-5  
**Synonyms:** CARBON NITRIDE ION; CYANIDE; CYANIDE(1-); CYANIDE ANION; CYANIDE ION; CYANIDE(1-) ION; CYANIDE SOLUTIONS; CYANIDE, DRY; CYANURE; HYDROCYANIC ACID, ION(1-); ISOCYANIDE  
**General Use:** Available ONLY for industrial and manufacturing purposes.

## Section 2 - Composition / Information on Ingredients

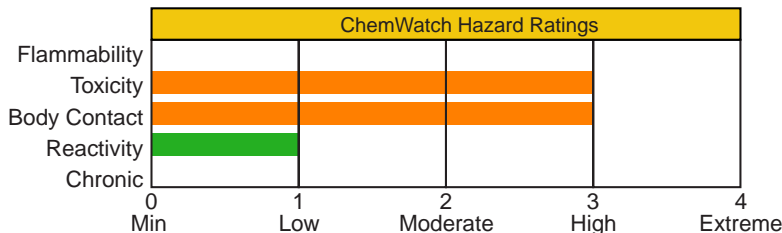
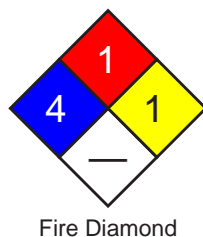
Name	CAS	%
cyanide ion	57-12-5	100

**OSHA PEL**  
 TWA: 5 mg/m<sup>3</sup>.

**NIOSH REL**

**ACGIH TLV**

## Section 3 - Hazards Identification



HMIS	
4	Health
1	Flammability
1	Reactivity

**ANSI Signal Word**

**Danger!**



### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Almond odor. Poison. Irritating to the eyes/respiratory tract. Fast acting chemical asphyxiant that prevents tissue utilization of oxygen. Chronic Effects: skin rash, appetite loss, weakness, dizziness, chest discomfort, nose bleed, hearing changes.

### Potential Health Effects

**Target Organs:** brain, heart, lungs, skin, blood

**Primary Entry Routes:** inhalation, ingestion, skin absorption

#### Acute Effects

**Inhalation:** The dust is highly discomforting to the upper respiratory tract and extremely toxic and may be fatal.

As little as a few breaths of higher concentrations of hydrogen cyanide vapor, given off from moist material, may cause instant collapse and stop breathing.

**Eye:** The solid/dust is corrosive to the eyes and is capable of causing severe damage with loss of sight.

The material may be absorbed in toxic amounts through the eyes.

**Skin:** The solid/dust is highly discomforting to the skin and it is absorbed by the skin and may be fatal.

The material is capable of causing chemical burns, ulceration and skin reactions which may lead to dermatitis.

Exposure limits with "skin" notation indicate that vapor and liquid may be absorbed through intact skin. Absorption by skin may readily exceed vapor inhalation exposure. Symptoms for skin absorption are the same as for inhalation. Contact with eyes and mucous membranes may also contribute to overall exposure and may also invalidate the exposure standard.

The material may cause second degree burns and deep ulcers. Prolonged or repeated skin contact with low concentrations of the dust may result in 'cyanide rash' characterized by itching and skin eruptions.



**Ingestion:** Considered an unlikely route of entry in commercial/industrial environments.

The solid/dust is extremely toxic and may be fatal if swallowed unless immediate treatment is applied.

The adult lethal dose is less than 250 mg.

**Carcinogenicity:** NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

**Chronic Effects:** Cyanide prevents body cells from using oxygen.

Overexposure causes headache, dizziness, sweating, ineffective breathing and nausea which can be followed by a weak and irregular heartbeat, unconsciousness, convulsions, coma and death. Chronic exposure may interfere with iodine uptake by the thyroid and lead to its enlargement and related thyroid disorders. Loss of weight and appetite, mental deterioration, weakness and nervous system abnormalities may result.

Sodium cyanide is alkaline and is irritating and corrosive to body tissue.

Repeated minor contact causes cyanide rash, also itching, papules (small, superficial raised spots on the skin).

Inhalation may result in obstruction, bleeding, sloughs and in some cases perforations of the septum.

## Section 4 - First Aid Measures

**Inhalation:** Remove to fresh air, lay down and rest.

If not breathing, ensure clear airway, apply resuscitation.

Keep patient warm.

Use approved cyanide antidote kit.

Transport to hospital.

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DOT  
ERG

**Eye Contact:** Immediately hold eyes open and flush continuously with running water for at least 15 minutes. Ensure irrigation under eyelids.

Seek medical attention without delay.

**Skin Contact:** Quickly but gently, wipe material off skin with a dry, clean cloth.

Immediately remove all contaminated clothing, including footwear.

Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

**Ingestion: IMPORTANT: ESTABLISH A FIRST AID PLAN BEFORE WORKING WITH CYANIDES. ANTIDOTES SHOULD BE AVAILABLE ON SITE.**

In all cases of cyanide exposure get medical help urgently after administering first aid.

NOTE: Amyl nitrite is no longer considered to have an antidotal role in the treatment of real or suspected cyanide poisoning. As a first aid measure its disadvantages include: (i) Vasodilatory effects may promote fatal cardiac arrhythmias (particularly if the patient is not really poisoned by cyanide), (ii) Disguise of any arrhythmias or respiratory stimuli used as an indication of true cyanide poisoning, (iii) Its role as a competitive inducer of methemoglobin in the blood-stream is highly variable and, alone, may produce levels of methemoglobin as low as 5% only. (iv) An increase in use of nitrite "poppers" as aphrodisiacs introduces substance-abuse problems.

For cyanide poisonings by any route:

1. Contact Poison Control Center.
2. Seek immediate medical attention.
3. Place casualty in coma position.
4. Give oxygen when available.
5. Consider external cardiac compression, mechanical resuscitation and use of antidote kit.
6. If breathing stops mouth-to-mouth resuscitation may be given only as a last resort. Should such resort prove necessary, first wash the casualty's mouth and lips. A first aid attendant must not inhale the expired air of the casualty.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

### Note to Physicians:

1. Signs & symptoms of acute & cyanide poisoning reflect cellular hypoxia and are often non-specific.
  2. Cyanosis may be a late finding.
  3. A bradycardia, hypertensive and tachypneic patient suggests poisoning especially if CNS and cardiovascular depression subsequently occurs.
  4. Immediate attention should be directed towards assisted ventilation, administration of 100% oxygen, insertion of intravenous lines and institution of cardiac monitoring.
  5. Obtain an arterial blood gas immediately and correct any severe metabolic acidosis (pH below 7.15).
  6. Mildly symptomatic patients generally require supportive care alone.
- Nitrites should not be given indiscriminately - in all cases of moderate to severe poisoning, they should be given in conjunction with thiosulfate.

As a temporizing measure supply amyl nitrite perles (0.2 mL inhaled 30 seconds every minute) until intravenous lines for sodium nitrite are established. 10 mL of a 3% solution is administered over 4 minutes to produce 20% methemoglobin in adults. Follow directly with 50 mL of 25% sodium thiosulfate, at the same rate, IV. If symptoms reappear or persist within 1/2-1 hour, repeat nitrite and thiosulfate at 50% of initial dose.

As the mode of action involves the metabolic conversion of the thiosulfate to thiocyanate, renal failure may enhance thiocyanate toxicity.

7. Methylene blue is not an antidote.



## Section 5 - Fire-Fighting Measures

**Flash Point:** -17.8 °C Closed Cup

**Extinguishing Media:** Dry chemical powder.

Vaporizing liquid.

Do NOT use carbon dioxide (CO<sub>2</sub>) or acidic chemical extinguishers.

**General Fire Hazards/Hazardous Combustion Products:** Pollutant.

Noncombustible.

Dangerous hazard when exposed to heat or flame.

Contact with acids produces toxic fumes.

Decomposes on heating and produces toxic fumes of hydrogen cyanide, nitrogen oxides (NO<sub>x</sub>).

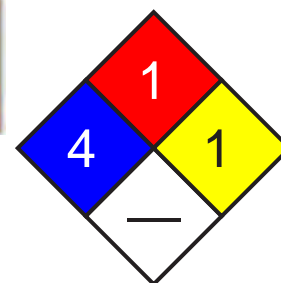
**Fire Incompatibility:** Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

**Fire-Fighting Instructions:** Contact fire department and tell them location and nature of hazard.

Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.

Cool fire-exposed containers with water spray from a protected location.

Fight fire from a safe distance, with adequate cover.



Fire Diamond

## Section 6 - Accidental Release Measures

**Small Spills:** Environmental hazard - contain spillage. Clean up all spills immediately.

Wear protective clothing, gloves, safety glasses and dust respirator.

Use dry clean-up procedures and avoid generating dust.

Sweep up.

Vacuum up or sweep up.

Place in suitable containers for disposal.

**Large Spills:** Pollutant - contain spillage. Clear area of personnel and move upwind.

Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.

If contamination of drains or waterways occurs, advise emergency services.

Stop leak if safe to do so.

Increase ventilation.

Avoid generating dust.

Recover uncontaminated product in clean, dry, labeled containers.

Collect residues and seal in labeled drums for disposal.

Wash spill area with large quantities of water.

After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).



## Section 7 - Handling and Storage

**Handling Precautions:** Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Use good occupational work practices.

Avoid generating and breathing dust.

Avoid contact with skin and eyes.

Wear personal protective equipment when handling.

When handling, DO NOT eat, drink or smoke.

Avoid contact with incompatible materials.

Avoid sources of heat.

Avoid physical damage to containers.

Use in a well-ventilated area.

Keep containers securely sealed when not in use.

Wash hands with soap and water after handling.

Launder contaminated clothing before reuse.

**Recommended Storage Methods:** Glass container; plastic container.

Plastic drum.

Polylined drum.

Packaging as recommended by manufacturer.

Check that containers are clearly labeled.

**Regulatory Requirements:** Follow applicable OSHA regulations.



## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** If inhalation risk exists, wear NIOSH-approved respirator.

Local exhaust ventilation usually required.

**Personal Protective Clothing/Equipment:**

**Eyes:** Chemical goggles. Full face shield.

Safety glasses with side shields.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

**Hands/Feet:** Impervious gloves; rubber gloves.

Rubber boots.

**Respiratory Protection:**

Exposure Range >5 to <25 mg/m<sup>3</sup>: Supplied Air, Constant Flow/Pressure Demand, Half Mask

Exposure Range 25 to unlimited mg/m<sup>3</sup>: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Note: poor warning properties

**Other:** Eyewash unit. Overalls. Laboratory coat. Rubber apron.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Information applies to the cyanide ion which is a constituent of a number of cyanide compounds.

**Physical State:** Divided solid

**Boiling Point:** Varies

**Vapor Pressure (kPa):** Negligible

**Freezing/Melting Point:** Varies

**Formula Weight:** 26.02

**Volatile Component (% Vol):** Negligible

**pH:** Not applicable

**Water Solubility:** Soluble in water

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Contact with acids produces toxic fumes.

Sodium cyanide is deliquescent and is gradually decomposed on exposure to air by reaction with carbon dioxide and moisture forming hydrogen cyanide gas.

**Storage Incompatibilities:** Avoid reaction with oxidizing agents. Avoid strong acids, bases.

Avoid contamination of water, foodstuffs, feed or seed.

## Section 11 - Toxicological Information

### Toxicity

Intraperitoneal (mouse) LD<sub>50</sub>: 3 mg/kg

### Irritation

Nil reported

See RTECS GS 7175000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** No data found.

**Ecotoxicity:** No data found.

## Section 13 - Disposal Considerations

**Disposal:** Recycle wherever possible. Consult manufacturer for recycling options.

Follow applicable federal, state, and local regulations.

Waste solutions can be reacted with ferrous sulfate to form relatively non-toxic ferrocyanide, or reacted with sodium hypochlorite or calcium hypochlorite to form less toxic cyanate.

Caution: Concentrated hypochlorite should not be mixed with concentrated cyanide solutions or solid cyanide because highly toxic cyanogen chloride gas will be released.

Decontaminate empty containers. Puncture containers to prevent reuse.

Bury empty containers at an authorized landfill.



**Section 14 - Transport Information****DOT Hazardous Materials Table Data (49 CFR 172.101):**

**Note:** This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

**Shipping Name and Description:** Cyanides, inorganic, solid, n.o.s.

**ID:** UN1588

**Hazard Class:** 6.1 - Poisonous materials

**Packing Group:** I - Great Danger

**Symbols:**

**Label Codes:** 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*

**Special Provisions:** IB7, IP1, N74, N75

**Packaging:** Exceptions: None      **Non-bulk:** 211      **Bulk:** 242

**Quantity Limitations:** Passenger aircraft/rail: 5 kg      **Cargo aircraft only:** 50 kg

**Vessel Stowage:** Location: A      **Other:** 52



**Shipping Name and Description:** Cyanides, inorganic, solid, n.o.s.

**ID:** UN1588

**Hazard Class:** 6.1 - Poisonous materials

**Packing Group:** II - Medium Danger

**Symbols:**

**Label Codes:** 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*

**Special Provisions:** IB8, IP2, IP4, N74, N75

**Packaging:** Exceptions: None      **Non-bulk:** 212      **Bulk:** 242

**Quantity Limitations:** Passenger aircraft/rail: 25 kg      **Cargo aircraft only:** 100 kg

**Vessel Stowage:** Location: A      **Other:**



**Shipping Name and Description:** Cyanides, inorganic, solid, n.o.s.

**ID:** UN1588

**Hazard Class:** 6.1 - Poisonous materials

**Packing Group:** III - Minor Danger

**Symbols:**

**Label Codes:** 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*

**Special Provisions:** IB8, IP3, N74, N75

**Packaging:** Exceptions: 153      **Non-bulk:** 213      **Bulk:** 240

**Quantity Limitations:** Passenger aircraft/rail: 100 kg      **Cargo aircraft only:** 200 kg

**Vessel Stowage:** Location: A      **Other:**

**Section 15 - Regulatory Information****EPA Regulations:**

**RCRA 40 CFR:** Not listed

**CERCLA 40 CFR 302.4:** Not listed

**SARA 40 CFR 372.65:** Not listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed

**Section 16 - Other Information**

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

43/60

**Material Name:** Benzo(a)pyrene

**CAS Number:** 50-32-8

**Chemical Formula:** C<sub>20</sub>H<sub>12</sub>

**EINECS Number:** 200-028-5

**ACX Number:** X1002798-4

**Synonyms:** B(A)P; BAP; BENZO(D,E,F)CHRYSENE; 3,4-BENZOPYRENE; 1,2-BENZOPYRENE; 3,4-BENZOPYRENE; 6,7-BENZOPYRENE; BENZO(A)PYRENE; 3,4-BENZOPYRENE; 3,4-BENZ(A)PYRENE; 3,4-BENZOPYRENE; BENZ(A)PYRENE; BENZ[A]PYRENE; 3,4-BENZYLPIRENE; 3,4-BENZOPYRENE; 3,4-BP; BP; COAL TAR PITCH VOLATILES: BENZO(A)PYRENE

**Derivation:** Synthesized from pyrene and succinic anhydride.

**General Use:** Benzo(a)pyrene is no longer used or produced commercially in the US. In its pure form, benzo(a)pyrene may be used as a research laboratory reagent. It also occurs in combustion products of coal, oil, petroleum, wood and other biological matter; in motor vehicle and other gasoline and diesel engine exhaust; in charcoal-broiled foods; in cigarette smoke and general soot and smoke of industrial, municipal, and domestic origin. It occurs naturally in crude oils, shale oils, coal tars, gases and fly ash from active volcanoes and forest fires.

## Section 2 - Composition / Information on Ingredients

Name	CAS	%
Benzo(a)pyrene	50-32-8	ca 100% wt

Except in laboratories, benzo(a)pyrene is usually mixed with other coal tar pitch chemicals. Consider exposure limits for coal tar pitch volatiles as a guideline. However, because benzo(a)pyrene is considered a probable carcinogen to humans, it is recommended that exposures to carcinogens be limited to the lowest feasible concentration.

**OSHA PEL**

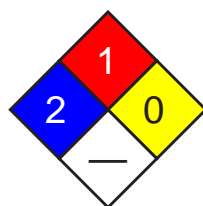
TWA: 0.2 mg/m<sup>3</sup>.

**NIOSH REL**

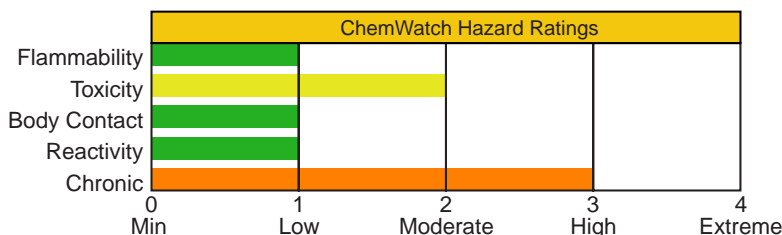
**ACGIH TLV**

Exposure by all routes should be carefully controlled to levels as low as possible.

## Section 3 - Hazards Identification



Fire Diamond



HMIS	
2	Health
1	Flammability
0	Reactivity

**ANSI Signal Word**

**Warning!**

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Pale yellow, crystalline solid or powder. Irritating to skin, eyes, respiratory tract. Chronic Effects: carcinogen, mutagen. Handle with extreme caution!

### Potential Health Effects

**Target Organs:** Respiratory system, bladder, kidneys, skin.

**Primary Entry Routes:** Inhalation, ingestion.

**Acute Effects**

**Inhalation:** Respiratory tract irritation. Pregnant women may be especially susceptible to exposure effects of benzo(a)pyrene; exposure may damage the fetus. In general, polycyclic aromatic hydrocarbons such as benzo(a)pyrene tend to localize primarily in body fat and fatty tissues (for ex. breasts) and are excreted in breast milk. Benzo(a)pyrene may also affect the male reproductive system (testes and sperm).



**Eye:** Irritation and/or burns on contact.

**Skin:** Irritation with burning sensation, rash, and redness; dermatitis on prolonged exposure. Sunlight enhances effects (photosensitization).

**Ingestion:** None reported.

**Carcinogenicity:** NTP - Class 2B, Reasonably anticipated to be a carcinogen, sufficient evidence of carcinogenicity from studies in experimental animals; IARC - Group 2A, Probably carcinogenic to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Class A2, Suspected human carcinogen; EPA - Class B2, Probable human carcinogen based on animal studies; MAK - Class A2, Unmistakably carcinogenic in animal experimentation only.

**Medical Conditions Aggravated by Long-Term Exposure:** Respiratory system, bladder, kidney, and skin disorders.

**Chronic Effects:** Inhalation: Cough and bronchitis. Eye: Photosensitivity and irritation. Skin: Skin changes such as thickening, darkening, pimples, loss of color, reddish areas, thinning of the skin, and warts. Sunlight enhances effects (photosensitization). Other: Gastrointestinal (GI) effects include leukoplakia (a pre-cancerous condition characterized by thickened white patches of epithelium on mucous membranes, especially of the mouth). Cancer of the lung, skin, kidneys, bladder, or GI tract is also possible. Smoking in combination with exposure to benzo(a)pyrene increases the chances of developing lung cancer. Persons with a high degree of inducibility of the enzyme aryl hydrocarbon hydroxylase may be a high risk population.

## Section 4 - First Aid Measures

**Inhalation:** Remove exposed person to fresh air and support breathing as needed.

**Eye Contact:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of tepid water for at least 15 min. Consult an ophthalmologist if irritation or pain persist.

**Skin Contact:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water (less than 15 min). Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water to dilute. Inducing vomiting is not necessary since benzo(a)pyrene has a low acute toxicity and therefore, is generally an unnecessary procedure. Consider activated charcoal/cathartic.

**After first aid, get appropriate in-plant, paramedic, or community medical support.**

**Note to Physicians:** Monitor CBC and arterial blood gases, conduct liver, renal, and pulmonary function tests (if respiratory tract irritation is present), and urinalysis. Biological monitoring techniques testing for metabolites in blood or urine, or DNA adducts in blood or tissues are useful for epidemiological studies that determine if exposure has occurred. Because neither normal nor toxic levels have been established, those techniques may not be useful for evaluating individual patients.

**Special Precautions/Procedures:** Emergency personnel should protect against exposure.

See  
DOT  
ERG

## Section 5 - Fire-Fighting Measures

**Flash Point:** None reported. Benzo(a)pyrene may burn, but does *not* readily ignite.

**Autoignition Temperature:** None reported.

**LEL:** None reported.

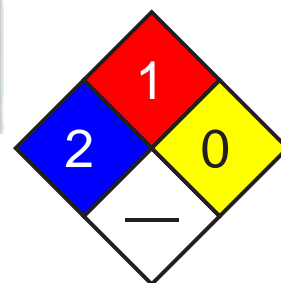
**UEL:** None reported.

**Extinguishing Media:** For small fires, use dry chemical, sand, water spray, or foam. For large fires, use water spray, fog, or foam.

**General Fire Hazards/Hazardous Combustion Products:** Carbon monoxide and carbon dioxide.

**Fire-Fighting Instructions:** Isolate hazard and deny entry. If feasible and without undue risk, move containers from fire hazard area. Otherwise, cool fire-exposed containers with water spray until well after fire is extinguished. Do not release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode and full protective clothing.

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ERG



Fire Diamond

## Section 6 - Accidental Release Measures

**Spill/Leak Procedures:** Notify safety personnel of large spills, remove heat and ignition sources, and provide adequate ventilation. Cleanup personnel should protect against dust inhalation and skin or eye contact. Clean up spills promptly.

**Small Spills:** Carefully scoop up spilled material and place into appropriate containers for disposal. For liquid spills, take up with a noncombustible, inert absorbent and place into appropriate containers for disposal.

**Large Spills:** For large spills, dike far ahead of liquid spill or contain dry spill for later disposal. Do not release into sewers or waterways. *Do not* dry sweep! Use a vacuum with a HEPA filter or a wet method to reduce dust. After

See  
DOT  
ERG



cleanup is complete, thoroughly decontaminate all surfaces. *Do not* reuse contaminated cleaning materials.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

## Section 7 - Handling and Storage

**Handling Precautions:** Handle with extreme caution and take all necessary measures to avoid exposure to benzo(a)pyrene because it is a carcinogen and mutagen. Follow good personal hygiene procedures and thoroughly wash hands with soap and water after handling. Use safety pipettes for all pipetting.

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

**Recommended Storage Methods:** Store in tightly closed and properly labeled containers in a cool, well-ventilated area.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Use a Class I, Type B, biological safety hood when working with benzo(a)pyrene in a laboratory. Decrease the rate of air extraction, so that benzo(a)pyrene can be handled without powder being blown around the hood. Keep glove boxes under negative pressure. Use vertical laminar-flow, 100% exhaust, biological safety cabinets for containment of in vitro procedures. The exhaust air flow should be sufficient to provide an inward air flow at the face opening of the cabinet. Ensure contaminated air sheaths that are under positive pressure are leak-tight. Never use horizontal laminar-flow hoods or safety cabinets where filtered air is blown across the working area towards the operator. Test cabinets before work begins to ensure they are functioning properly. Provide general or local exhaust ventilation systems to maintain airborne concentrations as low as possible. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

**Administrative Controls:** Consider preplacement and periodic medical examinations with emphasis on the oral cavity, bladder, kidneys, skin, and respiratory tract. Conduct urinalysis including specific gravity, albumin, glucose, and microscopic examination of centrifuged sediment for red blood cells. Also, include 14" x 17" chest roentgenogram, FVC + FEV1, and CBC to detect any leukemia or aplastic anemia. It is recommended that this exam be repeated on an annual basis and semiannual basis for employees 45 yr of age or older or with 10 or more years of exposure to coal tar pitch volatiles. Train workers about the hazards of benzo(a)pyrene and the necessary protective measures to prevent exposure. Periodically inspect lab atmospheres, surfaces such as walls, floors, and benches, and interior of fume hoods and air ducts for contamination. Post appropriate signs and labels on doors leading into areas where benzo(a)pyrene is used.

**Personal Protective Clothing/Equipment:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. In animal laboratories, wear protective suits (disposable, one-piece and close-fitting at ankles and wrists), gloves, hair covering, and overshoes. In chemical laboratories, wear gloves and gowns. Wear protective eyeglasses or chemical safety, gas-proof goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy.

**Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. The following respirator recommendations are for coal tar pitch volatiles. For any unknown concentration, wear any SCBA with a full facepiece and operated in a pressure-demand or other positive pressure mode, or any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive pressure mode. For escape, wear any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister having a high-efficiency particulate filter, or any appropriate escape-type SCBA. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

**Other:** Shower and change clothes after exposure or at the end of the workshift. Separate contaminated work clothes from street clothes. Launder before reuse. Remove benzo(a)pyrene from your shoes and clean personal protective equipment. Use procedures to ensure laundry personnel are not exposed. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Pale yellow monoclinic needles with a faint, aromatic odor.

**Physical State:** Solid

**Vapor Pressure (kPa):** >1 mm Hg at 68 °F (20 °C)

**Formula Weight:** 252.30

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 1.351

**Boiling Point:** >680 °F (>360 °C); 590 °F (310 °C) at 10 mm Hg

**Freezing/Melting Point:** 354 °F (179 °C)

**Water Solubility:** Insoluble; 0.0038 mg (+/- 0.00031 mg) in 1 L at 77 °F (25 °C)



**Other Solubilities:** Ether, benzene, toluene, xylene, alcohol, methanol.  
concentrated hydrosulfuric acid; sparingly soluble in

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Benzo(a)pyrene is stable at room temperature in closed containers under normal storage and handling conditions. It undergoes photo-oxidation when exposed to sunlight or light in organic solvents and is also oxidized by chromic acid and ozone. Hazardous polymerization cannot occur. Avoid heat and ignition sources and incompatibles.

**Storage Incompatibilities:** Strong oxidizers (chlorine, bromine, fluorine) and oxidizing chemicals (chlorates, perchlorates, permanganates, and nitrates).

**Hazardous Decomposition Products:** Thermal oxidative decomposition of benzo(a)pyrene can produce carbon monoxide and carbon dioxide.

## Section 11 - Toxicological Information

### Acute Oral Effects:

Rat, oral: 15 mg/kg produced gastrointestinal and musculoskeletal tumors.

### Irritation Effects:

Mouse: 14 µg caused mild irritation.

### Other Effects:

Rat, oral: 40 mg/kg on the 14th day of pregnancy caused changes in the extra embryonic structures.

Rat, oral: 2 g/kg administered 28 days prior to mating and 1-22 days of pregnancy produced a stillbirth.

Tumorigenicity, mouse, oral: 75 mg/kg administered to the female during the 12- 14 day of pregnancy produced biochemical and metabolic effects on the newborn.

Mouse, inhalation: 200 ng/m<sup>3</sup>/6 hr administered intermittently over 13 weeks produced tumors of the lungs.

Human, HeLa cell: 1500 nmol/L caused DNA inhibition.

Human, lung cell: 1 µmol/L caused DNA damage.

Human, liver cell: 100 nmol/L caused DNA damage.

Rabbit, skin: 17 mg/kg administered intermittently over 57 weeks produced tumors of the skin and appendages.

See RTECS DJ3675000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** If released to water, benzo(a)pyrene adsorbs very strongly to particulate matter and sediments, bioconcentrates in aquatic organisms which cannot metabolize it, but does not hydrolyze. Direct photolysis at the water surface, evaporation, or biodegradation may be important, but adsorption may significantly retard these processes. Adsorption to particulates may also retard direct photolysis when benzo(a)pyrene is released to air. Benzo(a)pyrene may be removed from air by reaction with nitrogen dioxide (half-life, 7 days) or ozone (half-life, 37 min), or photochemically produced hydroxyl radicals (estimated half-life, 21.49 hr). It will adsorb very strongly to the soil. Although it is not expected to appreciably leach to the groundwater, groundwater samples indicate that it can be transported there. It is not expected to significantly evaporate or hydrolyze from soils and surfaces. However, it may be subject to appreciable biodegradation in soils. It will adsorb very strongly to the soil. Although it is not expected to appreciably leach to the groundwater, groundwater samples indicate that it can be transported there. It is not expected to significantly evaporate or hydrolyze from soils and surfaces. However, it may be subject to appreciable biodegradation in soils.

**Ecotoxicity:** Oysters, BCF (bioconcentration factor): 3000; rainbow trout, BCF: 920; *Daphnia pulex*, BCF: 13,000.

**BCF:** Some marine organisms such as phytoplankton, certain zooplankton, scallops (*Placopecten sp.*), snails (*Littorina littorea*), and mussels (*Mytilus edulis*) lack a metabolic detoxification enzyme system to metabolize benzo(a)pyrene and therefore, tend to accumulate benzo(a)pyrene. Humic acid in solution may decrease bioconcentration.

**Octanol/Water Partition Coefficient:** log K<sub>ow</sub> = 6.04

## Section 13 - Disposal Considerations

**Disposal:** Small quantities: 10 mL of a solution containing 0.3 mol/L of potassium permanganate and 3 mol/L of sulfuric acid will degrade 5 mg of benzo(a)pyrene. Also, can treat with sodium dichromate in strong sulfuric acid (1-2 days). Benzo(a)pyrene is also a good candidate for fluidized bed incineration at a temperature range of 842 to 1796 °F (450 to 980 °C) or rotary kiln incineration at 820 to 1600°C. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.



**Section 14 - Transport Information****DOT Hazardous Materials Table Data (49 CFR 172.101):**

**Shipping Name and Description:** Environmentally hazardous substances, solid, n.o.s.

**ID:** UN3077

**Hazard Class:** 9 - Miscellaneous hazardous material

**Packing Group:** III - Minor Danger

**Symbols:** G - Technical Name Required

**Label Codes:** 9 - Class 9

**Special Provisions:** 8, 146, B54, IB8, N20

**Packaging:**      **Exceptions:** 155   **Non-bulk:** 213   **Bulk:** 240

**Quantity Limitations:**   **Passenger aircraft/rail:** No limit   **Cargo aircraft only:** No limit

**Vessel Stowage:**      **Location:** A      **Other:**

**Section 15 - Regulatory Information****EPA Regulations:**

**RCRA 40 CFR:** Listed U022 Toxic Waste

**CERCLA 40 CFR 302.4:** Listed per RCRA Section 3001, per CWA Section 307(a) 1 lb (0.454 kg)

**SARA 40 CFR 372.65:** Listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed

**Section 16 - Other Information**

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

51/60

**Material Name:** Diesel Fuel Oil No. 2-D

**CAS Number:** 68334-30-5

**Chemical Formula:** Un

**Structural Chemical Formula:** Unspecified; variable

**EINECS Number:** 269-822-7

**ACX Number:** X1012054-0

**Synonyms:** AUTOMOTIVE DIESEL OIL; DIESEL FUEL; DIESEL FUEL OIL NO. 2-D; DIESEL OIL (PETROLEUM); DIESEL OILS; DIESEL TEST FUEL; FUELS, DIESEL; OLEJ NAPIEDOWY III; SANTOS MOOMBA DISTILLATE

**Derivation:** Fuel oil may be a distilled fraction of petroleum, a residuum from refinery operations, a crude petroleum or a blend of two or more of these.

**General Use:** This medium viscosity residual fuel oil has both light and heavy grades, and is used in furnaces and boilers of utility and industrial power plants, ships, locomotives, and metallurgical operations.

## Section 2 - Composition / Information on Ingredients

Name	CAS	%
Diesel fuel oil no. 2-D	68334-30-5	ca 100% vol;
diesel fuels consist primarily of aliphatic (64% vol), aromatic (35% vol), and olefinic (1-2% vol) hydrocarbons.		
<b>Trace Impurities:</b> May contain sulfur (< 0.5 ), benzene (<100 ppm), and additives such as sulfurized esters.		

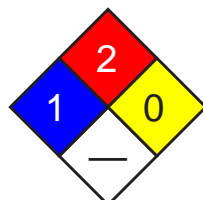
**OSHA PEL**

**NIOSH REL**

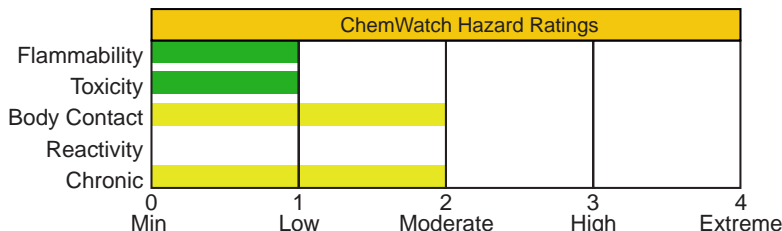
**ACGIH TLV**

TWA: 100 mg/m<sup>3</sup>; skin.

## Section 3 - Hazards Identification



Fire Diamond



**ANSI Signal Word**

**Warning!**

HMIS	
1	Health
2	Flammability
0	Reactivity



Flammable

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Brown, slightly viscous liquid; kerosene-like odor. Irritating to skin/respiratory tract. Other Acute Effects: headache, nausea, vomiting, diarrhea, CNS depression, tachycardia, cyanosis, pulmonary edema, liver/kidney injury. Flammable.

### Potential Health Effects

**Target Organs:** Skin, CNS, cardiovascular system (CVS), respiratory system, liver, kidneys

**Primary Entry Routes:** Inhalation, ingestion, skin contact/absorption

#### Acute Effects

**Inhalation:** Euphoria, respiratory irritation, cardiac dysrhythmia, increased respiration rates, cyanosis, pulmonary edema, hemoptysis (spitting up blood from the respiratory tract), respiratory arrest, renal (kidney) and liver injury, and CNS toxicity can result from inhalation of diesel fuel oil no. 2-D mist or vapor.

**Eye:** Contact may result in irritation.

**Skin:** Contact may cause irritation, systemic effects, and block the sebaceous (oil) glands, resulting in a rash of acne-like pimples and spots, usually on the arms and legs.



**Ingestion:** Gastrointestinal irritation, vomiting, diarrhea, and in severe cases, CNS depression progressing to coma and death and other systemic effects can result. Aspiration can result in transient CNS depression or excitement, hypoxia, infection, pneumatocele (abnormal cavities in lungs) formation, and chronic lung dysfunction.

**Carcinogenicity:** NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

**Medical Conditions Aggravated by Long-Term Exposure:** None reported.

**Chronic Effects:** Prolonged or repeated skin contact causes dermatitis and possible systemic toxicity. Prolonged or repeated inhalation can cause CNS and peripheral nervous system damage.

## Section 4 - First Aid Measures

**Inhalation:** Remove exposed person to fresh air and support breathing as needed.

**Eye Contact:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 minutes. Consult a physician or ophthalmologist if pain and/or irritation develops.

**Skin Contact:** Quickly remove contaminated clothing. Rinse with flooding amounts of water followed by washing the exposed area with soap and water. For reddened or blistered skin, consult a physician.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Have the *conscious and alert* person drink 1 to 2 glasses of water. Contact a poison control center. Because of aspiration risk, *do not* induce vomiting unless the poison control center advises otherwise.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** Gastric lavage is contraindicated due to aspiration risk. Instead, consider administration of charcoal or milk. If ingestion amount is large, gastric emptying in the alert patient can be accomplished through administration of Syrup of Ipecac. Treat overexposure symptomatically and supportively.

See  
DOT  
ERG

## Section 5 - Fire-Fighting Measures

**Flash Point:** 100.4 °F (38 °C), Closed Cup

**Autoignition Temperature:** 351-624 °F (177-329 °C)

**LEL:** 1.3% v/v

**UEL:** 75% v/v

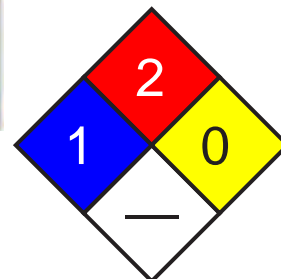
**Flammability Classification:** OSHA Class II Combustible Liquid

**Extinguishing Media:** Use dry chemical, carbon dioxide, foam, low velocity water fog or spray. Use a smothering technique to extinguish fire. Water may be ineffective in putting out a fire involving diesel fuel oil no. 2-D, and a solid water stream may spread the flames; however, a water spray may be used to cool fire-exposed containers, and flush spills away from ignition sources.

**General Fire Hazards/Hazardous Combustion Products:** Heating diesel fuel oil no. 2-D to decomposition can produce acrid smoke and irritating vapors. Vapor or mist can form explosive mixtures in air. In still air, the heavier-than-air vapors of diesel fuel oil no. 2-D from a large source may travel along low-lying surfaces to distant sources of ignition and flash back to the material source. Containers may explode in heat of fire.

**Fire-Fighting Instructions:** *Do not* release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

See  
DOT  
ERG



Fire Diamond

## Section 6 - Accidental Release Measures

**Spill/Leak Procedures:** Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Ground all equipment used when handling this product. *Do not* touch or walk through spilled material. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. A fire fighting foam may be used to suppress vapors. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material.

**Small Spills:** Absorb diesel fuel oil no. 2-D with vermiculite, earth, sand or similar material.

**Large Spills:** For large spills, consider downwind evacuation of at least 1000 ft (300 m). Dike far ahead of liquid spill for later disposal. *Do not* release into sewers or waterways. Ground all equipment. Use non-sparking tools. Spills can be absorbed with materials such as peat, activated carbon, polyurethane foam, or straw. Sinking agents, gelling agents, dispersants, and mechanical systems can also be use to treat oil spills.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

See  
DOT  
ERG



## Section 7 - Handling and Storage

**Handling Precautions:** Avoid vapor or mist inhalation, and skin and eye contact. Use only with ventilation sufficient to reduce airborne concentrations to non-hazardous levels (see Sec. 2). Wear protective gloves (or use barrier cream), and clothing (see Sec. 8). Keep away from heat and ignition sources. Ground and bond all containers during transfers to prevent static sparks. Use non-sparking tools to open and close containers. .

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

**Recommended Storage Methods:** Store in tightly closed container in cool, well-ventilated area, away from heat, ignition sources and incompatibles (see Sec. 10). Periodically inspect stored materials. Equip drums with self-closing valves, pressure vacuum bungs, and flame arrestors.

**Regulatory Requirements:** Follow applicable OSHA regulations. Also 29 CFR 1910.106 for Class II Combustible Liquid.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations. Provide general or local exhaust ventilation systems to maintain airborne concentrations as low as possible. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

**Administrative Controls:** Enclose operations and/or provide local exhaust ventilation appropriately designed for flammable mist and vapor at the site of chemical release. Where possible, transfer diesel fuel oil no. 2-D from drums or other storage containers directly to process containers. Minimize sources of ignition in surrounding low-lying areas.

**Personal Protective Clothing/Equipment:** Wear chemically protective gloves, boots, aprons, and gauntlets. Wear protective eyeglasses, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

**Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), use an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

**Other:** Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Brown, slightly viscous; kerosene-like odor.

**Physical State:** Liquid

**Odor Threshold:** 0.7 ppm

**Vapor Pressure (kPa):** < 0.1 mm Hg at 68 °F (20 °C)

**Vapor Density (Air=1):** > 6

**Formula Weight:** N/A

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** < 0.86

**Boiling Point:** 340-676 °F (171-358 °C)

**Freezing/Melting Point:** -29.2 °F (-34 °C)

**Viscosity:** 1.9-4.1 centistoke at 104 °F (40 °C)

**Surface Tension:** 23-32 dynes/cm at 68 °F (20 °C)

**Water Solubility:** Insoluble

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Diesel fuel oil no. 2-D is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Exposure to heat and ignition sources.

**Storage Incompatibilities:** Include strong oxidizing agents.

**Hazardous Decomposition Products:** Thermal oxidative decomposition of diesel fuel oil no. 2-D can produce low molecular weight hydrocarbons, hydrocarbon derivatives, carbon oxides (CO<sub>x</sub>), and sulfur oxides (SO<sub>x</sub>).



## Section 11 - Toxicological Information

### Acute Oral Effects:

Rat, oral, LD<sub>50</sub>: 7500 mg/kg.

### Acute Skin Effects:

Rabbit, skin, LD: > 5 mL/kg.

### Irritation Effects:

Rabbit, skin, standard Draize test: 500 µL/24 hr, resulted in severe reaction.

### Other Effects:

Rat, inhalation: 2 g/m<sup>3</sup>/6 hr/3 weeks, intermittently, resulted in changes in blood erythrocyte (RBC) count, and focal fibrosis (pneumoconiosis) and other changes in the lung, thorax or respiration.

Rat, inhalation: 400 µg/m<sup>3</sup>/16 hr/2.5 years, intermittently, caused other changes in the blood, and biochemical effects - transaminases.

Rabbit, skin: 80 mL/kg/12 days, continuously, resulted in other changes in the liver, kidney, ureter, and bladder, and death.

See RTECS HZ1800000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** Diesel fuel oil no. 2-D will evaporate from water or soil. In surface water, it may partition from the water column to suspended sediments. Biodegradation may occur in soil and water.

**Ecotoxicity:** Juvenile American shad, salt water TL<sub>m</sub>: 204 mg/L/24 hr; mallard duck, LD<sub>50</sub>=20 mg/kg.

## Section 13 - Disposal Considerations

**Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Note:** This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

**Shipping Name and Description:** Diesel fuel

**ID:** NA1993

**Hazard Class:** 3 - Flammable and combustible liquid

**Packing Group:** III - Minor Danger

**Symbols:** D - Domestic transportation

**Label Codes:** None

**Special Provisions:** 144, B1, IB3, T4, TP1, TP29

**Packaging:** Exceptions: 150 **Non-bulk:** 203 **Bulk:** 242

**Quantity Limitations:** Passenger aircraft/rail: 60 L **Cargo aircraft only:** 220 L

**Vessel Stowage:** Location: A **Other:**

**Shipping Name and Description:** Diesel fuel

**ID:** UN1202

**Hazard Class:** 3 - Flammable and combustible liquid

**Packing Group:** III - Minor Danger

**Symbols:** I - International transportation

**Label Codes:** 3 - Flammable Liquid

**Special Provisions:** 144, B1, IB3, T2, TP1

**Packaging:** Exceptions: 150 **Non-bulk:** 203 **Bulk:** 242

**Quantity Limitations:** Passenger aircraft/rail: 60 L **Cargo aircraft only:** 220 L

**Vessel Stowage:** Location: A **Other:**



## Section 15 - Regulatory Information

### EPA Regulations:

**RCRA 40 CFR:** Not listed

**CERCLA 40 CFR 302.4:** Not listed

**SARA 40 CFR 372.65:** Not listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed



**Section 16 - Other Information**

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Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

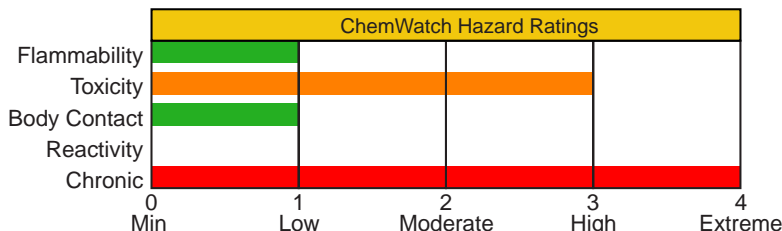
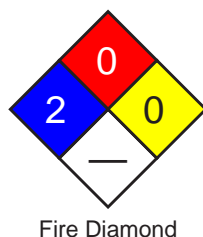
54/60

**Material Name:** Arsenic **CAS Number:** 7440-38-2  
**Chemical Formula:** As  
**Structural Chemical Formula:** As<sub>4</sub>  
**EINECS Number:** 231-148-6  
**ACX Number:** X1002785-7  
**Synonyms:** ARSEN; ARSENIA; ARSENIC; ARSENIC-75; ARSENIC BLACK; ARSENICALS; COLLOIDAL ARSENIC; GRAY ARSENIC; GREY ARSENIC; METALLIC ARSENIC  
**General Use:** In metallurgy for hardening copper, lead alloys. In the manufacture of certain types of glass.

## Section 2 - Composition / Information on Ingredients

Name	CAS	%
Arsenic		>98
<b>OSHA PEL</b> TWA: 0.01 mg/m <sup>3</sup> .		
<b>NIOSH REL</b> Ceiling: 0.002 mg/m <sup>3</sup> ; 15-minute.		
<b>ACGIH TLV</b> TWA: 0.01 mg/m <sup>3</sup> .		
<b>IDLH Level</b> 5 mg/m <sup>3</sup> (as As).		

## Section 3 - Hazards Identification



HMIS	
3	Health
0	Flammability
1	Reactivity

ANSI Signal Word

**Warning!**



### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Brittle, crystalline, silvery-black metal. Irritating to eyes/skin/respiratory tract. Chronic Effects: damage to blood-forming organs, nervous/cardiovascular systems effects. Cancer hazard. Powder is flammable.

### Potential Health Effects

**Target Organs:** liver, kidneys, skin, lungs, lymphatic system

**Primary Entry Routes:** inhalation, ingestion of dust and fumes, skin absorption

#### Acute Effects

**Inhalation:** The dust is toxic and discomforting to the upper respiratory tract and lungs.

Acute inhalation exposure can cause cough, chest pain, shortness of breath, dizziness, headache, pulmonary edema and extreme general weakness.

Prolonged or repeated exposure can cause perforation of the nasal septum.

High exposures can cause poor appetite, nausea, vomiting and muscle cramps. Heart effects with abnormal EKG can also occur with very high exposures.

**Eye:** The dust may produce eye discomfort causing smarting, pain and redness.

**Skin:** The material is moderately discomforting to the skin and may be harmful.

Exposure may result in abnormal redness (caused by capillary congestion), burning, itching, swelling, skin eruptions and dermatitis.

Toxic effects may result from skin absorption.

Repeated skin contact can cause thickened skin and/or patchy areas of darkening and loss of pigment. Some persons develop white lines on the nails.

**Ingestion:** The solid/dust is discomforting to the gastrointestinal tract and is toxic and may be fatal if swallowed.



Symptoms of acute poisoning by ingestion, which develop within 4 hours include epigastric pain, vomiting and watery diarrhea. Blood may appear in vomitus and stools. If amount ingested is sufficiently high, shock may develop, followed by death within 24 hours.

Considered an unlikely route of entry in commercial/industrial environments.

**Carcinogenicity:** NTP - Class 1, Known to be a carcinogen; IARC - Group 1, Carcinogenic to humans; OSHA - Listed as a carcinogen; NIOSH - Listed as carcinogen; ACGIH - Class A1, Confirmed human carcinogen; EPA - Class A, Human carcinogen; MAK - Class A1, Capable of inducing malignant tumors as shown by experience with humans.

**Chronic Effects:** Symptoms of chronic poisoning by inhalation include weight loss, nausea and diarrhea alternating with constipation, pigmentation and eruption of the skin, loss of hair, peripheral neuritis, blood disorders (anemia), striations on fingernails and toenails.

Long-term exposure can cause an ulcer or hole in the 'bone' dividing the inner nose. Hoarseness and sore eyes also occur.

High or repeated exposure can cause nerve damage with 'pins and needles', burning, numbness, and later weakness of arms and legs. Repeated exposure can also damage the liver, causing narrowing of the blood vessels, or interfere with the bone marrow's ability to make red blood cells.

Many cases of skin cancer have been reported among people exposed to arsenic through medical treatment with inorganic trivalent arsenic compounds. In some instances skin cancers have occurred in combination with other cancers, such as liver angiosarcoma, intestinal and urinary bladder carcinomas and meningioma. Epidemiological studies of cancer after medical treatment have shown an excess of skin cancers but no clear association with other cancers has been shown. An association between environmental exposure to arsenic through drinking water and skin cancer has been observed and confirmed. Epidemiological studies in areas where drinking water contained 0.35-1.14 mg/l arsenic elevated risks for cancers of the bladder, kidney, skin, liver, lung and colon in both men and women. Occupational exposure to inorganic arsenic, especially in mining and copper smelting, has consistently been associated with an increased risk of cancer. An almost tenfold increase in the incidence of lung cancer was found in workers most heavily exposed to arsenic and relatively clear dose-response relationships have been obtained with regard to cumulative exposure. Other smelter worker populations have been shown to have consistent increases in lung cancer incidence, as well as increases of about 20% in the incidence of gastrointestinal cancer and of 30% for renal cancer and hematolymphatic malignancies.

## Section 4 - First Aid Measures

**Inhalation:** Remove to fresh air. Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

**Eye Contact:** Immediately hold the eyes open and wash continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**Skin Contact:** Quickly but gently, wipe material off skin with a dry, clean cloth.

Immediately remove all contaminated clothing, including footwear.

Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

**Ingestion:** Contact a Poison Control Center.

If swallowed, and if more than 15 minutes from a hospital, induce vomiting, preferably using Ipecac Syrup APF.

Note: DO NOT INDUCE VOMITING in an unconscious person

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** For acute or short term repeated exposures to arsenic, soluble compounds:

Treat as per arsenic poisoning.

1. Acute skin lesions such as contact dermatitis usually do not require other treatment than removal from exposure.
2. If more severe symptoms of the respiratory system, the skin or the gastrointestinal tract occur, British Anti-Lewisite (BAL, dimercaprol) may be given. Prompt administration in such cases is vital; to obtain maximum benefit such treatment should be administered within 4 hours of poisoning.
3. In addition, general treatment such as prevention of further absorption from the gastrointestinal tract are mandatory.
4. General supportive therapy such as maintenance of respiration and circulation, maintenance of water and electrolyte balance and control of nervous system effects, as well as elimination of absorbed poison through dialysis and exchange transfusion, may be used if feasible.
5. Dimercaprol is given by deep intramuscular injection as a 5% solution in peanut oil (or a 10% solution with benzylbenzoate in vegetable oil). It is usually given in a dose of 3 mg/kg, 4-hourly, for the first two days, or twice daily for up to seven days.
6. BAL Therapy is effective for hematological manifestations of chronic arsenic poisoning but not for neurological symptoms. Watch for side effects (e.g. urticaria, burning sensation in the lips, mouth and throat, fever, conjunctivitis etc).
7. Some relief results from administration of diphenhydramine (Benadryl) (1.5 mg/kg intramuscularly or by mouth every 6 hour).

BIOLOGICAL EXPOSURE INDEX - BEI

See  
DOT  
ERG



These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

<u>Determinant</u>	<u>Index</u>	<u>Sampling Time</u>	<u>Comments</u>
Inorganic arsenic metabolites in urine	50 ug/g creatinine	End of workweek	B

B: Background levels occur in specimens collected from subjects NOT exposed  
Consult specific documentation.

## Section 5 - Fire-Fighting Measures

**Flash Point:** Noncombustible solid

**Extinguishing Media:** Use fire fighting procedures suitable for surrounding area.

**General Fire Hazards/Hazardous Combustion Products:** Solid which exhibits difficult combustion or is difficult to ignite.

Avoid generating dust, particularly clouds of dust in a confined or unventilated space. Dust may form an explosive mixture with air, and any source of ignition, i.e. flame or spark, will cause fire or explosion.

Dry dust can be charged electrostatically by turbulence, pneumatic transport, pouring, in exhaust ducts and during transport. Build-up of electrostatic charge may be prevented by bonding and grounding.

Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.

Decomposes on heating and produces toxic fumes of arsenic oxides (AsO<sub>x</sub>).

**Fire Incompatibility:** Avoid contact with acids, oxidizing agents, halogens.

**Fire-Fighting Instructions:** Contact fire department and tell them location and nature of hazard.

Wear breathing apparatus plus protective gloves for fire only. Prevent, by any means available, spillage from entering drains or waterways.

Use fire fighting procedures suitable for surrounding area.

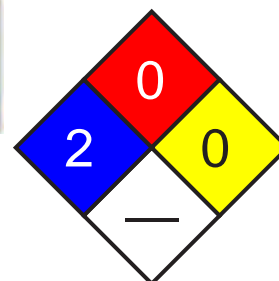
Do not approach containers suspected to be hot.

Cool fire exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

Equipment should be thoroughly decontaminated after use.

See  
DOT  
ERG



Fire Diamond

## Section 6 - Accidental Release Measures

**Small Spills:** Clean up all spills immediately. Wear protective clothing, impervious gloves and safety glasses. Increase ventilation.

Use a vacuum or a wet method to reduce dust during clean-up. DO NOT dry sweep.

Place in suitable containers for disposal.

Wash area down with large quantity of water and prevent runoff into drains.

**Large Spills:** POLLUTANT -contain spillage. Clear area of personnel and move upwind.

Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

If contamination of drains or waterways occurs, advise emergency services.

Shut off all possible sources of ignition and increase ventilation.

Stop leak if safe to do so.

Contain spill with sand, earth or vermiculite.

Use dry clean up procedures and avoid generating dust.

Collect recoverable product into labeled containers for recycling. Collect residues and seal in labeled drums for disposal.

Wash area down with large quantity of water and prevent runoff into drains.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

See  
DOT  
ERG

## Section 7 - Handling and Storage

**Handling Precautions:** Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Use good occupational work practice.

Avoid contact with skin and eyes.

Avoid generating and breathing dust.

Use in a well-ventilated area.



Wear protective clothing when risk of exposure occurs.

Avoid sources of heat. Avoid contact with incompatible materials. Avoid physical damage to containers.

Keep containers securely sealed when not in use.

When handling, DO NOT eat, drink or smoke.

Wash hands with soap and water after handling.

Work clothes should be laundered separately: NOT at home.

**Recommended Storage Methods:** Glass container. Plastic drum. Polyethylene or polypropylene container. Steel drum. Metal drum.

Check that containers are clearly labeled.

**Storage Requirements:** Observe manufacturer's storing and handling recommendations.

Store in a cool, dry place. Store in a well-ventilated area. Store away from sources of heat or ignition/bare lights.

Avoid storage at temperatures higher than 60 °C. Store away from incompatible materials. Store away from foodstuff containers.

Protect containers against physical damage.

Keep containers securely sealed.

Check regularly for spills and leaks.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** General exhaust is adequate under normal operating conditions.

Local exhaust ventilation may be required.

Use ventilated helmet or air-line hood to provide clean air at the breathing zone.

If risk of overexposure exists, wear NIOSH approved respirator. Correct fit is essential to obtain adequate protection.

**Personal Protective Clothing/Equipment:**

**Eyes:** Safety glasses. Chemical goggles.

Full face shield.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

**Hands/Feet:** Impervious, gauntlet length gloves; Rubber gloves. Neoprene gloves.

Rubber boots.

**Respiratory Protection:**

Exposure Range >0.01 to 0.1 mg/m<sup>3</sup>: Air Purifying, Negative Pressure, Half Mask

Exposure Range >0.1 to 1 mg/m<sup>3</sup>: Air Purifying, Negative Pressure, Full Face

Exposure Range >1 to <5 mg/m<sup>3</sup>: Supplied Air, Constant Flow/Pressure Demand, Full Face

Exposure Range 5 to unlimited mg/m<sup>3</sup>: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Cartridge Color: magenta (P100)

**Other:** Overalls. PVC apron. PVC protective suit may be required if exposure severe.

Eyewash unit. Ensure there is ready access to a safety shower.

\* Preplacement and periodic medical examinations are essential for workers exposed to arsenic. Preplacement physical examinations should give particular attention to allergic and chronic skin lesions, eye disease, psoriasis, chronic eczematous dermatitis, hyperpigmentation of the skin, keratosis and warts, baseline weight, baseline blood and hemoglobin counts, baseline urinary arsenic determinations.

Annual physical examinations should give attention to general health, weight, skin condition, and any evidence of excessive exposure or absorption of arsenic.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Grey, shiny, brittle, metallic-looking rhombohedral crystals. Can be heated to burn in air with a bluish flame, giving off an odor of garlic and dense white fumes of arsenic trioxide. Loses its luster on exposure to air. Converted by nitric acid or hot sulfuric acid into arsenous or arsenic acid.

Brinell hardness: 147

Mohs' scale: 3.5

**Physical State:** Divided solid

**Vapor Pressure (kPa):** Not applicable

**Vapor Density (Air=1):** Not applicable

**Formula Weight:** 74.92

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 5.73

**Evaporation Rate:** Not applicable

**pH:** Not applicable

**pH (1% Solution):** Not applicable

**Boiling Point:** Sublimes

**Freezing/Melting Point:** 817 °C (1502.6 °F) at 28 atm

**Volatile Component (% Vol):** Not applicable

**Water Solubility:** Insoluble

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Contact with acids liberates toxic gases. Presence of heat source and ignition source.

Product is considered stable under normal handling conditions. Hazardous polymerization will not occur.

**Storage Incompatibilities:** Segregate from oxidizing agents, halogens.



Contact with acids produces toxic fumes.

## Section 11 - Toxicological Information

### Toxicity

Oral (man) TD<sub>Lo</sub>: 7857 mg/kg/55 years

Oral (rat) LD<sub>50</sub>: 763 mg/kg

Tumorigenic - Carcinogenic by RTECS criteria.

### Irritation

Nil reported

See RTECS CG 0525000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** No data found.

**Ecotoxicity:** Food chain concentration potential: Bioaccumulated by fresh water and marine aquatic organisms

**BCF:** bioaccumulated by aquatic organisms

**Biochemical Oxygen Demand (BOD):** none

## Section 13 - Disposal Considerations

**Disposal:** Follow all federal, state, and local regulations.

## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Shipping Name and Description:** Arsenic

**ID:** UN1558

**Hazard Class:** 6.1 - Poisonous materials

**Packing Group:** II - Medium Danger

**Symbols:**

**Label Codes:** 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*

**Special Provisions:** IB8, IP2, IP4

**Packaging:** Exceptions: None      **Non-bulk:** 212      **Bulk:** 242

**Quantity Limitations:** Passenger aircraft/rail: 25 kg      **Cargo aircraft only:** 100 kg

**Vessel Stowage:** Location: A      **Other:**



## Section 15 - Regulatory Information

### **EPA Regulations:**

**RCRA 40 CFR:** Listed

**CERCLA 40 CFR 302.4:** Listed per CWA Section 307(a), per CAA Section 112 1 lb (0.454 kg)

**SARA 40 CFR 372.65:** Listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed

## Section 16 - Other Information

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

55/60

**Material Name:** Bentonite

**CAS Number:** 1302-78-9

**Chemical Formula:** Unknown

**EINECS Number:** 215-108-5

**ACX Number:** X1006363-7

**Synonyms:** ALBAGEL PREMIUM USP 4444; BENTONITE; BENTONITE 2073; BENTONITE MAGMA; COLLOIDAL CLAY; HI-JEL; INVITE I.G.B.A; MAGBOND; MONTMORILLONITE; OTAYLITE; PANTHER CREEK BENTONITE; SOUTHERN BENTONITE; TIXOTON; VOLCALY BENTONITE BC; VOLCLAY; WILKINITE; WILKONITE

**General Use:** emulsifier for oils; base for plasters; pharmaceutical aid; granular carrier; liq clarifier; reagglomerating agent for iron ore; cracking catalyst for petro; agent in drilling mud; in foundry molding sands; lubricant for extrusion of animal feed; absorbent in pet litter, for purifying oils, etc; in sugar purification, brewing, paper industries; cement slurries for oil-wells, canal walls; asphalt modifier; thickener in greases & fireproofing; cosmetics; decolorizing agent; filler in ceramics, etc; polishes & abrasives; food additive.

## Section 2 - Composition / Information on Ingredients

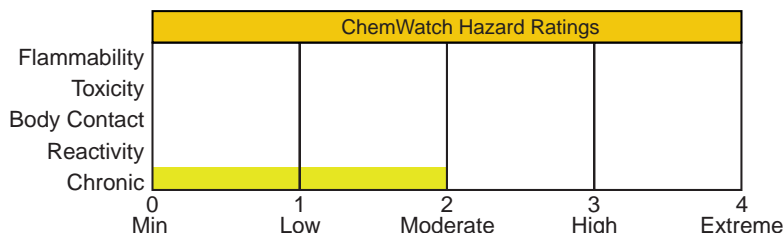
Name	CAS	%
bentonite	1302-78-9	>95

**OSHA PEL**

**NIOSH REL**

**ACGIH TLV**

## Section 3 - Hazards Identification



**ANSI Signal Word**

**Caution**

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Cream to pale brown powder; in massive condition varies from yellowish-white to almost black; light yellow or green, cream, pink, gray to black; odorless. Irritating. Other Acute Effects: may be harmful. Chronic: lung irritation; asthma.

### Potential Health Effects

**Target Organs:** eyes, skin, respiratory system

**Primary Entry Routes:** accidental skin and eye contact, inhalation of generated dusts

#### Acute Effects

**Inhalation:** The dust is discomforting to the upper respiratory tract. Persons with impaired respiratory function, airway diseases, or conditions such as emphysema or chronic bronchitis may incur further disability if excessive concentrations of particulate are inhaled. Effects on lungs are significantly enhanced in the presence of respirable particles.

**Eye:** The dust may produce eye discomfort and abrasive eye inflammation.

**Skin:** The material may be abrasive to the skin.

**Ingestion:** Considered an unlikely route of entry in commercial/industrial environments. The solid/dust is slightly discomforting to the gastrointestinal tract.



**Carcinogenicity:** NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

**Chronic Effects:** Chronic dust inhalation has been associated with lung disease. Symptoms are those of nodular fibrosis and respiratory impairment is characterized by obstruction and restriction of lung function. Long-term exposure to high dust concentrations may cause changes in lung function (i.e. pneumoconiosis) caused by particles less than 0.5 micron penetrating and remaining in the lung. A prime symptom is breathlessness. Lung shadows show on X-ray. Repeated exposures, in an occupational setting, to high levels of fine-divided dusts may produce a condition known as pneumoconiosis which is the lodgement of any inhaled dusts in the lung irrespective of the effect.

### Section 4 - First Aid Measures

**Inhalation:** • If dust is inhaled, remove to fresh air.

- Encourage patient to blow nose to ensure clear breathing passages.
- Ask patient to rinse mouth with water but to not drink water.
- Seek immediate medical attention.

**Eye Contact:** • Immediately hold the eyes open and flush with fresh running water.

- Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
- Seek medical attention if pain persists or recurs.

• Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**Skin Contact:** • Wash affected areas thoroughly with water (and soap if available).

- Seek medical attention in event of irritation.

**Ingestion:** • DO NOT induce vomiting. Contact a Poison Control Center. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.

- Observe the patient carefully.
- Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e., becoming unconscious.
- Give water (or milk) to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink.
- Seek medical advice.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** Long-term exposure to high dust concentrations may cause changes in lung function (i.e. pneumoconiosis) caused by particles less than 0.5 micron penetrating and remaining in the lung. A prime symptom is breathlessness. Lung shadows show on X-ray.

### Section 5 - Fire-Fighting Measures

**Extinguishing Media:** There is no restriction on the type of extinguisher which may be used.

**General Fire Hazards/Hazardous Combustion Products:** • Noncombustible.

- Not considered to be a significant fire risk; however, containers may burn.

**Fire Incompatibility:** None known.

**Fire-Fighting Instructions:** • Contact fire department and tell them location and nature of hazard.

- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or waterways.
- Use fire fighting procedures suitable for surrounding fire.

### Section 6 - Accidental Release Measures

**Small Spills:** • Clean up all spills immediately.

- If exposure to workplace dust is not controlled, respiratory protection is required; wear NIOSH-approved dust respirator.
- Use dry clean up procedures and avoid generating dust.
- Place in clean drum then flush area with water.

**Large Spills:** • Clear area of personnel and move upwind.

- If exposure to workplace dust is not controlled, respiratory protection is required; wear NIOSH-approved dust respirator.
- Prevent, by any means available, spillage from entering drains or waterways.
- Use dry clean up procedures and avoid generating dust.
- Recover uncontaminated product in clean, dry, labeled containers.
- Collect recoverable product into labeled containers for recycling.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

### Section 7 - Handling and Storage

**Handling Precautions:** • Limit all unnecessary personal contact.

- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Avoid contact with incompatible materials.



- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately.
- Follow good occupational work practices.
- Observe manufacturer's storage and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
- Avoid generating and breathing dust.

**Recommended Storage Methods:** Multi-ply paper bag with sealed plastic liner or heavy gauge plastic bag. Bags should be stacked, blocked, interlocked, and limited in height so that they are stable and secure against sliding or collapse. Check that all containers are clearly labeled and free from leaks.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** • Use in a well-ventilated area. Local exhaust ventilation is required where solids are handled as powders or crystals; even when particulates are relatively large, a certain proportion will be powdered by mutual friction.

- If in spite of local exhaust an adverse concentration of the substance in air could occur, respiratory protection should be considered. Such protection might consist of: (a): particle dust respirators, if necessary, combined with an absorption cartridge; (b): filter respirators with absorption cartridge or canister of the right type; (c): fresh-air hoods or masks
- Build-up of electrostatic charge on the dust particle, may be prevented by bonding and grounding.
- Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.

### Personal Protective Clothing/Equipment:

**Eyes:** Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them. Safety glasses with side shields.

**Hands/Feet:** PVC gloves.

**Other:** No special equipment needed when handling small quantities. Otherwise:

- Overalls.
- Barrier cream.
- Eyewash unit.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Light pink, off white impalpable powder with no distinct odor. Insoluble in common organic solvents. Extremely slippery when wet.

**Physical State:** cream to pale brown powder, in massive condition varies from yellowish-white to almost black; light yellow or green, cream, pink, gray to black

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** approximately 2.6

**pH:** In presence of water 9

**Freezing/Melting Point:** 1337 °C (2439 °F)

**Water Solubility:** Insoluble in Water or Acids

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Product is considered stable. Hazardous polymerization will not occur.

**Storage Incompatibilities:** No data found.

## Section 11 - Toxicological Information

No significant acute toxicological data identified in literature search.

See RTECS CT9450000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** No data found.

**Ecotoxicity:** No data found.

## Section 13 - Disposal Considerations

**Disposal:** Recycle wherever possible. Bury residue in an authorized landfill. Recycle containers if possible, or dispose of in an authorized landfill.



**Section 14 - Transport Information****DOT Hazardous Materials Table Data (49 CFR 172.101):**

**Shipping Name and Description:** No data found.

**Section 15 - Regulatory Information****EPA Regulations:**

**RCRA 40 CFR:** Not listed

**CERCLA 40 CFR 302.4:** Not listed

**SARA 40 CFR 372.65:** Not listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed

**Section 16 - Other Information**

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

53/60

**Material Name:** Cadmium

**CAS Number:** 7440-43-9

**Chemical Formula:** Cd

**EINECS Number:** 231-152-8

**ACX Number:** X1002486-9

**Synonyms:** C I 77180; C.I. 77180; CADMIUM; CADMIUM DUST FUME; CADMIUM POWDER; COLLOIDAL CADMIUM; KADMIUM

**Derivation:** Cadmium is collected as dust or fume from roasting zinc ores, mixed with coal or coke and sodium or zinc chloride, and sintered. The cadmium fume is collected in an electrostatic precipitator, leached, fractionally precipitated, and distilled; collected as sludge from zinc sulfate purification; prepared from direct distillation of cadmium-bearing zinc; obtained by recovery from electrolytic zinc process; may be prepared from cadmium sulfate in the laboratory.

**General Use:** Cadmium is used as a constituent of easily fusible alloys; soft solder and solder for aluminum; in electroplating; as a deoxidizer for nickel plating; for process engraving; electrodes for cadmium vapor lamps; photoelectric cells; photometry of ultraviolet sun-rays; in Ni-Cd storage batteries; to charge Jones reducers; as an amalgam in dentistry; power transmission wire; TV phosphors; basis of pigments used in ceramic glazing, machinery enamels, baking enamels; Weston-standard-cell control of atomic fission in nuclear reactors; reactor control rods; fungicide; photography and lithography; selenium rectifiers.

## Section 2 - Composition / Information on Ingredients

Name	CAS	%
Cadmium		ca 99.5+% wt

**Trace Impurities:** < 10 ppm

### OSHA PEL

TWA: 0.005 mg/m<sup>3</sup>.

### NIOSH REL

Lowest Feasible Concentration.

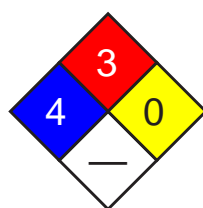
### ACGIH TLV

TWA: 0.01 mg/m<sup>3</sup>; measured as inhalable fraction of the aerosol;  
 TWA: 0.002 mg/m<sup>3</sup>; measured as respirable fraction of the aerosol.

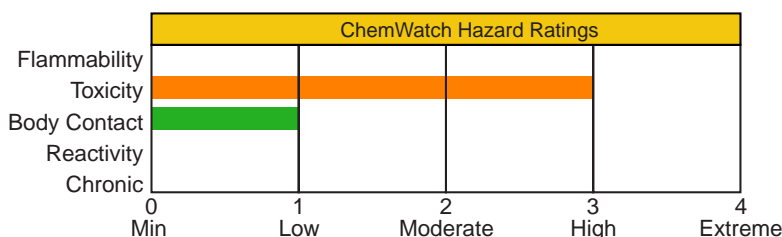
### IDLH Level

9 mg/m<sup>3</sup> (as Cd).

## Section 3 - Hazards Identification

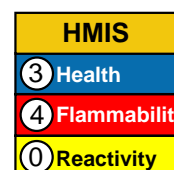


Fire Diamond



ANSI Signal Word

**Danger!**



### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Lustrous metal solid, silver-white to bluish color; odorless. Irritating to skin/respiratory tract. Toxic by inhalation. Chronic Effects: kidney damage, obstructive lung disease, possible carcinogen/teratogen. Dust ignites spontaneously in air. Forms explosive dust-air mixtures.

### Potential Health Effects

**Target Organs:** Respiratory system, kidneys

**Primary Entry Routes:** Inhalation and ingestion



**Acute Effects**

**Inhalation:** Initial signs/symptoms of cadmium poisoning resemble those of the flu. Inhalation of dust or fumes causes throat dryness, cough, headache, vomiting, chest pain, dyspnea (shortness of breath), central nervous system (CNS) effects, extreme restlessness and irritability, pneumonitis, possibly bronchopneumonia, pulmonary edema, and death due to respiratory failure in severe cases. Symptoms may be delayed up to 24 hours. Residual emphysema and fibrosis may result. Note: heating of cadmium may produce cadmium oxide, the inhalation of which can result in metal fume fever, characterized by fever, chills, malaise, headache, myalgias, fatigue, cough, thirst, and abdominal discomfort, with symptom onset about 3 to 10 hours after exposure. Symptoms do not usually last beyond 24 to 48 hours.

**Eye:** May cause irritation.

**Skin:** Contact may cause irritation, skin eruptions and pruritus. Significant dermal absorption rarely occurs.

**Ingestion:** Causes increased salivation, dry mouth, choking, nausea, vomiting, abdominal pain and cramping, blurred vision, anemia, kidney dysfunction, diarrhea, gastroenteritis, and substernal pain.

**Carcinogenicity:** NTP - Class 2A, Reasonably anticipated to be a carcinogen, limited evidence of carcinogenicity from studies in humans; IARC - Group 1, Carcinogenic to humans; OSHA - Listed as a carcinogen; NIOSH - Listed as carcinogen; ACGIH - Class A2, Suspected human carcinogen; EPA - Class B1, Probable human carcinogen based on epidemiologic studies; MAK - Class A2, Unmistakably carcinogenic in animal experimentation only.

**Medical Conditions Aggravated by Long-Term Exposure:** Kidney disorders, respiratory disorders.

**Chronic Effects:** Include chronic obstructive lung disease such as emphysema, kidney damage (renal tubular disorder and proteinuria (low molecular weight)), bone demineralization, microfractures and osteomalacia, respiratory cancer, gastrointestinal symptoms, anosmia (loss of sense of smell), rhinitis and discoloration of the teeth. It is implicated as the causative agent in Itai- Itai disease in Japan.

## Section 4 - First Aid Measures

**Inhalation:** Remove exposed person to fresh air and support breathing as needed.

**Eye Contact:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 minutes. Consult a physician or ophthalmologist if pain or irritation persist.

**Skin Contact:** Quickly remove contaminated clothing. Rinse with flooding amounts of water. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the conscious and alert person drink 1 to 2 glasses of water, then induce vomiting.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** Consider a chest X-ray after acute exposure.

See  
DOT  
ERG

## Section 5 - Fire-Fighting Measures

**Flash Point:** Data not found.

**Autoignition Temperature:** 482 °F (250 °C) (layer cadmium metal dust)

**LEL:** Data not found.

**UEL:** Data not found.

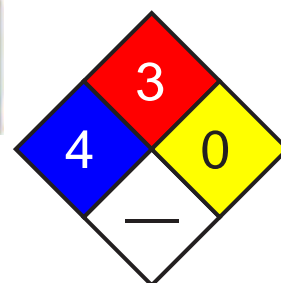
**Flammability Classification:** Flammable

**Extinguishing Media:** Extinguish with carbon dioxide, dolomite, dry powder, graphite, soda ash, sodium chloride, dry chemical, or sand.

**General Fire Hazards/Hazardous Combustion Products:** When heated to decomposition, toxic fumes of cadmium are emitted. The finely divided material is pyrophoric. The more finely divided the powder the greater the fire/explosion hazard.

**Fire-Fighting Instructions:** Do not release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

See  
DOT  
ERG



Fire Diamond

## Section 6 - Accidental Release Measures

**Spill/Leak Procedures:** Notify safety personnel, evacuate all unnecessary personnel, remove heat and ignition sources. Isolate and ventilate area, deny entry, stay upwind. Cleanup personnel should protect against exposure. Prevent entry into water, sewers, basements or confined areas.

**Small Spills:** If in solid form, do not sweep! Absorb or cover with dry earth, sand or other noncombustible material. Carefully scoop up or vacuum (with a HEPA filter).

**Large Spills:** Do not release into sewers or waterways.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120). Also 1910.1027 .

See  
DOT  
ERG



## Section 7 - Handling and Storage

**Handling Precautions:** Wear personal protective clothing and equipment to prevent dust inhalation and any contact with skin or eyes (Sec. 8). Wash thoroughly after handling cadmium.

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

**Recommended Storage Methods:** Store in tightly closed containers in a cool, well-ventilated area away from heat, light, ignition sources, incompatibles, and air. Cadmium slowly oxidizes in air to form cadmium oxide.

**Storage Requirements:** Areas where cadmium is used or stored must be labeled according to 29 CFR 1910.1027.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Where feasible, enclose operations to avoid dust dispersion into the work area. Provide general or local exhaust ventilation systems to maintain airborne concentrations below exposure limits (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

**Administrative Controls:** Educate workers about the health and safety hazards associated with this material. Train in work practices which minimize exposure. Consider preplacement and periodic medical exams with emphasis on kidney functions (including urine screening for micro-globulins), lungs and blood. Follow written procedures set forth by OSHA in 29 CFR 1910.1027.

**Personal Protective Clothing/Equipment:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent any skin contact. Butyl rubber, chlorinated polyethylene, and polyvinyl chloride are recommended materials. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not protective eye devices. Appropriate eye protection must be worn instead of, or in conjunction with, contact lenses.

**Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. Select respirator based on exposure range as follows. Exposure range  $>0.005$  to  $0.05 \text{ mg/m}^3$  use air purifying respirator, negative-pressure, half-mask;  $>0.05$  to  $0.5 \text{ mg/m}^3$  use air purifying respirator, negative-pressure, full-face;  $>0.5$  to  $5 \text{ mg/m}^3$  use supplied-air respirator, constant flow/pressure-demand, full-face;  $>5 \text{ mg/m}^3$  use a SCBA, pressure-demand, full-face. Use a magenta cartridge (P100). For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, cartridge change schedules, and convenient, sanitary storage areas.

**Other:** Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Silver-white, blue-tinged. Odorless.

**Physical State:** Solid; lustrous metal or granular powder

**Vapor Pressure (kPa):** 1 mm Hg at 741 °F (394 °C)

**Formula Weight:** 112.41

**Density:** 8.642 at 77 °F (25 °C)

**Refractive Index:** 1.8 at 578 nm and 20 °C

**Boiling Point:** 1409 °F (765 °C)

**Freezing/Melting Point:** 609.8 °F (321 °C)

**Ionization Potential (eV):** 8.99367 eV

**Water Solubility:** Insoluble

**Other Solubilities:** Dissolved by acids; ammonium nitrate solution

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Cadmium is stable at room temperature in closed containers under normal storage and handling conditions. It slowly oxidizes in air to form cadmium oxide. Finely divided material is pyrophoric, i.e., it may ignite or explode spontaneously in air. Hazardous polymerization cannot occur. Avoid creation of dust clouds, contact with chemical incompatibles, heat, and sources of ignition.

**Storage Incompatibilities:** Include acids (reacts readily with dilute nitric acid, slowly with hydrochloric acid); explodes on contact with hydrazoic acid; violent or explosive reaction when heated with ammonium nitrate; tellurium; zinc; ammonia; sulfur; selenium; nitryl fluoride; oxidizing agents; metals.

**Hazardous Decomposition Products:** Thermal oxidative decomposition of cadmium can produce toxic fumes of cadmium and cadmium oxide.



## Section 11 - Toxicological Information

### Acute Oral Effects:

Rat, oral, LD<sub>50</sub>: 2330 mg/kg.

Mouse, oral, LD<sub>50</sub>: 890 mg/kg.

### Acute Inhalation Effects:

Rat, inhalation, LC<sub>50</sub>: 25 mg/m<sup>3</sup>/30 minutes produced dyspnea.

Human, inhalation, LC<sub>Lo</sub>: 39 mg/m<sup>3</sup>/20 minutes produced cardiac changes; respiratory depression.

### Acute Skin Effects:

Rabbit, subcutaneous, LD<sub>Lo</sub>: 6 mg/kg produced toxic effects: Effects on newborn - reduced weight gain and behavioral.

### Other Effects:

Reproductive Effects: Rat, female, oral, 23 mg/kg administered on gestational days 1 - 22 produced specific developmental abnormalities - blood and lymphatic system (including spleen and marrow).

Rat, female, oral, 21.5 mg/kg administered to multigenerations produced toxic effects: Effects on fertility - preimplantation mortality; Effects on newborn - germ cell effects in offspring.

Rat, male, oral, 155 mg/kg administered 13 weeks prior to mating produced toxic effects: Effects on newborn - reduced weight gain and behavioral.

Mouse, micronucleus test, cell type - embryo: 6 µmol/L induced mutation.

Hamster, cytogenic analysis, cell type - ovary: 1 µmol/L induced mutation.

Tumorigenic Effects - Woman, inhalation, 129 µg/m<sup>3</sup>/20 years, continuous produced toxic effects: carcinogenic by RTECS criteria; Lung, thorax or respiration - tumors.

Human, inhalation, TC<sub>Lo</sub>: 88 µg/m<sup>3</sup>/8.6 years produced proteinuria.

Rat, oral, 546 mg/kg administered for 26 weeks continuously produced toxic effects: changes in serum composition; transaminases; weight loss or decreased weight gain.

Rat, oral, 1512 mg/kg administered for 48 weeks continuously produced toxic effects: changes to liver, kidneys, ureter and bladder.

Rat, subcutaneous, 3372 µg/kg produced toxic effects: carcinogenic by RTECS criteria, tumors at site of application.

See RTECS EU9800000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** No data found.

**Ecotoxicity:** *Dreissena polymorpha*, zebra mussels, chronic LC<sub>50</sub>: 130 mcg/L; *Rivulus marmoratus*, mangrove fish, LC<sub>50</sub> in fresh water: 2.96 mg/L; Steelhead trout, LC<sub>50</sub>: 0.0009 ppm for 96 hours; *Daphnia magna*, 0.1 ppm lethal.

## Section 13 - Disposal Considerations

**Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable federal, state, and local regulations.

## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Note:** This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

**Shipping Name and Description:** Cadmium compounds

**ID:** UN2570

**Hazard Class:** 6.1 - Poisonous materials

**Packing Group:** I - Great Danger

**Symbols:**

**Label Codes:** 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*

**Special Provisions:** IB7, IP1

**Packaging:** Exceptions: None      **Non-bulk:** 211      **Bulk:** 242

**Quantity Limitations:** Passenger aircraft/rail: 5 kg      **Cargo aircraft only:** 50 kg

**Vessel Stowage:** Location: A      **Other:**





**Shipping Name and Description:** Cadmium compounds**ID:** UN2570**Hazard Class:** 6.1 - Poisonous materials**Packing Group:** II - Medium Danger**Symbols:****Label Codes:** 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B***Special Provisions:** IB8, IP2, IP4**Packaging:**      **Exceptions:** None      **Non-bulk:** 212      **Bulk:** 242**Quantity Limitations:**    **Passenger aircraft/rail:** 25 kg      **Cargo aircraft only:** 100 kg**Vessel Stowage:**      **Location:** A      **Other:****Shipping Name and Description:** Cadmium compounds**ID:** UN2570**Hazard Class:** 6.1 - Poisonous materials**Packing Group:** III - Minor Danger**Symbols:****Label Codes:** 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B***Special Provisions:** IB8, IP3**Packaging:**      **Exceptions:** 153    **Non-bulk:** 213      **Bulk:** 240**Quantity Limitations:**    **Passenger aircraft/rail:** 100 kg      **Cargo aircraft only:** 200 kg**Vessel Stowage:**      **Location:** A      **Other:**

### Section 15 - Regulatory Information

**EPA Regulations:****RCRA 40 CFR:** Listed**CERCLA 40 CFR 302.4:** Listed per CWA Section 307(a) 10 lb (4.535 kg)**SARA 40 CFR 372.65:** Listed**SARA EHS 40 CFR 355:** Not listed**TSCA:** Listed

### Section 16 - Other Information

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

54/60

**Material Name:** Chromium **CAS Number:** 7440-47-3  
**Chemical Formula:** Cr  
**Structural Chemical Formula:** Cr  
**EINECS Number:** 231-157-5  
**ACX Number:** X1002501-1  
**Synonyms:** CHROM; CHROME; CHROMIUM; CHROMIUM METAL  
**General Use:** Used in the manufacture of chrome-steel or chrome-nickel-steel alloys (stainless steel); for greatly increasing resistance and durability of metals; for chrome-plating of other metals.

## Section 2 - Composition / Information on Ingredients

Name	CAS	%
chromium	7440-47-3	> 99.5

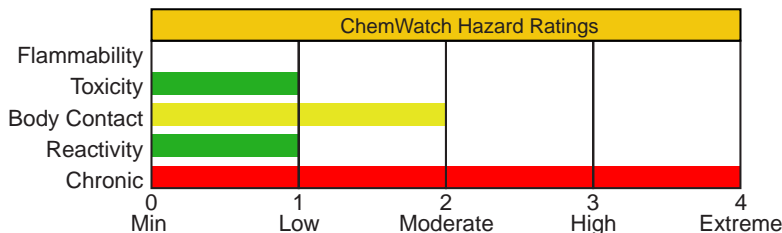
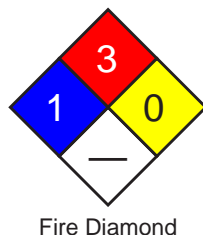
**OSHA PEL**  
 TWA: 1 mg/m<sup>3</sup>.

**NIOSH REL**  
 TWA: 0.5 mg/m<sup>3</sup>.

**ACGIH TLV**  
 TWA: 0.5 mg/m<sup>3</sup>.

**IDLH Level**  
 250 mg/m<sup>3</sup> (as Cr).

## Section 3 - Hazards Identification



HMIS	
1	Health
3	Flammability
0	Reactivity

ANSI Signal Word

**Warning!**



### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Steel-gray, lustrous metal powder; odorless. Irritating to eyes/skin/respiratory tract. Chronic Effects: lung fibrosis. Flammable. Explosive in air.

### Potential Health Effects

**Target Organs:** respiratory system

**Primary Entry Routes:** inhalation, skin absorption, ingestion

#### Acute Effects

**Inhalation:** The dust may be discomfoting to the upper respiratory tract and may be harmful if inhaled.

Chrome fume is irritating to the respiratory tract and lungs.

Toxic effects result from over-exposure.

Asthmatic conditions may result as a consequence of the sensitizing action of chrome VI compounds.

**Eye:** The dust may produce eye discomfort and abrasive eye inflammation.

**Skin:** The material may be mildly discomfoting to the skin and is capable of causing skin reactions which may lead to dermatitis.

Chrome fume, as the chrome VI oxide, is corrosive to the skin and may aggravate pre-existing skin conditions such as dermatitis and eczema.

As a potential skin sensitizer, the fume may cause dermatoses to appear suddenly and without warning. Absorption of chrome VI compounds through the skin can cause systemic poisoning effecting the kidneys and liver.

**Ingestion:** The material is moderately discomfoting to the gastrointestinal tract and may be harmful if swallowed in large quantity.



**Carcinogenicity:** NTP - Listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A4, Not classifiable as a human carcinogen; EPA - Not listed; MAK - Not listed.

**Chronic Effects:** Metallic dusts generated by the industrial process give rise to a number of potential health problems. The larger particles, above 5 micron, are nose and throat irritants. Smaller particles however, may cause lung deterioration. Particles of less than 1.5 micron can be trapped in the lungs and, dependent on the nature of the particle, may give rise to further serious health consequences.

Chromium(III) is considered an essential trace nutrient serving as a component of the "glucose tolerance factor" and a cofactor for insulin action. High concentrations of chromium are also found in RNA. Trivalent chromium is the most common form found in nature.

Chronic inhalation of trivalent chromium compounds produces irritation of the bronchus and lungs, dystrophic changes to the liver and kidney, pulmonary edema, and adverse effects on macrophages. Intratracheal administration of chromium(III) oxide, in rats, increased the incidence of sarcomas, and tumors and reticulum cell sarcomas of the lung. There is inadequate evidence of carcinogenicity of chromium(III) compounds in experimental animals and humans (IARC).

Chronic exposure to hexavalent chromium compounds reportedly produces skin, eye and respiratory tract irritation, yellowing of the eyes and skin, allergic skin and respiratory reactions, diminished sense of smell and taste, blood disorders, liver and kidney damage, digestive disorders and lung damage. There is sufficient evidence of carcinogenicity of chromium(VI) compounds in experimental animals and humans to confirm these as Class 1 carcinogens (IARC).

Exposure to chromium during chrome production and in the chrome pigment industry is associated with cancer of the respiratory tract. A slight increase in gastrointestinal cancer following exposure to chromium compounds has also been reported. The greatest risk is attributed to exposure to acid-soluble, water-insoluble hexavalent chromium which occurs in roasting and refining processes. Animal studies support the idea that the most potent carcinogenic compounds are the slightly soluble hexavalent compounds.

The cells are more active in the uptake of the hexavalent forms compared to trivalent forms and this may explain the difference in occupational effect. It is the trivalent form, however, which is metabolically active and binds with nucleic acid within the cell suggesting that chromium mutagenesis first requires biotransformation of the hexavalent form by reduction.

Hexavalent chromes produce chronic ulceration of skin surfaces (quite independent of other hypersensitivity reactions exhibited by the skin).

Water-soluble chromium(VI) compounds come close to the top of any published "hit list" of contact allergens (eczematogens) producing positive results in 4 to 10% of tested individuals. On the other hand only chromium(III) compounds can bind to high molecular weight carriers such as proteins to form a complete allergen (such as a hapten). Chromium(VI) compounds cannot.

## Section 4 - First Aid Measures

**Inhalation:** Remove to fresh air.

Encourage patient to blow nose to ensure clear breathing passages. Rinse mouth with water. Consider drinking water to remove dust from throat.

Seek medical attention if irritation or discomfort persist.

**Eye Contact:** Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**Skin Contact:** Immediately remove all contaminated clothing, including footwear (after rinsing with water).

Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

**Ingestion:** Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

**After first aid, get appropriate in-plant, paramedic, or community medical support.**

**Note to Physicians:** Long term exposure to high dust concentrations may cause changes in lung function i.e. pneumoconiosis; caused by particles less than 0.5 micron penetrating and remaining in the lung. Prime symptom is breathlessness; lung shadows show on X-ray.



## Section 5 - Fire-Fighting Measures

**Flash Point:** Noncombustible Solid

**Autoignition Temperature:** 580 °C (cloud)

**LEL:** Not applicable

**UEL:** Not applicable

**Extinguishing Media:** Sand, dry powder extinguishers or other inerts should be used to smother dust fires.

These are the only suitable means for extinguishing metal dust fires.

Do NOT use water.

**General Fire Hazards/Hazardous Combustion Products:** Sand, dry powder extinguishers or other inerts should be used to smother dust fires.

These are the only suitable means for extinguishing metal dust fires.

Do NOT use water.

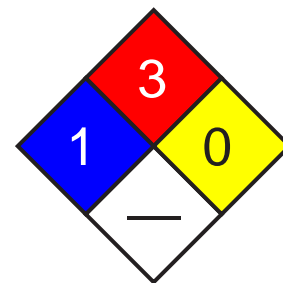
**Fire Incompatibility:** Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

**Fire-Fighting Instructions:** Contact fire department and tell them location and nature of hazard.

Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.



Fire Diamond

## Section 6 - Accidental Release Measures

**Small Spills:** Clean up all spills immediately. Avoid contact with skin and eyes.

Wear impervious gloves and safety glasses.

Remove all ignition sources.

Use dry clean-up procedures and avoid generating dust.

Vacuum up or sweep up.

Place spilled material in clean, dry, sealable, labeled container.

**Large Spills:** Clear area of personnel.

Contact fire department and tell them location and nature of hazard.

Control personal contact by using protective equipment.

Prevent, by any means available, spillage from entering drains or water ways.

Moderate hazard.

No smoking, bare lights or ignition sources. Increase ventilation.

Stop leak if safe to do so.

Avoid generating dust.

Collect recoverable product into labeled containers for recycling.

Collect residues and seal in labeled drums for disposal.

Wash area down with large quantity of water and prevent runoff into drains.

After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.

If contamination of drains or waterways occurs, advise emergency services.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

## Section 7 - Handling and Storage

**Handling Precautions:** Limit all unnecessary personal contact.

Wear protective clothing when risk of exposure occurs.

Use in a well-ventilated area. When handling DO NOT eat, drink or smoke.

Always wash hands with soap and water after handling.

Avoid physical damage to containers. Use good occupational work practices.

Observe manufacturer's storing and handling recommendations.

**Recommended Storage Methods:** Packaging as recommended by manufacturer.

Check that containers are clearly labeled.

Store in metal drums or safety cans.

Plastic container.

Metal can.

Metal drum.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Metal dusts must be collected at the source of generation as they are potentially explosive.



1. Vacuum cleaners, of flame-proof design, should be used to minimize dust accumulation.
2. Metal spraying and blasting should, where possible, be conducted in separate rooms. This minimizes the risk of supplying oxygen, in the form of metal oxides, to potentially reactive finely divided metals such as aluminum, zinc, magnesium or titanium.
3. Work-shops designed for metal spraying should possess smooth walls and a minimum of obstructions, such as ledges, on which dust accumulation is possible.
4. Wet scrubbers are preferable to dry dust collectors.
5. Bag or filter-type collectors should be sited outside the workrooms and be fitted with explosion relief doors.
6. Cyclones should be protected against entry of moisture as reactive metal dusts are capable of spontaneous combustion in humid or partially wetted state.
7. Local exhaust systems must be designed to provide a minimum capture velocity at the fume source, away from the worker, of 0.5 meter/sec.

Special ventilation requirements apply for processes which result in the generation of barium, chromium, lead, or nickel fume and in those processes which generate ozone.

The use of mechanical ventilation by local exhaust systems is required as a minimum in all circumstances (including outdoor work).

(In confined spaces always check that oxygen has not been depleted by excessive rusting of steel or snowflake corrosion of aluminum). Local exhaust systems must be designed to provide a minimum capture velocity at the fume source, away from the worker, of 0.5 meter/sec.

#### Personal Protective Clothing/Equipment:

**Eyes:** Safety glasses with side shields; or as required, chemical goggles.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

**Hands/Feet:** PVC gloves; Safety footwear.

Rubber gloves.

#### Respiratory Protection:

Exposure Range >1 to 10 mg/m<sup>3</sup>: Air Purifying, Negative Pressure, Half Mask

Exposure Range >10 to 100 mg/m<sup>3</sup>: Air Purifying, Negative Pressure, Full Face

Exposure Range >100 to <250 mg/m<sup>3</sup>: Supplied Air, Constant Flow/Pressure Demand, Half Mask

Exposure Range 250 to unlimited mg/m<sup>3</sup>: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Cartridge Color: dust/mist filter (use P100 or consult supervisor for appropriate dust/mist filter)

**Other:** Overalls. Eyewash unit.

### Section 9 - Physical and Chemical Properties

**Appearance/General Info:** A hard, brittle, lustrous, steel-grey metal which is very resistant to corrosion. Soluble in dilute sulphuric and hydrochloric acids. Welding flux grades typical sieve analysis (cumulative retention %): - 200 um 0, 150 um 10-40, 100 50-80, 75 um 80-95, 63 um 90-96, 43 um 97-100.

**Physical State:** Divided solid

**Vapor Pressure (kPa):** 0.13 at 1616 °C

**Vapor Density (Air=1):** 1.79

**Formula Weight:** 52.00

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 7.2

**Evaporation Rate:** Not applicable

**pH:** Not applicable

**pH (1% Solution):** Not applicable.

**Boiling Point:** 2642 °C (4788 °F)

**Freezing/Melting Point:** 1900 °C (3452 °F)

**Volatile Component (% Vol):** Nil

**Decomposition Temperature (°C):** Not applicable

**Water Solubility:** Insoluble in water

### Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Product is considered stable. Hazardous polymerization will not occur.

**Storage Incompatibilities:** Segregate from strong oxidizers, nitric oxide, potassium chlorate, sulfur dioxide, acids and strong alkalis.

### Section 11 - Toxicological Information

No relevant toxicological data found at time of research.

See RTECS GB 4200000, for additional data.

### Section 12 - Ecological Information

**Environmental Fate:** No data found.

**Ecotoxicity:** No data found.

**BCF:** snails 1 x10<sup>6</sup>

**Biochemical Oxygen Demand (BOD):** 62.5 lb/lb, 5 days



**Section 13 - Disposal Considerations**

**Disposal:** Recycle wherever possible. Consult manufacturer for recycling options. Follow applicable federal, state, and local regulations.

Bury residue in an authorized landfill.

Recycle containers if possible, or dispose of in an authorized landfill.

**Section 14 - Transport Information****DOT Hazardous Materials Table Data (49 CFR 172.101):**

**Shipping Name and Description:** None

**Section 15 - Regulatory Information****EPA Regulations:**

**RCRA 40 CFR:** Listed

**CERCLA 40 CFR 302.4:** Listed per CWA Section 307(a) 5000 lb (2268 kg)

**SARA 40 CFR 372.65:** Listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed

**Section 16 - Other Information**

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

54/60

**Material Name:** Isobutene

**CAS Number:** 115-11-7

**Chemical Formula:** C<sub>4</sub>H<sub>8</sub>

**Structural Chemical Formula:** (CH<sub>3</sub>)<sub>2</sub>C=CH<sub>2</sub>

**EINECS Number:** 204-066-3

**ACX Number:** X1003822-9

**Synonyms:** Isobutene; ISOBUTYLENE; ASYM-DIMETHYLETHYLENE; GAMMA-BUTYLENE; 1,1-DIMETHYLETHYLENE; ISO-BUTENE; ISOBUTENE; ISOPROPYLIDENEMETHYLENE; LIQUEFIED PETROLEUM GAS; 2-METHYL-1-PROPENE; 2-METHYLPROPENE; 2-METHYLPROPYLENE; 1-PROPENE,2-METHYL-; PROPENE,2-METHYL-; UNSYM. DIMETHYLETHYLENE

**General Use:** Production of butene polymers used as adhesives, tackifiers, oil additives.

Butyl rubbers, copolymer resins with butadiene, acrylates and methacrylates.

Also to produce anti-oxidants for foods, food supplements, plastics and in production of isooctane and high-octane aviation gasoline.

Used in closed pressurized systems, fitted with safety relief valve.

Vented gas is flammable, denser than air and will spread. Vent path must not contain ignition sources, pilot lights, bare flames.

## Section 2 - Composition / Information on Ingredients

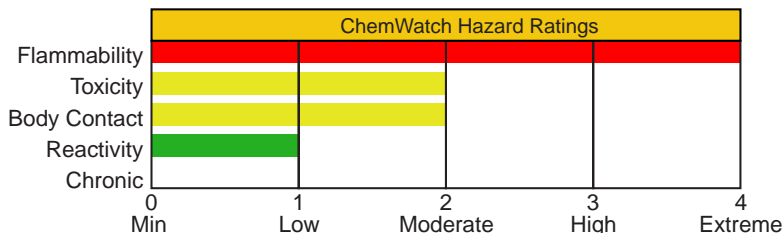
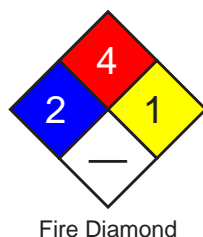
Name	CAS	%
isobutene	115-11-7	>99

OSHA PEL

NIOSH REL

ACGIH TLV

## Section 3 - Hazards Identification



HMIS	
1	Health
4	Flammability
0	Reactivity

ANSI Signal Word

**Danger!**



### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless gas. Acute Effects: Simple asphyxiant which can displace available oxygen; initial symptoms: rapid respiration, air hunger, diminished mental alertness, impaired muscular coordination. Can form explosive mixtures in air. Flammable.

### Potential Health Effects

**Target Organs:** None reported

**Primary Entry Routes:** inhalation

#### Acute Effects

**Inhalation:** The gas is a simple asphyxiant (precludes access to oxygen) and is harmful if exposure is prolonged and inhalation may cause loss of consciousness.

Acute effects from inhalation of high concentrations of gas / vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.



If exposure to highly concentrated atmosphere of gas is prolonged this may lead to narcosis, unconsciousness, even coma, and unless resuscitated, death.

Iso-butene is a simple asphyxiant and may have a narcotic action.

Material is highly volatile and may quickly form concentrated atmosphere in confined or unventilated area. Vapor is heavier than air and may displace and replace air in breathing zone, acting as a simple asphyxiant. This may happen with little warning of overexposure.

Hydrocarbons may sensitize the heart to adrenalin and other circulatory catecholamines; as a result cardiac arrhythmias and ventricular fibrillation may occur. Abrupt collapse may produce traumatic injury.

Central nervous system (CNS) depression may be evident early. Symptoms of moderate poisoning may include giddiness, headache, dizziness and nausea.

Serious poisonings may result in respiratory depression and may be fatal.

The paraffin gases C1-4 are practically non-toxic below their lower flammability limits (18000-50000 ppm). Above this level, incidental effects include CNS depression and irritation but these are reversible upon cessation of the exposure. The C3 and iso-C5 hydrocarbons show increasing narcotic properties; branching of the chain also enhances the effect.

The C4 hydrocarbons appear to be more highly neurotoxic than the C3 and C5 members. Several fatalities due to voluntary inhalation of butane have been reported, possibly due to central, respiratory and circulatory effects resulting from anesthesia, laryngeal edema, chemical pneumonia or the combined effects of cardiac toxicity and increased sympathomimetic effects.

Inhalation of petroleum gases may produce narcosis, due in part to olefinic impurities. Displacement of oxygen in the air may cyanosis.

If present in sufficient quantity these gases may reduce the oxygen level to below 18% producing asphyxiation.

Symptoms include rapid respiration, mental dullness, lack of coordination, poor judgement, nausea and vomiting.

The onset of cyanosis may lead to unconsciousness and death.

**Eye:** The liquid is highly discomforting and may cause severe cold burns and is capable of causing pain and severe conjunctivitis.

Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.

The gas is regarded as non-irritating to the eyes.

**Skin:** Vaporizing liquid causes rapid cooling and contact may cause cold burns, frostbite. The liquid is discomforting to the skin and may rapidly cause severe cold burns.

Bare unprotected skin should not be exposed to this material.

There is no evidence of skin absorption but contact may cause frostbite,

**Ingestion:** Overexposure is unlikely in this form.

Considered an unlikely route of entry in commercial/industrial environments.

The liquid is highly discomforting if swallowed and may cause severe cold burns.

**Carcinogenicity:** NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

**Chronic Effects:** Chronic overexposure may produce dermatitis.

## Section 4 - First Aid Measures

**Inhalation:** Avoid becoming a casualty and remove to fresh air.

Lay patient down. If breathing is shallow or has stopped, ensure clear airway and apply resuscitation.

If available, medical oxygen should be administered by trained personnel.

Transport to hospital or doctor, without delay.

**Eye Contact:** Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**Skin Contact:** In case of cold burns (frost-bite): Bathe the affected area immediately in cold water for 10 to 15 minutes, immersing if possible and without rubbing.

Do not apply hot water or radiant heat. Apply a clean, dry dressing.

Transport to hospital or doctor.

**Ingestion:** Contact a Poison Control Center. DO NOT induce vomiting. Observe the patient carefully. Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. Give water (or milk) to rinse out mouth. Then provide liquid slowly and as much as casualty can comfortably drink. Transport to hospital or doctor without delay.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** For acute or short-term repeated exposures to petroleum distillates or related hydrocarbons:

1. Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.
2. Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases ( $pO_2 < 50$  mm Hg or  $pCO_2 > 50$  mm Hg) should be intubated.

See  
DOT  
ERG



3. Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.

4. A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.

5. Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.

Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.

6. Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.

## Section 5 - Fire-Fighting Measures

**Flash Point:** -76.111 °C

**Autoignition Temperature:** 465 °C

**LEL:** 1.8% v/v

**UEL:** 9.6% v/v

**Extinguishing Media:** Water spray or fog; dry chemical powder.

Carbon dioxide.

Foam.

**General Fire Hazards/Hazardous Combustion Products:** Flammable gas. Liquid and vapor are highly flammable.

Dangerous hazard when exposed to heat, flame and oxidizers.

Gas may form explosive mixtures with air over a wide area.

Decomposes on heating and produces toxic fumes of carbon monoxide (CO) and carbon dioxide (CO<sub>2</sub>).

**Fire Incompatibility:** Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

**Fire-Fighting Instructions:** Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

Do not extinguish burning gas. If safe to do so, stop flow of gas.

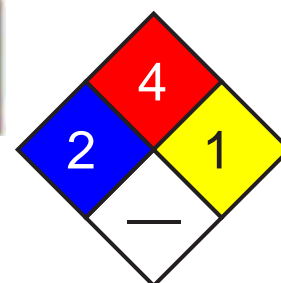
If flow of gas cannot be stopped, leave gas to burn.

Cool fire-exposed containers with water spray from a protected location.

Do not approach cylinders suspected to be hot.

If safe to do so, remove containers from path of fire.

Fight fire from a safe distance, with adequate cover.



Fire Diamond

## Section 6 - Accidental Release Measures

**Small Spills:** Avoid breathing vapor and any contact with liquid or gas. Protective equipment including respirator should be used. Do NOT enter confined spaces where gas may have accumulated. Shut off all sources of possible ignition and increase ventilation. Clear area of personnel. Stop leak only if safe to do so. Remove leaking cylinders to safe place. Release pressure under safe controlled conditions by opening valve. Keep area clear of personnel until gas has dispersed.



**Large Spills:** DO NOT touch the spill material. Shut off all possible sources of ignition and increase ventilation.

Restrict access to area. Clear area of personnel and move upwind.

May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

Avoid spraying water onto liquid pools.

Use extreme caution to avoid a violent reaction.

Stop leak if safe to do so.

DO NOT enter confined places where gas may have collected. Remove leaking cylinders to a safe place. Fit vent pipes. Release pressure under safe, controlled conditions by opening valve. Burn issuing gas at vent pipes.

Do not exert excessive pressure on valve; do not attempt to operate damaged valve.

Keep area clear of personnel until gas has dispersed

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

## Section 7 - Handling and Storage

**Handling Precautions:** Use good occupational work practices. Use in a well-ventilated area.

Obtain a work permit before attempting any repairs.

Do not attempt repair work on lines, vessels under pressure.

Atmospheres must be tested and O.K. before work resumes after leakage.



Wear protective clothing and gloves when handling containers.  
 No smoking, bare lights, heat or ignition sources.  
 Use spark-free tools when handling. Ground all lines and equipment.  
 Prevent concentration in hollows and sumps. DO NOT enter confined spaces until atmosphere has been checked.  
 Gas may travel a considerable distance to source of ignition.  
 Vapor may ignite on pumping or pouring due to static electricity.  
 Avoid physical damage to containers.  
 DO NOT transfer gas from one cylinder to another.  
 Natural gases contain a contaminant, radon-222, a naturally occurring radioactive gas. During subsequent processing, radon tends to concentrate in liquified petroleum streams and in product streams having similar boiling points. Industry experience indicates that the commercial product may contain small amounts of radon-222 and its radioactive decay products (radon daughters). The actual concentration of radon-222 and radioactive daughters in process equipment (IE lines, filters, pumps and reactor units) may reach significant levels and produce potentially damaging levels of gamma radiation. A potential external radiation hazard exists at or near any pipe, valve or vessel containing a radon enriched stream or containing internal deposits of radioactive material. Field studies, however, have not shown that conditions exist that expose the worker to cumulative exposures in excess of general population limits. Equipment containing gamma-emitting decay products should be presumed to be internally contaminated with alpha- emitting decay products which may be hazardous if inhaled or ingested.  
 During maintenance operations that require the opening of contaminated process equipment, the flow of gas should be stopped and a four hour delay enforced to allow gamma-radiation to drop to background levels. Protective equipment (including high efficiency particulate respirators (P3) suitable for radionucleotides or supplied air) should be worn by personnel entering a vessel or working on contaminated process equipment to prevent skin contamination or inhalation of any residue containing alpha-radiation.  
 Airborne contamination may be minimized by handling scale and/or contaminated materials in a wet state.

**Recommended Storage Methods:** Packaging as recommended by manufacturer.  
 Check that containers are clearly labeled.  
 Cylinder fitted with valve protector cap.  
 Ensure the use of equipment rated for cylinder pressure.  
 Ensure the use of compatible materials of construction.  
 Cylinder valve must be closed when not in use or when empty.  
 Cylinder must be properly secured either in use or in storage.  
**WARNING:** Suckback into cylinder may result in rupture.  
 Use back-flow preventive device in piping.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Use in a well-ventilated arealf gas concentrations are high: or If risk of overexposure exists, wear NIOSH-approved respirator.  
 Correct fit is essential to obtain adequate protection.  
 Used in closed pressurized systems; fitted with temperature and pressure safety relief valves which are vented to allow safe dispersal.  
 Provide adequate ventilation in warehouse or closed storage areas.

**Personal Protective Clothing/Equipment:**  
**Eyes:** Safety glasses with side shields; or as required, chemical goggles.  
 Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.  
**Hands/Feet:** Protective gloves eg. leather gloves or gloves with leather facing. Neoprene rubber gloves.  
 Safety footwear.  
**Other:** Operators should be trained in correct use & maintenance of respirators Ensure that there is ready access to breathing apparatus.  
 Protective overalls, closely fitted at neck and wrist. Eye-wash unit.  
**IN CONFINED SPACES:**  
 1. Non-sparking protective boots.  
 2. Static-free clothing.  
 3. Ensure availability of lifeline.  
 Staff should be trained in all aspects of rescue work.  
 Ensure there is ready access to an emergency shower.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Easily liquified flammable gas or colorless highly volatile liquid. Packed as liquid under pressure and remains liquid only under pressure. Sudden release of pressure or leakage may result in rapid vaporization with generation of large volume of highly flammable / explosive gas. Strong gasoline odor. Floats and boils on water giving a flammable / explosive, visible cloud. Soluble in alcohol, ether, benzene and sulphuric acid.

**Physical State:** Liquiefied gas **Vapor Pressure (kPa):** 182 kPa at 10 °C



**Vapor Density (Air=1):** 2.01  
**Formula Weight:** 56.11  
**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 0.59  
**Evaporation Rate:** Very rapid  
**pH:** Not applicable

**pH (1% Solution):** Not applicable.  
**Boiling Point:** -6.9 °C (20 °F)  
**Freezing/Melting Point:** -140.35 °C (-220.63 °F)  
**Volatile Component (% Vol):** 100  
**Water Solubility:** Practically insoluble in water

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Product is considered stable. Hazardous polymerization will not occur.

**Storage Incompatibilities:** Avoid contact with oxidizing agents.

The interaction of alkenes and alkynes with nitrogen oxides and oxygen may produce explosive addition products; these may form at very low temperatures and explode on heating to higher temperatures (the addition products from 1,3-butadiene and cyclopentadiene form rapidly at -150 °C and ignite or explode on warming to -35 to -15 °C). These derivatives ("pseudo-nitrosites") were formerly used to characterize terpene hydrocarbons.

Exposure to air must be kept to a minimum so as to limit the build-up of peroxides which will concentrate in bottoms if the product is distilled.

The product must not be distilled to dryness if the peroxide concentration is substantially above 10 ppm (as active oxygen) since explosive decomposition may occur. Distillate must be immediately inhibited to prevent peroxide formation. The effectiveness of the antioxidant is limited once the peroxide levels exceed 10 ppm as active oxygen. Addition of more inhibitor at this point is generally ineffective.

Prior to distillation it is recommended that the product should be washed with aqueous ferrous ammonium sulfate to destroy peroxides; the washed product should be immediately re-inhibited.

A range of exothermic decomposition energies for double bonds is given as 40-90 kJ/mol. The relationship between energy of decomposition and processing hazards has been the subject of discussion; it is suggested that values of energy released per unit of mass, rather than on a molar basis (J/g) be used in the assessment. For example, in "open vessel processes" (with man-hole size openings, in an industrial setting), substances with exothermic decomposition energies below 500 J/g are unlikely to present a danger, whilst those in "closed vessel processes" (opening is a safety valve or bursting disk) present some danger where the decomposition energy exceeds 150 J/g.

Avoid reactions with oxidizing agents, organic acids, inorganic acids halogenated compounds, polymerizable esters, oxygen, cyanohydrins and molten sulphur.

## Section 11 - Toxicological Information

### Toxicity

Inhalation (rat) LC<sub>50</sub>: 620000 mg/m<sup>3</sup>/4h

### Irritation

Nil reported

See RTECS UD 0890000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** No data found.

**Ecotoxicity:** No data found.

**BCF:** no food chain concentration potential

**Biochemical Oxygen Demand (BOD):** none

## Section 13 - Disposal Considerations

**Disposal:** Consult manufacturer for recycling options.

Discharge to burning flare. Return empty cylinders to supplier.

## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Note:** This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

**Shipping Name and Description:** Isobutylene *see also* Petroleum gases, liquefied

**ID:** UN1055

**Hazard Class:** 2.1 - Flammable gas

**Packing Group:**

**Symbols:**

**Label Codes:** 2.1 - Flammable Gas





**Special Provisions:** 19, T50

**Packaging:** Exceptions: 306 **Non-bulk:** 304 **Bulk:** 314, 315

**Quantity Limitations:** Passenger aircraft/rail: Forbidden

**Cargo aircraft only:** 150 kg

**Vessel Stowage:** Location: E Other: 40

**Shipping Name and Description:** Petroleum gases, liquefied *or* Liquefied petroleum gas

**ID:** UN1075

**Hazard Class:** 2.1 - Flammable gas

**Packing Group:**

**Symbols:**

**Label Codes:** 2.1 - Flammable Gas

**Special Provisions:** T50

**Packaging:** Exceptions: 306 **Non-bulk:** 304 **Bulk:** 314, 315

**Quantity Limitations:** Passenger aircraft/rail: Forbidden

**Cargo aircraft only:** 150 kg

**Vessel Stowage:** Location: E Other:



## Section 15 - Regulatory Information

### EPA Regulations:

**RCRA 40 CFR:** Not listed

**CERCLA 40 CFR 302.4:** Not listed

**SARA 40 CFR 372.65:** Not listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed

## Section 16 - Other Information

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

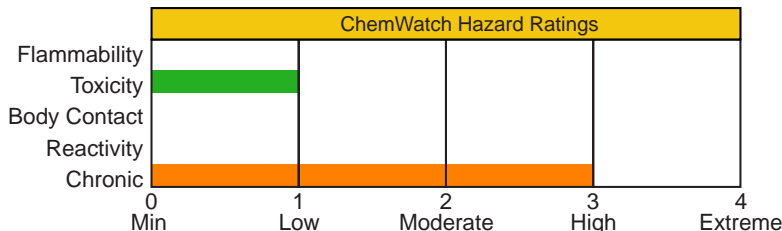
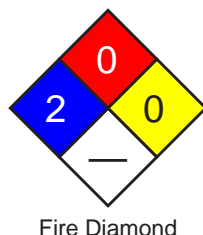
54/60

**Material Name:** Lead **CAS Number:** 7439-92-1  
**Chemical Formula:** Pb  
**Structural Chemical Formula:** Pb  
**EINECS Number:** 231-100-4  
**ACX Number:** X1000227-2  
**Synonyms:** C.I. 77575; C.I. PIGMENT METAL 4; GLOVER; KS-4; LEAD; LEAD FLAKE; LEAD INORGANIC; LEAD METAL; LEAD S2; LEAD SZ; OLOW; OMAHA & GRANT; PB-S 100; PLUMBUM  
**General Use:** Used as a construction material in chemical reaction equipment (tank piping, etc.); manufacture of tetraethyl lead; pigments for paints.  
 Used in pottery glazes, glass, ceramics, bearing metal and alloys, solder and other lead alloys.  
 Also used in metallurgy of steel and other metals, cable sheathing, storage batteries, radiation shielding and ammunition.

## Section 2 - Composition / Information on Ingredients

Name	CAS	%
lead	7439-92-1	>99
<b>OSHA PEL</b> TWA: 0.05 mg/m <sup>3</sup> ; as Pb inorganic.	<b>NIOSH REL</b> TWA: 0.05 mg/m <sup>3</sup> .  <b>IDLH Level</b> 100 mg/m <sup>3</sup> (as Pb).	<b>DFG (Germany) MAK</b> TWA: 0.1 mg/m <sup>3</sup> ; PEAK: 8 mg/m <sup>3</sup> ; measured as inhalable fraction of the aerosol; Excluding lead arsenate and lead chromate.
<b>ACGIH TLV</b> TWA: 0.05 mg/m <sup>3</sup> .		

## Section 3 - Hazards Identification



HMIS	
3	Health
1	Flammability
0	Reactivity

ANSI Signal Word

**Danger!**



### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Bluish-white, silvery, or gray metal. Cumulative poison. Chronic Effects: severe neurological effects, blood/kidney damage, sterility, decreased fertility, developmental damage to fetus. Possible cancer hazard.

### Potential Health Effects

**Target Organs:** blood, central nervous system (CNS), peripheral nervous system, kidneys, gastrointestinal (GI) tract

**Primary Entry Routes:** inhalation, ingestion

#### Acute Effects

**Inhalation:** The dust may be discomforting to the upper respiratory tract and may be harmful if inhaled.

**Eye:** The dust may be discomforting to the eyes.

**Skin:** The material may be mildly discomforting to the skin.

Prolonged exposure may cause skin reactions.

Skin absorption is not considered a significant route of exposure.

**Ingestion:** The material is moderately discomforting to the gastrointestinal tract and may be harmful if swallowed.

In rats intestinal lead absorption is bidirectional and does not follow a linear relationship with oral dose.



Acute effects of exposure are generally minor because of its relative insolubility and physical form. Unusual instances of exposure have been reported in inadequately ventilated indoor firing ranges (as fume), in the application of surma, a mascara-like cosmetic agent, to the conjunctival surfaces in Asian countries and in lead-smelting and associated occupations.

In humans lead metabolism fits into a three compartment model. The first compartment in which lead has a half-life of about 35 days includes the blood; it receives blood from the gut and delivers some of it to the urine and communicates with the other two pools. The second compartment in which lead has a similar half-life includes the soft tissues which contain about half the blood level; they share lead with hair, nails, sweat, saliva, bile and other digestive secretions. The skeleton is the third compartment and contains the vast bulk of the total body burden, possesses a very long half-life and demonstrates a difference between the dense and less dense components to bind lead.

**Carcinogenicity:** NTP - Not listed; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class B2, Probable human carcinogen based on animal studies; MAK - Not listed.

**Chronic Effects:** Symptoms of exposure include headache, fatigue, sleep disturbances, abdominal pains and decreased appetite. Overexposure to lead in the form of dust has toxic effects on the lungs and kidneys and on the nervous system resulting in mental disturbances and anemia.

Skin absorption is not considered to be a significant route of exposure.

Worker exposure to lead must be kept to a minimum, especially in cases where lead is worked at temperatures whereby lead vapors are evolved e.g. metal refining.

Lead is an accumulative poison and exposure even to small amounts can raise the body's content to toxic levels. Potential adverse effects on the offspring of pregnant workers have been cited in the literature.

## Section 4 - First Aid Measures

**Inhalation:** Remove to fresh air.

Lay patient down. Keep warm and rested.

If available, administer medical oxygen by trained personnel.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

**Eye Contact:** Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**Skin Contact:** Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

**Ingestion:** Rinse mouth out with plenty of water.

Seek medical attention if irritation or discomfort persist.

**After first aid, get appropriate in-plant, paramedic, or community medical support.**

**Note to Physicians:** 1. Gastric acids solubilize lead and its salts and lead absorption occurs in the small bowel.

2. Particles of less than 1 µm diameter are substantially absorbed by the alveoli following inhalation.

3. Lead is distributed to the red blood cells and has a half-life of 35 days.

It is subsequently redistributed to soft tissue & bone-stores or eliminated. The kidney accounts for 75% of daily lead loss; integumentary and alimentary losses account for the remainder.

4. Neurasthenic symptoms are the most common symptoms of intoxication.

Lead toxicity produces a classic motor neuropathy.

Acute encephalopathy appears infrequently in adults.

Diazepam is the best drug for seizures.

5. Whole-blood lead is the best measure of recent exposure; free erythrocyte protoporphyrin (FEP) provides the best screening for chronic exposure. Obvious clinical symptoms occur in adults when whole-blood lead exceeds 80 µg/dL.

6. British Anti-Lewisite is an effective antidote and enhances fecal and urinary excretion of lead. The onset of action of BAL is about 30 minutes and most of the chelated metal complex is excreted in 4-6 hours, primarily in the bile.

Adverse reaction appears in up to 50% of patients given BAL in doses exceeding 5 mg/kg. CaNa2EDTA has also been used alone or in concert with BAL as an antidote.

D-penicillamine is the usual oral agent for mobilization of bone lead; its use in the treatment of lead poisoning remains investigational.

2-3-dimercapto-1-propanesulfonic acid (DMPS) and dimercaptosuccinic acid (DMSA) are water soluble analogues of BAL and their effectiveness is undergoing review.

As a rule, stop BAL if lead decreases below 50 µg/dL; stop CaNa2EDTA if blood lead decreases below 40 µg/dL or urinary lead drops below 2 mg/24 hrs.

**BIOLOGICAL EXPOSURE INDEX - BEI**

These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

<u>Determinant</u>	<u>Index</u>	<u>Sampling Time</u>	<u>Comments</u>
--------------------	--------------	----------------------	-----------------



Lead in blood	50 ug/100 mL	Not Critical	B
Lead in urine	150 ug/gm creatinine	Not critical	B
Zinc Protoporphyrin in blood	250 ug/100 mL erythrocytes OR 100 ug/100 mL blood	After 1 month exposure	B

B: Background levels occur in specimens collected from subjects NOT exposed.

### Section 5 - Fire-Fighting Measures

**Flash Point:** Not available; probably noncombustible

**Autoignition Temperature:** Not applicable

**LEL:** Not applicable

**UEL:** Not applicable

**Extinguishing Media:** There is no restriction on the type of extinguisher which may be used.

**General Fire Hazards/Hazardous Combustion Products:** Noncombustible.

Not considered to be a significant fire risk; however, containers may burn.

Moderate fire hazard, in the form of dust, when exposed to heat or flames.

Decomposition products may include toxic lead dust and lead oxide fumes.

**Fire Incompatibility:** Incompatible with strong acids, oxidants, ammonium nitrate, chlorine trifluoride and sodium azide.

**Fire-Fighting Instructions:** Contact fire department and tell them location and nature of hazard.

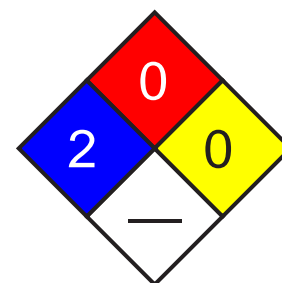
Use fire fighting procedures suitable for surrounding area.

Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.

If safe to do so, remove containers from path of fire.

Cool fire-exposed containers with water spray from a protected location.

Equipment should be thoroughly decontaminated after use.



Fire Diamond

### Section 6 - Accidental Release Measures

**Small Spills:** Clean up all spills immediately. Avoid contact with skin and eyes.

Wear protective clothing, gloves, safety glasses and dust respirator.

Use dry clean-up procedures and avoid generating dust.

Vacuum up.

Place spilled material in clean, dry, sealable, labeled container.

**Large Spills:** Clear area of personnel and move upwind.

Contact fire department and tell them location and nature of hazard.

Control personal contact by using protective equipment and dust respirator.

Prevent spillage from entering drains, sewers or waterways.

Recover product wherever possible. Avoid generating dust. Sweep / shovel up.

If required, wet with water to prevent dusting.

Put residues in labeled plastic bags or other containers for disposal.

Wash area down with large quantity of water and prevent runoff into drains.

If contamination of drains or waterways occurs, advise emergency services.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

### Section 7 - Handling and Storage

**Handling Precautions:** Limit all unnecessary personal contact.

Wear protective clothing when risk of exposure occurs.

Use in a well-ventilated area.

Avoid contact with incompatible materials.

When handling, DO NOT eat, drink or smoke.

Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling.



Work clothes should be laundered separately.

Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

**Recommended Storage Methods:** Check that containers are clearly labeled.

Packaging as recommended by manufacturer.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** General exhaust is adequate under normal operating conditions.

If risk of overexposure exists, wear NIOSH-approved dust respirator.

Correct fit is essential to obtain adequate protection.

**Personal Protective Clothing/Equipment:**

**Eyes:** Safety glasses with side shields; or as required, chemical goggles.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

**Hands/Feet:** Impervious gloves; rubber gloves.

Rubber boots.

Protective footwear.

**Respiratory Protection:**

Exposure Range >0.05 to 0.5 mg/m<sup>3</sup>: Air Purifying, Negative Pressure, Half Mask

Exposure Range >0.5 to 2.5 mg/m<sup>3</sup>: Air Purifying, Negative Pressure, Full Face

Exposure Range >2.5 to 50 mg/m<sup>3</sup>: Powered Air Purifying Respirator, Half or Full Facepiece or Hood

Exposure Range >50 to 100 mg/m<sup>3</sup>: Supplied Air Respirator with Full Facepiece, Hood, Helmet, or Suit, operated in a Positive Pressure Mode

Exposure Range >100 to unlimited mg/m<sup>3</sup>: Self-contained Breathing Apparatus, Pressure Demand, Full Face Cartridge Color: magenta (P100)

**Note:** (29CFR 1910.1025) for general industry

**Other:** Overalls. Eyewash unit. Skin cleansing cream.

Provide adequate ventilation in warehouse or closed storage areas.

General and local exhaust ventilation usually required to maintain airborne dust levels to safety levels.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Bluish-white, silvery-gray metal. Malleable, lustrous when freshly cut and tarnishes when exposed to air. Reacts with strong acids like nitric acid, sulphuric or hydrochloric acid. Attacked by water in presence of oxygen. Poor electrical conductor. Lead fumes are formed at temperatures above 500-700 °C.

**Physical State:** Divided solid

**pH:** Not applicable

**Vapor Pressure (kPa):** 0.24 at 1000 °C

**pH (1% Solution):** Not applicable.

**Vapor Density (Air=1):** Not applicable

**Boiling Point:** 1740 °C (3164 °F)

**Formula Weight:** 207.19

**Freezing/Melting Point:** 327.4 °C (621.32 °F)

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 11.34

**Volatile Component (% Vol):** Not applicable

**Evaporation Rate:** Not applicable

**Water Solubility:** Insoluble in water

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Hazardous polymerization will not occur. Stable under normal storage conditions.

**Storage Incompatibilities:** Avoid storage with strong acids, oxidants, ammonium nitrate, chlorine trifluoride and sodium azide.

## Section 11 - Toxicological Information

### Toxicity

Oral (woman) TD<sub>Lo</sub>: 450 mg/kg/6 years

Inhalation (human) TC<sub>Lo</sub>: 0.01 mg/m<sup>3</sup>

**WARNING:** Lead is a cumulative poison and has the potential to cause abortion and intellectual impairment to unborn children of pregnant workers.

### Irritation

Nil Reported

See RTECS OF 7525000, for additional data.



## Section 12 - Ecological Information

**Environmental Fate:** If released or deposited on soil, it will be retained in the upper 2-5 cm of soil, especially soils with at least 5% organic matter or a pH 5 or above. Leaching is not important under normal conditions although there is some evidence to suggest that it is taken up by some plants. Generally, the uptake from soil into plants is not significant. It is expected to slowly undergo speciation to the more insoluble sulfate, sulfide, oxide, and phosphate salts. It enters water from atmospheric fallout, runoff or wastewater; little is transferred from natural ores. It is a stable metal and adherent films of protective insoluble salts form that protect the metal from further corrosion. That which dissolves tends to form ligands. It is effectively removed from the water column to the sediment by adsorption to organic matter and clay minerals, precipitation as insoluble salt (the carbonate or sulfate, sulfide), and reaction with hydrous iron and manganese oxide. Under most circumstances, adsorption predominates. It does not appear to bioconcentrate significantly in fish but does in some shellfish such as mussels. When released to the atmosphere, it will generally be in dust or adsorbed to particulate matter and subject to gravitational settling and be transformed to the oxide and carbonate.

**Ecotoxicity:** LC<sub>50</sub> Japanese quail (*Coturnix japonica*), males or females, 14 days old, oral (5-day ad libitum in diet) >5,000 ppm; at 1000, 2236 & 5000 onset of toxic signs began at 7, 7 & 7 days and remitted 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)

**BCF:** freshwater fish 1.38 to 1.65

## Section 13 - Disposal Considerations

**Disposal:** Recycle wherever possible. Consult manufacturer for recycling options.  
Follow applicable federal, state, and local regulations.

## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Shipping Name and Description:** None

## Section 15 - Regulatory Information

### EPA Regulations:

**RCRA 40 CFR:** Listed

**CERCLA 40 CFR 302.4:** Listed per CWA Section 307(a) 10 lb (4.535 kg)

**SARA 40 CFR 372.65:** Listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed

## Section 16 - Other Information

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

44/60

**Material Name:** Mercury

**CAS Number:** 7439-97-6

**Chemical Formula:** Hg

**EINECS Number:** 231-106-7

**ACX Number:** X1002555-9

**Synonyms:** COLLOIDAL MERCURY; HYDRARGYRUM; KWIK; LIQUID SILVER; MERCURE; MERCURIO; MERCURY; MERCURY (ELEMENTAL); MERCURY METAL; COLLOIDAL MERCURY; MERCURY, METALLIC; METALLIC MERCURY; QUECKSILBER; QUICK SILVER; QUICKSILVER; QUICKSILVER SYNONYMS OF; RTEC

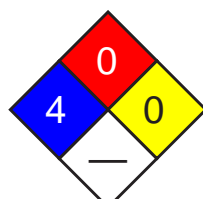
**Derivation:** Obtained by roasting cinnabar (mercury sulfide) and purified by distillation, or as a by-product of gold mining.

**General Use:** Used in agricultural poisons, anti-fouling paint, dental amalgams, mining amalgamation (to remove gold and other metals from ore), thermometers, barometers, dry cell batteries, chlorine and caustic soda production, electrical apparatus, and as a neutron absorber in nuclear power plants.

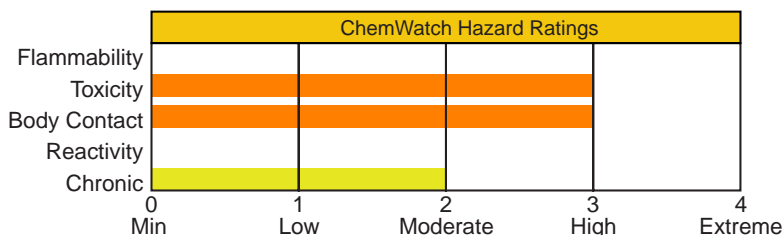
## Section 2 - Composition / Information on Ingredients

Name	CAS	%
Mercury		ca 100% wt
<b>OSHA PEL</b> Ceiling: 0.1 mg/m <sup>3</sup> .	<b>NIOSH REL</b> Hg Vapor: TWA: 0.05 mg/m <sup>3</sup> ; skin. Other: Ceiling 0.1 mg/m <sup>3</sup> ; skin.	<b>DFG (Germany) MAK</b> TWA: 0.1 mg/m <sup>3</sup> ; PEAK: 0.8 mg/m <sup>3</sup> ; danger of sensitization of the skin.
<b>OSHA PEL Vacated 1989 Limits</b> TWA: 0.05 mg/m <sup>3</sup> ; STEL: 0.1 mg/m <sup>3</sup> .	<b>IDLH Level</b> 10 mg/m <sup>3</sup> (as Hg).	
<b>ACGIH TLV</b> TWA: 0.025 mg/m <sup>3</sup> ; skin.		

## Section 3 - Hazards Identification



Fire Diamond



ANSI Signal Word

**Danger!**

HMIS	
4	Health
0	Flammability
0	Reactivity



Poison



Corrosive

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Heavy silver-white liquid metal; odorless. Corrosive. Poison. Other Acute Effects: irreversible nervous system damage.

### Potential Health Effects

**Target Organs:** Central nervous system, eyes, skin, respiratory system, liver, kidneys.

**Primary Entry Routes:** Inhalation, eye and skin contact/absorption.



**Acute Effects** The onset of signs and symptoms usually is prompt, but may be delayed up to 12 hr.

**Systemic Effects by all routes:** Nausea, vomiting, abdominal pain, diarrhea, excessive salivation, sweating, headache, giddiness, vertigo (dizziness), weakness, blurring or dimness of vision, miosis or mydriasis (dilatation of the pupils), tearing, bradycardia (slow heart beat), tachycardia (fast heart beat), cardiac irregularities (arrhythmias, complete heart block), loss of muscle coordination, slurred speech, muscle twitching (particularly tongue and eyelids), generalized profound weakness, confusion, disorientation, drowsiness, difficulty in breathing, excessive secretion of saliva and mucus, cyanosis, rales, high blood pressure, random jerky movements, incontinence, convulsions, coma, and death due to respiratory paralysis.

**Inhalation:** Exposure to high vapor concentrations can cause severe respiratory damage. Other symptoms include wakefulness, muscle weakness, anorexia, headache, ringing in the ear, headache, diarrhea, liver changes, fever, gingivitis, chest pain, difficulty breathing, cough, inflammation of the mouth (stomatitis), salivation, bronchitis, and pneumonitis. Acrodynia (pink or Swifts disease), characterized by redness and peeling of the skin on the toes and fingers, was commonly seen in children in the 1950s and is still *infrequently* seen in workers.

**Eye:** Irritation and corrosion.

**Skin:** Skin can become severely irritated if allowed to remain in contact with mercury. Skin absorption will occur at 2.2% of the rate of absorption through the lungs.

**Ingestion:** Mercury generally passes through the digestive tract uneventfully. However, large amounts may get caught up in the intestine and require surgical removal. If an abscess or other perforation is present along the digestive tract, absorption into the blood stream with subsequent mercury poisoning is possible.

**Carcinogenicity:** NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

**Medical Conditions Aggravated by Long-Term Exposure:** Central nervous system disorders.

**Chronic Effects:** Chronic exposure appears more common than acute and is primarily associated with central nervous system damage which can be permanent (ex. paresthesia of the hands, lips, feet). Early signs of toxicity include weakness, fatigue, anorexia, weight loss, and gastrointestinal disturbances. If exposure levels are high, characteristic tremors of the fingers, eyelids, and lips occur with progression to generalized tremors of the entire body. Psychic disorders are noticeable and characterized by behavior and personality changes, increased excitability, memory loss, insomnia, and depression. In severe cases, delirium and hallucinations may occur. Kidney damage is observed with oliguria (decreased urine output) progressing to anuria (urine cessation) and may require dialysis. The cornea and lens of the eyes may take on a brownish discoloration and the extraocular muscles may be damaged. This syndrome has been termed *Asthenic-Vegetative Syndrome* or *Micromercurialism*. Chronic symptoms occur increasingly with exposures to 0.1 mg/m<sup>3</sup> or higher. *Mutation:* Aneuploidy and other chromosomal aberrations have been observed in the lymphocytes from whole blood cultures in workers exposed to mercury. *Reproductive:* Mercury has been detected in stillborn babies of women treated with mercury for syphilis. In a study of six men acutely exposed (occupationally) to mercury levels as high as 44 mg/m<sup>3</sup>, all suffered impaired sexual function. Repeated skin contact may cause allergic dermatitis in some individuals.

**Note:** Spilled mercury will release sufficient vapor over time to produce chronic poisoning.

## Section 4 - First Aid Measures

**Inhalation:** Remove exposed person to fresh air and support breathing as needed.

**Eye Contact:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

**Skin Contact:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water and then wash exposed area with soap. For reddened or blistered skin, consult a physician.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. In general, mercury will pass through the digestive tract uneventfully.

**After first aid, get appropriate in-plant, paramedic, or community medical support.**

**Note to Physicians:** BEI: *blood* (15 µg/L), *urine*: (35 µg/g creatinine). Extremely high urine levels of 0.5 to 0.85 mg Hg/L are indicative of polyneuropathy. 0.4 to 22 µg/L is reported to be the human lethal blood level. Obtain urinalysis including at a minimum: albumin, glucose, and a microscopic examination of centrifuged sediment. Use BAL or 2, 3-dimercaptosuccinic acid as chelators. *Do not* use calcium sodium EDTA because of nephrotoxicity. An electromyograph may determine extent of nerve dysfunction. It has been noted that exposure to mercury may predispose persons to development of carpal tunnel syndrome.

See  
DOT  
ERG



## Section 5 - Fire-Fighting Measures

**Flash Point:** Nonflammable

**Autoignition Temperature:** Nonflammable

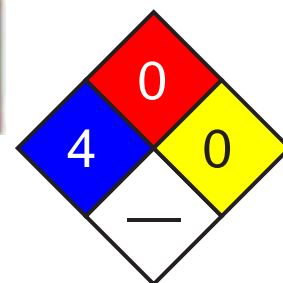
**LEL:** None reported.

**UEL:** None reported.

**Extinguishing Media:** Use agents suitable for surrounding fire.

**General Fire Hazards/Hazardous Combustion Products:** Toxic mercury vapor and mercuric oxide.

**Fire-Fighting Instructions:** Do not release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.



Fire Diamond

## Section 6 - Accidental Release Measures

**Spill/Leak Procedures:** Keep a mercury spill kit readily available in areas where mercury is used.

Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind.

**Small Spills:** Small and Large Spills: Follow instructions on mercury spill kit. Most kits come with an aspiration-driven vacuum trap with a mercury "sweeper" (copper or copper-plated brush). Wash spill area with a dilute calcium sulfide or nitric acid solution. If spill cannot be taken up readily, dust the top of the spill with flowers of sulfur or preferably, calcium polysulfide. This will produce a surface coating of mercury sulfide which will reduce mercury vapor dispersion into the air.

**Large Spills:** No data found.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).



## Section 7 - Handling and Storage

**Handling Precautions:** Use appropriate PPE when working with mercury. *Do not* use on porous work surfaces (wood, unsealed concrete, etc.) to prevent spills from lodging in cracks.

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

**Recommended Storage Methods:** Store in a cool, dry, well-ventilated area away from heat and incompatibles (Sec. 10). Store on non-porous floors and wash them regularly with a dilute calcium sulfide solution. Because mercury will form amalgamations with most metals except iron, metal shelves should be painted with a sufficiently thick coating to prevent this from happening.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Wherever possible, enclose processes to prevent mercury vapor dispersion into work area.

Provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PELs (Sec. 2).

Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

**Administrative Controls:** Consider pre-placement and periodic medical exams of exposed workers with emphasis on the skin, eyes, central nervous system, liver, and kidneys.

**Personal Protective Clothing/Equipment:** Wear chemically protective gloves, boots, aprons, and gauntlets made of butyl rubber, nitrile rubber, fluorocarbon rubber, neoprene rubber, polyvinyl chloride, chlorinated polyethylene, or polycarbonate to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

**Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For  $\leq 0.5 \text{ mg/m}^3$ , use any chemical cartridge respirator with cartridges providing protection against mercury and equipped with an ESLI (end of service life indicator), any SCBA, or any SAR (supplied-air respirator). For  $\leq 1.25 \text{ mg/m}^3$ , use any SAR operated in continuous-flow mode, any PAPR (powered, air-purifying respirator) with an ESLI. For  $\leq 2.5 \text{ mg/m}^3$ , use any SCBA or SAR with a full facepiece, any SAR with a tight-fitting facepiece and operated in continuous-flow mode, or any chemical cartridge respirator with a full facepiece, chemical cartridges providing protection against mercury, and equipped with an ESLI. For  $\leq 28 \text{ mg/m}^3$ , use any SAR operated in pressure-demand or other positive-pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA with full facepiece and operated in pressure-demand or other positive pressure mode. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.



**Other:** Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Silvery-white, odorless.

**Physical State:** Liquid metal

**Vapor Pressure (kPa):** 0.0018 mm Hg at 77 °F (25 °C)

**Formula Weight:** 200.59

**Density:** 13.534 g/cm<sup>3</sup> at 77 °F (25 °C)

**Boiling Point:** 674.09 °F (356.72 °C)

**Freezing/Melting Point:** -37.97 °F (-38.87 °C)

**Viscosity:** 15.5 mP at 77 °F (25 °C)

**Surface Tension:** 484 dyne/cm at 77 °F (25 °C)

**Critical Temperature:** 2664 °F (1462 °C)

**Critical Pressure:** 1587 atm

**Water Solubility:** 0.28 µmol/L at 77 °F (25 °C)

**Other Solubilities:** Soluble in boiling sulfuric acid, nitric acid (reacts); slightly in lipids, and 2.7 mg/L in pentane. Insoluble in alcohol, ether, cold sulfuric acid, hydrogen bromide, and hydrogen iodide.

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Mercury does not tarnish at ordinary temperatures but when heated to near its boiling point, it slowly oxidizes to mercuric oxide. Hazardous polymerization does not occur. Exposure to high temperatures, metal surfaces or incompatibles.

**Storage Incompatibilities:** Mercury forms alloys (amalgamates) with most metals except iron. It is incompatible with oxidizers such as bromine, 3-bromopropyne, methylsilane + oxygen, chlorine, chlorine dioxide, nitric acid, or peroxyformic acid; tetracarbonyl nickel + oxygen, alkynes + silver perchlorate, ethylene oxide, acetylenic compounds (explosive), ammonia (explosive), boron phosphodiiodide, methyl azide, nitromethane, and ground sodium carbide.

**Hazardous Decomposition Products:** Thermal oxidative decomposition of mercury can produce mercuric oxide.

## Section 11 - Toxicological Information

### Acute Oral Effects:

Man, oral, TD<sub>Lo</sub>: 43 mg/kg caused tremor and jaundice or other liver changes.

### Acute Inhalation Effects:

Woman, inhalation, TC<sub>Lo</sub>: 150 µg/m<sup>3</sup>/46 days caused anorexia, diarrhea, and wakefulness.

Man, inhalation, TC<sub>Lo</sub>: 44300 µg/m<sup>3</sup>/8 hr caused muscle weakness, liver changes, and increased body temperature.

### Acute Skin Effects:

Man, skin, TD<sub>Lo</sub>: 129 mg/kg for 5 continuous hours caused ringing in the ears, headache, and allergic dermatitis.

### Other Effects:

Rat, inhalation: 1 mg/m<sup>3</sup>/24 hr for 5 continuous weeks caused proteinuria.

Rat, inhalation: 890 ng/m<sup>3</sup>/24 hr for 16 weeks prior to mating had an effect on spermatogenesis.

See RTECS OV4550000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** Mercury is expected to volatilize rapidly when deposited on soil surfaces. Once in the air, it can be transported long distances before being redeposited on soil or in water. In water, mercury appears to bind to particulates where it eventually becomes deposited on the bed sediment. In general, mercury entering the environment can be deposited and revolatilized several times.

**Ecotoxicity:** Catfish, LC<sub>50</sub> = 0.35 mg/L/96 hr; mollusk (*Modiolus carvalhoi*), LC<sub>50</sub> = 0.19 ppm/96 hr; tadpole (*Rana hexadactyla*), LC<sub>50</sub> = 0.051 ppm/96 hr. Mercury is transformed to methyl mercury by bacteria in the environment and undergoes bioaccumulation readily. BCF for freshwater fish = 63,000; for saltwater fish = 10,000; and for marine and freshwater invertebrates = 100,000.

## Section 13 - Disposal Considerations

**Disposal:** Incineration is *not* an appropriate disposal method. Wastewater may be treated by addition of chlorine to oxidize the mercury to its ionic state. The water can then be passed through an absorbent (an activated charcoal concentrate with a sulfur coating or peanut shell charcoal) to collect the ionic mercury, followed by distillation to recover the mercury. Sodium borohydride, a reducing agent, can be used to precipitate mercury from waste solutions. Bioremediation, using *Pseudomonas putida*, has also been suggested. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.



**Section 14 - Transport Information****DOT Hazardous Materials Table Data (49 CFR 172.101):****Shipping Name and Description:** Mercury**ID:** UN2809**Hazard Class:** 8 - Corrosive material**Packing Group:** III - Minor Danger**Symbols:** A W**Label Codes:** 8 - Corrosive**Special Provisions:****Packaging:** Exceptions: 164 **Non-bulk:** 164 **Bulk:** 240**Quantity Limitations:** Passenger aircraft/rail: 35 kg Cargo aircraft only: 35 kg**Vessel Stowage:** Location: B Other: 40, 97**Section 15 - Regulatory Information****EPA Regulations:****RCRA 40 CFR:** Listed U151 Toxic Waste**CERCLA 40 CFR 302.4:** Listed per RCRA Section 3001, per CWA Section 307(a), per CAA Section 112 1 lb (0.454 kg)**SARA 40 CFR 372.65:** Listed**SARA EHS 40 CFR 355:** Not listed**TSCA:** Listed**Section 16 - Other Information**

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

54/60

**Material Name:** Portland Cement

**CAS Number:** 65997-15-1

**Chemical Formula:** Unspecified or Variable

**EINECS Number:** 266-043-4

**ACX Number:** X1003349-5

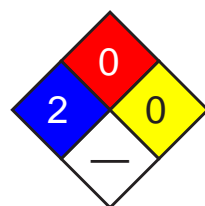
**Synonyms:** Portland Cement; PORTLAND CEMENT; CEMENT; HYDRAULIC CEMENT; PORTLAND CEMENT SILICATE

**General Use:** Hydraulic binder used for mixing concrete, concrete masonry, mortars and grouts; also soil stabilization.

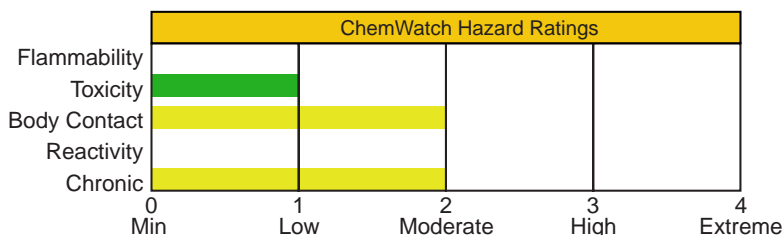
## Section 2 - Composition / Information on Ingredients

Name	CAS	%
portland cement	65997-15-1	varies
<b>OSHA PEL</b> TWA: 50 mppcf; 15 mg/m <sup>3</sup> (total); 5 mg/m <sup>3</sup> (respirable).	<b>NIOSH REL</b> TWA: 10 mg/m <sup>3</sup> ; total; TWA: 5 mg/m <sup>3</sup> ; respirable.	<b>DFG (Germany) MAK</b> TWA: 5 mg/m <sup>3</sup> ; measured as inhalable fraction of the aerosol.
<b>OSHA PEL Vacated 1989 Limits</b> TWA: 10 mg/m <sup>3</sup> ; total. Other Values: respirable mg/m <sup>3</sup> ; 5.	<b>IDLH Level</b> 5000 mg/m <sup>3</sup> .	
<b>ACGIH TLV</b> TWA: 10 mg/m <sup>3</sup> ; Value is for particulate matter containing no asbestos and <1% crystalline silica.		

## Section 3 - Hazards Identification



Fire Diamond



HMIS	
2	Health
0	Flammability
1	Reactivity

ANSI Signal Word

**Caution**

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Gray powder; odorless. Irritating to eyes/skin/respiratory tract. Also causes (on contact with wet cement): corneal edema, dermatitis, cracked skin. Chronic: bronchitis, dermatitis.

### Potential Health Effects

**Target Organs:** respiratory system, skin, eyes

**Primary Entry Routes:** inhalation, ingestion, skin contact

#### Acute Effects

**Inhalation:** Generated dust may be highly discomforting if inhaled and may even cause in some cases, sensitization.

Respiratory sensitization may result in allergic/asthma like responses; from coughing and minor breathing difficulties to bronchitis with wheezing, gasping.

Effects on lungs are significantly enhanced in the presence of respirable particles.

**Eye:** The solid/dust is highly discomforting, may be abrasive to the eyes and capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.



**Skin:** The dust is extremely discomforting to the skin and is capable of causing skin reactions which may lead to dermatitis.

Handling wet cement can cause dermatitis. Cement when wet is quite alkaline and this alkali action on the skin contributes strongly to cement contact dermatitis since it may cause drying and defatting of the skin which is followed by hardening, cracking, lesions developing, possible infections of lesions and penetration by soluble salts. Cement contact dermatitis (CCD) may occur when contact shows an allergic response, which may progress to sensitization. Sensitization is due to soluble chromates (chromate compounds) present in trace amounts in some cements, cement products. Soluble chromates readily penetrate intact skin.

Cement dermatitis can be characterized by fissures, eczematous rash, dystrophic nails, and dry skin; acute contact with highly alkaline mixtures may cause localized necrosis.

**Ingestion:** Considered an unlikely route of entry in commercial/industrial environments.

The material is harmful if swallowed.

The dust is discomforting to the gastrointestinal tract.

**Carcinogenicity:** NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

**Chronic Effects:** Cement eczema may be due to chromium in feed stocks or contamination from materials of construction. Sensitization to chromium may be the leading cause of nickel and cobalt sensitivity and the high alkalinity of cement is an important factor in cement dermatoses.

Repeated, prolonged severe inhalation exposure may cause pulmonary edema and rarely, pulmonary fibrosis. Workers may also suffer from dust-induced bronchitis with chronic bronchitis reported in 17% of a group occupationally exposed to high dust levels.

Data suggests that occupational exposure to Portland cement dust may lead to a higher incidence of chronic respiratory symptoms and a reduction of ventilatory capacity.

## Section 4 - First Aid Measures

**Inhalation:** Remove to fresh air.

Encourage patient to blow nose to ensure clear breathing passages.

Ask patient to rinse mouth with water but to not drink water.

Seek immediate medical attention.

**Eye Contact:** Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**Skin Contact:** Immediately remove all contaminated clothing, including footwear (after rinsing with water).

Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

**Ingestion:** Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** Treat symptomatically as for strong alkaline material.

## Section 5 - Fire-Fighting Measures

**Flash Point:** Noncombustible

**Autoignition Temperature:** Not applicable

**LEL:** Not applicable

**UEL:** Not applicable

**Extinguishing Media:** If small amounts are involved in a fire, there is no restriction on the type of extinguisher. Otherwise, use LARGE AMOUNTS of water to absorb heat generated.

**General Fire Hazards/Hazardous Combustion Products:** Noncombustible.

Not considered to be a significant fire risk; however, containers may burn.

Decomposes on heating and produces toxic fumes of caustic compounds.

**Fire Incompatibility:** No known incompatibility with normal range of industrial materials.

**Fire-Fighting Instructions:** Contact fire department and tell them location and nature of hazard.

Wear breathing apparatus plus protective gloves for fire only. Prevent, by any means available, spillage from entering drains or waterways.

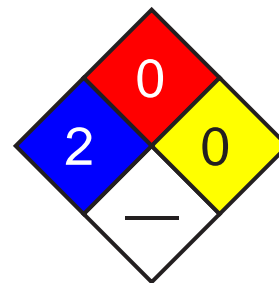
Use fire fighting procedures suitable for surrounding area.

Do not approach containers suspected to be hot.

Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

Equipment should be thoroughly decontaminated after use.



Fire Diamond



## Section 6 - Accidental Release Measures

**Small Spills:** Clean up all spills immediately. Avoid contact with skin and eyes.

Wear protective clothing, gloves, safety glasses and dust respirator.

Use dry clean-up procedures and avoid generating dust.

Vacuum up or sweep up. Place in clean drum then flush area with water.

**Large Spills:** Clear area of personnel and move upwind.

Use dry clean-up procedures. Avoid generating dust.

If inhalation risk of exposure exists, wear NIOSH-approved dust respirator.

Collect recoverable product into labeled containers for recycling.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

## Section 7 - Handling and Storage

**Handling Precautions:** Avoid generating and breathing dust. Limit all unnecessary personal contact.

Wear protective clothing when risk of exposure occurs.

Use in a well-ventilated area. Atmosphere should be checked against exposure standards to ensure safe working conditions are maintained.

Avoid contact with incompatible materials.

When handling, DO NOT eat, drink or smoke.

Always wash hands with soap and water after handling.

Use good occupational work practices.

Observe manufacturer's storing and handling recommendations.

**Recommended Storage Methods:** Packaging as recommended by manufacturer.

Check that containers are clearly labeled.

Metal pail or Paper bag with sealed plastic liner.

Multi-ply woven plastic or paper bag with sealed plastic liner.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Use in a well-ventilated area.

If exposure to workplace dust is not controlled, respiratory protection is required; wear NIOSH-approved dust respirator.

General exhaust is adequate under normal operating conditions.

If risk of overexposure exists, wear NIOSH-approved dust respirator.

Correct fit is essential to obtain adequate protection.

**Personal Protective Clothing/Equipment:**

**Eyes:** Safety glasses with side shields; or as required, chemical goggles.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

**Hands/Feet:** Barrier cream and Wear chemical protective gloves, eg. PVC.

Wear safety footwear or safety gumboots, eg. Rubber.

**Respiratory Protection:**

Exposure Range >5 to 50 mg/m<sup>3</sup>: Air Purifying, Negative Pressure, Half Mask

Exposure Range >50 to 500 mg/m<sup>3</sup>: Air Purifying, Negative Pressure, Full Face

Exposure Range >500 to <5000 mg/m<sup>3</sup>: Supplied Air, Constant Flow/Pressure Demand, Full Face

Exposure Range 5000 to unlimited mg/m<sup>3</sup>: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Cartridge Color: dust/mist filter (use P100 or consult supervisor for appropriate dust/mist filter)

**Other:** Overalls. Eyewash unit. Ensure there is ready access to a safety shower.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Finely divided grey to off-white colored powder with no odor. Hardens after reaction with water. A finely ground mixture of cement clinker and gypsum, surface area 300-500 m<sup>2</sup>/kg (Blaine Method).

**Physical State:** Divided solid

**Evaporation Rate:** Not applicable

**Vapor Pressure (kPa):** Not applicable

**pH:** alkaline

**Vapor Density (Air=1):** Not applicable

**Freezing/Melting Point:** > 1200 °C (2192 °F)

**Formula Weight:** Not applicable.

**Decomposition Temperature (°C):** Not applicable

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 3.0-3.2

**Water Solubility:** Insoluble

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Product is considered stable. Hazardous polymerization will not occur.

**Storage Incompatibilities:** Segregate from strong oxidizers and strong acids.



**Section 11 - Toxicological Information**

No relevant toxicological data found at time of research.

See *RTECS* VV 8770000, for additional data.

**Section 12 - Ecological Information**

**Environmental Fate:** No data found.

**Ecotoxicity:** No data found.

**Section 13 - Disposal Considerations**

**Disposal:** Recycle wherever possible or consult manufacturer for recycling options.

Follow applicable federal, state, and local regulations.

Bury residue in an authorized landfill.

Recycle containers where possible, or dispose of in an authorized landfill.

**Section 14 - Transport Information****DOT Hazardous Materials Table Data (49 CFR 172.101):**

**Shipping Name and Description:** None

**Section 15 - Regulatory Information****EPA Regulations:**

**RCRA 40 CFR:** Not listed

**CERCLA 40 CFR 302.4:** Not listed

**SARA 40 CFR 372.65:** Not listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed

**Section 16 - Other Information**

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Appendix F

Emergency Action Plan and Route to  
Hospital



## EMERGENCY ACTION PLAN

### Emergency Contact List

Emergency Contact	Phone
Local Police – 10 <sup>th</sup> Precinct	911 (if appropriate) or (212) 741-8211
Local Ambulance –	911 (if appropriate)
Local Fire Department –	911 (if appropriate)
Local Hospital – Saint Vincent's Hospital and Medical Center	(212) 604-7000 (212) 604-2224
Local Weather Data –	<a href="http://www.noa.gov">www.noa.gov</a>
Poison Control	800-222-1222
National Response Center (all spills in reportable quantities)	800.424.8802
NY Spills Hotline	800-457-7362
U.S. Coast Guard (spills to water)	800.424.8802
Project Manager – Margaret Carrillo-Sheridan	315-671-9167
Site Manager – Craig Massaro	212-682-9271
H&S Manager – Chuck Webster	315-671-9297
Client Contact – Neil O'Halloran-Con Edison	718-204-4145 (o); 646-533-8821 (c)
Joe Baratta - Con Edison Construction Management Chief Construction Inspector (CCI)	718-204-4270 (o); 917-567-7012 (c)
WorkCare	800-455-6155
Dig Safely NY (3 day notice required for utility markouts)	800-962-7962



Additional project contact information is included after the hospital route and map.  
List the Emergency Notification Procedure for the project:

- Step 1: Contact Emergency Services (Contact WorkCare for non-emergency medical care)
- Step 2: Contact ARCADIS Project Manager
- Step 3: Contact Client Contact - Con Edison Construction Inspection Representative
- Step 4: Contact ARCADIS Health and Safety

If emergency attention is not needed but professional medical attention is necessary, the employee will be taken to (see hospital route):

Medical  
Facility: Saint Vincent's Hospital and Medical Center  
Address: 153 West 11th Street  
Manhattan, NY 10011  
Phone  
Number: (212) 604-7000

### Emergency Supplies and Equipment List

Emergency Supplies and Equipment (check all that apply)	Location on Project Site
<input checked="" type="checkbox"/> First Aid Kit (type):	Field vehicle
<input checked="" type="checkbox"/> Fire Extinguisher	Field vehicle
<input checked="" type="checkbox"/> Mobile Phone <input type="checkbox"/> Satellite Phone	On Persons
<input checked="" type="checkbox"/> Traffic Cones	Field vehicle
<input type="checkbox"/> Walkie Talkies	
<input checked="" type="checkbox"/> Water or Other Fluid Replenishment	Field vehicle
<input type="checkbox"/> Eye Wash/Quick Drench Station	
<input checked="" type="checkbox"/> Eye Wash Bottle	Field vehicle/PPE Bag
<input type="checkbox"/> Wash and Dry Towelettes	
<input checked="" type="checkbox"/> Sunscreen (SPF 15 or higher)	Field vehicle/PPE Bag
<input type="checkbox"/> Insect Repellant	
<input type="checkbox"/> Chemical Spill Kit	
<input type="checkbox"/> Other (specify):	



It is the responsibility of the HSS to verify the directions to the hospital prior to the start of work.

Travel east on West 19th Street and go 0.1 miles.  
Turn left onto 10th Avenue and go 0.1 miles.  
Turn right onto west 20th Street and go 0.9 miles.  
Turn right onto 5th Avenue and go 0.4 miles.  
Turn right onto West 11th Street.

**Saint Vincent's Hospital and Medical Center**

**Total Estimated Time:** 5 minutes    **Total Est. Distance:** 1.7 miles

Yahoo! Driving Directions - New York, NY





**Additional Project Contacts:**

Title/Role	Name	Phone
Con Edison	Neil O'Halloran	(718) 204-4145
<b><u>Project Contractor Contacts</u></b>		
Project Manager	Margaret Carrillo-Sheridan	(315) 671-9167 (315) 317-0502 (cell)
Project Contractor Health & Safety Officer	Craig Massaro	(212) 682-9271 ext. 41 (813) 476-9938 (cell)
<b><u>Subcontractors</u></b>		
Boart Longyear	Mike Rivella	(781) 933-3210
NAEVA Geophysics, Inc.	Mark Weiss	(845) 268-1800
Clean Earth	Bill Faherty	(973) 344-4004
Test America	Johanna Dubauskas	(203) 929-8140
<b><u>Regulatory Agency Personnel</u></b>		
NYSDEC Division Environmental Remediation	William Ottaway	(518) 402-9686



**General Site Specific Information: Heat Stress**

Heat stress is caused by several interacting factors, including environmental conditions, clothing, and workload, as well as the physical and conditioning characteristics of the individual. Since heat stress is one of the most common illnesses associated with heavy outdoor work conducted with direct solar load and, in particular, because wearing PPE can increase the risk of developing heat stress, workers must be able to recognize the signs and symptoms of heat-related illnesses. Personnel must be aware of the types and causes of heat-related illnesses, and be able to recognize the signs and symptoms of these illnesses in themselves and their co-workers.

The average mean, normal low, normal high, and record high, and record low temperatures for each month are provided for New York, NY in Table 4-1.

**TABLE 4-1****NEW YORK, NEW YORK MONTHLY TEMPERATURE SUMMARY**

<b>Month</b>	<b>Mean (F)</b>	<b>Normal Low (F)</b>	<b>Normal High (F)</b>	<b>Record Low (F)</b>	<b>Record High (F)</b>
January	32	25	38	-4	68
February	34	26	40	-2	73
March	42	34	49	10	83
April	52	43	60	19	89
May	62	53	70	36	98
June	71	63	79	46	99
July	77	68	84	54	105
August	76	67	83	50	101
September	69	60	76	41	98
October	58	49	65	30	86
November	48	41	54	17	80
December	37	30	42	-1	75



## Traffic Safety

If investigation work will take place within a street, diagrams will be provided to Con Edison for mid-street and intersection traffic protection mechanisms. Work-area protection plans shall, minimally, conform to the Con Edison Work Area Protection and Traffic Control Field Manual, February 2005.

The work area may be located within or adjacent to a public or private roadway or sidewalk where exposure to vehicular traffic is possible. For work within roadways and sidewalks, a permit will be required, as issued by the New York City Department of Transportation or New York State Department of Transportation, or both organizations, as applicable. Signage and other control measures stipulated by the permitting authority or authorities will be applied during field activities. This may include the closure of a travel lane or lanes or sidewalks, and erection of signs, cones, barricades, or flashing lights, as applicable.

In addition, during activities along or within a roadway, equipment will be aligned parallel to the roadway to the extent feasible, facing into the oncoming traffic so as to place a barrier between the work crew and the oncoming traffic. All crewmembers must remain behind the equipment and the traffic barrier. Crewmembers working in or near streets will wear orange reflective traffic safety vests.

The flow of traffic into and out of the adjacent business and other organizations must be assessed, and precautions taken to warn motorists of the presence of workers and equipment. Where possible, vehicles should be aligned to provide physical protection to people and equipment.

## Material Handling

In general, the following guidelines will be used for material handling activities. This may include the movement of drums, investigation equipment, debris, or objects blocking drilling locations.

If investigation work will take place within a street, diagrams will be provided to Con Edison for mid-street and intersection traffic protection mechanisms. Work-area protection plans shall, minimally, conform to the Con Edison

- Whenever possible heavy objects will be lifted and moved by mechanical devices rather than by manual effort;



- The mechanical devices will be appropriate for the lifting or moving task and will be operated only by trained and authorized personnel;
- Objects that require special handling or rigging will only be moved under the guidance of a person who has been specifically trained to move such objects;
- Lifting devices (including equipment, slings, ropes, chains and straps) will be inspected, certified, and labeled to confirm their weight capacities. Defective equipment will be taken out of service immediately and repaired or destroyed;
- The wheels of any trucks being loaded or unloaded will be chocked to prevent movement;
- Outriggers will be extended on a flat, firm surface during operation;
- The lift and swing path of a crane/equipment will be watched and maintained clear of obstructions;
- Personnel will not pass under a raised load, nor will a suspended load be left unattended;
- Personnel will not be carried on lifting equipment, unless it is specifically designed to carry passengers;
- All reciprocating, rotating, or other moving parts will be guarded at all times;
- Accessible fire extinguishers will be available in all mechanical lifting devices;
- All material must be stored in tiers, racked, blocked, or otherwise secure to prevent sliding, falling, or collapse; and
- Verify all loads/material are secure before transportation.

Materials Handling tasks that are unusual or require specific guidance will need a written addendum to this HASP. The addendum must identify the lifting protocols and must be submitted to Con Edison for approval before the tasks are performed. Upon approval, the plan must be reviewed with all affected employees and documented. Any deviation from a written plan will require approval by Con Edison.



## **Compressors**

A New York City Fire Department Certificate of Fitness is required for the individual operating a compressor (e.g., compressor used for an air knife employed as part of vacuum excavation activities). The Certificate of Fitness will be provided to the Con Edison Construction Inspection representative.







Con Edison

Health and Safety Plan



# Guide 1: Introduction

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## Program outline

Contractors EHS Programs and Procedures (eHASP)

Contractor Responsibility

Purpose of this Guide

eHASP – Hazard Analysis and Control

Contractor eHASP Implementation & Oversight

Con Edison Contractor Evaluation and Procurement Process

Table 1        Matrix of Common Con Edison Contracts and Typical  
Associated Project Hazards

Attachment 1 EH&S Hazard Analysis For Contractor Work

Attachment 2 EH&S Plan Checklist

Attachment 3 Project Specific eHASP (Template)



## Guide 1: Introduction

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### Con Edison commitment to EH&S excellence

Con Edison's policy is to demonstrate leadership and excellence in worker and public safety and health and environmental protection. This commitment shall be evident and continually reinforced in all Company operations and shall be adopted by each contractor performing work for Con Edison.

Each contractor shall be required to meet fundamental workplace requirements established by law and by regulation and be expected to reach beyond these basic requirements to realize a higher level of achievement for Environmental Health and Safety (EH&S) matters.

### Contractors EHS programs and procedures (ehasp)

Contractors interested in working for ConEdison are required to submit 2 types of EHS Plans. The first plan required of contractor's is the Corporate EHS Program and Procedures (generic eHASP) and the second may be a project specific EHS Plan and or a task specific EHS Plan.

The first plan, the Contractor's corporate environmental, health, and safety programs and procedures (generic eHASP) is required in order to be placed on the approved bidder list. This information shall consist of documents uniquely authored by each contractor for the purpose of detailing practical implementation of all environmental, health, and safety standards that would be applicable to their work, such as a respiratory protection, scaffold or hazard communication program. If a primary activity of the contractor is scaffold erection, a corporate scaffold procedure (in addition to other programs) is required in order for contractor approval. Health and safety-related documents shall, as a minimum, address all applicable Occupational Safety and Health Act (OSHA) regulations. These documents shall be prepared at a level of detail necessary to illustrate how the contractor complies with each applicable OSHA requirement applicable to the business they are involved in. Documents that simply restate the regulatory standards verbatim will not be considered acceptable.

Once on the approved bidder list, a contractor may be chosen to bid on specific project within the Con Ed system which then requires the second EHS plan. A requirement of this bid is the development of a project specific environmental, health and safety plan (eHASP). This document is a written plan outlining the work to be performed which addresses the hazards expected and presents control measures for environmental and personnel protection. The hazards and control measures identified here are briefly stated but clearly identify the requirements of the contractors workers in performing the job activities. The hazards and control

measures identified are supported by the contractors corporate EHS programs and procedures. As an example, control measure specified in a project specific eHASP requiring the use of respiratory protection would also require a Corporate Respiratory Protection Program in compliance with OSHA. See attachment 3 for a project specific eHASP template that can be used to develop you project specific eHASP.

For those situations where a repetitive and routine task is performed by a contractor at several locations within our territory, we have approved the use of a "Task Specific eHASP". A Task



## Guide 1: Introduction

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Specific eHASP is an alternate form of a project specific eHASP. A Task Specific eHASP is a general EHS plan developed by Con Ed or the contractor and accepted by Con Ed for use. This plan identifies the common hazards expected and control measures which the contractor is expected to be expert in and responsible for addressing. The contractor may utilize a Task Specific eHASP if they have agreed to the terms of the plan and have provided Con Edison with a signed copy. See section C of the manual for an example task specific ehasp.

The following sections provide guidance in the process of developing project specific environmental, health and safety plans (eHASP). At this point, we would expect the contractor has already been placed on the approved bidders list and has satisfied their obligation to provide an acceptable Corporate EHS Program.

### Contractor responsibility

It is the responsibility of every contractor to be aware of and comply with all federal, state, and local regulations governing the environment and worker health and safety (EH&S). The contractor work plan required by Con Edison prior to the start of work must include processes for anticipating, identifying, assessing, and controlling any potential effects to the environment and potential hazards to workers, Con Edison employees, and the public. Con Edison personnel will review this work plan against the project scope of work, specifications and EH&S considerations and verify it is implemented in the field.

Con Edison will review the EH&S component of each contractor's work and any violations of EH&S law by a contractor can result in suspension or termination of that contractor.

### Purpose of this guide

This guide is a general reference for all contractors for the preparation of acceptable EH&S programs and work plans when performing work for Con Edison. This document provides EH&S guidance for the development of a eHASP for all contractors performing the following three work categories:

- Work requiring a project/site specific work plan (see # 1 on page 6);
- Work that complies with Con Edison's EH&S task specific guidance (see # 2 on page 8);
- All other work to be performed for Con Edison (see # 3 on page 8).

Note: The user organization's EH&S representative will determine the type of eHASP required of the contractor.

The requirement for a site eHASP depends on the environmental, health and safety issues expected on the job. Jobs that involve the handling of hazardous materials, working around unsafe situations or working with power equipment, requires a written eHASP. When this type of work is performed in new locations with changing environmental conditions and with variable hazards, a site specific or job specific eHASP is required. When the job is routine and performed on a regular basis, a task specific eHASP may be used for all similar jobs. The contractor may



## Guide 1: Introduction

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use a Con Edison generated task specific eHASP or may prepare their own task specific eHASP for our review. The eHASP shall address

- Important contractor information for project management and emergency use
- Job description
- Hazard identification and control methods
- Personal protective equipment requirements
- Employee training
- Site control and housekeeping
- Waste management

This guide is **not** intended to be, nor should it be interpreted as, an all-inclusive and comprehensive digest of all applicable federal, state, and local EH&S laws and regulations. The guide will help focus contractors on potential EH&S issues that may be encountered during work at Con Edison facilities and project sites and allow contractors to take appropriate steps in assessing and proactively preparing for site conditions.

This guide presents summaries of the main points found in EH&S laws and regulations that are commonly applicable to contractor activities at Con Edison facilities. References for locating additional sources of information for each topic are provided. This guide is meant to encourage every contractor to better preplan Con Edison projects and to assure EH&S regulatory compliance, accident prevention and efficient job completion.

### eHASP - Hazard analysis and control

The following three sections identify what actions will be taken by Con Edison and the Contractor for the development of an eHASP for a specific project/job. The intent of this process is to assure that all EH&S issues are identified and properly addressed by the contractor in the eHASP. In the event any new or unusual situations or hazards arise which were not initially addressed, it is the responsibility of both Con Edison and the contractor to resolve these issues onsite.

#### **1. For contractors who are required to submit a project /site specific eHASP , the following steps are required:**

##### **Con Edison will:**

- Provide a “Request for Bid” or Proposal to qualified contractors.
- Include in the Request for Bid or Proposal details about the job to be performed and a listing of the hazards present or that may be expected on-site, by attaching a completed and signed “EH&S Hazard Analysis for Contractor Work”, Attachment 1. Also provide a copy of attachment 2 “EH&S Plan Checklist” for the contractor to complete and sign.



## Guide 1: Introduction

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### Contractor will:

- Review Table 1 to determine some of the hazards expected based on the job activity.
- Review Attachment 1 to verify the information is accurate and co-sign the page. Comment and include additional hazards as necessary.
- Complete and sign Attachment 2, the “EH&S Plan Checklist.
- Identify any additional hazards in Attachments 1 and 2. Address all these hazards in the eHASP to be submitted for review by Con Edison.
- Ensure that the specific requirements of regulations and standards are met during all phases of the project.
- Bids for the proposed work are sent directly to the Corporate Purchasing Department.
- The proposed project/site specific eHASP for work to be performed shall be forwarded directly to the Contract Administrator by the contractor and will include completed and signed Attachments 1 and 2.

The contractor will correspond directly with the user organization requesting the work to assure a complete and clear project/site specific work plan is approved prior to the start of work. The Purchasing Department will issue a purchase order when commercial procurement matters are satisfied notwithstanding any work plan issues. Work will commence only when a ‘Notice to Proceed’ is issued by the user organization upon receipt of an acceptable project/site specific work plan.

### **2. For contractors who will comply with a Con Edison EH&S Task Specific EH&S guidance, the following steps are required:**

#### Con Edison will:

- Provide a Request for Bid or Proposal to qualified contractors.
- Include in the Request for Bid or Proposal an EH&S task-specific eHASP guidance developed by Con Edison for the task to be performed for the length of the contract.

#### Contractor will:

Review and sign the task-specific eHASP guidance for implementation. Contractor may prepare their own task specific guidance for Con Edison review.

- Prepare a written explanation when a signed task specific guidance package is not provided.
- Provide the signed task specific eHASP guidance or explanation, and bid to Con Edison's Corporate Purchasing Department.

### **3. All other contractors working for Con Edison will:**

Use the information in this guide for the continued improvement of their work practices, EH&S programs and compliance with all federal, state and local laws and regulations



## Guide 1: Introduction

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### Contractor eHASP implementation & oversight

#### Contractor:

Will have in possession, the project or task specific eHASP at the start of work. Each contractor supervisor, worker and employee onsite will be familiar with contents of the eHASP. Contractor supervision will be accountable and will be responsible to assure all work is performed in compliance with the eHASP as written. Contractor will conduct a prejob review of the work to be performed to review the eHASP and technical aspects of the job and to verify current EH&S issues in the field have not changed.

#### Con Edison:

Will review with the contractor the work to be performed and the eHASP prior to the start of work. Contractor employees will be evaluated as to their knowledge of the eHASP by the designated Con Ed Representatives. Con Ed will verify the eHASP is on site and being implemented in all phases of work. Appropriate equipment, supplies and ppe will be inspected. Inspection frequency of the contractors will be determined by the local organizations and will be conducted as necessary to assure compliance to the contract and the eHASP.

Failure of the contractor to comply with the requirements of their eHASP and EH&S law may lead to suspension or termination in accordance with our Corporate Procedures.

### Con Edison contractor evaluation and procurement process

The Con Edison Purchasing Department, the EH&S Department, and the designated operating department representatives (as appropriate) are responsible for contractor evaluation and award as follow:

- Purchasing - will identify the successful bidder and notify the requesting organization.
- EH&S – will resolve Corporate eHASP Plan issues directly with the contractor(s).
- Operating Department - will review the contractor work plan and eHASP specific to the job specifications and the EH&S requirements of the job in compliance with this document.

It is Con Edison's policy that each prime contractor and its subcontractor(s) must meet all requirements of this program. The contractors must assure that environmental, health and safety matters are managed during all phases of the project to ensure the safety and health of contractor personnel, Con Edison personnel and the public, and to ensure the protection of the environment.

Contractors are responsible for ensuring that their work activities are completed as required by this guide and applicable EH&S laws and regulations, whichever will better protect the environment and ensure the safety of the public and personnel.



## Guide 1: Introduction

Table 1

Matrix of common Con Edison contracts  
And typical associated project hazards

Contractor	Typical Hazards	Applicable Guide Sections
<b>Asbestos Abatement Operations</b>	<b>Respiratory:</b> asbestos, silica, dust	3, 17, 26
	<b>Dermal:</b> chemicals, cuts, abrasions	3,5
	<b>Eye:</b> asbestos, dusts, particles, chemicals	3,5
	<b>Electrical:</b> shock from frayed wires, improper grounds, cut wires	7
	<b>Hand Tools:</b> cuts, pinching, smashing, exposed moving parts	19
	<b>Lifting:</b> musculoskeletal problems	18
	<b>Falls:</b> heights, scaffolds, ladders	33
	<b>Fires:</b> open flame, storage, housekeeping	11
<b>Excavation</b>	<b>Heavy Equipment:</b> crushing, pinching	17, 18, 19
	<b>Trenching:</b> cave in, unstable soils, falls, falling objects, drowning	9
	<b>Utilities:</b> electrocution, explosion, steam heat, water	7
	<b>Tools:</b> cuts, pinching, smashing, exposed moving parts	19
	<b>Confined Spaces:</b> lack of oxygen, toxic gases, H2S, methane	6, 26
	<b>Respiratory:</b> asbestos, silica, dust	26
	<b>Eye:</b> asbestos, dust, particles, chemical	24
	<b>Lifting:</b> musculoskeletal problems	18
	<b>Traffic:</b> accidents, pedestrian safety	32
<b>Construction – General</b>	<b>Heavy Equipment:</b> crushing, pinching	16,17
	<b>Trenching:</b> cave in, unstable soils, falls, falling objects, drowning	8
	<b>Utilities:</b> electrocution, explosion, steam heat, water	7
	<b>Tools:</b> cuts, pinching, smashing, exposed moving parts	19
	<b>Confined Spaces:</b> lack of oxygen, toxic gases, hydrogen sulfide, methane	6, 8



## Guide 1: Introduction

Contractor	Typical Hazards	Applicable Guide Sections
<b>Construction – General (continued)</b>	<b>Respiratory:</b> asbestos, silica, dust	26
	<b>Eye:</b> asbestos, dusts, particles, chemicals	24
	<b>Lifting:</b> musculoskeletal problems	18
	<b>Welding / Torching:</b> fire, sparks, heat, toxic gases, metal fumes	11, 31
	<b>Grinding:</b> abrasions, cuts, heat, fire, particles, metal fumes	11, 24, 26
	<b>Traffic:</b> accidents, pedestrian safety	32
<b>Construction – Electrical</b>	<b>Heavy Equipment:</b> crushing, pinching	17, 18
	<b>Trenching:</b> cave in, unstable soils, falls, falling objects, drowning	9
	<b>Utilities:</b> electrocution, explosion, steam heat, water	7
	<b>Tools:</b> cuts, pinching, smashing, exposed moving parts	19
	<b>Confined Spaces:</b> lack of oxygen, toxic gases, hydrogen sulfide, methane	6, 8
	<b>Respiratory:</b> asbestos, silica, dust	26
	<b>Eye:</b> asbestos, dusts, particles, chemicals	24
	<b>Lifting:</b> musculoskeletal problems	18
	<b>Falls:</b> heights, scaffolds, ladders	33
	<b>Traffic:</b> accidents, pedestrian safety	32
<b>Construction – Gas</b>	<b>Heavy Equipment:</b> crushing, pinching	17, 18
	<b>Trenching:</b> cave in, unstable soils, falls, falling objects, drowning	9
	<b>Utilities:</b> electrocution, explosion, steam heat, water	7
	<b>Tools:</b> cuts, pinching, smashing, exposed moving parts	19
	<b>Confined Spaces:</b> lack of oxygen, toxic gases, hydrogen sulfide, methane	6, 8
	<b>Respiratory:</b> asbestos, silica, dust	26
	<b>Eye:</b> asbestos, dusts, particles, chemicals	24
	<b>Lifting:</b> musculoskeletal problems	18
	<b>Traffic:</b> accidents, pedestrian safety	32
<b>Construction – Asphalt</b>	<b>Heavy Equipment:</b> crushing, pinching	17, 18
	<b>Utilities:</b> electrocution, explosion, steam heat, water	7
	<b>Tools:</b> cuts, pinching, smashing, exposed moving parts	19
	<b>Respiratory:</b> asbestos, silica, dust, volatile organic vapors, H2S	26



## Guide 1: Introduction

Contractor	Typical Hazards	Applicable Guide Sections
<b>Construction – Asphalt cont.</b>	<b>Eye:</b> asbestos, dusts, particles, chemicals	24
	<b>Lifting:</b> musculoskeletal problems	18
	<b>Traffic:</b> accidents, pedestrian safety	32
<b>Painting</b>	<b>Tools:</b> cuts, pinching, smashing, exposed moving parts	17, 19
	<b>Respiratory:</b> asbestos, silica, dust, volatile organic vapors	26
	<b>Eye:</b> asbestos, dusts, particles, chemicals	24
	<b>Lifting:</b> musculoskeletal problems	18
	<b>Falls:</b> heights, scaffolds, ladders	33
	<b>Grinding:</b> abrasions, cuts, heat, fire, airborne particles, metal dust	24
<b>Lead Abatement</b>	<b>Lead:</b> toxic materials	16, 17
	<b>Tools:</b> cuts, pinching, smashing, exposed moving parts	19
	<b>Respiratory:</b> asbestos, silica, dust, volatile organic vapors	26
	<b>Eye:</b> asbestos, dusts, particles, chemicals	24
	<b>Lifting:</b> musculoskeletal problems	18
	<b>Falls:</b> heights, scaffolds, ladders	33
	<b>Grinding:</b> abrasions, cuts, heat, fire, airborne particles, metal dust	24
	<b>Fires:</b> smoke, toxic vapors, burns	11
<b>Welding/Torch Cutting</b>	<b>Respiratory:</b> metal fumes, VOC	17, 26
	<b>Eye:</b> airborne metal particles, intense light	24
	<b>Dermal:</b> burns, cuts, abrasions	24
	<b>Fires:</b> intense heat, open flame	11
<b>Grinding</b>	<b>Tools:</b> cuts, pinching, smashing, exposed moving parts	17, 19
	<b>Eye:</b> airborne metal particles, sparks	24
<b>Grinding (continued)</b>	<b>Dermal:</b> burns, cuts, abrasions	24
	<b>Fires:</b> intense heat, sparks	11
	<b>Chemicals:</b> organic vapors, fire, dermal contact	11, 26
	<b>Work Positions:</b> musculoskeletal problems	18
<b>HVAC Maintenance</b>	<b>Tools:</b> cuts, pinching, smashing,	17, 19
	<b>Eye:</b> dusts, particles, chemicals	24
	<b>Respiratory:</b> dust, volatile organic chemicals, biological agents	26
	<b>Lifting:</b> musculoskeletal problems	18
	<b>Falls:</b> heights, scaffolds, ladders	33



## Guide 1: Introduction

Contractor	Typical Hazards	Applicable Guide Sections
	<b>Grinding:</b> abrasions, cuts, heat, fire, airborne particles, metal dust	24
	<b>Lead:</b> inhalation and ingestion	16, 26
	<b>Gas:</b> fire, explosion, asphyxiant	11, 12
	<b>Electrical:</b> shock	7
	<b>Asbestos:</b> incidental contact with walls, insulation, respiratory and dermal hazard	3, 15
<b>Housekeeping</b>	<b>Asbestos:</b> incidental contact, dermal hazard, respiratory protection	3, 15, 17
	<b>Lead:</b> paint, inhalation and ingestion	16
	<b>Tools:</b> cuts, pinching, smashing, exposed moving parts	19
	<b>Respiratory:</b> dust, volatile organic chemicals, biological agents	26
	<b>Eye:</b> dusts, particles, chemicals	24
	<b>Lifting:</b> musculoskeletal problems	18
	<b>Falls:</b> heights, scaffolds, ladders	33
	<b>Grinding:</b> abrasions, cuts, heat, fire, airborne particles, metal dust	24
	<b>Gas:</b> fire, explosion, asphyxiant	11, 12
	<b>Electrical:</b> shock	7
<b>Vehicle Maintenance</b>	<b>Asbestos:</b> respiratory/ dermal hazard	3
	<b>Lead:</b> paint, inhalation and ingestion	16
	<b>Tools:</b> cuts, pinching, smashing, exposed moving parts	19
	<b>Respiratory:</b> dust, volatile organic chemicals, biological agents	26
	<b>Eye:</b> dusts, particles, chemicals	24
	<b>Lifting:</b> musculoskeletal problems	18
<b>Vehicle Maintenance (continued)</b>	<b>Gas:</b> fire, explosion, asphyxiant	11,12, 17
	<b>Electrical:</b> shock	7
	<b>Grinding:</b> abrasions, cuts, heat, fire, airborne particles, metal dust	24
	<b>Welding/Torching:</b> fire, sparks, heat, metal fumes	11, 31
	<b>Lifting:</b> musculoskeletal problems	18
	<b>Falls:</b> heights, scaffolds, ladders	33
<b>Roofing Repair/Replacement</b>	<b>Grinding:</b> abrasions, cuts, heat, fire, airborne particles, metal dust	17, 24
	<b>Welding/Torching:</b> fire, sparks, heat, metal fumes	11, 31
	<b>Lifting:</b> musculoskeletal problems	18
	<b>Falls:</b> heights, scaffolds, ladders	33
	<b>Asbestos:</b> insulation, respiratory and dermal hazard	3,
	<b>Lead:</b> paint, inhalation and ingestion	16
	<b>Tools:</b> cuts, pinching, smashing, exposed moving parts	19



## Guide 1: Introduction

Contractor	Typical Hazards	Applicable Guide Sections
	<b>Respiratory:</b> dust, volatile organic chemicals, biological agents	26
	<b>Eye:</b> dusts, particles, chemicals	24
	<b>Fire:</b> Burns	11
	<b>Volatile organic chemicals:</b> tar/pitch	5
	<b>Sheet metal:</b> cuts	24
<b>Boiler Maintenance / Repair</b>	<b>Grinding:</b> abrasions, cuts, heat, fire, airborne particles, metal dust	17, 24
	<b>Welding/Torching:</b> fire, sparks, heat, metal fumes	11, 31
	<b>Lifting:</b> musculoskeletal problems	18
	<b>Falls:</b> heights, scaffolds, ladders	33
	<b>Asbestos:</b> insulation, respiratory and dermal hazard	3
	<b>Lead:</b> paint, inhalation and ingestion	16
	<b>Tools:</b> cuts, pinching, smashing, exposed moving parts	19
	<b>Respiratory:</b> dust, volatile organic chemicals	26
	<b>Eye:</b> dusts, particles, chemicals	24
	<b>Fire:</b> Burns	11
	<b>Volatile organic chemicals:</b> tar/pitch	5
	<b>Utilities:</b> explosion, steam heat, water	7



## Guide 1: Introduction

### Attachment 1 Eh&s hazard analysis for Contractor work

#### Applicable to

#### Project

#### Section

#### Yes

#### No

1.0	Introduction	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.0	Air Resources	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3.0	Asbestos Awareness	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.0	Bloodborne Pathogens Exposure Control Plan	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5.0	Chemical Safety and Handling	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6.0	Confined Space Program (Permit-Required)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7.0	Electrical Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>
8.0	Electrical Enclosed Spaces	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9.0	Excavation and Trenching	<input type="checkbox"/>	<input checked="" type="checkbox"/>
10.0	Fish, Wildlife and Wetlands	<input type="checkbox"/>	<input checked="" type="checkbox"/>
11.0	Fire Protection and Prevention	<input checked="" type="checkbox"/>	<input type="checkbox"/>
12.0	Gas Enclosed Spaces	<input type="checkbox"/>	<input checked="" type="checkbox"/>
13.0	Hazard Communication Program	<input checked="" type="checkbox"/>	<input type="checkbox"/>
14.0	Hearing Conservation	<input checked="" type="checkbox"/>	<input type="checkbox"/>
15.0	Insulation Materials (Non-Asbestos)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
16.0	Lead Management Program	<input type="checkbox"/>	<input checked="" type="checkbox"/>
17.0	Management of Change	<input checked="" type="checkbox"/>	<input type="checkbox"/>
18.0	Materials Handling	<input checked="" type="checkbox"/>	<input type="checkbox"/>
19.0	Mechanical Equipment	<input checked="" type="checkbox"/>	<input type="checkbox"/>
20.0	Mercury Management Program	<input type="checkbox"/>	<input checked="" type="checkbox"/>
21.0	Noise	<input checked="" type="checkbox"/>	<input type="checkbox"/>
22.0	Oil and Dielectric Fluid	<input type="checkbox"/>	<input checked="" type="checkbox"/>
23.0	PCB Management	<input type="checkbox"/>	<input checked="" type="checkbox"/>
24.0	Personal Protective Equipment	<input checked="" type="checkbox"/>	<input type="checkbox"/>
25.0	Pesticide Use, Storage, and Disposal	<input type="checkbox"/>	<input checked="" type="checkbox"/>
26.0	Respiratory Protection Program	<input checked="" type="checkbox"/>	<input type="checkbox"/>
27.0	Sampling	<input checked="" type="checkbox"/>	<input type="checkbox"/>
28.0	Vehicle Management	<input checked="" type="checkbox"/>	<input type="checkbox"/>
29.0	Waste Management	<input checked="" type="checkbox"/>	<input type="checkbox"/>
30.0	Water Resources	<input type="checkbox"/>	<input checked="" type="checkbox"/>
31.0	Welding and Burning	<input checked="" type="checkbox"/>	<input type="checkbox"/>
32.0	Work Area Protection	<input checked="" type="checkbox"/>	<input type="checkbox"/>
33.0	Working at Elevations	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Explanation of Additional Hazards Present:

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Provided by: Con Edison Representative

Name

Date

Received by: Contractor Representative

David Rivera-Lutz

4/18/06

Name



# Guide 1: Introduction

## Attachment 2

### EH&S plan checklist

Contractor: Blasland, Bouck & Lee, Inc.

Description of Project/Job: Former East 11th Street Works Site  
remedial investigation

Con Edison Facility/Location: East 11th Street, Manhattan, New York

If you answer "yes" to any of the items below, describe in the project – specific environmental, health and safety ) plan (eHASP) how you will protect your employees, Con Edison employees, the public and the environment, if applicable, from the indicated hazard as required by OSHA, EPA, DEC, and any other federal, state, or local laws and regulations. The hazards identified by Con Edison in attachment 1 shall also be used to answer this questionnaire and develop your eHASP. Indicate how and where you will dispose of all waste. After you complete your EH&S plan, enter the page number(s) to identify where in your eHASP each hazard is addressed. This checklist does not preclude the submission of a eHASP nor is it meant to be an all-inclusive guide to EH&S issues.

- 1) Do you expect that the job may involve any of the following? (Please circle the response for each item, either to confirm or indicate that the project does not involve the item.)

	Yes	No	Section(s)
Asbestos .....	<input checked="" type="checkbox"/> X	<input checked="" type="checkbox"/> X	_____
PCBs .....	<input checked="" type="checkbox"/> X	<input checked="" type="checkbox"/> X	_____
Lead or lead paint or chips* .....	<input checked="" type="checkbox"/> X	<input checked="" type="checkbox"/> X	_____
Mercury .....	<input checked="" type="checkbox"/> X	<input checked="" type="checkbox"/> X	_____
Other hazardous wastes (corrosive, reactive, toxic, ignitable, or listed hazardous wastes) .....	<input checked="" type="checkbox"/> X	<input type="checkbox"/> X	3.5/3.9
Non-hazardous wastes .....	<input checked="" type="checkbox"/> X	<input type="checkbox"/> X	3.5/3.9
Other hazardous materials/chemicals (MSDS) .....	<input checked="" type="checkbox"/> X	<input type="checkbox"/> X	3.9/Attachment A
Work at high elevations (scaffolds, ladders, etc.) .....	<input checked="" type="checkbox"/> X	<input checked="" type="checkbox"/> X	_____
Work in excavations .....	<input checked="" type="checkbox"/> X	<input checked="" type="checkbox"/> X	_____
Heavy equipment .....	<input checked="" type="checkbox"/> X	<input type="checkbox"/> X	3.2/3.7
Hand and/or power tools .....	<input checked="" type="checkbox"/> X	<input type="checkbox"/> X	3.4
Work in confined or enclosed spaces .....	<input checked="" type="checkbox"/> X	<input checked="" type="checkbox"/> X	_____
Welding/burning .....	<input checked="" type="checkbox"/> X	<input checked="" type="checkbox"/> X	_____
Electrical, Gas or Steam work .....	<input checked="" type="checkbox"/> X	<input checked="" type="checkbox"/> X	_____
Explosives .....	<input checked="" type="checkbox"/> X	<input checked="" type="checkbox"/> X	_____

- Note: All paint removed at Con Edison is considered to contain lead

	Yes	No	Page(s)
Discharges to water, land or sewers .....	<input checked="" type="checkbox"/> X	<input checked="" type="checkbox"/> X	_____
Air emissions .....	<input checked="" type="checkbox"/> X	<input type="checkbox"/> X	Section 6
Excessive Noise .....	<input checked="" type="checkbox"/> X	<input type="checkbox"/> X	Section 4.8
Traffic and/or Roadway .....	<input checked="" type="checkbox"/> X	<input type="checkbox"/> X	Section 4.16
Petroleum or Used Oil .....	<input checked="" type="checkbox"/> X	<input checked="" type="checkbox"/> X	_____
Pesticides .....	<input checked="" type="checkbox"/> X	<input checked="" type="checkbox"/> X	_____
Permits and/or Certifications-Licenses .....	<input checked="" type="checkbox"/> X	<input type="checkbox"/> X	Section 8



## Guide 1: Introduction

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- 2) If you expect to encounter any other EH&S hazards, please list them below and address them in your EH&S plan.

Hazard

Page(s)

_____	_____
_____	_____
_____	_____

- 3) In your EH&S plan, detail the training and personal protective equipment your employees will be required to have to perform this job.

- 4) List in your EH&S plan all emergency contacts and phone numbers, including contractor and Con Edison representatives.

- 5) Company SIC Code: 8711

- 6) Last 2 Years OSHA Incident Rate: <sup>2004</sup> 0.97 <sup>2005</sup> 1.40

- 7) Present Experience Modification Rate: 0.94

Signature David Rivard - Lertz

Date 4/18/06

Type/Print Name David Rivard - Lertz

Title Senior Engineer II

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### Con Edison Acceptance

To be completed by authorized Con Edison Representative

	<u>Yes</u>	<u>No</u>
Accepted.....	<u>X</u>	<u>X</u>

Signature \_\_\_\_\_

Date \_\_\_\_\_

Type/Print Name \_\_\_\_\_

Title \_\_\_\_\_



## Guide 4: Bloodborne Pathogens Exposure Control Plan

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### Overview

Bloodborne pathogens (BBP) are pathogenic microorganisms that may be present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV). A source of occupational exposure may occur when an employee gives First Aid and CPR to an individual who has infectious blood. The occupational exposure occurs when there is the possibility for an employee's eyes, mucous membranes, non-intact skin (i.e., cut and abraded skin) to come into contact with potentially infectious materials from another employee. Additional sources of exposure are contact with infectious waste found at project sites, glassware, needles and other sharp objects which have been involved in injuries to personnel and are contaminated with blood or related bodily fluids.

### Minimum BBP Requirements

In order to perform work on any Con Edison facility or project, all contractors must, at least, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental Health and Safety Plan submitted to Con Edison and include a process to meet these requirements.

- If there is a reasonably anticipated contact with any potentially infectious materials, the contractor's written BBP Exposure Control Plan must be available to all contractor and Con Edison personnel for review upon request.
- The Exposure Control Plan must include procedures for:
  - Exposure determinations;
  - Methods of compliance;
  - HBV vaccinations and post-exposure evaluation and follow-up;
  - Communications of hazards to workers;
  - Worker training.
- Universal precautions (i.e., treat all potentially infectious material as if it were infected) must be used at all times.
- Proper PPE must be used at all times when there is a chance for exposure to infectious materials.
- Hand-washing facilities or products (antiseptic hand cleaner, etc.) must be readily available to all employees.
- All infectious material must be placed in appropriate, labeled containers (sharps containers, bio-hazard bags, etc.) and disposed of properly.



## Guide 4: Bloodborne Pathogens Exposure Control Plan

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- All infected equipment and surfaces must be decontaminated with an appropriate disinfecting solution prior to re-use.
- Following a report of exposure, the exposed employee is entitled to a confidential medical evaluation.
- All employees with a reasonable risk for exposure must attend appropriate training, which includes:
  - An explanation of the OSHA BBP standard;
  - A general explanation of bloodborne diseases;
  - An explanation of the modes of transmission of BBP;
  - An explanation of the Exposure Control Plan;
  - Appropriate methods for recognizing tasks that involve potential exposure;
  - An explanation of the use and limitations of methods to prevent exposure;
  - Proper types, use, handling, decontamination, and disposal of PPE;
  - The availability of HBV vaccines and the procedures for obtaining a vaccination;
  - Appropriate actions to take during an emergency involving BBP;
  - Post-exposure procedures;
  - An explanation of required signs and labels.
- All required records for exposed employees must be kept confidential.

### Regulatory Citations

A complete text of the requirements for BBP can be found in Title 29 Code of Federal Regulations, Part 1910, Section 1030.

### Contacts

For additional information regarding BBP requirements or clarification of these requirements, contact the New York regional OSHA office located at 201 Varick Street, Room 670, New York, New York 10014 (212-337-2378), or visit the OSHA web site at: [www.OSHA.gov](http://www.OSHA.gov)



## Guide 5: Chemical Safety and Handling

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### Overview

Federal and State laws as well as Con Edison require that specific procedures are followed to properly handle chemicals to protect workers and prevent spills. These procedures include those for storing, handling, transferring, and processing chemicals.

### Minimum Chemical Safety and Handling Requirements

Prior to working in any Con Edison facility or on any Con Edison project, all contractors must, at a minimum, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific work plan submitted to Con Edison and include a process to meet these requirements.

- The contractor must assure that the equipment brought into a Con Edison site to deliver or store hazardous chemicals is in good condition and that all equipment required is operating. This includes, but is not limited to all deadman switches, valves, hoses, pumps, lights, etc.
- Contractor personnel must be licensed and/or have the necessary handling permits or certifications. Documentation must be present with the driver or on the vehicle at all times for inspection by Con Edison representative. Incomplete documentation will prevent chemicals/shipment from being permitted in a Con Edison facility or site.
- Contractor personnel must be thoroughly familiar with operation of equipment and the use of materials or chemicals used in the Con Edison facility.
- Contractor personnel should have knowledge of the physical properties, hazards, and personnel protective equipment (PPE) required. All contractor personnel shall be provided with appropriate PPE for the chemicals or hazards present.
- Spill response equipment shall be available on location to contain or control a reasonably anticipated release or spill. All chemical spills in a Con Edison facility or location must be reported to a Con Edison authorized representative immediately upon discovery.
- Contractor will provide to Con Ed a complete inventory of chemicals brought onto a Con Ed facility or location. Contractor must have all material safety data sheets (MSDS) for the material carried or at Con Ed facilities or locations and available on request.
- The reportable quantity of each hazardous substance and the amount that exceeds the reportable quantity shall be known regardless of the units used (pounds vs. gallons).



## Guide 5: Chemical Safety and Handling

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- At the end of the project the contractor shall remove any chemicals that were not used.
- If quantities of chemicals brought on-site exceed the threshold planning quantities (TPQs) or threshold reporting quantities (TRQs), the contractor shall identify how the Community Right-To-Know reporting requirements will be met, including the procedures for:
  - Retaining of Material Safety Data Sheets (MSDS).
  - Filing an annual chemical inventory form with the NYSDEC.
  - Coordinating with the local emergency planning committee (LEPC) and the fire department with jurisdiction over the job area.
  - Preparing Risk Management Plans, as required.

### Regulatory Citations

A complete text of the requirements for chemical safety and handling can be found in:

- Title 29 Code of Federal Regulations (CFR) Part 1910; Title 33 CFR Part 153.
- Title 40 CFR Parts 68, 117, 280, 302, 355 and 370.
- Title 6 New York Code of Rule and Regulations (NYCRR), Parts 595 through 599.
- The New York City Administrative Code Chapter 4, Subchapter 9.
- Title 3 Rules of New York City (RCNY) Chapter 1; Title 15 RCNY Chapters 11 and 41.
- Article 22 Westchester County Sanitary Code, Articles 1&3 Rockland Sanitary Code.

### Contacts

For additional information or clarification of these requirements, contact the following agencies:

- Projects in the five boroughs, contact Region 2 NYSDEC office located at Hunters Point Plaza, 47-40 21st St, Long Island City, NY 11101 (718-482-4900). [www.dec.state.ny.us](http://www.dec.state.ny.us).
- For projects in Westchester, Rockland and Dutchess Counties, contact the NYSDEC Region 3 office at 21 South Putt Corners Road, New Paltz, NY 12561 (914-256-3000).
- Projects in the five boroughs, contact the NYCDEP at 59-17 Junction Boulevard, 10th Floor, Corona, NY 11368 (718-337-4375). NYCDEP's web is [www.ci.nyc.ny.us](http://www.ci.nyc.ny.us).



## Guide 5: Chemical Safety and Handling

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- Westchester County projects, contact Westchester Department of Environmental Facilities at 207 North Avenue, New Rochelle, NY 10810 (914-637-3000). [www.co.westchester.ny.us](http://www.co.westchester.ny.us).
- For projects located in Rockland County, contact the Rockland County Department of Health on Sanatorium Road, Pomona, NY 10970 (914-634-2500). [www.co.rockland.ny.us](http://www.co.rockland.ny.us).

Region II office of the Environmental Protection Agency (EPA) is located at 290 Broadway, New York, New York 10007 (212-637-3000). The EPA's website is [www.EPA.gov](http://www.EPA.gov).



## Guide 7: Electrical Safety

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### Overview

Electrical safety is an important component to any safety program. To minimize personal injury from contact with energized sources, workers must be trained in the fundamentals of electrical safety and all electrical hazards on a project must be identified and corrected. Only properly licensed electricians may perform any electrical work on Con Edison projects.

### Minimum Electrical Safety Requirements

In order to perform work on any Con Edison facility or project, all contractors must, at least, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental Health and Safety Plan submitted to Con Edison and include a process to meet these requirements.

- Before work begins, all electric circuits, exposed or concealed, that may be contacted by workers must be posted with warning signs.
- All workers must be notified of the location and hazard involved with nearby electrical circuits and protective measures taken.
- Workers must not work near any part of an electrical circuit unless they are protected against shock by guarding or by de-energizing and grounding the circuit.
- Workspaces, walkways, and similar locations must be kept free of electric cords and tools.
- Equipment must not be stored around electrical cabinets to prevent access.
- Workers must inspect all electrical equipment, including extension cords, for the following hazards:
  - Missing ground pins on plugs (except double-insulated);
  - Insulation pulled free from plugs or support connections;
  - Damaged insulation;
  - Exposed wires; and
  - Evidence of arcing, sparking, or smoking.
- When any conditions are identified on equipment that make it unsafe to operate, the equipment must be removed from the site until repaired by a qualified person.
- Portable lamps must be covered by a fixed, grounded (if metal) guard and equipped with an insulated handle.



## Guide 7: Electrical Safety

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- All underground utilities must be marked prior to any groundbreaking activities.
- Flexible cords must be suitable for the condition and location of use and must be used as appropriate.
- Three-wire extension cords must be used and must be rated for hard or extra-hard use.
- Splices and/or taps are prohibited in extension cords.
- Extension cords must not be fastened with staples, hung on nails, or suspended on wires.
- Workers must be trained in the safety-related work practices that pertain to their job and cannot work near electrical hazards without training to recognize and avoid the hazard.
- Electrical workers must test all equipment to verify if energy is present.
- Only qualified, trained workers may test electrical equipment.
- Workers must properly lockout and tagout any circuit or equipment being worked on and verify the equipment is de-energized.
- Personal protective equipment used by electrical workers must be appropriate and in good condition.
- Portable metal ladders and ladders with metal reinforcement are prohibited near energized electrical equipment.
- ALL electrical equipment used on a project (hand tools, etc.) must be protected with a ground-fault circuit interrupter (GFCI).
- Materials must not be stored in transformer vaults.
- AC and DC wiring systems must be properly grounded.
- Proper clearance from overhead power lines must be maintained at all times.

### Regulatory Citations

A complete text of the requirements for Electrical Safety can be found in Title 29 Code of Federal Regulations, Part 1910, Section 147 and Subpart S, and Part 1926, Subpart K.



## Guide 7: Electrical Safety

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### Contacts

For additional information regarding Electrical Safety requirements or clarification of these requirements, contact the New York regional OSHA office located at 201 Varick Street, Room 670, New York, New York 10014 (212-337-2378). The OSHA website can be found at [www.OSHA.gov](http://www.OSHA.gov).



# Guide 11: Fire Protection and Prevention

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## Overview

Fire safety and prevention is critical to the effective operations of Con Edison facilities. Con Edison focuses on responsibly safeguarding human and business assets to avoid a fire or explosion that may cause injury or disrupt operations. All contractors performing construction and maintenance operations must implement measures to prevent and control fires, if one occurs.

## Fire Prevention and Fire Control Requirements

Prior to working in a Con Edison facility or on a Con Edison project, all contractors must, at a minimum, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental Health and Safety (EH&S) Plan submitted to Con Edison and a process to meet these requirements.

- The contractor program must identify the fire protection requirements and procedures.
- The contractor must identify personnel who are trained in the use of fire extinguishers and fire fighting techniques personnel and can fight a fire during the early or incipient stage.
- A Con Edison Rep will be informed of all fire or explosion occurrences.
- Ensure all field offices, shanties, and storage facilities are constructed in accordance with applicable codes, and fabricated noncombustible material for protection against fire.
- The contractor must identify operations that present a potential fire hazard, for example hotwork (welding, grinding and cutting) and the use of flammable liquids and gases.
- Contractor must identify procedures to eliminate and control fire hazards including housekeeping, electrical safety, safety procedures for hot work, storage and handling of flammable and combustible liquids and compressed gases.
- Good housekeeping standards must be enforced in the work area, including the requirements that waste, rubbish and flammable materials and rags be removed from the area daily.
- All waste, rubbish, and flammable materials must be stored in approved containers.
- Handling procedures will address safe transport, use, and storage of flammable materials.
- Noncombustible tables or shelves, or protected work area will be used for hot work.



## Guide 11: Fire Protection and Prevention

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- Storing flammable liquids in approved safety cans that are painted red with a yellow band around the can and labeled to identify the contents.
- Storing combustible liquids in green safety cans that are labeled to identify the contents.
- Storing all FCL in closed approved metal cabinets and only storing quantities of these liquids on-site that do not exceed the minimum amount required for efficient operation.
- Storing bulk drum quantities of FCL liquids in storage rooms specially designed for fire and spill protection.
- Prohibit the use of gasoline and other highly flammable liquids for cleaning.
- Using approved pumps, or approved self-closing faucets and drip pans when dispensing FCL from drums or portable tanks.
- Class B/C rated fire extinguishers will be located in close proximity to FCL areas and monthly and annual inspections will be performed to ensure that the units are ready for use.
- In the event of a fire involving compressed gases, the gases will be permitted to burn and not extinguished, under any circumstances, unless it is possible to control the gas flow.
- Oil, grease, and highly volatile liquids must not be stored near oxygen cylinders.
- Smoking is prohibited in the vicinity of flammable or combustible liquids and gases.
- Using liquefied petroleum gas (LPG) indoors for cutting and/or welding operations shall be limited to small quantities and no more than a 1-pound bottle shall be stored in the building.
- Open flames or spark-producing tools must not be used in any enclosure where an explosion concern may exist until testing indicates that an explosion hazard does not exist.

### Regulatory Citations

A complete text of the requirements for Hot Work can be found in Title 29 Code of Federal Regulations, Part 1910, Subpart Q and Part 1926, Subpart J.



## Guide 11: Fire Protection and Prevention

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### Contacts:

For additional information or clarification of these requirements, contact:

- The New York regional OSHA office located at 201 Varick Street, Room 670, New York, New York (212-337-2378), or visit the OSHA web site at: [www.OSHA.gov](http://www.OSHA.gov).
- The NYC Fire Department located at 250 Livingston Blvd, Brooklyn, NY (718-694-2000).



## Guide 13: Hazard Communication

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### Overview

OSHA requires that the hazards associated with all chemicals used or stored at a job site be evaluated. This information must be communicated to employees who may be exposed to these chemicals or use them in their daily jobs. The process for informing employees about the chemicals, their locations, and potential hazards is called a Hazard Communication (HAZCOM) program. In general, this program includes requirements and procedures for container labeling and other forms of warning, procedures for obtaining and retaining material safety data sheets (MSDSs) and employee training.

### Minimum HAZCOM Requirements

In order to work in any Con Edison facility or on any project, all contractors must, at least, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental Health and Safety Plan submitted to Con Edison and include a process to meet these requirements.

- If any hazardous material is used or stored at the job site, the contractor's written HAZCOM program must be available to all contractor and Con Edison personnel for review upon request.
- The HAZCOM program must include procedures for:
  - Labeling containers and the use of warning forms;
  - Obtaining and retaining MSDSs;
  - Specific worker training requirements;
  - Documentation that these training requirements have been completed by each worker;
  - A list or inventory of hazardous material at the job site.
- The supervisor must inform all workers about the hazardous materials at the job site when they first are first assigned to a project and whenever a new hazardous material is brought to the site.
- Workers must be informed of the location of:
  - The HAZCOM program;
  - The list/inventory of hazardous substances;
  - The locations of MSDSs and the procedures for obtaining a copy of an MSDS;
  - These must all be available for each worker to review during their work period.
- The Con Edison representative must be informed of all chemicals brought to the site.



## Guide 13: Hazard Communication

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- Each contractor must obtain information from the Con Edison representative regarding chemicals that Con Edison uses or stores at the site.
- When more than one contractor is working at a job site, each contractor must inform the other(s) concerning the location of their MSDSs and procedures for labeling and worker protection.
- THE PRIME CONTRACTOR IS RESPONSIBLE FOR COORDINATING THE HAZCOM PROGRAM ON THE JOB SITE.
- ALL containers will be labeled.
  - Labels on hazardous material containers will not be defaced or removed.
  - The labels will identify the substance in the container and appropriate warnings about the substance.
  - The material identity will match the material currently in the container, its MSDS, and the overall list/inventory.
- An MSDS must be available at the job site for every chemical that is present at that site.
- A documented training program will be provided to every worker at the job site. This training will include:
  - Information regarding the HAZCOM program;
  - Health and environmental hazards of every chemical used at the job site;
  - Ways to detect the presence of hazardous materials at a job site (including monitoring methods and devices used);
  - How to read and understand the information contained on an MSDS; and
  - How workers can protect themselves from harmful exposure (e.g., safe work practices, personal hygiene, and protective equipment).

### Regulatory Citations

A complete text of the requirements for HAZCOM can be found in Title 29 Code of Federal Regulations, Part 1910, Section 1200, and Title 29 Code of Federal Regulations, Part 1926, Section 59.

### Contacts

For additional information regarding HAZCOM requirements or clarification of these requirements, contact the New York regional OSHA office located at 201 Varick Street, Room 670, New York, New York 10014 (212-337-2378). The OSHA web site can be found at [www.OSHA.gov](http://www.OSHA.gov).



## Guide 14: Hearing Conservation

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### Overview

Noise is defined as unwanted sound. Noise can cause sudden traumatic temporary hearing loss, long-term slowly occurring hearing loss that is irreversible, disruption of communication, and masking of warning devices and alarms. These long-term effects may occur at noise levels lower than are constant and daily.

### Minimum Hearing Conservation Requirements

In order to perform work on any Con Edison facility or project, all contractors must, at least, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental Health and Safety Plan submitted to Con Edison and include a process to meet these requirements.

- Workers must not be exposed to noise levels above those stated in the regulations.
- All noise levels must be measured on the A-weighted scale by a trained person.
- When noise exposure includes two or more periods at different noise levels, the combined noise exposure must be calculated.
- When noise levels exceed the permissible limits, worker exposure must be controlled through engineering controls, administrative controls, personal protective equipment (PPE), or a combination of these.
- Engineering controls consist of isolating, enclosing, or insulating equipment or operations or substituting quieter equipment or operations.
- Engineering controls are always preferred over other controls.
- Administrative controls involve rotating workers to jobs having lower noise exposures and reducing the time that each worker is exposed.
- PPE, for example earplugs and earmuffs, must be rated to reduce the noise exposure to within acceptable limits.
- A noise exposure at or above 85 decibels on the A-weighted scale (dBA) averaged over an 8-hour time period (with or without PPE) requires a formal written hearing conservation program.
- A hearing conservation program must include:
  - Noise monitoring;



## Guide 14: Hearing Conservation

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- Procedures for employee notification;
  - Provisions to permit employees to observe monitoring;
  - Initial and annual audiometric testing, and an evaluation of the audiogram by a qualified professional;
  - A noise training program for all affected workers; and
  - Formal record keeping.
- The following table is a guide to common noise levels:

Permissible Duration	dBa	Examples of Noise Sources
No protection or time exposure calculation required.	15	Wooded Forest
25		Quiet Bedroom
35		Library
65		Normal Speaking
75		General Office Area
Action Level for Hearing Conservation Program	85	Average Machine Shop
8 Hours	90	
6 Hours	92	
4 Hours	95	
3 Hours	97	
2 Hours	100	Air Spray Operation
1.5 Hours	102	
30 Minutes	110	Power Table Saw
15 Minutes	115	
7.5 Minutes	120	
4 Minutes	125	Rock-n-Roll Concert
2 Minutes	130	Aircraft Jet Engine/Ear Pain Threshold
NOT TO EXCEED	140	

- A standard rule-of-thumb for noise states that when standing face-to-face at a distance of 1 to 2 feet, if it is necessary to raise your voice to be heard, the background noise exceeds 85 dBA.

### Regulatory Citations

A complete text of the requirements for Hearing Conservation can be found in Title 29 Code of Federal Regulations, Part 1910, Section 95 and Part 1926, Section 52.

### Contacts

For additional information regarding Hearing Conservation requirements or clarification of these requirements, contact the New York regional OSHA office located at 201 Varick Street, Room 670, New York, New York 10014 (212-337-2378). The OSHA website can be found at [www.OSHA.gov](http://www.OSHA.gov).



## **Guide 14: Hearing Conservation**

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## Guide 17: Management of Change

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### Overview

Con Edison requires that all contractors comply with all environmental, health and safety (EH&S) regulations. This includes EH&S regulations that are identified prior to beginning each project and those that become apparent after the job has begun. To ensure that all EH&S requirements are met during the project, the Contractor must develop a process to manage change. This management of change process will allow the Contractor to meet all EH&S obligations required by the regulations and to keep Con Edison informed of changing conditions that may trigger modifications to the Contractor's anticipated work plan.

### Minimum Management of Change Requirements

When working in any Con Edison facility or on any Con Edison project, all contractors must, at least, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental Health and Safety Plan submitted to Con Edison and include a process to meet these requirements.

- The Contractor must notify the Con Edison Authorized Representative of any change in working conditions that could affect compliance with environmental or health and safety requirements as soon as the changed conditions are identified.
- An example of change in conditions can include, but is not limited to the following:
  - Unforeseen hazards not anticipated the bidding process.
  - Weather conditions that could affect worker safety.
  - Unexpected changes in the scope of the project.
  - The potential to generate wastes not expected during project planning.
  - The potential for unexpected sample collection.
- The Contractor shall identify the contingencies they have prepared for managing change.
- The Contractor shall take all appropriate precautions prior to implementing any contingencies prepared to manage change. Precautions can include the following:
  - Increasing or decreasing the levels of personal protective equipment.
  - Taking special safety precautions to deal with unsuspected conditions (for example, unanticipated confined space conditions).
  - Planning for inclement weather.
  - Identifying the potential for environmental permits due to changing field conditions.



## Guide 17: Management of Change

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- All personnel shall be appropriately trained to perform their job function under the changed conditions prior to being allowed to work under the changed conditions.
- Subcontractors will be held to the management of change procedures outlined by the Prime Contractor.
- THE PRIME CONTRACTOR SHALL HAVE THE ULTIMATE RESPONSIBILITY FOR IMPLEMENTING MANAGEMENT OF CHANGE PROCEDURES RELATIVE TO THE PROJECT.

### Regulatory Citations

A complete text of the statutory requirements for Management of Change can be found in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) at Title 42 United States Code (U.S.C.) Sections 9601 through 9675; in the Resource Conservation and Recovery Act (RCRA) at Title 42 U.S.C. Sections 6901 through 692K; and in the New York Environmental Conservation Law, Articles 70 and 71.

### Contacts

For additional information regarding management of change requirements or clarification of these requirements, contact the following agencies:

- For projects within the five boroughs, contact the Region 2 NYSDEC office located at Hunters Point Plaza, 47-40 21st Street, Long Island City, New York 11101 (718-482-4900). NYSDEC's web site can be found at [www.dec.state.ny.us](http://www.dec.state.ny.us).
- For projects located in Dutchess, Orange, Rockland, or Westchester Counties, contact the Region 3 NYSDEC office at 21 South Putt Corners Road, New Paltz, NY 12561 (914-256-3000).
- For all projects, also contact the Region II office of the Environmental Protection Agency (EPA) located at 290 Broadway, New York, New York 10007 (212-637-3000). EPA's web site can be found at [www.EPA.gov](http://www.EPA.gov).



## Guide 18: Materials Handling

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### Overview

Materials handling can be accomplished in a variety of ways, lifted and moved both manually or using a mechanical means, such as a fork truck or crane. All types of material handling operations require safety planning and practices that are clearly defined.

### Minimum Materials Handling Requirements

In order to perform work in any Con Edison facility or on any project, all contractors must, at least, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental Health and Safety Plan submitted to Con Edison and include a process to meet these requirements.

- Whenever possible, objects will be lifted and moved by mechanical devices (cranes, manually operated chain hoists, fork trucks, etc.) rather than by manual effort.
- The mechanical devices will be appropriate for the lifting or moving task and will be operated only by trained and authorized personnel.
- Objects that require special handling or rigging will only be moved under the guidance of a person who has been specifically trained to move such objects.
- Lifting devices will be inspected, certified, and labeled to confirm their weight capacities.
- All devices shall be inspected by a trained and qualified individual at least once a year and will be inspected prior to each use by the user.
- Defective equipment will be taken out of service immediately and repaired or destroyed.
- Personnel will not pass under a raised load, nor will a suspended load be left unattended.
- Personnel will not be carried on lifting equipment, unless it is specifically designed to carry passengers.
- The wheels of the truck being loaded or unloaded will be chocked to prevent movement.
- The lift and swing path of a crane will be watched and maintained clear of obstructions.
- Accessible areas within the swing radius of a crane will be guarded or barricaded.
- All reciprocating, rotating, or other moving parts will be guarded at all times.



## Guide 18: Materials Handling

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- Accessible fire extinguishers will be available in all mechanical lifting devices.
- Lifting devices will never be left near the edge of excavations or unstable areas.
- Mobile lifting equipment, equipped with outriggers will be set before any work is begun.
- Operations near overhead power lines are prohibited unless the power source has been shut off and locked out/tagged out or the appropriate clearance distances are maintained.
- Cranes may only be moved when directed by a signal person.
- Wire ropes will be removed from service when any abrasion, scrubbing, peening, evidences of corrosion, kinking, crushing, bird caging, or other damage exists.
- Unsafe behavior while driving a fork truck is not permitted.
- Each fork truck will be provided with an overhead guard.
- All mobile lifting devices shall be equipped with an audible backup warning device.
- All traffic regulations shall be observed when a lifting device is in operation.
- Only authorized personnel shall refill liquefied petroleum gas (LPG) tanks on fork trucks.
- Employees involved in heavy lifting will be properly trained in lifting procedures and should be physically qualified to protect the person and the material.
- Tiered or stacked material will be stored within acceptable height limits to avoid falling. Only material that will be immediately used may be stored on scaffolds or runways.
- Personnel will be trained in the procedures used for material handling. This training will address the requirements of applicable regulations, for example the training of personnel who operate powered industrial trucks.

### Regulatory Citations

A complete text of the requirements for Materials Handling can be found in Title 29 Code of Federal Regulations, Part 1910, Subpart N and Part 1926, Subparts H and O.



## Guide 18: Materials Handling

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### Contacts

For additional information regarding Materials Handling requirements or clarification of these requirements, contact the New York regional OSHA office located at 201 Varick Street, Room 670, New York, New York 10014 (212-337-2378), or visit the OSHA web site at: [www.OSHA.gov](http://www.OSHA.gov).



## Guide 19: Mechanical Equipment

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### Overview

Hand and power tools are commonplace on most project sites. OSHA requires that these tools be maintained in a safe condition to protect both the worker and the public from injury.

### Minimum Requirements for Hand and Power Tools

In order to perform work on any Con Edison facility or project, all contractors must, at least, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental Health and Safety Plan submitted to Con Edison and include a process to meet these requirements.

- All contractor hand and power tools must be maintained in a safe condition and used properly.
- Only workers who have been trained in the use of a particular tool may operate that tool.
- All hand and power tools must be inspected prior to use to ensure proper operation and structural integrity.
- All hand and power tools that are damaged must be removed from the job site until they are repaired.
- Removing any guards from a power tool is prohibited and operating a power tool with any guards removed is prohibited.
- Moving parts of equipment (belts, pulleys, shafts, etc.) must have guards that comply with the appropriate American National Standards Institute (ANSI) standards.
- Workers who are exposed to flying objects, dust, fumes, vapors, etc. when using hand or power tools must wear the appropriate personal protective equipment (PPE).
- Wrenches of any kind must be removed from the project site when the jaws are worn to the point where slippage occurs.
- Mushroomed heads on impact tools (chisels, etc.) must be repaired or removed from the site.
- Wooden tool handles must be free of splinters and cracks and be tight in the tool.
- Electric hand tools must be double insulated or grounded and protected by a ground-fault circuit interrupter (GFCI).



## Guide 19: Mechanical Equipment

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- All fixed electric tools must have a disconnect switch that can be locked or tagged in the off position.
- Compressed air may only be used for cleaning when the pressure is set to less than 30 pounds per square inch (psi) and chip guards and PPE are used.
- The use of compressed air for personal cleaning is prohibited.
- All pneumatic hand tools must be equipped with a safety device on the muzzle to prevent accidental discharge and be secured to the air line with a safety chain or other means to prevent accidental disconnect.
- Fuel-powered hand tools must be turned off when being refueled or serviced.
- Powder-actuated hand tools must be inspected tested and inspected daily prior to use to ensure proper working conditions.
- Grinding machines must be guarded in accordance with applicable ANSI standards.
- Work rests on stationary grinders must be within 1/4 inch of the grinding wheel surface and the tongue guard must be within 1/4 inch of the grinding wheel surface.
- The manufacturer's capacity rating must be marked on all jacks and must never be exceeded.
- As soon as a load has been raised by a jack, the load must be cribbed, blocked, or otherwise secured.

### Regulatory Citations

A complete text of the requirements for Hand and Power Tools can be found in Title 29 Code of Federal Regulations, Part 1910, Subparts O and P, and Part 1926, Subpart I.

### Contacts

For additional information regarding Hand and Power Tool requirements or clarification of these requirements, contact the New York regional OSHA office located at 201 Varick Street, Room 670, New York, New York 10014 (212-337-2378), or visit the OSHA web site at [www.OSHA.gov](http://www.OSHA.gov).



## Guide 21: Noise

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### Overview

Local laws and regulations require that the noise produced during construction/work activities is neither excessive nor intrusive. The contractor must identify the measures that will be taken to assure the noise limits for the area in which they are working will not be exceeded. The noise levels that are acceptable generally depend on the location where the noise is generated and the time of day. In general, most regulations require that facility and commercial operations do not produce unnecessary noise as compared to the surrounding community. For operations within a fixed facility (for example, a generating station), the noise levels measured at the facility perimeter are used to determine impacts on the community. For a discussion of worker protection from excessive noise, refer to the Hearing Conservation EH&S Work Plan Guide.

Prior to working in any Con Edison facility or on any Con Edison project, all contractors must, at a minimum, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental Health and Safety Plan submitted to Con Edison and include a process to meet these requirements.

### Minimum Noise Requirements

- Local noise ordinances should be reviewed to determine the maximum levels of noise that can be generated at the job site during specific work periods.
- Local noise ordinances should be reviewed to determine whether octave band measurements are required.
- Noise measurements should be obtained by qualified personnel using the guidance of the American National Standards Institute (ANSI) standards and the results should be compared to the applicable ordinances.
- The sampling should be performed by a qualified person who is familiar with the make and type of equipment used in the measurements and experienced in general noise data collection procedures.
- To comply with ordinances, sampling should evaluate the sound levels associated with specific types of noise, for example:
  - Impulse noise is short bursts of noise.
  - Periodic noise is steady, high-level noise.
- The contractor is responsible for ensuring that all work performed by both his crew and subcontractors complies with applicable noise ordinances.



## Guide 21: Noise

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- Equipment and vehicles need to be maintained in good operating condition, ie. mufflers, belts and tune-ups.

### Regulatory Citations

A complete text of the requirements for noise can be found in the:

- New York City Administrative Code and Charter, Title 24, Chapter 2, Subchapter 6.
- New York City Zoning Resolutions Section 42-21, Article IV.
- Rockland County Health Code, Article IX.
- Westchester County regulations which can be obtained from local townships.

### Contacts

For additional information regarding noise requirements or clarification of these requirements, contact the following agencies:

- For projects within the five boroughs, contact the New York City Department of Environmental Protection (NYCDEP) office located at 59-17 Junction Boulevard, 10th Floor, Corona, NY 11368 (718-337-4375 or visit their walk-up One Stop Information and Referral Center at 96-05 Horace Harding Expressway, Corona, NY 11368. NYCEP's web site can be found at [www.ci.nyc.ny.us](http://www.ci.nyc.ny.us).
- For projects located in Rockland County, contact the Rockland County Department of Health on Sanatorium Road, Pamonka, NY 10970 (914-634-2500). Rockland County's web site can be found at [www.co.rockland.ny.us](http://www.co.rockland.ny.us).
- For information on standard practices for monitoring noise, contact the American National Standards Institute (ANSI) at 11 West 42nd Street, New York, NY 10036 (212-642-4900). ANSI's web site can be found at [www.ansi.org](http://www.ansi.org).



## Guide 24: Personal Protective Equipment

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### Overview

For many tasks, personal protective equipment (PPE) is as essential to the job as any tool. OSHA requires that every employer evaluate all tasks associated with a project to determine the hazards associated with these tasks and the appropriate PPE to be worn by each affected employee. This hazard assessment must be documented.

### Minimum PPE Requirements

In order to perform work on any Con Edison facility or project, all contractors must, at least, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental Health and Safety Plan submitted to Con Edison and include a process to meet these requirements.

- All employers must conduct a hazard assessment prior to the start of every project and as conditions change on the project to determine the types of PPE necessary for each task.
- The results of the hazard assessment must be communicated to every employee on the project prior to the start of work and as conditions change.
- All workers must be trained to recognize the need for and types of PPE necessary, the proper use of PPE, the limitations of PPE, and proper care and disposal of PPE.
- All workers must be trained in the procedures for inspecting PPE prior to use to ensure it provides the required protection.
- All PPE used must meet applicable American National Standards Institute (ANSI) standards.
- All PPE must be maintained in a sanitary and reliable condition.
- Where employees supply their own PPE, the employer is responsible for ensuring the adequacy, maintenance, and sanitation of this PPE.
- Hard hats must never be changed or modified in any way and must be appropriate for the type of work being performed. White hard hats are not permitted on any Con Edison site.
- Eye protection must be appropriate for the type of work being performed, and must be equipped with side shields.
- Burning goggles must be equipped with appropriate filtering lenses for the work being performed.



## Guide 24: Personal Protective Equipment

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- Gloves must provide adequate wrist and hand protection based on the tasks being performed, and must be compatible with and resistant to any potential hazard (sharps, chemical, electrical, etc.).
- Safety shoes or boots must be fitted with protective toe guards.
- Additional PPE may be necessary for certain situations, for example overboots or rubber boots should be worn for wet conditions or chemical spills, etc.
- Protective clothing (reusable or disposable) must be appropriate for the type of work being performed.
- Orange reflective vests, approved by the U.S. Department of Transportation, must be worn when working in areas exposed to or adjacent to vehicle traffic.
- Fall protection devices must meet the requirements defined in the Con Edison EHS Work Plan Guide for Working at Elevation which is Section 33 in this manual.
- Workers required to wear hearing protection must be allowed to select the type of device they wish to wear from a number of suitable devices.
- Flame resistant garments are required in areas where there is a potential for arc or flash.

### Regulatory Citations

A complete text of the requirements for Personal Protective Equipment can be found in Title 29 Code of Federal Regulations, Part 1910, Subpart I, and Part 1926, Section 28 and Subpart E.

### Contacts

For additional information regarding Personal Protective Equipment requirements or clarification of these requirements, contact the New York regional OSHA office located at 201 Varick Street, Room 670, New York, New York 10014 (212-337-2378). The OSHA website can be found at [www.OSHA.gov](http://www.OSHA.gov).



## Guide 26: Respiratory Protection Program

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### Overview

Respiratory protection is often necessary to allow employees to work safely in hazardous environments. When an airborne contaminant or oxygen-deficient atmosphere exceeds the regulated exposure limits, an employer must eliminate the hazard through engineering and administrative controls or use of the proper respiratory protective equipment.

### Minimum Respiratory Protection Requirements

In order to perform work on any Con Edison facility or project, all contractors must, at least, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental Health and Safety Plan submitted to Con Edison and to include a procedure to meet these requirements.

- Contractor must have available a written Respiratory Protection Program (RPP).
- Perform Exposure Assessments to assess the need for respiratory protection based on limits established by OSHA, American Conference of Governmental Industrial Hygienist, National Institute of Occupational Safety and Health or Con Edison.
- Selection of the proper Air Purifying Respirators (APR) or Supplied Air Respirators (SAR) will depend on the characteristics of the workplace and the level of protection necessary. Characteristics include the concentration of airborne contaminants, immediately dangerous to life or health (IDLH) conditions, oxygen-deficient atmospheres, and the protection factor (PF) of each respirator.
- APR's will not be worn in oxygen-deficient atmospheres, IDLH conditions, when the contaminant exceeds the PF of the respirator, or when cartridges do not exist for a particular contaminant.
- Breathing air quality must meet the Compressed Gas Association's definition of "Grade D" air for all supplied air respirator use. This includes breathing air cylinders and 5-minute escape cylinders. Compressors shall meet applicable OSHA standards.
- In IDLH atmospheres prior to entry, a rescue plan shall be conveyed to crew members.
- The contractor will follow OSHA regulations regarding maintenance, inspection, proper use of cylinders, fittings, hoses, manifolds, etc., and recordkeeping.
- Self-Contained Breathing Apparatus (SCBA) shall be used in situations where the contaminant or concentration of a contaminant is unknown.



## Guide 26: Respiratory Protection Program

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- Respirator use requires training with the properly selected respirator, medical evaluation to wear the respirator, and proper fit-testing of the respirator.
- Respirators shall be inspected, maintained, cleaned, disinfected, and stored according to the manufacturers' directions and applicable OSHA guidelines..
- Emergency equipment shall be inspected monthly and all records will be kept on file.
- The RPP administrator shall maintain results of periodic program review, and shall identify, based on the results of the review, any necessary changes which may need to be made to the respiratory program. Records shall identify the name of the person conducting the review, the date, and any observations made during the review.
- Based on the RPP outlined in this work plan guide, the program manager shall maintain the following records at all times:
  - Hazard Assessments.
  - Employee Training.
  - Fit-Testing.
  - Medical Surveillance.
  - Respirator and Fit-Test Equipment Maintenance and Repair.

### Regulatory Citations

A complete text of the requirements for Respiratory Protection can be found in Title 29 Code of Federal Regulations, Part 1910, Section 134.

### Contacts

For additional information regarding Confined Space requirements or clarification of these requirements, contact the New York regional OSHA office located at 201 Varick Street, Room 670, New York, New York 10014 (212-337-2378), or visit the OSHA web site at: [www.OSHA.gov](http://www.OSHA.gov).



## Guide 27: Sampling

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### Overview

Samples may be required to characterize a material or waste, to confirm the presence or absence of hazardous substances, to determine the extent of a spill or release, to confirm that cleanup standards have been met, and/or to comply with permit or regulatory criteria or standards. It is the contractor's responsibility to ensure that samples are properly managed and analyzed, collection methods are consistent with all regulatory protocols and good sampling practice and samples are representative of the material.

### Minimum Sampling Requirements

Prior to working in any Con Edison facility or on a Con Edison project, all contractors must, at a minimum, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental Health and Safety (EH&S) Plan submitted to Con Edison and include a process to meet these requirements.

- The contractor must have a Sampling Plan including:
  - Sampling techniques that will be used.
  - A sampling summary, including sample matrices, parameters analyzed for, sample preparation, analytical method numbers, volumes and types of sample containers, sample preservation methods if required, and holding times allowed for the samples.
  - Sample handling procedures.
  - Quality Assurance /Quality Control procedures and Chain-of-Custody procedures..
  - Equipment and personnel decontamination procedures.
  - How wastes generated during the sampling effort will be managed.
  - Method detection limits, method quantification limits, and reporting limits.
  - Data validation procedures and record keeping and documentation procedures.
- The contractor shall identify the procedures used to ensure that representative samples will be collected, including the procedures to prevent cross-contamination of samples, to prevent the loss of volatile constituents when samples are handled and placed in jars, and collect homogeneous samples of materials.
- If composite samples are identified for collection in the EH&S Plan, the Contractor shall specify how many aliquots will be used to make up each composite sample.
- The contractor must identify how many and what types of quality assurance/quality control (QA/QC) samples (i.e., duplicate, field blank, rinsate blank, and trip blank samples) will be collected during the sampling event.



## Guide 27: Sampling

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- The contractor must identify whether the laboratory that will analyze the samples is approved under New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) for the methods proposed. If the laboratory is ELAP-certified, the Contractor must provide the laboratory ELAP certification number.
- For asbestos sampling requirements, see the Con Edison Contractor EH&S Work Plan Guide for Asbestos.

### Regulatory Citations

Documents prepared by United States Environmental Protection Agency (USEPA) and the New York State Department of Environmental Control (NYSDEC) governing the collection and analysis of environmental samples include:

- The Region II CERCLA Quality Assurance Manual, Revision 1, USEPA, October 1989,
- The NYSDEC Sampling Guidelines and Protocols, Division of Water, Bureau of Spill Prevention and Response, March 1991.

### Contacts

For additional information regarding sampling requirements or clarification of these requirements, contact the following agencies:

- For projects within the five boroughs, contact the Region 2 NYSDEC office located at Hunters Point Plaza, 47-40 21st Street, Long Island City, New York 11101 (718-482-4900) "[www.dec.state.ny.us](http://www.dec.state.ny.us)".
- For projects located in Dutchess, Orange, Rockland, or Westchester Counties, contact the Region 3 NYSDEC office at 21 South Putt Corners Road, New Paltz, NY 12561 (914-256-3000) "[www.dec.state.ny.us](http://www.dec.state.ny.us)".
- For information on NYSDOH's ELAP program, contact the New York State Department of Health office in the Wadsworth Center, Empire State Plaza, Albany, NY 12201-0509 (518-485-5570) "[www.health.state.ny.us](http://www.health.state.ny.us)".
- For all projects, also contact the Region II office of the EPA located at 290 Broadway, New York, New York 10007 (212-637-3000) "[www.EPA.gov](http://www.EPA.gov)".



## Guide 28: Vehicle Management

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### Overview

Vehicles may be used for personnel transport, equipment or soil hauling, earthmoving, and pile driving. OSHA has specific requirements designed to ensure that vehicles are maintained and operated in a safe condition to protect workers and the public. In addition, state licenses and department of motor vehicles regulations address the proper operation and maintenance of vehicles.

### Minimum Vehicle Management Requirements

In order to perform work on any Con Edison facility or project, all contractors must, at least, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental Health and Safety Plan submitted to Con Edison and include a process to meet these requirements.

- Only properly trained personnel may operate the vehicles for which they are trained.
- All applicable personnel must possess valid Commercial Drivers Licenses.
- All vehicles must have a functioning service, emergency, and parking brake system and functioning brake lights.
- Vehicles will be inspected prior to use and removed from service if deficiencies exist.
- Vehicles used on public roads must have U.S. Department of Transportation approved flares, triangles, or other warning devices in the vehicle.
- Tools and materials carried in passenger compartments must be secured.
- Vehicles with cabs must have windshields and functioning powered wipers.
- All vehicles must have proper seats with seat belts for each person.
- Vehicles loaded by crane, loader, or similar equipment must have a cab shield or canopy. Equipment cabs must have safety glass that does not distort the driver's vision.
- All vehicles left near a highway at night must have appropriate warning devices.
- Workers must not work under or between equipment or vehicles suspended from slings, hoists, or jacks until the equipment is blocked or otherwise supported.



## Guide 28: Vehicle Management

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- All vehicles must be fully lowered and blocked during repair or when not in use.
- Parking brake must be set and wheels chocked when parked and on an incline.
- All vehicles must have functioning backup alarms.
- Loads/Material must be secured and covered if disturbed by winds while in transit.
- Vehicles and equipment designed to move slowly over public roads must display an appropriate slow-moving traffic identification symbol (orange triangle).
- Roadway weight limits will be adhered to.
- The following equipment must have Roll-Over Protection Structures (ROPS):
  - Rubber-tired scrapers, loaders, and dozers, Wheeled tractors;
  - Crawler tractors and loaders, and Motor graders.
- ROPS must be labeled appropriately.
- Fueling operations must be conducted in accordance with the requirements of the Con Edison EHS Work Plan Guide for Fire Protection and Prevention in this manual.

### Regulatory Citations

A complete text of the requirements for Vehicle Management can be found in Title 29 Code of Federal Regulations, Part 1926, Subparts F and O.

### Contacts

For additional information regarding Vehicle Management requirements or clarification of these requirements, contact the New York regional OSHA office located at 201 Varick Street, Room 670, New York, New York 10014 (212-337-2378), or visit the OSHA web site at: [www.OSHA.gov](http://www.OSHA.gov).



## Guide 29: Waste Management

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### Overview

Federal and State laws require that wastes be properly classified and managed as hazardous waste, solid waste, or universal waste. Waste classification will define the requirements for managing the materials. In general, waste management includes characterization, labeling, storage, transportation, disposal, personnel training, and reporting and recordkeeping.

### Minimum Waste Management Requirements

Prior to working in any Con Edison facility or on any Con Edison project, all contractors must, at a minimum, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental Health and Safety Plan submitted to Con Edison, and include a process to meet these requirements.

- Contractors take title to all wastes generated if so stated in the specifications; however, CON EDISON RESERVES THE RIGHT TO TAKE TITLE TO ALL WASTES GENERATED BY THE CONTRACTOR'S ACTIVITIES AT CON EDISON FACILITIES AND WORK SITES.
- Contractor must have an active EPA waste generator identification for waste disposal.
- Contractor will comply with all applicable requirements for hazardous wastes generated, including:
  - Characterizing the waste, managing accumulated and stored waste.
  - Labeling of containers, storing the waste, inspecting the storage areas.
  - Filling out manifests and Land Disposal Restriction (LDR) forms.
  - Training of personnel concerning the proper procedures to use.
  - Ensuring that waste is disposed at a permitted facility.
  - Ensuring that reports and records are maintained.
- Contractor shall identify the procedures to classify wastes generated at the job site.
- Wastes shall be segregated when stored to prevent mixing of waste types.
- Storing of solid waste dumpsters will be properly maintained, able to store 150% of expected generation, and covered (with lids, doors, and/or tarps).
- Security measures will avoid non-authorized personnel from tampering with wastes.
- Contractor must evaluate the waste generated for recycling, instead of disposing of waste.



## Guide 29: Waste Management

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- Contractor must identify the transportation/disposal firms and their permit numbers to manage and transport Con Edison waste. Only permitted treatment/disposal facilities may be used to receive solid and hazardous wastes generated from a Con Edison job site.
- Department of Transportation (DOT) requirements will be adhered to for waste packaging, shipping, and transport, including container selection and vehicle placards.
- All hazardous and solid waste transporters must have the appropriate permits and certifications prior to hauling waste.
- The contractor shall provide copies of all shipping papers and certificates of disposal that are obtained and prepared for wastes generated at the job site.

### Regulatory Citations

A complete text of the requirements for waste management can be found in:

- Title 40 CFR, US EPA, Parts 172, 173, 260 through 262, 264, 265, and 268;
- Title 6 NYCRR, Parts 360, 364, 367, 370 through 374, and 376;
- Title 6 Rules of the City of New York (RCNY) Chapter 2; Title 16 RCNY Chapter 1;
- Westchester County, Chapter 825 and Westchester County Local Law No. 14-1992;
- Dutchess County Local Law No. 4 of 1990.

### Contacts

For additional information contact the following agencies:

- In five boroughs, contact the NYC Department of Sanitation at 125 Worth Street, NYC, NY 10013 (212-219-8090) [www.ci.nyc.ny.us](http://www.ci.nyc.ny.us) and Region 2 NYSDEC at 47-40 21st Street, Long Island City, NY 11101 (718-482-4900) "[www.dec.state.ny.us](http://www.dec.state.ny.us)".
- Projects in Westchester, Rockland and Dutchess Counties, contact the Region 3 NYSDEC office at 21 South Putt Corners Road, New Paltz, NY 12561 (914-256-3000). Projects in Westchester County, contact the local municipality. Projects in Rockland County, contact the Rockland County Department of Health on Sanatorium Road, Pamonka, NY 10970 (914-634-2500) "[www.co.rockland.ny.us](http://www.co.rockland.ny.us)". Projects in Dutchess County, contact the Dutchess County Health Department, Division of Environmental Health Services in Poughkeepsie, NY 12601 (914-486-3404) "[www.dutchessny.gov](http://www.dutchessny.gov)".



## Guide 32: Work Area Protection

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### Overview

Workers must not only be protected from hazards on the project site but also from hazards generated by nearby operations. Members of the public passing near work areas must also be protected from any site-generated hazards. It is therefore important that all work areas be properly barricaded and posted with warning signs and that signals be used to control nearby vehicle traffic. In addition to OSHA, local agencies may have specific requirements for work conducted in roadways or near pedestrian traffic.

### Minimum Work Area Protection Requirements

In order to perform work on any Con Edison facility or project, all contractors must, at least, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental Health and Safety Plan submitted to Con Edison and include a process to meet these requirements.

- All work areas must be sufficiently barricaded to prevent unauthorized access and limit exposure of the public to work area hazards.
- Accident prevention signs (e.g., "Danger - Keep Out") must be visible when work is being performed and must be covered when hazards no longer exist.
- All signs must conform to the requirements specified by OSHA and be used only for their intended purpose.
- Traffic signs must be placed appropriately to control vehicle traffic on or near project sites and must conform to applicable American National Standards Institute (ANSI) standards.
- Flaggers must be used to control traffic when signs, signals and barricades do not provide the necessary protection.
- Flaggers and workers working near traffic must wear a reflective orange vest approved by the U.S. Department of Transportation.
- Only appropriately trained personnel may act as flaggers.
- Flashing warning lights must be placed on barriers during hours of darkness.
- Caution, warning, and construction information traffic signs must be displayed, as appropriate.
- Construction vehicles or equipment left or parked near a roadway must have appropriate



## Guide 32: Work Area Protection

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warnings displayed or barricades positioned.

- Disabled vehicles must display reflective triangles, warning lights, flags, or flares to warn traffic of their position.
- The arrangement of traffic control devices must be inspected periodically to ensure their effectiveness.
- Barricades must be weighted or supported to prevent their displacement.
- Workers responsible for placing traffic control devices must be trained in the use and placement of these devices.

### Regulatory Citations

A complete text of the requirements for Work Area Protection can be found in Title 29 Code of Federal Regulations, Part 1910, Sections 144 and 145, and Part 1926, Subpart G.

### Contacts

For additional information regarding Work Area Protection requirements or clarification of these requirements, contact:

- The New York regional OSHA office located at 201 Varick Street, Room 670, New York, New York (212-337-2378). The OSHA website can be found at [www.OSHA.gov](http://www.OSHA.gov).
- The New York City Department of Transportation located at 40 Worth Street, Manhattan, New York (212-442-7070).
- The New York State Department of Transportation located at 47-40 21st Street, Long Island City, New York (718-482-4600).



## **Addendum 1**

### **Health and Safety Plan West 18<sup>th</sup> Street Gas Works NYSDEC Site No. V00530**

Addendum Number: 1 Project Number: B0043000.0000  
Date of Changed Conditions: 8/19/2015 Date of Addendum: 8/19/2015

#### **Description of Change that Results in Modifications to HASP:**

A site-specific *Health and Safety Plan* (HASP) has been approved for remedial activities at the Former 18<sup>th</sup> Street Gas Works Site (dated May 2009). This Addendum addresses additional soil boring installation and sampling activities to be conducted within the Bayview Building (550 W. 20<sup>th</sup> Street) basement and addresses necessary changes or updates to the HASP based on the planned additional activities.

#### **1. Utility Clearance**

All utility clearance activities will be performed in accordance with the Con Edison Utility Clearance Process for Intrusive Activities Revision 1A, dated December 31, 2007 (Con Edison, October 2007) and the ARCADIS Utility Location and Clearance Standard (ARCHSFS019) dated February 23, 2015. Soil boring locations will be marked, and a New York City Rules and Regulations Code 753 mark-out will be requested by the drilling subcontractor to locate underground utilities. As part of the utility clearance activities, an initial desktop review of utility drawings, including Con Edison plates, will be followed by a geophysical survey and excavation/clearance of a minimum of 5 feet of soil/fill at boring locations will be performed. The geophysical survey will include the use of ground penetrating radar (GPR) to verify the location of the former holder tank. For any intrusive excavation activities within 7 feet of a critical utility, identified as a 69/138/345KV electric feeder, gas main over 125 psig, or fuel oil line, those utilities shall be exposed first by manual or vacuum excavation methods. The Con Edison Utility Clearance Process Checklist and Procedures (Appendix I), as well as ARCADIS' Utilities and Structures Checklist will be used to document that nearby utilities have been marked on the ground and that the drill site has been cleared. Each checklist will be in the possession of the Site Safety Officer (SSO) prior to commencement of the intrusive investigation at that point of the site.

#### **2. Soil Boring Installation and Sampling Activities**

Eight soil borings (SB-301 through SB-307) will be completed to evaluate subsurface conditions. The proposed locations may be adjusted in the field as necessary based on the location of underground utilities, visual observations/obstructions, overhead lighting/sprinkler systems, or traffic/parking considerations within the basement. Soil borings will not be relocated more than 10 feet from the proposed location without prior consultation with the Con Edison Project Manager. In addition, proposed soil boring locations are subject to review and approval by the property owner and the NYSDEC.



Access into the basement and ceiling height within the building limit the drilling equipment that can be used to install the soil borings. Access doors to the basement exist on \_\_ Street. These doors are approximately \_\_ feet wide and \_\_ feet high. The ceiling within the basement appears to be approximately \_\_ feet high. Given these constraints, the soil borings will be completed using direct push drilling methods.

The first 5 feet of each soil boring (i.e., ground surface to 5 feet below ground surface) will be excavated by non-mechanical means (i.e., hand auger or post-hole digger). Below 5 feet soil samples will be collected continuously from each soil boring. The soil borings will be advanced to 25 feet bgs, or refusal, whichever is encountered first/shallower. Borings not completed in one work day will be surrounded by cones and caution tape, and the facility will be locked.

Soil recovered from each sample interval will be visually characterized (for soil type, grain size, color, texture, and moisture content) and screened with a photoionization detector (PID).

Level D PPE (safety-toe boots, hardhat, safety glasses with attached side shields, long pants and shirts, gloves [nitrile when contacting soil], and ear protection) will be worn as designated in Section 4.2 of the original HASP. The chemicals of concern in soil boring installation and sampling activities are the same as those listed in Section 5.1 of the HASP.

### **Hazard Analysis for Change in Work:** Indoor Soil Boring Installation and Sampling

HAZARD	Site Security; Set up of necessary traffic and public access controls	Level of Risk:	High
Source of Hazard	Struck by vehicle due to improper traffic controls.		
Admin. & Eng. Controls	Use a buddy system for placing site control cones, barricades, and/or signage. Position barricades so that you are protected from moving traffic, and consistent with Con Edison's <i>Work Area Protection and Traffic Control Manual</i> dated May 2014.	PPE:	Steel-toe boots, Class II traffic vest, hardhat, and safety glasses
HAZARD	Utility Clearance	Level of Risk:	High
Source of Hazard	Underground and aboveground utilities could be encountered during drilling activities.		
Admin. & Eng. Controls	Complete utility clearance in accordance with the ARCADIS and Con Edison H&S procedures and guidance documents	PPE:	Steel-toe boots, Class II traffic vest, hardhat, and safety glasses
HAZARD	Noise	Level of Risk:	Medium
Source of Hazard	Noise will be generated during rig operation in the basement.		



Admin. & Eng. Controls	When the engine is used at high RPMs or soil samples are being collected, hearing protection will be worn. Barricades or cones will be used to set a parameter from vehicles and drill rig in the work area. A noise monitor will be used to set the parameter. Employees will not be exposed to noise over 85 dBA over an 8 hour period. As described below, the Noise Mitigation Plan will be maintained and posted on site at all times for the Public to view.	PPE:	Ear plugs and ear muffs
HAZARD	Injury from repetitive motion	Level of Risk:	Low
Source of Hazard	Injuries could results from pinch points on sampling equipment, lifting heavy coolers or equipment, muscle strain from hand augering.		
Admin. & Eng. Controls	Utilize good lifting techniques. Stretch frequently. Situate equipment so pivoting is not required. Use two people to move heavy coolers.	PPE:	Work gloves
HAZARD	Driving early/late	Level of Risk:	High
Source of Hazard	Workers may potentially be driving to or from the site early or late, in poor lighting conditions.		
Admin. & Eng. Controls	Take breaks and switch drivers as necessary. Make sure vehicle is in proper working condition. Do not use cell phone while driving.	PPE:	Seatbelt
HAZARD	City driving	Level of Risk:	High
Source of Hazard	Workers will be driving field vehicles in city driving conditions.		
Admin. & Eng. Controls	Stay alert. Take a map. Pre-plan driving routes.	PPE:	Smith System 5-keys, seatbelt.
HAZARD	Drums and Containers	Level of Risk:	Low
Source of Hazard	Soil cuttings or decon water exposure from leaking drum.		
Admin. & Eng. Controls	Drums are to be covered and sealed to limit potential vapors. When not actively being used, drums will be staged within the Haven Plaza garage in an area agreed upon by Con Edison, ARCADIS, and Haven Plaza management. It is anticipated that the drum(s) will be staged against a wall, out of normal traffic flow patterns. The drum(s) will be placed on plastic and secured with cones and flagging tape. The drum(s) will be picked up for off-site disposal on the last day of investigation activities.	PPE:	Drum dolly
HAZARD	Cold/Heat Stress	Level of Risk:	High
Source of Hazard	There is potential for cold stress during winter months and heat stress during summer months.		



Admin. & Eng. Controls	Wear the appropriate clothing during winter months. Wear light colored clothing during summer months. Take breaks when appropriate during the summer, drinking water and sport drinks.	PPE:	Appropriate clothing. Warm clothing in layers for cold weather.
HAZARD	Exhaust from hydraulic power unit	Level of Risk:	Low
Source of Hazard	Vapors from running equipment (hydraulic power unit) in the work area		
Admin. & Eng. Controls	Exhaust from the gas engine on the hydraulic power unit will be actively vented away from working location; preferably outside, using flexible hosing, to a location not occupied by the public (e.g., barricaded garage ramp/entrance). Access doors will be opened to promote ventilation. Cones will be placed in open doors to eliminate pedestrian traffic. A hand-held meter will be used to monitor O <sub>2</sub> , CO, CO <sub>2</sub> , and LEL within the work area. Where possible, the hydraulic power unit will be set up outside and hydraulic hosing will be run to the portable drill rig.	PPE:	None
HAZARD	Dust Control; Dust from saw cutting and/or drill rig operation	Level of Risk:	Medium
Source of Hazard	Potential exposure to dust generated during saw cutting and/or portable drill rig operations.		
Admin. & Eng. Controls	During saw cutting and portable drill rig operations, dust monitoring will be performed as required in the CAMP. Dust will be controlled using a water suppression spray. If water suppression is not sufficient, work will be stopped and PPE will be upgraded or other dust suppression methods employed (pre-wetting area, alternate cutting/clearing methods, etc.)	PPE:	Eye protection, steel-toe boots, hardhat, ear protection, and gloves.

## 2.1 Noise Monitoring

Noise monitoring may be conducted during drilling operations. Hearing protection is mandatory for all employees in noise hazardous areas, such as around saw cutting and drilling equipment. As a general rule, sound levels that cause speech interference at normal conversation distance should require the use of hearing protection. Where ambient sound levels cause speech interference, hearing protection will be mandatory. Barricades/cones will be used to establish a parameter around the work zone; however, it is anticipated that the basement will be vacant during the entire duration of investigation activities. It is not anticipated that noise levels will exceed 85 dB outside the building where the closest public exposure would exist. If noise levels exceed 85 dB outside the building, the Contractor will be required to provide noise mitigation (e.g., shroud, barrier walls, etc.). In addition, appropriate noise mitigation procedures per Con Edison's Corporate Environment Health and Safety Procedure (CEHSP) E08.02 – *Noise Construction and Utility Activities* (Appendix H) will be followed.



## 2.2 Air Monitoring

Air and dust monitoring requirements have been established in the Section 6 of the original HASP. The benzene action level for upgrading to level C PPE has been updated to 0.5 ppm and the revised Table 6-1 is provided below:

**Table 6-1  
Airborne Contaminant Action Levels**

Parameter	Reading	Action
Total Organic Vapors	0 ppm to $\leq$ 1 ppm	Normal operations; hourly breathing zone monitoring; continuous monitoring during soil intrusive activities.
	> 1 ppm to 5 ppm	Normal operations; continuous monitoring; screen for benzene with colorimetric tubes at these concentrations if readings are sustained for more than 15 minutes; investigate cause of reading and initiate controls if feasible
	$\geq$ 5 ppm to $\leq$ 10 ppm	Normal operations; continuous monitoring; screen for benzene with colorimetric tubes; investigate cause of reading and initiate controls if feasible
	$\geq$ 10 ppm to $\leq$ 50 ppm	Upgrade to Level C PPE; screen for benzene with colorimetric tubes; investigate cause of reading and initiate controls if feasible
	> 50 ppm	Stop work; investigate cause of reading; initiate controls before resuming work
Benzene (colorimetric tube)	< 0.5 ppm	Normal operations
	$\geq$ 0.5 ppm to 5 ppm	Upgrade to Level C PPE
	> 5 ppm	Stop work; investigate cause of reading
Total Particulates <sup>2</sup>	$\leq$ 0 to 0.100 milligrams per cubic meter (mg/m <sup>3</sup> )	Normal operations
	>0.100 mg/m <sup>3</sup> above background, or visible airborne dust.	Initiate wetting of work area to control dust; upgrade to level C if dust control measures do not control dust within 15 minutes, monitor downwind impacts.
	>0.15 mg/m <sup>3</sup> in worker breathing zone or at downwind perimeter of work area.	Stop work; investigate cause of reading; contact PM and HSO.
Carbon Monoxide	0 ppm to <10 ppm	Normal operations.
	10 ppm to <20 ppm	Normal operations; evaluate sources of carbon monoxide and implement additional ventilation of work area.
	20 ppm	Stop work.
Flammable Vapors LEL	< 10% LEL	Normal operations; investigate any positive readings above and initiate controls if feasible
	> 10% LEL	Stop work; ventilate area; investigate source of vapors.
Oxygen	< 19.5 %	Stop work; evacuate work area, investigate cause of reading; ventilate area; contact C. Webster.
	> 19.5% to < 23.5 %	Normal operations.
	> 23.5 %	Stop work; evacuate work area; investigate cause of reading; ventilate area; contact C. Webster.
Hydrogen Sulfide	0 ppm to < 5 ppm	Normal operations.
	> 5 ppm	Stop work; evacuate work area, investigate cause of reading; ventilate area; contact C. Webster.

## 3.0 Near-Miss Reporting Hotline

The Near-Miss Reporting Hotline referenced in section 2.8 of the original HASP has been discontinued and has not been replaced. Near-misses will be reported immediately to the



ARCADIS Project Manager, recorded on the Incident/Near-Miss Investigation Report form provided in Attachment D and entered into the 4-Sight database as soon as possible.

#### 4.0 Updated Contact List

HASP Table 2-1 has been updated to reflect current project contacts and the updated Table 2-1 is provided below.

**Table 2-1  
Key Personnel**

<b>Title/Role</b>	<b>Name</b>	<b>Mailing Address</b>	<b>Phone</b>
Con Edison Project Manager	Neil O'Halloran	31- 01 20 <sup>th</sup> Avenue Building 136 Long Island City, NY 11105	718.204.4145
<b>ARCADIS</b>			
Corporate Health and Safety Manager	Charles Webster	6723 Towpath Road Syracuse, NY 13214	315.671.9297
Project Manager	Adam Etringer	855 Route 146, Suite 210, Clifton Park, NY 12065	518.250.7314
Health and Safety/Site Supervisor	Loretta Kwong	655 Third Avenue, New York, NY 10017	415.744.4906
<b>Subcontractors</b>			
Zebra Technical Services, LLC.	David Vines	30 North Prospect Ave, Lynbrook, NY 11563	516.596.6300
NAEVA Geophysics, Inc.	Mark Weis	225 N. Route 303, Suite 102 Congers, NY 10920	845.268.1800
DPK Consulting, LLC	Steven D. Parent	147 Union Avenue, Suite 1, Middlesex, NJ 08846	732.764.0100
Test America	Anthony Massa	118 Boss Road, Syracuse, NY 13211	315.431.0171
Alpha Analytical Laboratories, Inc.	Liz Porta	320 Forbes Blvd., Mansfield, MA 02048	508.844.4124
Clean Venture	David Quinones	36 Butler Street Elizabeth, NJ 07206	908.354.0210
<b>Regulatory Agency Personnel</b>			
William Ottaway	NYSDEC Division Environmental Remediation	625 Broadway Albany, NY 12233	518.402.9686



## 5.0 Updated Con Edison Forms and Procedures

Attachment G (attached) has been updated to reflect the current version of Con Edison EH&S Hazard Analysis for Contractor Work and should replace Attachment G in the original HASP.

The following updated attachments will be added to the HASP and have been attached to this addendum:

- H Con Edison's Corporate Environmental Health and Safety Procedure (CEHSP)  
A32.00.01 – Rules We Live By and Con Edison CEHSPs
- I Con Edison Utility Clearance Process Checklist and Procedures/ARCADIS Utility  
Location and Clearance Standard

Signed:   
Adam Etringer  
Project Manager

Signed:   
Charles Webster  
Corporate H&S Manager



**Appendix E – Generic Community Air Monitoring Plan**





## Appendix 1A

### New York State Department of Health Generic Community Air Monitoring Plan

#### Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

#### Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

**Continuous monitoring** will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

**Periodic monitoring** for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or



overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

### VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.
4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

### Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.



1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter ( $\text{mcg}/\text{m}^3$ ) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed  $150 \text{ mcg}/\text{m}^3$  above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than  $150 \text{ mcg}/\text{m}^3$  above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within  $150 \text{ mcg}/\text{m}^3$  of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009



## **Appendix 1B**

### **Fugitive Dust and Particulate Monitoring**

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.
2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.
3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM<sub>10</sub>) with the following minimum performance standards:
  - (a) Objects to be measured: Dust, mists or aerosols;
  - (b) Measurement Ranges: 0.001 to 400 mg/m<sup>3</sup> (1 to 400,000 :ug/m<sup>3</sup>);
  - (c) Precision (2-sigma) at constant temperature: +/- 10 :g/m<sup>3</sup> for one second averaging; and +/- 1.5 g/m<sup>3</sup> for sixty second averaging;
  - (d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
  - (e) Resolution: 0.1% of reading or 1g/m<sup>3</sup>, whichever is larger;
  - (f) Particle Size Range of Maximum Response: 0.1-10;
  - (g) Total Number of Data Points in Memory: 10,000;
  - (h) Logged Data: Each data point with average concentration, time/date and data point number
  - (i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
  - (j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
  - (k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
  - (l) Operating Temperature: -10 to 50° C (14 to 122° F);
  - (m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.
4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.
5. The action level will be established at 150 ug/m<sup>3</sup> (15 minutes average). While conservative,



this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m<sup>3</sup>, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m<sup>3</sup> above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m<sup>3</sup> continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM<sub>10</sub> at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

- (a) Applying water on haul roads;
- (b) Wetting equipment and excavation faces;
- (c) Spraying water on buckets during excavation and dumping;
- (d) Hauling materials in properly tarped or watertight containers;
- (e) Restricting vehicle speeds to 10 mph;
- (f) Covering excavated areas and material after excavation activity ceases; and
- (g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m<sup>3</sup> action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.



Appendix F – Site-Wide Inspection Form





# Property-Wide Inspection Form

## Former West 18<sup>th</sup> Street Gas Works

### 550 West 20<sup>th</sup> Street

### New York, New York

Date: \_\_\_\_\_

Temperature: \_\_\_\_\_

Personnel: \_\_\_\_\_

Weather Conditions: \_\_\_\_\_

Arrival Time: \_\_\_\_\_

Departure Time: \_\_\_\_\_

Inspection Checklist	Yes	No	Comments
<b>Soil Cover System</b>			
<i>Intrusive Activities Being Performed?</i>			
- Trenching?			
- Excavation?			
- Tunneling?			
- Saw cutting?			
- Other?			
<i>Signs of Previous Soil Disturbance?</i>			
- New underground utility or drainage feature?			
- New aboveground feature?			
- New grass or vegetation?			
- Other?			
<b>Groundwater Monitoring Wells</b>			
- Well ID clearly marked?			
- Concrete pad intact?			
- Curb box / well cover present?			
- All bolts present on flush-mount well covers?			
- Ground surface slopes away from well (with no ponded water at well location)?			

#### **Instructions:**

- Soil Cover System Inspection:** For any inspection item where a box is checked "yes", identify the location of the observed condition on a site plan, take a photograph(s) to document the condition, and document the size of the affected area in the "comments" field above.
- Groundwater Monitoring Well Inspection:** For any inspection item where a box is checked "no", identify the well ID in the comments section and take a photograph(s) to document the condition.
- General:** Take photographs from each of the four corners of the soil cover system (each photo facing diagonally across to the opposite corner) and take representative photographs showing conditions elsewhere around the Property.