57 Alexander Street

Yonkers, New York 10701
NYSDEC Index No. C360194-12-19

PREPARED FOR

57 Alexander Developer LLC
c/o Rose Associates, Inc.
777 Third Avenue
New York, New York 10017

PREPARED BY

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Certification

I, Jessica S. Collins, certify that I am currently a Qualified Environmental Professional as defined in 6 NYCRR Part 375 and that this Remedial Investigation Work Plan was prepared in accordance with all applicable statutes and regulations in substantial conformance with the Technical Guidance for Site Investigation and Remediation, dated May 2010 (DER-10).

Jessica S. Collins	March 6, 2020	
Qualified Environmental Professional	Date	Signature

1 Introduction

1.1 Purpose

VHB Engineering, Surveying, Landscape Architecture and Geology, P.C. (VHB) has prepared this Remedial Investigation Work Plan (RIWP) on behalf of 57 Alexander Developer LLC and 57 Alexander JV LLC (the Volunteers) for the 57 Alexander Street site located at 47-71 Alexander Street, in the City of Yonkers, New York (BCP Site No. C360194, or the Site). The Site comprises the upland portions of four (4) contiguous tax lots identified as Block 2605, Lot 51, and Block 2610, Lots 50, 53, and 73 on the Westchester County Tax Maps, encompassing an area of approximately 4.26 acres (surveyed to the existing bulkhead). The Site will be investigated and properly remediated under the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP). The planned redevelopment of the Site entails the construction of a multi-family residential building consisting of 440 housing units, as well as community and open/recreational space, and a lower-level at-grade parking garage. A Site Location Map (topographic map) is provided in Appendix A as Figure 1.

The Volunteer submitted a NYSDEC BCP application in October 2019 and was accepted into the program as a Volunteer in December 2019. The Brownfield Cleanup Agreement (BCA) was fully executed on January 7, 2020, and Index #C360194-12-19 was assigned to the Site. The BCA was subsequently amended to add the current owner, 57 Alexander Developer LLC as a Volunteer.

This RIWP was developed in accordance with the DER-10 Technical Guidance for Site Investigation and Remediation, dated May 2010 (DER-10), and has been prepared to achieve the following objectives:

- Characterize and delineate the nature and extent of soil, groundwater, and soil vapor contamination on the Site;
- Identify potential point sources of contamination;
- Assess the impact of the contamination on public health and the environment; and
- Collect sufficient data to determine the remedial action necessary to protect human health and the environment.

1.2 Project Team Organization

The project team organization and contact information is provided below:

Environmental Consultant:

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The geophysical survey contractor, drilling contractor and analytical laboratory have not yet been selected for this project. Upon selection, this information will be provided to the NYSDEC prior to the start of field activities.

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Site Background

This section provides pertinent background information, including a description of the Site and its setting, the history of the Site, and the results of previous environmental work conducted at the Site.

2.1 Property Description

As previously indicated, the Site consists of the landward portions of four parcels more definitively described as three rectangular and one irregularly-shaped contiguous tax parcels located on the west side of Alexander Street between Ashburton Avenue to the north and Wells Avenue to the South, and the Hudson River to the west, in the Getty Square section of the City of Yonkers, Westchester County, State of New York. The Site is identified by the following addresses:

Parcel Address	Section No.	Block No.	Lot No.	Acreage
71 Alexander Street	2	2610	P/O 50	0.59
65 Alexander Street	2	2610	P/O 53	0.69
57 Alexander Street	2	2610	P/O 57	1.05
47 Alexander Street	2	2605	P/O 51	1.93

The Site is located in an urban area and zoned for industrial use. In May 2009, the City of Yonkers adopted the Alexander Street Master Plan and Urban Renewal Plan for the entire Alexander Street corridor. These plans permit residential development with a Planned Urban Development (PUR) Special Use Permit, pursuant to Zoning Resolution No. 58-2019,

adopted by the City Council on May 14, 2019. The Alexander Street Master Plan is a conceptual land use plan that established a framework for the redevelopment of a critical segment of Yonkers' Hudson River waterfront. The Master Plan laid out a new roadway system to create development blocks within which a mix of residential, retail, commercial, and open space uses are contemplated. Overall, the Master Plan reflects a vision of the Alexander Street waterfront area as a transit-oriented development that is a vibrant mixed-use district of residences and parks.

The Master Plan also ties together several planning initiatives including the November 2008 City of Yonkers Alexander Street Urban Renewal Plan and a City of Yonkers Brownfield Opportunity Area Plan. We note that although adopted by the City of Yonkers, the Brownfield Opportunity Area Plan has not received certification by the NYS Department of State. The planned redevelopment of the Site is consistent with the goals of these plans.

2.1.1 Current Occupancy and Property Use

The Site is currently improved with six industrial/manufacturing warehouse buildings, an attached sales office/caretaker residence, one condemned former residence/ former Hudson Pilot dispatch office, and two storage sheds. The industrial warehouse buildings were most recently utilized for assembling, renting, and repairing stage lighting equipment as well as storage. The remaining portions of the Site are improved with asphalt-paved parking areas, landscaped areas, including a private dog-run, and three wooden piers extending off site into the Hudson River. Access to the Site can be obtained via three curb-cuts along Alexander Street or via the piers/docks on the Hudson River.

As of the anticipated date of the RI implementation, the Site is expected to still be occupied by the stage lighting assembly operations (the area of former school bus parking has been vacated). Coordination with the Site operator will ensure that in areas of planned sampling, exclusion zones will be set up to both protect the health and safety of onsite workers, and the sampling team and their subcontractors. Because of the active business activities at the Site, access to the site via the three curb-cuts cannot be obstructed—therefore, as planned for areas of high activity, the RI work zones will be cordoned off by safety cones and/or caution tape, or similar. Access to the private dog-run and three wooden piers is secured by locked six-foot chain-linked fencing and is not available to the public.

2.1.2 Utilities

Electricity is available via overhead distribution lines. Telephone is available via overhead distribution lines. Natural gas service is available via underground distribution lines. Sanitary wastes generated at the Site discharge into the City of Yonkers municipal sewer system. Stormwater generated at the Site discharges into storm drains onsite.

Potable water is provided to the Site by the City of Yonkers.

2.1.3 Proposed Development

The proposed development project includes the demolition of existing structures across the upland portions of four contiguous lots comprising 87,120 square feet (sf), and subsequent construction of a seven-story multi-family residential apartment building containing a ground-floor parking garage and lobby, mail room, rubbish room, and package room, second-floor parking garage and residential units along the exteriors of the building, and five upper floors comprising residential units and common area space. The development as a whole will contain 440 residential units. The residential building will consist of three sections connected through common hallways running parallel to Alexander Street. Separating each section will be two outdoor courtyards. A publicly accessible esplanade will be constructed along the shoreline of the Hudson River that will connect to the esplanade running along the adjacent parcels, in conformance with the Alexander Street Master Plan.

2.2 Site Geology and Hydrogeology

2.2.1 Elevation

The topography of the Site and surrounding area was reviewed from the USGS 7.5-minute series topographic map for the Yonkers, New York Quadrangle. In addition, VHB was provided with a survey of the Site completed by Aristotle Burnazos, P.C., dated September 10, 2018. According to the aforementioned resources, the Site has a topographic elevation ranging between 2.1 feet above mean sea level (ft amsl) to 11.87 ft amsl, sloping down toward the Hudson River to the west.

2.2.2 Surface Water Bodies and Wetlands

A portion of each of the four tax parcels comprising the Site is land under the Hudson River. These underwater lands are westward of the existing bulkhead and are improved with pilings/piers, and are not included as part of the Site. No additional surface water bodies are located on or adjacent to the Site.

According to the NYSDEC Tidal Wetlands Map No. 592-532, the nearest tidal wetlands are located adjacent to the west of the Site and are associated with the Hudson River. The NYSDEC classifies these features under the Littoral Zone tidal wetland category, which includes all lands under tidal waters less than six feet deep at mean low water that are not included in any other wetland category.

According to the NYSDEC Freshwater Wetlands Maps, there are no freshwater wetlands under NYSDEC jurisdiction on the Site. In addition, there are no freshwater wetlands located within one mile of the Site.

Potential federal wetlands were identified from the U.S. Fish and Wildlife Service (USFWS) Wetlands Mapper software and National Wetlands Inventory. According to available information, the nearest potential federally-regulated wetland is located adjacent to the west of the Site and identified as the Hudson River. The USFWS classifies these wetlands as E1UBL, which are defined as estuarine, sub-tidal wetlands with unconsolidated bottoms.

Federal Emergency Management Agency (FEMA) Floor Insurance Rate Maps (FIRMs) were reviewed to determine if the Site is located within the 100-year or 500-year flood zones. The FIRM showing the Site (No. 36119C0309F) indicates that portions of the Site are located with the flood zone AE with a base flood elevation determined at seven ft amsl. This indicates that there is a significant risk of flooding at the Site under current conditions.

2.2.3 Depth to the Water Table

Groundwater was encountered during a Phase II ESA performed by VHB in October 2018, between five and nine feet below grade surface (ft bgs). It should be noted that as the Hudson River is tidal in this area, the depth to groundwater beneath the Site is likely tidally influenced and varies. However, it should also be noted that the western perimeter of the landward portion of the Site is currently improved with a bulkhead, which may affect the tidal fluctuations beneath the Site.

2.2.4 Groundwater Flow Direction

Groundwater flow typically mimics surface topography and flows toward the nearest surface water body. As such, groundwater beneath the Site is expected based upon topography to generally flow to the west, toward the Hudson River. Information obtained during a previous environmental investigation of the Site indicated groundwater elevations were previously triangulated and confirmed to flow to the west.

2.2.5 Soils

Previous Site investigation activities, including the 2018 VHB Phase II ESA and a Geotechnical Report on Subsurface Soil and Foundation Investigation, dated October 11, 2019, prepared by Carlin-Simpson & Associates, identified the presence of fill material at the Site from beneath the asphalt layer to depths ranging from 17 to 22.5 ft bgs. Below the existing fill is soft gray silty clay, with shells and organics, presumed to be river bed sediments extending to depths ranging from 55 to 80 ft bgs. Underlying the river bed sediments are layers of sand, silt, clay, gravel, cobbles, and boulders extending to depths ranging from 75 to 130 ft bgs, and presumed to be glacial till. This is underlain by Gneiss bedrock ranging from 75 to 106 ft bgs.

2.3 Historical Site Use

The history of the Site has been established dating back to 1898, when the Site was improved with structures along the historic Hudson River shoreline pertaining to boat storage and maintenance on the western and southwestern portions of the Site. By 1917 the western half of the Site was filled to its approximate current configuration. It appears that a bulkhead has been in place since at least 1917. From at least 1942, the Site was improved with multiple structures associated with manufacturing, multiple automotive repair shops, machine shop, boat storage, and most recently, stage lighting manufacturing. Former underground storage tanks (USTs) were located on the central and northwestern portions of the Site and have impacted the subsurface. Two closed NYSDEC Spill Nos. 07-02708 and 12-

03845 are related to impacts from these USTs. According to historic records, during tank removal activities, approximately 38 tons of fuel oil-impacted soil were removed from the Site and disposed off-site in July 2007. Post-excavation soil and groundwater samples exhibited evidence of residual contamination, however the spill incidents were closed administratively.

2.4 Previous Environmental Investigation

2.4.1 VHB Phase II ESA

VHB conducted Phase II ESA activities at the Site on October 9, 10 and 11, 2018, which were summarized in a Phase II ESA Report, dated February 26, 2019. The Phase II ESA included the installation of 16 soil borings and the collection of multi-depth soil samples from each boring location, as well as the collection of ten (10) groundwater samples, two (2) sediment samples, and two (2) soil vapor samples. The results of the Phase II ESA are summarized below:

Soil

Sixteen soil borings were pre-cleared during the geophysical survey. The soil borings were installed utilizing a Geoprobe® 7822DT direct push rig. All field equipment associated with the Geoprobe® was decontaminated between boring locations using an Alconox detergent/potable water wash and potable water rinse. The soil borings were advanced to a depth of 10 feet bgs, below the average depth to groundwater. Continuous soil samples were collected utilizing factory-new macrocore soil sampling tubes from each soil boring location from the surface to the terminal boring depth. A total of 32 soil samples were collected and submitted for laboratory analysis in association with the 16 soil borings. Specifically, two (2) samples were collected from each boring from zero-to-two feet bgs and eight-to-ten feet bgs. Soil impacts were observed and evaluated for suspect characteristics (e.g., staining, odors, PID responses, etc.) in the field.

All soil samples were collected in accordance with NYSDEC DER-10, and were transferred directly into laboratory-supplied glassware, stored in an ice-packed cooler and transported to York, an NYSDOH ELAP and NELAP-approved laboratory under appropriate chain-of-custody protocols. Soil samples were analyzed for the following analyses:

- TCL VOCs using USEPA Method 8260;
- TCL SVOCs using USEPA Method 8270;
- TAL metals using USEPA Method 6010 and 7471;
- Pesticides using USEPA Method 8081; and
- PCBs using USEPA Method 8082.

Soil sample analytical results were compared to the 6 NYCRR §375-6.8(a) Unrestricted Use Soil Cleanup Objectives (UUSCOs) (aka Track One SCOs) and NYSDEC 6 NYCRR § 375-6.8(b) Restricted Use Restricted Residential SCOs (RRSCOs). Soil analytical results are provided in the Phase II ESA as Appendix B of this RIWP.

Arsenic, cadmium, lead, and mercury were detected in shallow and deep soil across the Site at concentrations in excess of RRSCOs, with maximum concentrations of 17.5 mg/kg (arsenic), 10.5 mg/kg (cadmium), 2,100 mg/kg (lead), and 27.4 mg/kg (mercury). VOCs, specifically BTEX constituents, were detected in soil at concentrations in excess of RRSCOs, specifically maximum concentrations of 1,2,4-trimethylbenzene at 740 mg/kg, 1,3,5-trimethylbenzene at 180 mg/kg, benzene at 200 mg/kg, ethylbenzene at 360 mg/kg, naphthalene at 14,000 mg/kg, and xylenes at 1,000 mg/kg. SVOCs, specifically polycyclic aromatic hydrocarbons (PAHs) ranging in concentration from 11 mg/kg (indeno[1,2,3-cd]pyrene) to 1,400 mg/kg (naphthalene). PCBs were detected in soil at concentrations ranging from 0.464 mg/kg to 51.8 mg/kg, significantly exceeding RRSCOs. Dieldrin was detected in soil at concentrations ranging from 0.01 mg/kg to 2.93 mg/kg. Two onsite storm drains with the potential to drain in-situ, were sampled and analyzed during the Phase II investigation. No metals were detected in either of the two (2) on-site storm drains exceeding their respective UUSCOs. VOCs were detected at concentrations exceeding their respective UUSCOs in each storm drain. In addition, storm drain SD-2 contained concentrations of VOCs exceeding their respective RRSCOs, specifically the chlorinated VOCs, 1,1,1-trichloroethane, cis-1,2-dichloroethene, trichloroethene and vinyl chloride. Furthermore, SVOCs were detected in both storm drains, exceeding their respective UUSCOs and/or RRSCOs.

Groundwater

Ten (10) groundwater samples were collected from temporary monitoring wells at the Site during the Phase II ESA in order to determine representative groundwater conditions.

Groundwater samples were analyzed for the following:

- TCL VOCs using USEPA Method 8260;
- TCL SVOCs using USEPA Method 8270;
- TAL metals (total and dissolved) using USEPA Methods 6010 and 7471;
- Pesticides using USEPA Method 8081; and
- PCBs using USEPA Method 8082.

Groundwater sampling results were compared to the NYSDEC Technical and Operation Guidance Series (TOGS) 1.1.1 list of Ambient Water Quality Standards and Guidance Values (AWQSGVs) and Groundwater Effluent Limitations, June 1998. Three VOCs were detected in groundwater samples, specifically 1,2,34,5-tetramethylbenzene at maximum concentration of 56 ug/L, benzene at 1.3 ug/L, and sec-butylbenzene at 5.6 ug/L, slightly to moderately exceeding their respective AWQSGVs. PAHs were detected in groundwater at concentrations ranging from 2.7 ug/L to 39 ug/L, significantly exceeding the AWQSGVs. Pesticides, specifically chlordane and dieldrin were detected in groundwater at maximum concentrations of 2.01 ug/L and 0.02 ug/L, respectively, exceeding AWQSGVs. PCBs were detected in groundwater ranging from 0.732 ug/L to 6.15 ug/L, significantly exceeding the AWQSGVs.

Soil Vapor

Consistent with NYSDOH guidance governing soil vapor intrusion, a soil vapor investigation

of the Site was conducted during the Phase II ESA subsurface investigation to determine if a vapor encroachment condition (VEC) is present. VHB collected one (1) sub-slab soil vapor sample beneath one of the onsite buildings, one (1) soil vapor sample at five-feet bgs located to the south of the building, and one (1) ambient indoor air sample located within the building at the same location as the sub-slab sample. The soil vapor samples were analyzed for VOCs using USEPA Method TO-15.

The analytical results were compared to the New York State (NYS) Homes – Indoor 1997 to 2003 reference values provided in *Final NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York*, October 2006, as revised in 2017 (hereinafter, the "NYSDOH Guidance"). Several chlorinated VOCs that are addressed in the decision matrices included in the NYSDOH Guidance, including 1,1,1-trichloroethane, methylene chloride, tetrachloroethene, and trichloroethene, were detected in the soil vapor samples and the indoor air sample. Based upon these vapor concentrations, the NYSDOH guidance recommends "No Further Action" for the majority of these compounds at the detected concentrations. However, according to NYSDOH Matrix B, TCE concentrations identified in sub-slab sample and the corresponding indoor air sample indicate that "Monitor" is recommended. It should also be noted that the sampling was conducted prior to the start of the heating season, so it is likely that detections of VOCs in soil vapor/indoor air are artificially low.

The Phase II ESA soil, groundwater, and soil vapor sampling results are shown on Figures 2, 3, and 4, respectively.

3

Remedial Investigation

VHB, on behalf of the Volunteers, has developed a Remedial Investigation (RI) scope of work presented in this RIWP that is intended to satisfy NYSDEC BCP requirements based on the anticipated future use of the Site. Data collected during the RI will determine the basis for remedial actions for the Site.

Standards, Criteria, and Guidance (SCGs) for soil at BCP Sites are the numerical SCOs presented in NYCRR 375-6.8. The SCOs are categorized into unrestricted use criteria and restricted use (residential, restricted-residential, commercial, or industrial) criteria, as well as criteria for the protection of groundwater (PGW) and ecological resources. The applicability of each category of SCOs is determined based upon the reasonably anticipated future use of the Site, as well as cleanup tracks being evaluated. The anticipated redevelopment for the Site is a multi-family residential building with community and open/recreational space, so the applicable SCOs are the RRSCOs, and PGW SCOs for those contaminants detected in groundwater. If a Track 1 remedy is contemplated the applicable standards are the UUSCOs.

Although the groundwater beneath the Site is not used as a drinking water source, based upon the evaluation of the current groundwater data discussed previously, the NYSDEC AQQSGVs – TOGS 1.1.1 will be considered.

For evaluating chlorinated solvent soil vapor, the NYSDOH Guidance will be considered. With respect to petroleum-related vapors, VHB will also evaluate the final data in relation to the June 2015 USEPA Soil Vapor Guidance documents, in light of the fact that the State of New York has not yet developed soil vapor guidance for petroleum hydrocarbons.

3.1 Objectives

Previous Site investigations have documented the following areas of concern (AOCs):

- Presence of soil, groundwater, and soil vapor contamination due to the former usage and structures present at the Site (e.g., boat maintenance and storage, manufacturing, multiple automotive repair shops, filling station, machine shop, glove factory, and stage lighting assembly and repair);
- Presence of soil and groundwater contamination due to historical fill material;
- Potential onsite migration of contaminants of concern in soil, groundwater, and soil vapor from surrounding properties (i.e., potential presence of NAPL, etc.);

Based on the existing data for the Site and known data gaps, the following objectives have been identified for the RIWP:

- Further delineate the nature and extent of impacts to soil from AOCs described above;
- Further delineate the nature and extent of impacts to groundwater;
- Further evaluate soil vapor quality within the Site and potential for offsite migration;
- Identify and delineate potential additional AOCs.

The RI will be conducted in accordance with 6 NYCRR Part 375 BCP regulations and in general conformance with DER-10 and will evaluate onsite soil, groundwater, and soil vapor impacts. The environmental data collected during the RI will be used to qualitatively assess the potential exposure of receptors to Site contaminants and develop the information necessary to support the development of a Remedial Action Work Plan (RAWP).

3.2 RI Scope

The scope of the RI will include the collection of data so that, together with the historical data, the entire Site will be sufficiently characterized to support the development of the Site-wide RAWP. To accomplish this, the scope of work for the RI will include the following:

- The advancement of soil borings, installation of temporary groundwater monitoring wells, and installation of soil vapor points;
- The collection of soil, groundwater, and soil vapor data sufficient to define the nature and extent of impacted media and current Site conditions;
- The performance of a qualitative exposure assessment (EA) to identify exposure pathways and evaluate contaminant fate and transport.

All investigation activity will be conducted in accordance with the applicable requirements of the NYSDEC DER-10. All soil and groundwater samples collected from the soil and groundwater investigation described in detail below will be analyzed for the Target Compound List (TCL) plus 30/ Target Analyte List (TAL)/ and Emerging Contaminants (EC) (TCL + 30/TAL/EC) list of parameters including:

- TCL VOC + 10 Tentatively identified compounds (TICs) using United States Environmental Protection Agency (USEPA) Method 8260C;
- TCL Base neutral acids (BNA)/SVOCs + 20 using USEPA Method 8270D;
- TCL Pesticides using USEPA Method 8081B;
- TCL PCBs using USEPA Method 8082A;
- TAL Metals (including hexavalent chromium) using USEPA Methods 6010D/7471B and USEPA Methods 3060A/7196A;
- 1,4-dioxane using USEPA Method 8270 selected ion monitoring (SIM); and
- NYSDEC List of 21 polyfluoroalkyl substances (PFAS) compounds (as referenced in the NYSDEC January 2020 Emerging Contaminants Guidance) using modified USEPA Method 537.

Soil samples will also be collected for geologic logging in accordance with the Unified Soils Classification System (USCS) and for visual inspection for evidence of contamination including staining and/or odors.

As required by NYSDEC, groundwater samples from a set of monitoring wells representing upgradient and downgradient locations onsite will also be analyzed for emerging contaminants (ECs) 1,4-Dioxane and Per- and Polyfluoroalkyl Substances (PFAS), which include the 21 compounds listed in the NYSDEC June 2019 Emerging Contaminants Guidance Memo. All soil samples to be analyzed for TCL + 30/TAL will also be sampled for ECs.

All soil vapor air samples will be analyzed using USEPA Method TO-15 for VOCs.

All data will be produced in accordance with NYSDEC Analytical Services Protocol (ASP) Category B deliverables and will be reviewed and validated by an independent party in a Data Usability Summary Report (DUSR) before being incorporated into the RI Report (RIR) for the Site. All data will be submitted to NYSDEC in electronic format, in accordance with DER-10, Section 1.15.

The overall scope of each component of the RI is discussed in the following subsections. Detailed field sampling procedures are provided in the Quality Assurance Project Plan/Field Sampling Plan (QAPP/FSP) in Appendix C. The proposed sampling locations are shown on Figure 5 of this RIWP and additional information, including intervals to be sampled and sample rationale, is provided in the sections below.

3.2.1 Site Reconnaissance

VHB has performed a Site inspection and has identified potential AOCs as part of the Phase II ESA, as described in Section 3.1, which will be targeted during the RI. A geophysical survey of the Site will be performed. If unanticipated field constraints are encountered, minor location changes will be made to accommodate as necessary.

3.2.2 Soil Investigation

In the February 2019 Phase II ESA, VHB collected soil data throughout the Site in a manner consistent with DER-10. The additional soil investigation proposed as part of this RI will supplement that data and enable a more refined delineation of Site conditions. In order to incorporate the prior soil data into the RIR, a DUSR will be prepared to validate all prior data and confirm that it meets applicable data quality objectives.

To characterize the soil conditions for AOCs at the Site and fill existing data gaps in vertical and horizontal delineation of contamination, 32 soil borings will be installed at the locations shown in Figure 5 and indicated below. Samples will be collected from surficial soils, i.e., 0 to 2 ft below grade surface (bgs), the two-foot interval above observed groundwater table, and the most impacted two-foot interval, if encountered.

The soil borings will be installed utilizing a GeoProbe® Direct-Push Drill Rig. Soil samples will be collected continuously from land surface to the water table (and in some locations to the historic river bed sediments), as shown below. During installation of the soil borings, the lithology will be recorded, and soil will be inspected for visual or olfactory evidence of contamination and field screened continuously for VOCs using a photoionization detector (PID) with a 10.6 eV lamp.

Soil borings will be advanced to characterize soil in the following locations at the Site:

Table 1 – Soil Sample Rationale

Locations	Sample Depth Intervals	Analyses	Rationale
B-1/GW-1, B-2/GW-2, B-3, B-7, B-8, B-9/GW-6	0-2', 8-10'	TCL/TAL	Already completed during 2018 Phase II ESA to investigate potential impacts resulting from Site operations/presence of historic fill/surrounding sites; co-located with temporary monitoring wells at noted boring locations.
B-4, B-5/GW-3, B-6/GW-4, B-10/GW-7, B-11/GW-8, B-12/GW-9, B-13, B-14/GW-10, B-15/GW-5, B-16	most impacted two-foot interval or two-foot interval above observed groundwater table if no observed impacts	TCL/TAL	Already completed during 2018 Phase II ESA to investigate potential impacts resulting from historic spills and Site operations/presence of historic fill/surrounding sites; co-located with temporary monitoring wells at noted boring locations.
SB-17, SB-18, SB-19/GW-11, SB-20 through SB-23, SB-24/GW-12, SB-27/GW-13 through SB-29/GW-15	0-2', two-foot interval above the observed groundwater table, and most impacted two-foot interval (if encountered) for deeper subset: same as above, plus two-foot interval directly above river bed sediments	TCL + 30/TAL/EC	Delineation of general Site conditions; investigate potential impacts resulting from Site operations/ presence of historic fill/surrounding sites; co-located with temporary monitoring wells at noted boring locations.

Locations	Sample Depth Intervals	Analyses	Rationale
SB-25N, E, S, W	0-2', two-foot interval above the observed groundwater table, and most impacted two-foot interval (if encountered) for deeper subset: same as above, plus two-foot interval directly above river bed sediments	TCL + 30/TAL/EC	Delineate potential source area at SD-2 storm drain, which was sampled during 2018 Phase II ESA; investigate interval above river bed sediments to determine the presence of NAPL found on surrounding properties
SB-26N, E/GW-16, S, W	0-2', two-foot interval above the observed groundwater table, and most impacted two-foot interval (if encountered) for deeper subset: same as above, plus two-foot interval directly above river bed sediments	TCL + 30/TAL/EC	Delineate potential source area at B-16 soil boring, which was sampled during 2018 Phase II ESA; investigate interval above river bed sediments to determine the presence of NAPL found on surrounding properties; co-located with a temporary monitoring well at noted boring location
SB-30N, E, S, W	0-2', two-foot interval above the observed groundwater table, and most impacted two-foot interval (if encountered)	TCL + 30/TAL/EC	Delineate potential source area at B-3 soil boring, which was sampled during 2018 Phase II ESA)
SB-31 through SB-35	0-2', two-foot interval above the observed groundwater table, and most impacted two-foot interval (if encountered) for deeper subset: same as above, plus two-foot interval directly above river bed sediments	TCL + 30/TAL/EC	Evaluate downgradient conditions at Site perimeter along bulkhead; investigate interval above river bed sediments to determine the presence of NAPL found on surrounding properties
SB-36 through SB-39	0-2', two-foot interval above the observed groundwater table, and most impacted two-foot interval (if encountered), and two-foot interval directly above river bed sediments	TCL + 30/TAL/EC	Delineation of general Site conditions/evaluate potential impacts from former usages, historic fill presence, and contamination migration; Investigate interval above river bed sediments to determine the presence of NAPL as found on surrounding properties

Following sample collection, boreholes that will not be converted to temporary monitoring wells will be backfilled with soil cuttings with an upper bentonite plug and restored with like materials to surrounding grade. Soil cuttings from surficial soils and obviously contaminated soil cuttings will be placed into sealed and labeled Department of Transportation (DOT) approved 55-gallon drums, pending characterization off-site disposal at a permitted facility.

If odor/visual evidence of contamination or elevated PID concentrations are noted, one sample in addition to those noted above will be collected from the interval that exhibits the greatest evidence of contamination.

3.2.3 Groundwater Investigation

To determine Site groundwater quality conditions and to evaluate for potential offsite migration, six (6) temporary monitoring wells will be installed at soil boring locations as discussed above in Table 1 in Section 3.2.2. The proposed groundwater monitoring well locations are shown on Figure 5. The locations of monitoring wells were chosen to extend general Site coverage based on the locations of the previous groundwater sample locations. Monitoring wells will be constructed to bridge the water table, with approximately seven feet of screen below the water table and three feet of screen above. Additional monitoring well design details are provided in the QAPP/FSP.

3.2.4 Soil Vapor Investigation

In order to evaluate the potential for soil vapor intrusion at the Site, 14 temporary soil vapor points will be installed within the proposed building footprint, the center of the Site, and along the northern and southern boundaries of the Site.

The soil vapor samples will be collected from soil vapor points installed by hand or by using a GeoProbe® to the target depth of two feet above the observed water table to assess current exposures along the northern border of the Site, and to just below the proposed foundation depth in the eastern portion of the Site. New Teflon®-lined tubing will be attached to an expendable soil vapor sampling point with a 6-inch stainless steel screen. The soil vapor points will be backfilled with #2 sand to approximately one foot above the screen. The remainder of the borehole will be backfilled with a concrete/bentonite slurry to grade.

The soil vapor samples will be collected using pre-cleaned (batch certified) 2.7-liter summa canisters with regulators calibrated to collect samples over a two-hour period and analyzed using USEPA Method TO-15 for VOCs. A helium tracer gas test will be performed on each vapor point prior to sampling in accordance with the procedures outlined in the NYSDOH Guidance. The proposed soil vapor sampling locations are shown on Figure 5. Additional details regarding soil vapor sampling methods are provided in the QAPP/FSP (Appendix C).

3.2.5 Qualitative Human Health Exposure Assessment

A Qualitative Human Health Exposure Assessment (EA) will be performed in accordance with Section 3.3(c)4 of DER-10 and the NYSDOH guidance for performing a qualitative EA (DER-10; Appendix 3B). The results of the EA will be provided in the RIR.

According to Section 3.10 of DER-10, and the Fish and Wildlife Resources Impact Analysis Decision Key in DER-10 Appendix 3C, a Fish and Wildlife exposure assessment will be performed (if needed) based on the results of the RI results.

4

Quality Assurance/Quality Control Protocols

During the remedial investigation activities, QA/QC procedures will be used to provide performance information with regard to accuracy, precision, sensitivity, representation, completeness, and comparability associated with sampling and analysis. The QA/QC protocols are summarized in the Quality Assurance Project Plan/Field Sampling Plan (QAPP/FSP) which is provided as Appendix C of this RIWP.

5

Health and Safety

5.1 Health and Safety Plan

A site-specific Health and Safety Plan (HASP) has been prepared for the Site and is provided as Appendix D. Investigative work performed under this RIWP will be in full compliance with applicable health and safety laws and regulations, including OSHA worker safety requirements and Hazardous Waste Operations and Emergency Response (HAZWOPER) requirements.

All field personnel involved in investigation activities will participate in training required under 29 CFR 1910.120, including 40-hour hazardous waste operator training and annual 8-hour refresher training. The designated Site Safety Officer will be responsible for maintaining workers' training records.

Personnel entering any exclusion zone will be trained in the provisions of the HASP and be required to sign a HASP acknowledgment. Site-specific training will be provided to field personnel. Additional safety training may be added depending on the tasks performed. Emergency telephone numbers will be posted at the Site before any work begins. A safety meeting will be conducted before each shift begins. Topics to be discussed include task hazards and protective measures (physical, chemical, environmental); emergency procedures; personal protection equipment (PPE) levels and other relevant safety topics. Meetings will be documented in a log book or specific form. Potential on-site chemicals of concern include SVOCs and heavy metals. Information fact sheets for each contaminant group and/or MSDSs are included in the HASP.

An emergency contact sheet with names and phone numbers for all pertinent project personnel as well as regulatory hotline information is included in the HASP.

5.2 Community Air Monitoring Plan

A Community Air Monitoring Plan (CAMP) has been developed for the Site, which fulfills the requirements set forth by the NYSDOH Generic Community Air Monitoring Plan, dated December 2009, and NYSDEC Fugitive Dust Suppression and Particulate Monitoring Program. The intent of the CAMP is to provide for a measure of protection for downwind communities from potential airborne releases of constituents of concern during on-site remedial investigation activities. The CAMP is provided as Appendix E and will be implemented during all RI invasive activities. The CAMP specifies potential air emissions, air monitoring procedures, monitoring schedule and data collection and reporting.

The upwind particulate and VOC concentrations will be measured at the start of each workday, and periodically throughout the day to establish background concentrations. Particulate matter and VOCs will be monitored continuously at upwind and downwind locations during all intrusive activities. In the event that any CAMP action level exceedances are observed, work will stop and corrective measures will be undertaken. CAMP data summary tables will be provided to NYSDEC and NYSDOH on a weekly basis, and notification of exceedances will be made within 24 hours to NYSDEC and NYSDOH. Additional details are provided in Appendix E.

6

Reporting and Schedule

Daily Reports will be provided to the NYSDEC Project Manager during the implementation of the RIWP. These reports will include a summary of daily activities, a summary of substantive findings, any CAMP exceedances and related corrective measures, and other pertinent information. The identification of any previously-unknown impacted media at the Site during the implementation of the RIWP will be communicated promptly to the NYSDEC Project Manager.

Following the completion of the remedial investigation activities, a RIR will be prepared and submitted to the NYSDEC and New York State Department of Health (NYSDOH) Project Managers. The RIR will include a description of the procedures followed and the results, including data summary tables and maps showing the extent of impacts to soil, groundwater and soil vapor.

Following completion of the RIR, a Remedial Action Work Plan (RAWP) will be prepared. The RAWP will provide a detailed description of the remedial action and the remedial technology to be implemented for each AOC at the Site.

Based upon current knowledge of the Site, a proposed schedule is provided below. This schedule will be updated as necessary. A minimum of five days' notice will be provided to the NYSDEC in advance of field activities.

BCP Project Schedule	Dates
Remedial Investigation Work Plan (RIWP) 30-day Public Comment Period	January 22 - February 21, 2020
NYSDEC Approval of RIWP	February 28, 2020
Implement Remedial Investigation	March 2020

BCP Project Schedule	Dates
Submit RIR to NYSDEC	April 2020
Submit Remedial Action Work Plan (RAWP) to NYSDEC	May 2020
RAWP 45-day Public Comment Period	June - July 2020
NYSDEC and NYSDOH Approval of RAWP	end of July 2020
Remedial Action (6 months)	August 2020 - January 2021
Submit Final Engineering Report to NYSDEC	April 2021
Obtain Certificate of Completion	2021

Appendices

Appendix A – Figures

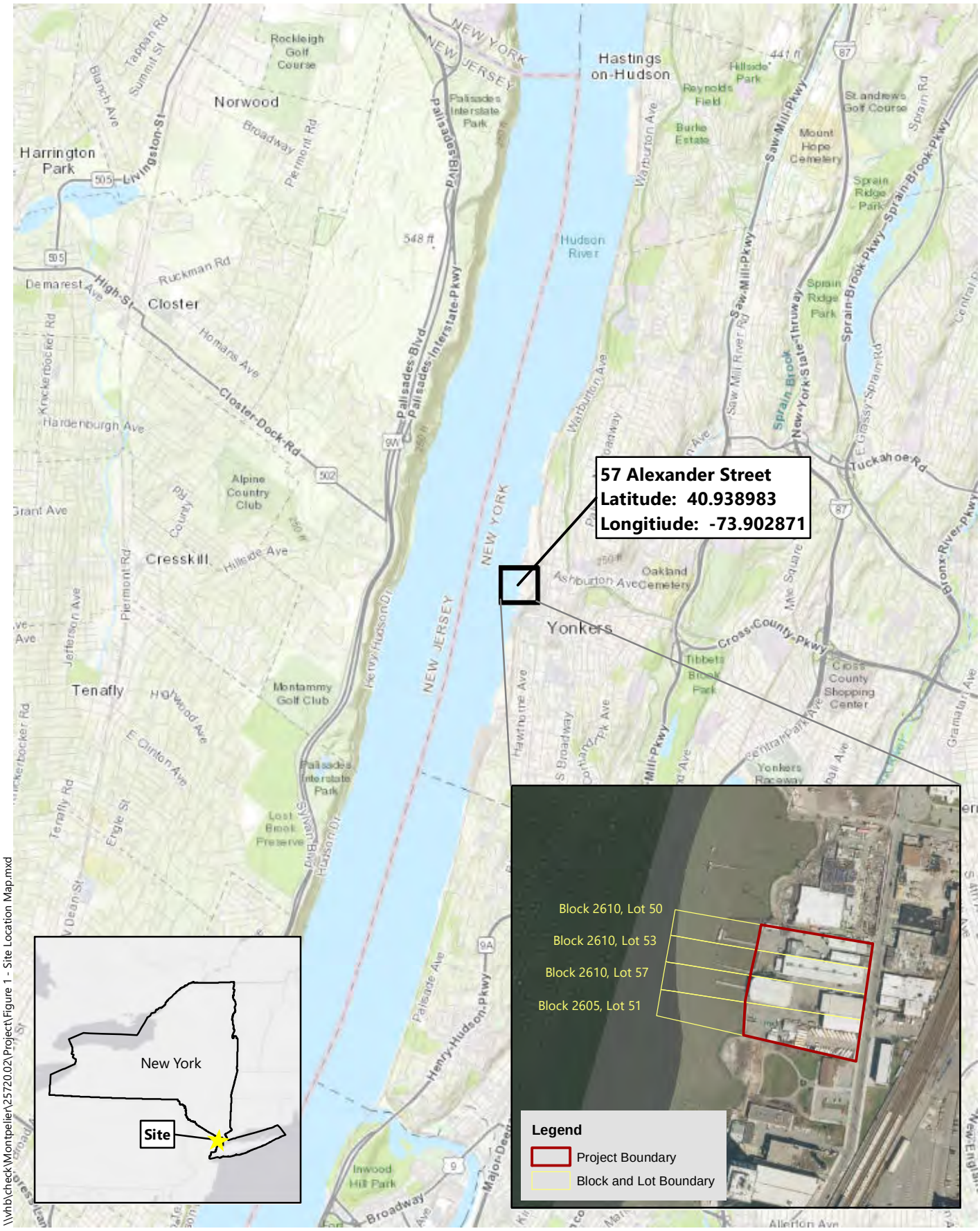
Figure 1. Site Location Map

Figure 2. Summary of Soil Exceedances Map

Figure 3. Summary of Groundwater Exceedances Map

Figure 4. Summary of Soil Vapor Detections Map

Figure 5. Proposed Sampling Locations Map



\\vhb\check\Montpelier\25720.02\Project\Figure 1 - Site Location Map.mxd

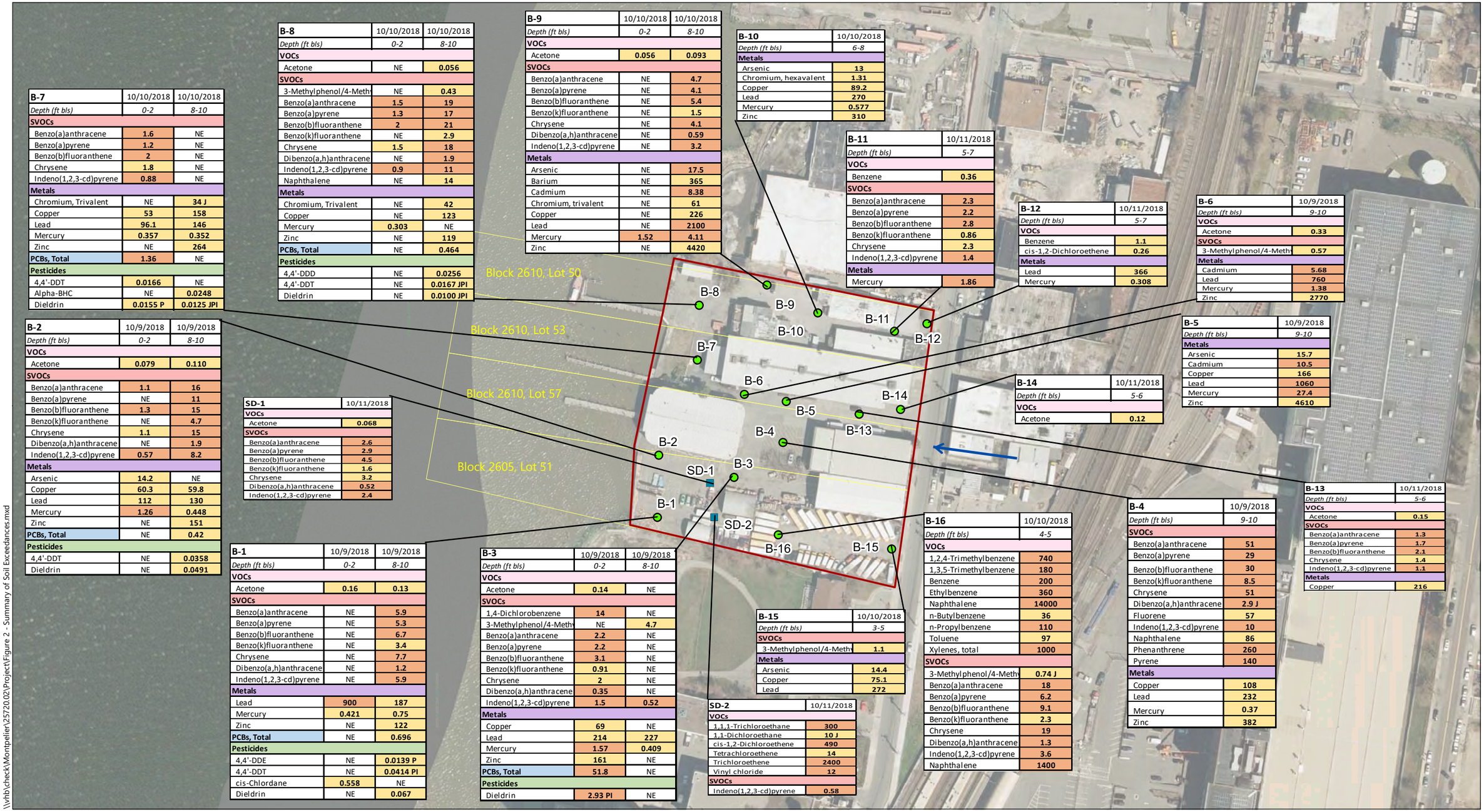
0 1 2 Miles

57 Alexander Street
Remedial Investigation Work Plan

Yonkers, New York

Sources:
ESRI World Topographic Base Map (2020)
ESRI/Digital Globe Imagery Base Map (2019)

Site Location Map



B-7	10/10/2018	10/10/2018
Depth (ft bls)	*0-2*	*8-10*
SVOCs		
Benzo(a)anthracene	**1.6**	NE
Benzo(a)pyrene	**1.2**	NE
Benzo(b)fluoranthene	**2**	NE
Chrysene	**1.8**	NE
Indeno(1,2,3-cd)pyrene	**0.88**	NE
Metals		
Chromium, Trivalent	NE	**34 J**
Copper	**53**	**158**
Lead	**96.1**	**146**
Mercury	**0.357**	**0.352**
Zinc	NE	**264**
PCBs, Total	**1.36**	NE
Pesticides		
4,4'-DDT	**0.0166**	NE
Alpha-BHC	NE	**0.0248**
Dieldrin	**0.0155 P**	**0.0125 JPI**

B-2	10/9/2018	10/9/2018
Depth (ft bls)	*0-2*	*8-10*
VOCs		
Acetone	**0.079**	**0.110**
SVOCs		
Benzo(a)anthracene	**1.1**	**16**
Benzo(a)pyrene	NE	**11**
Benzo(b)fluoranthene	**1.3**	**15**
Benzo(k)fluoranthene	NE	**4.7**
Chrysene	**1.1**	**15**
Dibenzo(a,h)anthracene	NE	**1.9**
Indeno(1,2,3-cd)pyrene	**0.57**	**8.2**
Metals		
Arsenic	**14.2**	NE
Copper	**60.3**	**59.8**
Lead	**112**	**130**
Mercury	**1.26**	**0.448**
Zinc	NE	**151**
PCBs, Total	NE	**0.42**
Pesticides		
4,4'-DDT	NE	**0.0358**
Dieldrin	NE	**0.0491**

B-8	10/10/2018	10/10/2018
Depth (ft bls)	*0-2*	*8-10*
VOCs		
Acetone	NE	**0.056**
SVOCs		
3-Methylphenol/4-Meth	NE	**0.43**
Benzo(a)anthracene	**1.5**	**19**
Benzo(a)pyrene	**1.3**	**17**
Benzo(b)fluoranthene	**2**	**21**
Benzo(k)fluoranthene	NE	**2.9**
Chrysene	**1.5**	**18**
Dibenzo(a,h)anthracene	NE	**1.9**
Indeno(1,2,3-cd)pyrene	**0.9**	**11**
Naphthalene	NE	**14**
Metals		
Chromium, Trivalent	NE	**42**
Copper	NE	**123**
Mercury	**0.303**	NE
Zinc	NE	**119**
PCBs, Total	NE	**0.464**
Pesticides		
4,4'-DDD	NE	**0.0256**
4,4'-DDT	NE	**0.0167 JPI**
Dieldrin	NE	**0.0100 JPI**

SD-1	10/11/2018
VOCs	
Acetone	**0.068**
SVOCs	
Benzo(a)anthracene	**2.6**
Benzo(a)pyrene	**2.9**
Benzo(b)fluoranthene	**4.5**
Benzo(k)fluoranthene	**1.6**
Chrysene	**3.2**
Dibenzo(a,h)anthracene	**0.52**
Indeno(1,2,3-cd)pyrene	**2.4**

B-1	10/9/2018	10/9/2018
Depth (ft bls)	*0-2*	*8-10*
VOCs		
Acetone	**0.16**	**0.13**
SVOCs		
Benzo(a)anthracene	NE	**5.9**
Benzo(a)pyrene	NE	**5.3**
Benzo(b)fluoranthene	NE	**6.7**
Benzo(k)fluoranthene	NE	**3.4**
Chrysene	NE	**7.7**
Dibenzo(a,h)anthracene	NE	**1.2**
Indeno(1,2,3-cd)pyrene	NE	**5.9**
Metals		
Lead	**900**	**187**
Mercury	**0.421**	**0.75**
Zinc	NE	**122**
PCBs, Total	NE	**0.696**
Pesticides		
4,4'-DDE	NE	**0.0139 P**
4,4'-DDT	NE	**0.0414 PI**
cis-Chlordane	**0.558**	NE
Dieldrin	NE	**0.067**

B-3	10/9/2018	10/9/2018
Depth (ft bls)	*0-2*	*8-10*
VOCs		
Acetone	**0.14**	NE
SVOCs		
1,4-Dichlorobenzene	**14**	NE
3-Methylphenol/4-Meth	NE	**4.7**
Benzo(a)anthracene	**2.2**	NE
Benzo(a)pyrene	**2.2**	NE
Benzo(b)fluoranthene	**3.1**	NE
Benzo(k)fluoranthene	**0.91**	NE
Chrysene	**2**	NE
Dibenzo(a,h)anthracene	**0.35**	NE
Indeno(1,2,3-cd)pyrene	**1.5**	**0.52**
Metals		
Copper	**69**	NE
Lead	**214**	**227**
Mercury	**1.57**	**0.409**
Zinc	**161**	NE
PCBs, Total	**51.8**	NE
Pesticides		
Dieldrin	**2.93 PI**	NE

B-9	10/10/2018	10/10/2018
Depth (ft bls)	*0-2*	*8-10*
VOCs		
Acetone	**0.056**	**0.093**
SVOCs		
Benzo(a)anthracene	NE	**4.7**
Benzo(a)pyrene	NE	**4.1**
Benzo(b)fluoranthene	NE	**5.4**
Benzo(k)fluoranthene	NE	**1.5**
Chrysene	NE	**4.1**
Dibenzo(a,h)anthracene	NE	**0.59**
Indeno(1,2,3-cd)pyrene	NE	**3.2**
Metals		
Arsenic	NE	**17.5**
Barium	NE	**365**
Cadmium	NE	**8.38**
Chromium, trivalent	NE	**61**
Copper	NE	**226**
Lead	NE	**2100**
Mercury	**1.52**	**4.11**
Zinc	NE	**4420**

B-10	10/10/2018
Depth (ft bls)	*6-8*
Metals	
Arsenic	**13**
Chromium, hexavalent	**1.31**
Copper	**89.2**
Lead	**270**
Mercury	**0.577**
Zinc	**310**

B-11	10/11/2018
Depth (ft bls)	*5-7*
VOCs	
Benzene	**0.36**
SVOCs	
Benzo(a)anthracene	**2.3**
Benzo(a)pyrene	**2.2**
Benzo(b)fluoranthene	**2.8**
Benzo(k)fluoranthene	**0.86**
Chrysene	**2.3**
Indeno(1,2,3-cd)pyrene	**1.4**
Metals	
Mercury	**1.86**

B-12	10/11/2018
Depth (ft bls)	*5-7*
VOCs	
Benzene	**1.1**
cis-1,2-Dichloroethene	**0.26**
Metals	
Lead	**366**
Mercury	**0.308**

B-6	10/9/2018
Depth (ft bls)	*9-10*
VOCs	
Acetone	**0.33**
SVOCs	
3-Methylphenol/4-Meth	**0.57**
Metals	
Cadmium	**5.68**
Lead	**760**
Mercury	**1.38**
Zinc	**2770**

B-5	10/9/2018
Depth (ft bls)	*9-10*
Metals	
Arsenic	**15.7**
Cadmium	**10.5**
Copper	**166**
Lead	**1060**
Mercury	**27.4**
Zinc	**4610**

B-14	10/11/2018
Depth (ft bls)	*5-6*
VOCs	
Acetone	**0.12**

B-15	10/10/2018
Depth (ft bls)	*3-5*
SVOCs	
3-Methylphenol/4-Meth	**1.1**
Metals	
Arsenic	**14.4**
Copper	**75.1**
Lead	**272**

SD-2	10/11/2018
VOCs	
1,1,1-Trichloroethane	**300**
1,1-Dichloroethane	**10 J**
cis-1,2-Dichloroethene	**490**
Tetrachloroethene	**14**
Trichloroethene	**2400**
Vinyl chloride	**12**
SVOCs	
Indeno(1,2,3-cd)pyrene	**0.58**

B-16	10/10/2018
Depth (ft bls)	*4-5*
VOCs	
1,2,4-Trimethylbenzene	**740**
1,3,5-Trimethylbenzene	**180**
Benzene	**200**
Ethylbenzene	**360**
Naphthalene	**14000**
n-Butylbenzene	**36**
n-Propylbenzene	**110**
Toluene	**97**
Xylenes, total	**1000**
SVOCs	
3-Methylphenol/4-Meth	**0.74 J**
Benzo(a)anthracene	**18**
Benzo(a)pyrene	**6.2**
Benzo(b)fluoranthene	**9.1**
Benzo(k)fluoranthene	**2.3**
Chrysene	**19**
Dibenzo(a,h)anthracene	**1.3**
Indeno(1,2,3-cd)pyrene	**3.6**
Naphthalene	**1400**

B-4	10/9/2018
Depth (ft bls)	*9-10*
SVOCs	
Benzo(a)anthracene	**51**
Benzo(a)pyrene	**29**
Benzo(b)fluoranthene	**30**
Benzo(k)fluoranthene	**8.5**
Chrysene	**51**
Dibenzo(a,h)anthracene	**2.9 J**
Fluorene	**57**
Indeno(1,2,3-cd)pyrene	**10**
Naphthalene	**86**
Phenanthrene	**260**
Pyrene	**140**
Metals	
Copper	**108**
Lead	**232**
Mercury	**0.37**
Zinc	**382**

B-13	10/11/2018
Depth (ft bls)	*5-6*
VOCs	
Acetone	**0.15**
SVOCs	
Benzo(a)anthracene	**1.3**
Benzo(a)pyrene	**1.7**
Benzo(b)fluoranthene	**2.1**
Chrysene	**1.4**
Indeno(1,2,3-cd)pyrene	**1.1**
Metals	
Copper	**216**

0 70 140 280 Feet

Legend

- 2018 Phase II ESA Storm Drain Sediment Sample
- 2018 Phase II ESA Soil Investigation Soil Boring Sample
- Project Boundary
- Block and Lot Boundary
- Inferred Groundwater Flow Direction
- Analyte was detected above UUSCOs
- Analyte was detected above RRSCOs

57 Alexander Street
Remedial Investigation Work Plan

Yonkers, New York

Notes:
J = analyte detected at or above the MDL (method detection limit) but below the RL (reporting limit) - data is estimated.
P = pesticide and/or PCB (Aroclor) target compounds with percent difference for detected concentrations that exceed method dictated limits between the two GC columns used for analysis.
NE = no exceedance
UUSCOs = NY Part 375 Unrestricted Use Soil Cleanup Objectives
RRSCOs = NY Part 375 Restricted-Residential Use Soil Cleanup Objectives
Aerial Imagery: ESRI Base Map, February 2019.

Summary of Soil Exceedances

\\vhb\check\Montpelier\25720.02\Project\Figure 2 - Summary of Soil Exceedances.mxd

GW-6 (B-9)	10/11/2018
SVOCs	
Benzo(a)anthracene	**3.2**
Benzo(a)pyrene	**2.7**
Benzo(b)fluoranthene	**3.8**
Benzo(k)fluoranthene	**1.3**
Chrysene	**2.8**
Indeno(1,2,3-cd)pyrene	**1.8**
Dissolved Metals	
Iron	**1950**
Magnesium	**51500**
Manganese	**1122**
Sodium	**577000**

GW-7 (B-10)	10/11/2018
SVOCs	
Benzo(a)anthracene	**0.4**
Benzo(a)pyrene	**0.27**
Benzo(b)fluoranthene	**0.43**
Benzo(k)fluoranthene	**0.17**
Chrysene	**0.35**
Indeno(1,2,3-cd)pyrene	**0.12**
Dissolved Metals	
Iron	**889**
Manganese	**383.5**
Sodium	**69500**

GW-8 (B-11)	10/11/2018
SVOCs	
Benzo(a)anthracene	**0.03 J**
Benzo(a)pyrene	**0.03 J**
Benzo(b)fluoranthene	**0.04 J**
Benzo(k)fluoranthene	**0.02 J**
Chrysene	**0.03 J**
Indeno(1,2,3-cd)pyrene	**0.03 J**
Dissolved Metals	
Iron	**593**
Manganese	**341.3**
Sodium	**75600**
Pesticides	
Dieldrin	**0.005 J**

GW-9 (B-12)	10/11/2018
VOCs	
Benzene	**1.3**
SVOCs	
Acenaphthene	**39**
Benzo(a)anthracene	**0.6**
Benzo(a)pyrene	**0.56**
Benzo(b)fluoranthene	**0.68**
Benzo(k)fluoranthene	**0.22**
Chrysene	**0.55**
Indeno(1,2,3-cd)pyrene	**0.27**
Dissolved Metals	
Iron	**1230**
Manganese	**471.3**
Sodium	**127000**

GW-4 (B-6)	10/10/2018
SVOCs	
Benzo(a)anthracene	**5.1**
Benzo(a)pyrene	**4.6**
Benzo(b)fluoranthene	**6.7**
Benzo(k)fluoranthene	**6.8**
Chrysene	**4.5**
Indeno(1,2,3-cd)pyrene	**2.7**
Pentachlorophenol	**4.8**
Dissolved Metals	
Iron	**343**
Manganese	**450.9**
Sodium	**111000**

GW-10 (B-14)	10/11/2018
SVOCs	
Benzo(a)anthracene	**0.06 J**
Benzo(a)pyrene	**0.05 J**
Benzo(b)fluoranthene	**0.07 J**
Benzo(k)fluoranthene	**0.03 J**
Chrysene	**0.06 J**
Indeno(1,2,3-cd)pyrene	**0.03 J**
Dissolved Metals	
Iron	**2820**
Manganese	**487.2**
Sodium	**176000**

GW-2 (B-2)	10/9/2018
SVOCs	
Benzo(a)anthracene	**0.28**
Benzo(a)pyrene	**0.25**
Benzo(b)fluoranthene	**0.46**
Benzo(k)fluoranthene	**0.17**
Chrysene	**0.25**
Indeno(1,2,3-cd)pyrene	**0.22**
Dissolved Metals	
Manganese	**1183**
Sodium	**81900**
PCBs, Total	**0.732**
Pesticides	
Chlordane	**2.01**

GW-1 (B-1)	10/9/2018
SVOCs	
Benzo(a)anthracene	**0.64**
Benzo(a)pyrene	**0.6**
Benzo(b)fluoranthene	**1.2**
Benzo(k)fluoranthene	**0.42**
Chrysene	**0.58**
Indeno(1,2,3-cd)pyrene	**0.58**
Dissolved Metals	
Antimony	**6.49 J**
Iron	**444**
Manganese	**571.1**
Sodium	**52800**
PCBs, Total	**6.15**
Pesticides	
Chlordane	**0.19 PI**
Dieldrin	**0.022 J**

GW-5 (B-15)	10/10/2018
SVOCs	
Benzo(a)anthracene	**0.33**
Benzo(a)pyrene	**0.3**
Benzo(b)fluoranthene	**0.62**
Benzo(k)fluoranthene	**0.26**
Chrysene	**0.36**
Indeno(1,2,3-cd)pyrene	**0.23**
Dissolved Metals	
Manganese	**440.8**
Sodium	**161000**

GW-3 (B-5)	10/10/2018
VOCs	
1,2,4,5-Tetramethylbenzene	**35**
sec-Butylbenzene	**5.6 J**
SVOCs	
Benzo(a)anthracene	**1.2**
Benzo(a)pyrene	**0.66 J**
Benzo(b)fluoranthene	**0.95 J**
Benzo(k)fluoranthene	**0.34 J**
Bis(2-ethylhexyl)phthalate	**7.4**
Chrysene	**1.5**
Indeno(1,2,3-cd)pyrene	**0.43 J**
Dissolved Metals	
Magnesium	**71100**
Manganese	**857**
Sodium	**142000**

Block 2610, Lot 50
Block 2610, Lot 53
Block 2610, Lot 57
Block 2605, Lot 51

B-8, B-9/GW-6, B-10/GW-7, B-11/GW-8, B-12/GW-9, B-7, B-6/GW-4, B-5/GW-5, B-13, B-14/GW-10, B-4, B-2/GW-2, SD-1, B-3, B-1/GW-1, SD-2, B-16, B-15/GW-5

0 62.5 125 250 Feet

Legend

- 2018 Phase II ESA Storm Drain Sediment Sample
- 2018 Phase II ESA Soil Investigation Soil Boring Sample
- Temporary Monitoring Well
- Project Boundary
- Block and Lot Boundary
- Inferred Groundwater Flow Direction

57 Alexander Street
Remedial Investigation Work Plan

Yonkers, New York

Notes:
J = analyte detected at or above the MDL (method detection limit) but below the RL (reporting limit) - data is estimated.
NE = no exceedance
Aerial Imagery: ESRI Base Map, February 2019.

Summary of Groundwater Exceedances

\\vhb\check\Montpelier\25720.02\Project\Figure 3 - Summary of Groundwater Exceedances.mxd

Indoor Air - 1 (IA-1)	10/10/2018
TO-15 VOCs	ug/m^3
Carbon tetrachloride[A]	0.43
1,1-Dichloroethene[A]	ND (0.079)
cis-1,2-Dichloroethene[A]	ND (0.079)
Trichloroethene (TCE)[A]	0.371
Methylene chloride[B]	ND (1.74)
Tetrachloroethene (PCE)[B]	0.441
1,1,1-Trichloroethane (1,1,1-TCA)[B]	ND (0.109)
Vinyl chloride[C]	ND (0.051)

Soil Vapor - 1 (SV-1)	10/10/2018	10/10/2018
TO-15 VOCs	Sub-slab	Indoor Air
	ug/m^3	ug/m^3
Carbon tetrachloride[A]	ND (3.15)	0.43
1,1-Dichloroethene[A]	ND (1.98)	ND (0.079)
cis-1,2-Dichloroethene[A]	ND (1.98)	ND (0.079)
Trichloroethene (TCE)[A]	6.77	0.371
Methylene chloride[B]	7.16	ND (1.74)
Tetrachloroethene (PCE)[B]	7.59	0.441
1,1,1-Trichloroethane (1,1,1-TCA)[B]	27.90	ND (0.109)
Vinyl chloride[C]	ND (1.28)	ND (0.051)

Soil Vapor - 2 (SV-2)	10/10/2018	10/10/2018
TO-15 VOCs	Sub-slab	Indoor Air
	ug/m^3	ug/m^3
Carbon tetrachloride[A]	ND (2.52)	0.43
1,1-Dichloroethene[A]	ND (1.59)	ND (0.079)
cis-1,2-Dichloroethene[A]	ND (1.59)	ND (0.079)
Trichloroethene (TCE)[A]	ND (2.15)	0.371
Methylene chloride[B]	ND (3.47)	ND (1.74)
Tetrachloroethene (PCE)[B]	6.58	0.441
1,1,1-Trichloroethane (1,1,1-TCA)[B]	51.5	ND (0.109)
Vinyl chloride[C]	ND (1.02)	ND (0.051)

Block 2610, Lot 50
Block 2610, Lot 53
Block 2610, Lot 57
Block 2605, Lot 51

B-9/GW-6, B-8, B-10/GW-7, B-11/GW-8, B-12/GW-9, B-7, IA-1, SV-1, B-6/GW-4, B-5/GW-5, SV-2, B-13, B-14/GW-10, B-4, B-2/GW-2, B-3, SD-1, B-1/GW-1, SD-2, B-16, B-15/GW-5

0 50 100 200 Feet

Legend

- 2018 Phase II ESA Storm Drain Sediment Sample
- 2018 Phase II ESA Soil Investigation Soil Boring Sample
- 2018 Phase II ESA Soil Vapor/Indoor Air Sample
- Temporary Monitoring Well
- Project Boundary
- Block and Lot Boundary
- Inferred Groundwater Flow Direction

57 Alexander Street
Remedial Investigation Work Plan

Yonkers, New York

Notes:
[A] = NYSDOH Soil Vapor/Indoor Air Matrix A
[B] = NYSDOH Soil Vapor/Indoor Air Matrix B
[C] = NYSDOH Soil Vapor/Indoor Air Matrix C
ND = analyte not detected
Aerial Imagery: ESRI Base Map, February 2019.

Summary of Soil Vapor Detections

\\vhb\check\Montpelier\25720.02\Project\Figure 4 - Summary of Soil Vapor Exceedances.mxd

\\vhb\check\Montpelier\25720.02\Project\Figure 5 - Proposed Sample Locations.mxd

0 35 70 140 Feet

Legend

- Proposed Soil Sample Location and Designation
- Proposed Deep Soil Boring Location and Designation
- Proposed Soil and Groundwater Sample Location and Designation
- Proposed Deep Soil and Groundwater Sample Location and Designation
- Proposed Soil Vapor Sample Location and Designation
- 2018 Phase II ESA Soil Sample
- 2018 Phase II ESA Soil and Groundwater Sample
- 2018 Phase II ESA Soil Vapor Sample
- 2018 Phase II ESA Sediment Sample
- Project Boundary
- Block and Lot Boundary

57 Alexander Street
Remedial Investigation Work Plan

Yonkers, New York

Notes:
Aerial Imagery: ESRI Base Map, February 2019.

Proposed Sampling Locations

Appendix B – Previous Environmental Report

(provided on CD)

Appendix C – Quality Assurance Project Plan / Field Sampling Plan

Quality Assurance Project Plan

57 Alexander Street
NYSDEC Site No. C360194

PREPARED FOR

57 Alexander Developer LLC
c/o Rose Associates, Inc.
777 Third Avenue
New York, New York 10017

PREPARED BY

VHB Engineering, Surveying, Landscape Architecture and Geology, P.C.
1 Penn Plaza
Suite 715
New York, New York 10119

JANUARY 2020
revised MARCH 2020

Table of Contents

1 Introduction

1.1 Purpose

VHB Engineering, Surveying, Landscape Architecture and Geology, P.C. (VHB), on behalf of 57 Alexander JV LLC (Volunteer), has prepared this Quality Assurance Project Plan/Field Sampling Plan (QAPP/FSP) to describe the measure that will be taken to ensure that the data generated during performance of the Remedial Investigation (RI) for 57 Alexander Street, located at 47-71 Alexander Street, in the City of Yonkers, New York (Site), are of quality sufficient to meet project-specific data quality objectives (DQOs). The Site comprises the landward portions of four (4) contiguous tax lots identified as Block 2605, Lot 51, and Block 2610, Lots 50, 53, and 73 on the City of Yonkers Tax Maps and is located on the western side of Alexander Street, between Ashburton Avenue to the north, Wells Avenue to the south, and the Hudson River to the west.

57 Alexander JV LLC is a Volunteer in the Brownfield Cleanup Program (BCP). RI activities will be conducted under the New York State Department of Environmental Conservation (NYSDEC) BCP (Site # C360194). This QAPP/FSP was prepared in accordance with the guidance provided in the NYSDEC Technical Guidance DER-10 Technical Guidance for Site Investigation and Remediation (DER-10), the NYSDEC BCP Guidance, and the United States Environmental Protection Agency's (USEPA's) Guidance for the Data Quality Objectives Process (EPA QA/G 4).

1.2 Project Objectives

The objective of the RI is to characterize and delineate the nature and extent of soil, groundwater, and soil vapor contamination on the Site, identify any potential point sources of contamination, assess the impact of the contamination on public health and the environment, and collect sufficient data to determine the remedial action necessary to protect human health and the environment.

1.3 Project Team Organization

VHB, on behalf of the Volunteer, will provide oversight for all work associated with implementing the Remedial Investigation Work Plan (RIWP). The third-party data validator and analytical laboratory have not yet been selected for this project. Upon selection, this information will be provided to the NYSDEC prior to field sampling activities. The project team organization and information are provided below.

1.3.1 VHB Project Engineer

George Lester, PE
VHB Engineering, Surveying, Landscape Architecture and Geology, P.C.
1 Penn Plaza, Suite 715
New York, New York 10119
Telephone: (802) 778-1271
Email: glester@vhb.com

The Project Engineer will provide technical guidance and oversight throughout the project, will provide technical review of required documents in accordance with NYSDEC DER-10, and will develop remedial alternatives for the Site.

1.3.2 VHB Project Principal

Stephen Kaplan, PG, Director of Site Investigation and Remediation
VHB Engineering, Surveying, Landscape Architecture and Geology, P.C.
100 Motor Parkway, Suite 350
Hauppauge, New York 11788
Telephone: (631) 787-3400
Email: skaplan@vhb.com

The Project Principal will provide overall management for the implementation of Site investigation and remediation activities, provide technical review, attend key meetings and have key involvement in development of remedial alternatives for the Site.

1.3.3 VHB Project Manager

Jessica Collins, Senior Project Manager, Hydrogeologist
VHB Engineering, Surveying, Landscape Architecture and Geology, P.C.
One Penn Plaza, Suite 715

New York, New York 10119
Telephone: (646) 809-8042
Email: jscollins@vhb.com

The Project Manager will support the Project Principal in providing overall management for the implementation of the site investigation and remediation activities. The Project Manager is also responsible for scheduling, coordination of field activities, verification of proper procedures by field staff, laboratory coordination, data review and interpretation, and report preparation.

1.3.4 VHB Quality Assurance Officer

Heather Waldmann, Senior Project Manager, CHMM
VHB Engineering, Surveying, Landscape Architecture and Geology, P.C.
100 Motor Parkway, Suite 350
Hauppauge, New York 11788
Telephone: (631) 787-3400
Email: hwaldmann@vhb.com

The Quality Assurance Officer (QAO) is responsible for reviewing sampling procedures, ensuring that data was collected and analyzed using the appropriate procedures, is not directly involved in the collection and analysis of the samples from the subject property, acts in conjunction with the Project Manager to develop the sampling and analytical portion of the QAPP, may conduct periodic field and sampling audits, interfaces with the laboratory to resolve problems and interfaces with the data validator and preparer of the Data Usability Summary Report (DUSR) to resolve any issues.

2

Quality Assurance/Quality Control for Collection of Data

The overall quality assurance/quality control (QA/QC) objectives are to develop and implement procedures in association with sampling, laboratory analysis, field data and reporting which will provide sufficient quality data to characterize existing conditions and determine an appropriate remedial approach. The QA/QC objectives for all data include completeness, representativeness, comparability, precision and accuracy.

2.1 Completeness

The parameters selected for analysis are determined based upon the objectives for the investigation, and the analysis must be appropriate and inclusive. Laboratory completeness is assessed by comparing the total number of parameters analyzed with the number of parameters successfully determined and validated. Analytical data must meet a 90 percent completeness criterion. If the criterion is not met, sample results will be evaluated for trends in rejected and unusable data. The effect of unusable data required for a determination of compliance will also be evaluated.

2.2 Representativeness

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. It is dependent upon the adequate design of the sampling program and is satisfied ensuring that the scope of work is followed and that specified

sampling and analysis techniques are utilized. The rationale for the sampling locations is discussed in the RIWP. Representativeness will be satisfied by verifying that field personnel follow the RIWP and utilize proper sampling techniques. Laboratory representativeness is ensured by compliance with nationally-recognized analytical methods, compliance with sample holding times, and maintaining sample integrity while the samples are in the possession of the laboratory. This is accomplished by following applicable methods, laboratory-issued standard operating procedures (SOPs) and the laboratory's QA Manual. The laboratory is required to be properly certified and accredited.

2.3 Comparability

Comparability expresses the confidence with which one set of data can be compared to another. This objective is achieved in the field by conducting sampling in accordance with the RIWP and QAPP. Laboratory comparability is achieved by following the laboratory's QA Manual, through consistent sample preparation and analysis in conformance with approved laboratory methods and through strict adherence to sample holding times.

2.4 Precision

Precision is a measure of reproducibility of repeated measurements of the same parameter under a specific set of conditions and is calculated as a range or as a standard deviation. Field sampling precision is measured through the collection of duplicate samples, and analytical precision is measured by analyzing QC duplicates or matrix spike duplicates.

2.5 Accuracy

Accuracy is the agreement of a measured value with the true or expected value. Accuracy in the field is monitoring through the use of field and trip blanks, and analytical accuracy is measured through percent recoveries of surrogate compounds added to each sample, laboratory method blanks, instrument calibration and the percent recoveries of matrix spike compounds added to selected samples and laboratory blanks.

3

Remedial Investigation Sampling Program

The media to be sampled during the RI include soil, groundwater, and soil vapor. Sampling locations, analytical suites, and frequency may vary by medium. A discussion of the sampling schedule for each medium, including quality control (QC) samples, is shown in Tables 1 through 3. Specifics regarding the collection of samples at each location and for each task are provided in Section 4 of this QAPP/FSP.

3.1 Soil Sampling

Soil samples are to be used to characterize the soil conditions for the AOCs at the Site, fill existing data gaps in vertical delineation of contamination, and to collect the data sufficient to define the nature and extent of impacted soils. Samples collected at borings B-1 through B-16 were collected in October 2018 in a manner consistent with this QAPP/FSP, and 32 soil borings are proposed to be installed at the locations shown in Figure 5 of the Remedial Investigation Work Plan (RIWP).

Soil borings will be advanced to characterize soil in the following locations at the Site:

Locations	Sample Depth Intervals	Analyses (see notes below)	Rationale
B-1/GW-1, B-2/GW-2, B-3, B-7, B-8, B-9/GW-6	0-2', 8-10'	TCL/TAL	Already completed during 2018 Phase II ESA to investigate potential impacts resulting from site operations/presence of historic fill/surrounding sites; co-located with temporary monitoring wells at noted boring locations.

Locations	Sample Depth Intervals	Analyses (see notes below)	Rationale
B-4, B-5/GW-3, B-6/GW-4, B-10/GW-7, B-11/GW-8, B-12/GW-9, B-13, B-14/GW-10, B-15/GW-5, B-16	most impacted two-foot interval or two-foot interval above observed groundwater table if no observed impacts	TCL/TAL	Already completed during 2018 Phase II ESA to investigate potential impacts resulting from historic spills and site operations/presence of historic fill/surrounding sites; co-located with temporary monitoring wells at noted boring locations.
SB-17, SB-18, SB-19/GW-11, SB-20 through SB-23, SB-24/GW-12, SB-27/GW-13 through SB-29/GW-15	0-2', two-foot interval above the observed groundwater table, and most impacted two-foot interval (if encountered) for deeper subset: same as above, plus two-foot interval directly above river bed sediments	TCL + 30/TAL/EC	Delineation of general Site conditions; investigate potential impacts resulting from site operations/ presence of historic fill/surrounding sites; co-located with temporary monitoring wells at noted boring locations.
SB-25N, E, S, W	0-2', two-foot interval above the observed groundwater table, and most impacted two-foot interval (if encountered) for deeper subset: same as above, plus two-foot interval directly above river bed sediments	TCL + 30/TAL/EC	Delineate potential source area at SD-2 storm drain, which was sampled during 2018 Phase II ESA; investigate interval above river bed sediments to determine the presence of NAPL found on surrounding properties
SB-26N, E/GW-16, S, W	0-2', two-foot interval above the observed groundwater table, and most impacted two-foot interval (if encountered) for deeper subset: same as above, plus two-foot interval directly above river bed sediments	TCL + 30/TAL/EC	Delineate potential source area at B-16 soil boring, which was sampled during 2018 Phase II ESA; investigate interval above river bed sediments to determine the presence of NAPL found on surrounding properties; co-located with a temporary monitoring well at noted boring location
SB-30N, E, S, W	0-2', two-foot interval above the observed groundwater table, and most impacted two-foot interval (if encountered)	TCL + 30/TAL/EC	Delineate potential source area at B-3 soil boring, which was sampled during 2018 Phase II ESA
SB-31 through SB-35	0-2', two-foot interval above the observed groundwater table, and most impacted two-foot interval (if encountered) for deeper subset: same as above, plus two-foot interval directly above river bed sediments	TCL + 30/TAL/EC	Evaluate downgradient conditions at Site perimeter along bulkhead; investigate interval above river bed sediments to determine the presence of NAPL found on surrounding properties

Locations	Sample Depth Intervals	Analyses (see notes below)	Rationale
SB-36 through SB-39	0-2', two-foot interval above the observed groundwater table, and most impacted two-foot interval (if encountered), and two-foot interval directly above river bed sediments	TCL + 30/TAL/EC	Delineation of general Site conditions/evaluate potential impacts from former usages, historic fill presence, and contamination migration; Investigate interval above river bed sediments to determine the presence of NAPL as found on surrounding properties

**Note: Total Compound List (TCL) plus 30/ Target Analyte List (TAL)/ Emerging Contaminants (EC) (TCL + 30/TAL/EC) includes:*

- TCL VOC + 10 Tentatively identified compounds (TICs) using United States Environmental Protection Agency (USEPA) Method 8260C;
- TCL Base neutral acids (BNA)/SVOCs + 20 using USEPA Method 8270D;
- TCL Pesticides using USEPA Method 8081B;
- TCL PCBs using USEPA Method 8082A;
- TAL Metals (including hexavalent chromium) using USEPA Methods 6010D/7471B and USEPA Methods 3060A/7196A;
- 1,4-dioxane using USEPA Method 8270 selected ion monitoring (SIM); and
- NYSDEC List of 21 polyfluoroalkyl substances (PFAS) compounds (as referenced in the NYSDEC January 2020 Emerging Contaminants Guidance) using modified USEPA Method 537.

If odor/visual evidence of contamination or elevated photoionization detector (PID) readings are noted, additional samples will be collected from the interval that exhibits the highest concentration.

3.2 Groundwater Sampling

To characterize onsite groundwater quality conditions, six temporary monitoring wells will be installed at select soil boring locations (as noted above) across the Site and will be sampled. Based on data from previous environmental reports and the 2018 VHB Phase II Environmental Site Assessment (ESA), the average depth to groundwater at the Site ranges between approximately 5 to 9 feet below grade surface (ft bgs). GW-11 through GW-16 will be installed to a maximum depth of 15 ft bgs. All monitoring wells will be installed with a ten-foot well screen bridging the water table (i.e., three feet of screen above the water table and seven feet of well screen below). The proposed groundwater monitoring locations are shown on Figure 5 of the RIWP and monitoring well installation and groundwater sampling procedures are outlined below in Section 4.2.

Groundwater samples will be collected from the monitoring wells and submitted for laboratory analysis for TCL +30/TAL analysis (including filtered and unfiltered metals) and the emerging contaminants (ECs) 1,4-Dioxane and Per- and Polyfluoroalkyl Substances (PFAS), which include the 21 compounds listed in the NYSDEC June 2019 Groundwater Sampling for Emerging Contaminants Guidance Memo. Field parameters (e.g., pH, dissolved oxygen, oxidation-reduction potential [ORP], etc.) will also be collected in the field using a water quality meter during purging prior to sample collection.

3.3 Soil Vapor Sampling

Ten soil vapor samples (SV-03 through SV-12) will be collected during the RI to evaluate soil vapor conditions at the Site. The proposed soil vapor sampling locations are shown on Figure 5 of the RIWP. All soil vapor samples will be collected in accordance with the October 2006 New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion in the State of New York and June 2015 USEPA Soil Vapor Guidance. SV-03 through SV-08 will be collected from a depth that is representative of the bottom of proposed slab elevation; SV-09 through SV-12 will be installed along the northern perimeter of the Site to a depth of approximately two feet above the observed groundwater table. All soil vapor samples will be analyzed for VOCs using USEPA Method TO-15. Soil vapor point installation and soil vapor sampling procedures are outlined below in Section 4.3.

4

Field Sampling Procedures

This section provides a detailed discussion of the field procedures to be used during sampling of the soil, groundwater, and soil vapor being evaluated as part of the RI. As mentioned previously, the proposed sampling locations are depicted on Figure 5 of the RIWP and additional information including intervals to be sampled and sample rationale is provided in Table 1 of the RIWP.

4.1 Soil Sampling and Temporary Monitoring Well Installation

4.1.1 Soil Sampling

Soil borings will be advanced using a GeoProbe® Direct-Push drill rig. Samples will be collected continuously from land surface to a maximum depth of the riverbed sediments (observed on adjacent sites to be ranging in depth from 15 to 26 ft bgs), as shown in Table 1 of the RIWP.

The soil from each interval will be observed for lithology and evidence of contamination (i.e., staining, odors, and/or visible product), and screened for VOCs using a PID equipped with a 10.6 eV lamp. Samples for VOC analysis will be placed in laboratory-supplied bottleware. Soil samples will be collected according to Table 1 of the RIWP. These samples will be placed in the laboratory-supplied containers and shipped to the laboratory under chain of custody procedures in accordance with applicable guidance.

Following sample collection, boreholes will be backfilled with soil cuttings with a bentonite plug near ground surface and capped with concrete or asphalt. Contaminated soil cuttings, if encountered, will be placed in sealed and labeled United States Department of

Transportation (DOT)-approved 55-gallon drums pending characterization and off-site disposal at a permitted facility.

4.1.2 Temporary Monitoring Well Installation

Following soil sampling activities, temporary monitoring wells will be installed bridging the water table and to a maximum depth of approximately 15 ft bgs. Monitoring wells will be constructed of 1-inch inside diameter Schedule 40 polyvinyl chloride (PVC) casing and 0.020 inch slotted screen. Well screens will be ten feet long and will be installed with three feet above and seven feet below the water table. A sand pack will be placed around the well screen, extending two feet above the top of the screened zone.

Each newly installed temporary monitoring well will be developed to remove any fine grained material in the vicinity of the well screen and to promote hydraulic connection with the aquifer. The wells will be developed using a check-valve and/or peristaltic pump until well yield is consistent and turbidity is below 50 Nephelometric turbidity units (NTUs).

4.2 Groundwater Sampling

Groundwater samples will be collected a minimum of one hour following the development of the wells. Prior to sampling, depth to water will be measured at each well using an electronic water level meter. All wells will then be purged and sampled using a peristaltic pump or equivalent low-flow method, or an alternative method dependent on the observed depth to water and Site/groundwater conditions. Purging and sampling will be performed in conformance with USEPA low-flow sampling requirements. Field parameters (i.e., pH, dissolved oxygen, ORP, etc. as described in the USEPA low-flow sampling requirements) will be collected using a water quality meter with flow-through cell until parameters stabilized before samples are collected. Samples will be analyzed for TCL + 30/TAL as shown on Table 1 of the RIWP.

Temporary monitoring wells will be analyzed for the NYSDEC-required ECs in addition to the TCL + 30/TAL list. Additional necessary precautions will be taken when sampling ECs in the field, as described in Section 6.5, below.

All groundwater samples will be collected and placed in the laboratory-supplied containers and shipped to the laboratory under chain of custody procedures in accordance with DER-10.

4.3 Soil Vapor Sampling

Ten soil vapor samples will be collected during the RI to evaluate soil vapor concentrations at the Site. Six of the ten soil vapor samples will be collected from a depth that is representative of the bottom of proposed slab elevation (SV-02 through SV-08); and the remaining four soil vapor sampling points will be installed along the northern perimeter of the Site to a depth of approximately two feet above the observed groundwater table (SV-09 through SV-12). New Teflon® lined tubing well be attached to an expendable soil vapor sampling point with a 6-inch stainless steel screen. The soil vapor points will be backfilled

with #2 sand to approximately one foot above the screen. The remainder of the borehole will be backfilled with a cement/bentonite slurry to grade.

Prior to sample collection, the Teflon®-lined tubing will be purged of approximately two volumes of the tubing using a vacuum pump or equivalent. A tracer gas (i.e., helium) will be used to enrich the atmosphere in the immediate vicinity of the sampling location in order to test the borehole seal and verify that ambient air is not being drawn into the sample in accordance with the procedures outlined in the NYSDOH Guidance. Following purging and verification with the tracer gas, the tubing will be connected to the pre-cleaned (batch-certified) laboratory supplied 2.7-liter summa canister. All soil vapor samples will be collected using the canisters with regulators calibrated to collect samples over a 2-hour period and analyzed using USEPA Method TO-15 for VOCs.

5

Quality Assurance/Quality Control

In addition to field investigation sampling discussed in Section 4.0, above, field QA/QC samples will be collected and/or analyzed. The requirements and procedures for the QA/QC samples are outlined below.

5.1 Duplicate Samples

In accordance with NYSDEC DER-10, duplicate samples are required at a frequency of one duplicate sample per 20 investigative samples per matrix. Duplicates will be submitted for laboratory analysis of the same parameters as the corresponding investigative sample. The time and corresponding investigative sample of the duplicate sample will be recorded by field personnel in the project field notes for reference, but will not be recorded on any sample containers, labels, chain-of-custody or other material submitted to the laboratory. The analytical results of the duplicate will be compared to the corresponding investigative sample to measure the precision of the field sample collection methods and the precision of laboratory methods and instrumentation.

5.2 Field Blanks

Typical field blanks consist of distilled or deionized water. Field blanks associated with PFAS samples consist of "PFAS-free" water provided by the laboratory. Field blanks are prepared at the project site by pouring the distilled/deionized/PFAS-free water from one container into a set of laboratory-supplied bottleware. Field blanks will be collected at a frequency of one per 20 soil investigative samples and one per 20 groundwater investigative samples and are analyzed for the same analytical suite as the investigative samples. Field blanks are not

collected in association with soil vapor samples and field blanks are utilized to determine if ambient site conditions have the potential to result in sample contamination.

5.3 Trip Blanks

The laboratory is responsible for preparing the trip blank sampling container. Typical trip blanks consist of distilled or deionized water. Trip blanks associated with sampling for polyfluoroalkyl substances consist of PFAS-free water. One typical trip blank will be included with each cooler containing at least one soil or groundwater sample which will be submitted for laboratory analysis of VOCs. The aforementioned trip blanks will be analyzed for VOCs.

One PFAS-free trip blank will be included with each cooler containing soil or groundwater which will be submitted for laboratory analysis of PFAS. The PFAS-free trip blank will be analyzed only for PFAS. It should be noted that samples to be submitted for laboratory analysis of PFAS will not be stored in the same coolers as other investigative samples.

5.4 Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicates (MSD) samples are collected at a frequency of one MS/MSD sample per 20 investigative samples per matrix. The MS/MSD samples will be submitted for laboratory analysis of the same parameters as the corresponding investigative sample. The corresponding investigative sample of the duplicate sample will be recorded by field personnel in the project field notes for reference and will also be recorded on sample containers, labels and the chain-of-custody submitted to the laboratory.

The MS and MSD samples are prepared in the laboratory by adding a known volume of specific analytes to the investigative sample. The MS and MSD samples are then analyzed via the sample procedure as the investigative sample. Percent recovery of each of the spiked analytes reflects the ability of the laboratory and method to accurately determine the quantity of the analyte in that sample; thus, the percent recovery quantifies the accuracy in the specific sample matrix. Comparison of the MS and MSD analytical results reflects the precision of the laboratory analytical method.

6

Sample Handling and Analysis

Field QA/QC procedures will be used to provide performance information with regard to accuracy, precision, representativeness, completeness, and comparability associated with the sampling and analysis for this investigation. Field QA/QC procedures will be used to document that samples are representative of actual conditions at the Site and identify possible cross-contamination from field activities or sample transit.

6.1 Sample Custody

Sample handling in the field will conform to appropriate sample custody procedures. Field custody procedures include proper sample identification, completion of chain-of-custody forms, and packaging and shipping procedures. Sample labels will be attached to all sampling bottles before field activities begin to ensure proper sample identification; all sample labels should be pre-printed or filled out using waterproof ink. Each label will identify the site and sample location. Styrofoam or bubble wrap will be used to absorb shock and prevent breakage of sample containers. Ice or ice packs will be placed in between the plastic bags for sample preservation purposes.

After each sample is collected and appropriately identified, the following information will be entered into the chain-of-custody form:

- Site name and address;
- Sampler(s)' name(s) and signature(s);
- Names and signatures of persons involved in the chain of possession of samples;
- Sample number;

- Number of containers;
- Sample location;
- Date and time of collection;
- Type of sample, sample matrix and analyses requested;
- Preservation used (if any); and
- Any pertinent field data collected (e.g., pH, temperature, conductivity, Dissolved Oxygen [DO]).

The sampler will sign and date the "Relinquished" blank space prior to removing one copy of the custody form and sealing the remaining copies of the form in a Ziploc plastic bag taped to the underside of the sample cooler lid. The sample cooler will be sealed with tape prior to delivery or shipment to the laboratory.

6.2 Field Instruments

Field personnel will be trained in the proper operation of all field instruments (Community Air Monitoring Plan [CAMP] equipment, Trimble equipment, PID, groundwater pump, groundwater monitoring equipment utilized for low-flow sampling, etc.) prior to the start of field activities. Instruction manuals for the equipment will be on-site during the remedial investigation activities for reference and information regarding the appropriate calibration, operation and maintenance of the equipment. The equipment will be calibrated according to manufacturer specifications at the start of each day of fieldwork, if applicable. If an instrument fails calibration or is determined to be malfunctioning, the project manager will be contacted immediately, and a replacement instrument will be provided. Calibration, equipment issues and any associated corrective actions will be documented each day in the field notes.

6.3 Report Logs

Field logs and borings logs will be completed during the course of this investigation. A field log will be completed on a daily basis which will describe all field activities including:

- Project number, name, manager, and address;
- The date and time;
- The weather conditions;
- On-site personnel and associated affiliations;
- Description of field activities; and
- Pertinent sample collection information including sample identification numbers, description of samples, location of sampling points, GPS coordinates of each sampling location, number of samples taken, method of sample collection and any factors that may affect its quality, time of sample collection, name of collector, and field screening results, QA/QC sample information.

A boring log will be completed for the soil boring and will include the following information:

- Project number, name, manager, and location;
- The date and time;
- Drilling company and method used;
- Boring number;
- GPS coordinates of the boring location;
- Total boring depth and water table depths; and
- Pertinent soil sample information including sample number, interval, depth, amount recovered, color, composition, percent moisture, visual and olfactory observations of contamination, and PID readings.

A groundwater monitoring well completion log will be completed for each groundwater monitoring well which will include the following information:

- Project number, name, manager, and location;
- The date and time;
- Drilling company and method used;
- Groundwater monitoring well ID;
- GPS coordinates of the boring location;
- Total boring depth and water table depths;
- Well construction information including well diameter, well screen interval, riser length, and sand pack and hydrated bentonite seal interval depths within the annular space.

6.4 Laboratory Data

The laboratory will report analytical data results in the New York Analytical Services Protocol (ASP) Category B deliverable format for all samples collected as part of the remedial investigation. The NYSDEC Category B deliverable is required for the preparation of a DUSR. Information provided in a Category B deliverable includes the following:

- A narrative of the sample delivery group;
- Contract Lab Sample Information sheets;
- NYSDEC Data Package Summary Forms;
- Chain-of-custody forms;
- Laboratory analytical results;
- Calibration information;
- Surrogate recoveries;
- Laboratory blank results;
- MS/MSD recoveries;
- Laboratory QA/QC samples;
- Internal standard area and retention time summary;
- Chromatograms; and

› Raw data files.

The laboratory analytical data will include data flags where appropriate. Data flags are utilized in instances such as estimated detections below the reporting limit, estimated concentrations due to poor recovery, estimated concentrations due to poor spike sample recovery, and detection of a reported analyte in the associated laboratory method blank sample.

6.5 Emerging Contaminant Sampling

In accordance with the NYSDEC June 2019 Emerging Contaminant Guidance Memo, sampling for the emerging contaminants PFAS and 1,4-dioxane is required during remedial investigation activities. An approved USEPA analytical method currently only exists for PFAS analysis in drinking water. Approved analytical methods do not currently exist for the analysis of PFAS in groundwater and soil samples. In addition, due to the potential presence of PFAS in numerous products which may be utilized during site investigation activities such as cosmetics, sunscreen, stain and oil resistant clothing, coatings and other materials, specific field and sampling protocols are required in order to prevent cross-contamination of samples to be submitted for analysis of PFAS.

6.5.1 Sampling Equipment

During sampling activities, cosmetics, moisturizers, hand cream, unauthorized sunscreen and insect repellant, stain and oil resistant clothing (such as GORE-TEX) including water-resistant/water-proof boots, teflon and other products with the potential to contain PFAS will not be permitted. Boots must be made of PVC or polyurethane. Sampling materials are limited to stainless steel, high-density polyethylene (HDPE), acetate, silicon or polypropylene equipment. Plastic clipboards, binders, hard cover notebooks, adhesives, aluminum foil, sharpies or permanent markers are not permitted to be utilized. Water utilized for decontamination and equipment blanks must be "PFAS-free" and should be provided by the laboratory, if possible. Alconox and liquinox are permitted to be utilized during decontamination.

6.5.2 Sampling Protocols

Field staff will wash their hands prior to sampling activities and will wear gloves provided by the laboratory. Upon completion of the sampling, the gloves will be placed in a bag supplied by the laboratory and will be returned to the laboratory with the collected samples. Sampling for PFAS must occur prior to the collection of samples for other laboratory analyses.

6.5.3 Sample Containers and Storage

The PFAS sampling equipment and containers will be segregated from other equipment and containers, and PFAS samples will be placed in segregated coolers provided by the laboratory in order to prevent cross-contamination. Coolers are to be filled with loose ice; ice

packs are prohibited. All sample containers will be provided by the laboratory and will be made of HDPE or polypropylene. Water utilized for equipment blanks must be "PFAS-free" and should be provided by the laboratory, if possible.

Appendices

Appendix A – Tables

TABLE 1
SUMMARY OF SOIL SAMPLING REQUIREMENTS
57 ALEXANDER STREET
YONKERS, NEW YORK

Soil Samples											
Parameter	**USEPA Analytical Method**	**Sample Container Type**	**Sample Preservation***	**Sample Volume**	**Holding Time**	**Expected Number of Investigative Samples**	**Trip Blanks**	**Field Blanks**	**Equipment Blanks**	**Duplicates**	**MS/MSDs**
TCL VOCs + TICs	SW-846 8260B	Encore	Cool to 4°C	Approximately 5 grams per Encore sampler	48 hours from sample collection, 14 days if frozen to -7°C or extruded into methanol	96	1 trip blank per cooler containing at least 1 VOC sample	1 per 20 samples**	1 per 20 samples**	1 per 20 samples**	1 per 20 samples**
TCL SVOCs + TICS	SW-846 8270C	Glass jar, teflon-lined cap	Cool to 4°C	4 oz	14 days until laboratory extraction 40 days from extraction for analysis		None				
TAL Metals + hexavalent chromium	6010 and 7473	Glass jar, teflon-lined cap	Cool to 4°C	4 oz	28 days for mercury and hexavalent chromium, 6 months for remaining metals						
Pesticides	8081	Glass jar, teflon-lined cap	Cool to 4°C	100 g	14 days until laboratory extraction 40 days from extraction for analysis						
PCBs	8082	Glass jar, teflon-lined cap	Cool to 4°C		14 days until laboratory extraction 40 days from extraction for analysis						
1,4-dioxane	8270-SIM	Glass jar	Cool to 4°C	500 mL	14 days until laboratory extraction 40 days from extraction for analysis						
PFAS	modified 537	Three HDPE or polypropylene containers	Cool to 4°C	Three 250 ml containers	14 days			1 per 20 samples***	1 per 20 samples***	1 per 20 samples***	1 per 20 samples***

Notes:

ml - milliliter	TCL - USEPA Contract Laboratory Program Target Compound List
oz - ounce	TAL - Target Analyte List
g - grams	HDPE - High Density Polyethylene

*All samples will be stored at a temperature of 4 degrees Celcius or lower within coolers.
**Water utilized for field blank samples should be provided by the laboratory. As an alternative, deionized water may be utilized.
***PFAS-free water is provided by the laboratory for the field blank and equipment blank sample.

TABLE 2
SUMMARY OF GROUNDWATER SAMPLING REQUIREMENTS
57 ALEXANDER STREET
YONKERS, NEW YORK

Groundwater Samples											
Parameter	**USEPA Analytical Method**	**Sample Container Type**	**Sample Preservation***	**Sample Volume**	**Holding Time**	**Expected Number of Investigative Samples**	**Trip Blanks**	**Field Blanks**	**Equipment Blanks**	**Duplicates**	**MS/MSDs**
TCL VOCs + TICs	8260	Three 40 ml glass VOA vials	HCl	40 ml per vial, no headspace	14 days	6	1 trip blank per cooler containing at least 1 VOC sample	1 **	1 **	1 **	1 **
TCL SVOCs + TICS	8270	1 liter glass amber, teflon-lined cap	Cool to 4°C	2 liters	7 days until laboratory extraction 40 days from extraction for analysis		None				
TAL Metals + hexavalent chromium	6010 and 7473	Plastic or Glass	None for total metals, HNO_3 for dissolved metals	500 ml	24 hours for hexavalent chromium, 28 days for mercury, 6 months for remaining metals						
Pesticides	8081	1 liter glass amber, teflon-lined cap	Cool to 4°C	2 liters	7 days until laboratory extraction 40 days from extraction for analysis						
PCBs	8082	1 liter glass amber, teflon-lined cap	Cool to 4°C		7 days until laboratory extraction 40 days from extraction for analysis						
1,4-dioxane	8270-SIM	Glass jar	Cool to 4°C	NA - extracted from SVOC sample bottles	7 days until laboratory extraction 40 days from extraction for analysis						
PFAS	modified 537	Three 250 ml HDPE or polypropylene containers	Cool to 4°C	Three 250 ml containers	14 days			1 ***	1 ***	1 ***	1 ***

Notes:
ml - milliliter
*All samples will be stored at a temperature of 4 degrees Celcius or lower within coolers.
**Water utilized for field blank samples should be provided by the laboratory. As an alternative, deionized water may be utilized.
***PFAS-free water is provided by the laboratory for the field blank and equipment blank sample.

TABLE 3
SUMMARY OF SOIL VAPOR SAMPLING REQUIREMENTS
57 ALEXANDER STREET
YONKERS, NEW YORK

Soil Vapor Samples											
Parameter	**USEPA Analytical Method**	**Sample Container Type**	**Sample Preservation**	**Sample Volume**	**Holding Time**	**Expected Number of Investigative Samples**	**Trip Blanks**	**Field Blanks**	**Equipment Blanks**	**Duplicates**	**MS/MSDs**
VOCs + Helium	TO-15	Summa Canister	None	2.7-liter	30 days	14	None	None	None	1	None

Appendix B – Professional Profiles

Stephen Kaplan, PG

Director of SIR Services

Education

BA, Economics, State University of New York at Geneseo, 1992

Registrations/Certifications

Professional Geologist NY, 2017

Asbestos Inspector (Asbestos Inspection), 2001

Notary Public

OSHA 10-Hour Construction Safety and Health Certificate, 2012 & 2019

DOT 49 CFR Dangerous Goods Training Certificate, 2019

First Aid, CPR, AED, 2019

Transportation Worker Identification Credential (TWIC), through February 23, 2023

OSHA 40-Hour Hazwoper Certificate (40 hour), 2004

Stephen is Director of Site Investigation and Remediation Services and manages Phase I and Phase II Environmental Site Assessments and remediation projects. He consults with private clients, lending institutions, legal counsel, and municipalities. He routinely coordinates approvals, permitting, and remediation efforts with regulatory agencies. Stephen has performed site investigation and remediation services for residential, commercial, and industrial properties; communications facilities; and healthcare facilities.

27 years of professional experience

Avalon Great Neck, Great Neck, NY

Stephen oversaw the investigation and remediation services for the former Commander Oil-Great Neck Facility. The team conducted Phase I and Phase II Environmental Site Assessments on behalf of AvalonBay Communities as part of due diligence for redevelopment of the 3.49-acre parcel utilized as a Major Oil Storage Facility (MOSF) adjacent to Manhasset Bay. As part of its investigatory activities, the team conducted geophysical investigations, installed soil borings and monitoring wells, completed a groundwater tidal effects study, prepared a RAWP for submittal to NYSDEC. Stephen and his team worked directly with the NYSDEC under a Petroleum Spill Stipulation Agreement to successfully remediate the impacted soils and groundwater concurrent with the construction of a luxury apartment building located along the waterfront.

Commander Terminal Holdings, Oyster Bay, NY

Since January 2018, Stephen has been overseeing the onsite and offsite investigations, monitoring and maintenance of remediation equipment at an active MOSF currently leased and operated by Global. The facility is located along the waterfront in Oyster Bay and has been in operation as a gasoline, diesel and fuel oil MOSF since 1929. Ongoing remediation services include monthly gauging and bailing of onsite groundwater monitoring wells for LNAPL, monthly influent and effluent sampling of the active groundwater pump and treat system, bi-weekly ozone injection system maintenance and monitoring for control of CVOCs, quarterly groundwater sampling and issuance of Site Status Update Report (SSUR) and semi-annual seawall maintenance. Pursuant to the NYSDEC's specific request, a soil and multi-depth groundwater study was conducted in the Spring of 2019 at an offsite location to identify and delineate offsite impacts. Global's current lease with Commander Terminal Holdings continues through 2022, at which time the property will potentially enter the NYS Brownfields Program for redevelopment.

Smithtown Concrete Site Study and Remediation, Smithtown, NY

Stephen has managed the assessment and remediation for the commercial redevelopment of a 23-acre former concrete manufacturing site with municipal and private landfill. VHB determined contaminated soil related to a 10,000-gallon fuel oil tank, historic buried debris, and methane. Stephen oversaw the UST removal and worked with the NYSDEC to develop and implement a groundwater remediation system which ultimately led to spill closure. Stephen and his team have prepared multiple documents including a draft landfill closure plan for the NYSDEC, HASPs, a geophysical survey, groundwater, soil, soil vapor (including landfill gas survey), and air sampling. He

and his team are coordinating with NYSDEC and Suffolk County Department of Health Services to remove the remaining aboveground and underground storage tanks, and abandon the on-site registered groundwater well used for former industrial operations. The current property owner is CarMax and Stephen's team has prepared approved plans for the active SSDS, methane monitoring systems and methane capturing system to be installed during the property redevelopment.

Harbor Isle, Island Park, NY
Stephen and his team prepared Phase I Environmental Site Assessments on behalf of AvalonBay Communities as part of due diligence for redevelopment of the former Cibro MOSF adjacent to Reynolds Channel in Island Park. As part of Stephen's due diligence efforts for its client, Stephen has been involved with daily oversight of the BCP remediation project being conducted by the BCP Volunteer. The BCP project involves pile removals, petroleum-impacted soil removals, dewatering and water treatment, seawall installation and site-specific SCOs, demarcation layer, soil capping and site elevation increase to protect VHB's client's residential construction from rising sea levels.

Former Taystee Bakery Site Environmental Services, Phase I/II ESA, West Harlem, NY
Stephen oversaw Phase I and Phase II Environmental Site Assessments for the redevelopment of one block of vacant buildings located in West Harlem that were formerly utilized as a commercial bakery. As part of the Phase II ESA, a petroleum spill incident was identified, reported to, and closed by NYSDEC. He and his team also created a Work Plan approved by the New York City Mayor's Office of Environmental Remediation for the required E-Designation investigation of the property. Stephen and his team have prepared and conducted a community air monitoring plan (CAMP), onsite tracking of soil removal during construction activities, facilitated petroleum bulk storage (PBS) registrations and notifications to appropriate agencies as previously undocumented USTs and releases were identified during excavation, oversight of soil vapor barrier installation and preparation of Remedial Investigation Report (RIR).

Custom Earth Facility, Suffolk County, NY
Stephen managed the preparation and submission of an Engineering Report for an NYSDEC Part 360 permit application in Bay Shore. The existing facility operates under an NYSDEC Part 360 registration for the processing of wood mulch and other NYSDEC-designated recognizable uncontaminated concrete, asphalt, rock, brick and soils (RUCARBS) materials. The facility sought to expand operations related to soils processing. Stephen conducted and issued a property survey that was then used to prepare requisite figures and calculations for the facility's Site Plan (inclusive of a facility site flow), Work Flow Diagram, storage capacities, and setbacks. The NYSDEC issued a Part 360 Permit for the soil processing system in 2017.

Oberle Greenhouses, East Meadow, NY
Stephen has managed the assessment and remediation for the residential redevelopment of a former horticultural facility. The site was developed in the 1920s and improved with commercial greenhouses and growing fields until 2017. Stephen and his team conducted Phase I and II ESAs at the facility to quantify the impacts related to onsite soil, soil vapor and groundwater related to former horticultural usage, and inclusive of multiple in-service and out-of-service USTs, registered groundwater irrigation wells and a coal pile from historic boiler plant operations. Multiple

supplemental site investigation work plans, and site investigation reports related to the remediation conducted at the site were prepared. In addition, emerging contaminant (PFAS and 1,4-dioxane) soil and groundwater investigations were conducted to satisfy the NYSDEC's and the County DOH's specific requests.

The Landmark Colony Phase II ESA, Staten Island, NY
Stephen prepared a Phase II Environmental Site Assessment Work Plan for the development of a 427,000-square-foot construction project. This property redevelopment is for a mixed-use commercial and residential active design community in Staten Island. Since the project site has hazardous materials from its previous institutional uses, Stephen developed the Work Plan to include asbestos and lead-based paint surveys, a geophysical survey, soil and groundwater sampling, as well as soil vapor sampling. He prepared a NYCDEP-approved Work Plan in accordance with the current City Environmental Quality Review (CEQR) Technical Manual for the NYCDEP to evaluate site conditions and response actions to be implemented during the site redevelopment.

New York State Psychiatric Center Hospital Redevelopment Phase I and II ESAs, Central Islip, Brentwood, Melville and Dover Knolls, NY
Stephen coordinated site redevelopment issues with multiple parties following the initial Phase I and II ESAs at Central Islip. Coordination included working with County DOH, NYSDEC and the USEPA. Stephen's involvement with these projects included managing the removal of an electrical substation; remediation of PCB-contaminated soil; demolition of four out-of-service 500,000-gallon fuel oil ASTs; and remediation of fuel oil contamination. At one site, a soil management plan developed by Stephen addressed heavy metal and pesticide impacts at a former agricultural-use section. In addition, a portion of one former psychiatric center was developed as senior affordable housing which required that Stephen prepare various documents to satisfy HUD financing requirements.

Long Island MacArthur Airport On-Call Environmental Services, Ronkonkoma, NY
Stephen was the Project Manager for a three-year on-call agreement with the Town of Islip providing environmental consulting services. Monthly groundwater sampling was conducted at various locations of the airport property in accordance with the Town of Islip's NYSDEC SPDES compliance. Other consulting services included Phase II investigations, permitting, underground storage tank investigations, wetlands investigations, and remediation. To accomplish the goals of each task order, Stephen responded quickly to requests and worked closely with the Town of Islip, Suffolk County, and the NYSDEC.

Jessica Collins

Senior Project Manager

Education

BA, Geology, State University of New York at Binghamton, 2006

BA, Environmental Science, State University of New York at Binghamton, 2006

Registrations/Certifications

OSHA 10-Hour Construction Safety and Health Certificate, 2019

OSHA 40-Hour Hazwoper Certificate (with annual 8 Hour Refresher), 2006

OSHA 8- Hour Hazwoper Site Supervisor Certificate (8 Hour Training), 2008

Jessica is an accomplished Senior Project Manager with more than a decade of experience in the environmental and consulting industry. Her client-facing duties include providing coordination and analysis of a portfolio of environmental projects for compliance with regulations and policies, technical requirements and standards, client deliverable requirements, insurance companies standards, state regulatory agencies, and federal standards. Jessica specializes in Environmental Construction and Soil Management, Contaminated Site Remediation, Phase I and Phase II ESA Completion, Regulatory Agency Coordination, Brownfield Redevelopment, and Due Diligence Support. Core competencies include business development, leading collaborative teams, financial analysis & management, staff mentoring, field/contractor management, large-scale waste characterization, proposal writing, remedial cost estimating, and client management.

11 years of professional experience

Barclays Center and Atlantic Yards Redevelopment, Brooklyn, NY

Prior to joining VHB, Jessica was the Senior Project Manager and Field Manager for the largest ongoing redevelopment project in New York. The project included design, coordination and oversight of in situ waste characterization sampling, excavation and proper disposal of soil. In addition to overseeing the excavation of over 600,000 tons of soil, she was also responsible for implementing and managing remediation work at several NYSDEC spill sites within the project footprint, including in situ chemical oxidation, UST removal and soil excavation. She provided agency support for NYSDEC, NYCDEP, NYCOER, MTA (LIRR/NYCT) and ESDC.

Tangram NYC, Queens, NY

Prior to joining VHB, Jessica was the Senior Project Manager for a major redevelopment project in Flushing, New York. She was responsible for the design and management of a large-scale remedial investigation and waste characterization program for NYCOER VCP and E-designation programs. The project included coordination and oversight of in situ waste characterization sampling, excavation and proper disposal of over 450,000 tons of soil. The project also included managing remediation work of NYSDEC spill site within the project footprint.

VIA 57 West, New York, NY

Prior to joining VHB, Jessica was the Senior Project Manager responsible for management, investigation and remediation of a one-acre brownfield site containing chlorinated solvents, heavy metals and petroleum compounds in soil, soil vapor and groundwater over one city block in Manhattan, New York. This project included the implementation of a remedial investigation and completion of a Track 1 Unrestricted Use remediation through the New York State Department of Environmental Conservation (NYSDEC) Brownfields Cleanup Program (BCP). The project also included coordination and oversight of in situ waste characterization sampling; excavation and proper disposal of soil; and construction management and support for the excavation of 400,000 tons of soil.

Exide Technologies Battery Recycling Plant, Los Angeles County, CA
Prior to joining VHB, Jessica was the Senior Project Manager of field operations for the large-scale, high-profile investigation of 500 residential and sensitive-use properties located throughout Los Angeles County. She coordinated and managed the rapid assessment of soils by 12 sampling teams with heavy scrutiny by the press, regulators and home owners. Due to long-time aerial deposition of emissions originating from a former battery recycling facility in Vernon, CA, soil was analyzed for lead contamination on a real-time basis using X-ray fluorescence (XRF) instruments.

VHB, New York, NY
In 2018, Jessica joined VHB as a Senior Project Manager in Remediation.

Roux Associates, Inc., Islandia, NY
Prior to joining VHB, Jessica was a Senior Hydrogeologist at Roux Associates, Inc. where she led the Brownfields Practice Area as a senior project manager on multiple major remedial and construction projects. She designed, implemented, and managed projects from proposal stage through to closure, with focus on large-scale New York City construction management and client relationship development.

Other duties included the following

- Managed multiple large-scale projects with annual net revenue of $1-2 million
- Extensive experience in New York State Brownfields Cleanup Program, New York City Office of Environmental Remediation (NYCOER) E-Designation and Voluntary Cleanup Programs, and New York State Spills Program
- Designed and implemented staff training/mentoring program to assist with onboarding new staff. Focused on one-on-one junior staff mentorships
- Participated in business development efforts in growing the Brownfields Practice Area through attendance of major real estate conferences and events
- Concentrated on cost-benefit analysis of innovative remedial technology implementation with a focus on client cost saving

Project Highlights

- Senior Project Manager and Field Manager for the largest ongoing redevelopment project in New York. Project includes design, coordination, and oversight of in situ waste characterization sampling, excavation, and proper disposal of soil. Performed oversight of excavation of over 600,000 tons of soil. Responsible for implementing and managing remediation work at several NYSDEC spill sites within the project footprint, including in situ chemical oxidation, UST removal, and soil excavation. Agency support for NYSDEC, NYCDEP, NYCOER, MTA (LIRR/NYCT), and ESDC.
- Senior Project Manager for a major redevelopment project in Flushing, New York. Responsible for the design and management of a large-scale remedial investigation and waste characterization program for NYCOER VCP and E-designation programs. Project included coordination and oversight of in situ waste characterization sampling, excavation, and proper disposal of over 450,000 tons of soil. Also included managing remediation work of NYSDEC spill site within the project footprint.
- Senior Project Manager of field operations for large scale, high profile investigation of 500 residential and sensitive-use properties located throughout Los Angeles County. Coordinated and managed the rapid assessment of soils by twelve sampling teams with heavy scrutiny by the press, regulators, and home owners. Due to long-time aerial deposition of emissions originating from a former battery recycling facility in

Vernon, CA, soil was analyzed for lead contamination on a real-time basis using X-ray fluorescence (XRF) instruments.

- Senior Project Manager responsible for management, investigation, and remediation of a one-acre brownfield site containing chlorinated solvents, heavy metals, and petroleum compounds in soil, soil vapor, and groundwater over one city block in Manhattan, New York. This project included the implementation of a remedial investigation and completion of a Track 1 Unrestricted Use remediation through the New York State Department of Environmental Conservation (NYSDEC) Brownfields Cleanup Program (BCP). Project also included coordination and oversight of in situ waste characterization sampling, excavation, and proper disposal of soil. Construction management and support for excavation of 400,000 tons of soil.

George William Lester, PE

Project Engineer

Education

MS, Civil and Environmental Engineering, University of Vermont, 2013

BS, Civil Engineering, University of Vermont, 2011

Registrations/Certifications

Professional Engineer NC, 2019

Professional Engineer VT, 2016

Professional Engineer NY, 2017

OSHA 10-Hour Construction Safety and Health Certificate

Certified Concrete Testing Technician Grade I, American Concrete Institute, 2015

OSHA 40-Hour Hazwoper Certificate, 2015

OSHA 8- Hour Hazwoper Site Supervisor Certificate, 2016

OSHA 8- Hour Hazwoper Refresher Certificate, 2018

OSHA Confined Space Entry Training, 2016

Affiliations/Memberships

American Society of Civil Engineers, Vermont Chapter

Chi Epsilon

Tau Beta Pi

Order of the Engineer

George has civil and environmental engineering experience focused primarily on groundwater remediation, stormwater management, and geotechnical analysis and civil design. He has been involved with the design, implementation, operation, and monitoring of numerous soil, soil gas, and groundwater remediation systems at chlorinated solvent sites. He manages the field monitoring program for several contaminated sites including a Superfund site and several chlorinated solvent sites. Additionally, George has worked on stormwater treatment systems as well as residential and commercial development projects from the project planning phase through construction completion. He also has experience in geotechnical characterization and design, civil design, and land development. George is a licensed Professional Engineer in Vermont, New York, and North Carolina.

6 years of professional experience

Selected Experience Summary

Confidential Industrial Client – Groundwater Extraction and Treatment System Construction, Operation, Maintenance, and Monitoring – New York
Performed construction oversight tasks for the construction of a Waterloo Barrier®, engineered soil cap and the and the groundwater extraction and treatment system at a chlorinated solvent site in New York state. The Waterloo Barrier® encompasses approximately 2.6 acres ranging in depth from 35 to 55 feet below grade. The engineered soil cap was constructed with over 6000 cubic yards of imported low permeability clay, fill, and topsoil. George prepared the Site Management Plan, Operation, Maintenance and Monitoring Plan, and Sampling and Analysis Plan for the site. He continues to oversee the operation, maintenance, and monitoring of the groundwater extraction and treatment system including monitoring for compliance of air and water discharge regulations and verification of the system performance goals. He is responsible for annual certification of the maintenance of the engineering and institutional controls.

Confidential Industrial Client – Groundwater Extraction and Treatment System Construction, Operation, Maintenance, and Monitoring – North Carolina
Oversees the operation, maintenance, and monitoring of a groundwater extraction and air stripper treatment system at a former industrial site in North Carolina. As role involves conducting routine engineering inspections, ongoing preventative and unplanned equipment maintenance, continuous treatment system optimization, and reporting to NCDEQ.

Pine Street Canal Superfund Site, Compliance Monitoring Activities, Burlington, VT
Manages the ongoing long-term monitoring and operation and maintenance activities at the Pine Street Canal Superfund Site. Prepared and executed additional investigations including soil borings, profiling, monitoring well installation, and field sampling of sediment, surface water, and pore water in order to verify compliance with the project

Remedial Action Objectives. Provides ongoing technical guidance do the performing defendant group.

Confidential Industrial Client – Sub-Slab Depressurization System Design Construction, Operation, Maintenance, and Monitoring – New York
Completed the design and construction of a sub-slab depressurization system for a former manufacturing facility in Rockland County, New York. Responsibilities included pre-design testing, completion of the design report, and installation of the system. After successful construction, the system was started and optimized to insure adequate capture of the sub-slab soil gas. Ongoing work includes confirmation sampling, preparation of a Final Engineering Report and Site Management Plan for New York State.

Confidential Private Client, Stormwater Treatment Systems and Discharge Monitoring, Virginia and Tennessee
Assisted in the design of a stormwater treatment system at diesel fueling stations in Virginia and Tennessee, including the preparation of a stormwater runoff model, design of a filtration system, and estimating annual filtration media usage. He collaborated in the design and installation of monitoring and automated sampling equipment used to verify compliance with discharge permits. George analyzed data obtained from the monitoring and sampling equipment in an effort to optimize the functionality of the treatment system.

Big Mountain Hotel, Micropile Design and Construction Oversight, Jackson, WY
Project lead for the design and construction oversight of a deep foundation system incorporating micropiles for a new multi-story hotel in Jackson, Wyoming. The design required reviewing existing geotechnical information, initial design, pre-production Micropile verification testing, and a final design incorporating architectural and structural changes.

Wyoming DOT, Material Testing and Inspections, Hoback, WY
Managed the material testing and inspection program in accordance with the Wyoming DOT specifications for the installation of a soil-nailed retaining wall and approximately 200 shear piles to mitigate existing landslides along US Highway 89 in Hoback, Wyoming. Testing and inspection responsibilities included collecting grout samples for compressive strength testing, coring shotcrete panels for compressive strength testing, testing for temperature, slump, unit weight, and air content testing for cast-in-place concrete, and preforming gradation analysis for granular backfill.

Marriot Hotel, Soil Nail Design and Construction Oversight, Jackson, WY
Project lead for the design and construction oversight of a soil-nailed shoring wall for a new four-story hotel in Jackson, Wyoming. Design included a temporary soil-nail and shotcrete shoring wall and a shotcrete foundation wall. Testing included load verification testing prior to production soil nail installation and proof testing throughout soil nail production.

Jackson Hole Still Works, Geotechnical Investigation, Site Civil and Process Water Design, Jackson, WY
Conducted a geotechnical investigation including the installation of test helical piles and excavation of several test pits for geotechnical logging and completed the geotechnical engineering report including foundation design calculations and recommendations for a

new distillery. Completed the site civil design work including a new three-phase power line, commercial water and sewer lines, and site grading. Designed process water storage and distribution system including interior floor drainage, underground valves, underground storage tank, and piping and pump layout. Performed concrete testing (temperature, slump, density, air content, and compressive strength) for foundation and interior slab, and supervised installation of geo-grid and backfill to mitigate poor soil conditions.

FARMHOUSE Development, Deep Foundation Design, Testing and Inspections, Jackson, WY
Conducted a geotechnical investigation including the installation of test helical piles and excavation of several test pits for geotechnical logging and completed the geotechnical engineering report including foundation design calculations and recommendations for a 15-unit live/work development. Designed water distribution and sewer lift station and collection system that tie into the existing Town of Jackson water and sewer lines. Performed testing and inspection of the water and sewer line installations, completed stormwater management and grading plan to comply with the Town of Jackson and State of Wyoming regulations. Designed a deep foundation system incorporating vertical and battered helical piles. Performed oversight and testing for helical pile installations, and rebar inspections and concrete testing (temperature, slump, density, air content, and compressive strength) for foundation walls, as well as framing special inspection tasks to verify compliance with applicable codes and structural engineering drawings.

Colstrip Steam Electric Station, Groundwater Collection System, Colstrip, MT
Completed a System Operating Procedure and Piping and Instrumentation Diagram for a network of over 100 wells capturing groundwater around the effluent holding ponds at the Colstrip Steam Electric Station.

Colstrip Steam Electric Station, Process Water Treatment and Management, Colstrip, MT
Assisted in the preparation of a long-term management plan for fly ash slurry at the Colstrip Steam Electric Station. Designed numerous pumping stations for intra-pond water transfer and completed feasibility study for passive fly ash slurry settling pond. Designed several lined ponds for fly ash effluent storage including earthwork calculations and method specifications, design of liner underdrain system, and preparation of project specifications.

Village Center Inn, Foundation Drainage System, Teton Village, WY
Designed drainage and discharge system for a new hotel with underground parking garage below the water table. The design included a vast network of collection and manifold piping and a lift station. Analysis included the installation of groundwater wells for slug testing, the preparation of a groundwater flow model, and collection pipe and pump size calculations.

Geotechnical Engineering Reports, Wyoming, Idaho, Montana
Performed site investigations including the excavation of test pits and drilling of boreholes for geotechnical logging, test helical pile installations, and groundwater monitoring. Conduction soil laboratory analyses including sieve analysis, moisture content, Atterberg limits, and proctor compaction testing. Prepared geotechnical engineering reports including soil and rock identification and classification, lateral earth

pressures and bearing capacity calculations, and excavation, foundation, and drainage recommendations.

William S. Taber, PE

Senior Project Manager

Education

MBA, Business, Boston University, 1986

BS, Chemical Engineering, Worcester Polytechnic Institute, 1980

Registrations/Certifications

Professional Engineer (Chemical Engineering) MA, 1994

Professional Engineer (Chemical Engineer) CT, 2015

Professional Engineer (Chemical Engineer) VT, 2015

Professional Engineer (Chemical Engineer) NH, 2015

Professional Engineer (Chemical Engineer) ME, 2015

Professional Engineer (Chemical Engineer) RI, 2015

Professional Engineer (Professional Engineer) NY, 2015

UST Operator, Class A RI, 2012

UST Operator, Class A MA, 2012

UST Operator, Class B RI, 2012

UST Operator, Class B MA, 2012

Certified UST Third-Party Inspector, 2010

Certified Solid Waste Third Party Inspector, 2017

Bill is a Professional Chemical Engineer registered in each of the New England states and in New York with extensive experience in a wide variety of oil and hazardous materials compliance matters. Considered by many to be highly skilled in above and underground storage tanks, Bill is VHB's lead design engineer for fuel storage tank services, and he has played a key role on numerous tank projects for public- and private-sector clients, including state agencies, municipalities, and institutions.

40 years of professional experience

Transformer Spill Remediation, Lawrence, MA

For a confidential client, Bill developed a short-term remediation plan and then managed the remediation at a mill in Massachusetts. The remediation required the removal and clean-up of spilled transformers; removal of 55-gallon drums containing a variety of petroleum products, halogenated solvents, acids, and bases; removal of aboveground and underground fuel oil tanks; and recycling of petroleum contaminated soil onsite.

University of Massachusetts, Environmental Services, Dartmouth, MA

Bill conducted the removal of numerous underground storage tanks at the University of Massachusetts Dartmouth (UMD) and provided design and installation oversight for the new replacement underground and aboveground storage tanks. The designs included the development of bidding documents, construction specifications, assisting with contractor selection, and construction oversight. He provided Massachusetts Contingency Plan (MCP) support to the University related to diesel fuel and gasoline releases from the removed emergency generator and fueling facility USTs. He also managed remediation of impacted areas on campus related to diesel fuel and gasoline releases from the removed emergency generator and fueling facility USTs; conducted spill prevention and petroleum storage inspections for the University's garage, maintenance facility, power plant, and maintenance and fuel storage areas throughout the campus; and prepared the Spill Prevention Control and Countermeasure (SPCC) Plan for all of the facilities. He continues to update the spill plans for UMD as necessary and assist them with tank management issues.

Caithness Energy Plant Permitting, Yaphank, NY

Bill secured permits with the New York State Department of Environmental Conservation for the storage of oil and hazardous material on behalf of Caithness Energy's new power plants. He prepared a Major Oil Storage Facility License, a Draft Spill Prevention Control and Countermeasure Plan, and a Sewage Disposal System Plan. The facility will include 1.5 million gallons of No. 2/Diesel fuel aboveground storage, 40,000 gallons of aqueous ammonia storage, and various other hazardous materials and waste oils.

Littleton Public Works Garage and Water & Light Facility SPCC Services, Littleton, MA

For the Littleton Department of Public Works, Bill conducted spill prevention and petroleum storage inspections for the Highway Garage and Water & Light Garage and

OSHA Confined Space Entry Training, 1997

OSHA 8- Hour Hazwoper Site Supervisor Certificate, 1992

OSHA 40-Hour Hazwoper Certificate, 1990

OSHA 10-Hour Construction Safety and Health Certificate

Affiliations/Memberships

Licensed Site Professional Association, Massachusetts, 1994

American Institute of Chemical Engineers, Boston, 2007

its maintenance facilities. He also prepared Spill Prevention Control and Countermeasure (SPCC) Plan for both facilities.

Former Power Plant and Mill Development, Newport, RI
For a private developer, Bill managed the site investigation and subsurface exploration related to metals contamination from the power plant formerly located at this former mill site on Thames Street near Spring Wharf. He also worked closely with the property owner to provide insight into the environmental conditions onsite and provided remedial cost estimates. Additionally, Bill acted as liaison with the buyer's environmental consultant.

Lynn Harbor, Former Landfill & Coal Gasification Facility Subsurface Investigation, Lynn, MA
For a property abutting a former landfill and coal gasification facility, Bill managed a subsurface investigation that included the determination of the extent of subsurface contamination and recommendations for further investigation and short-term remedial actions.

Dry Cleaner Spill, New Hampshire
Bill developed a short-term remediation plan to clean up a septic system for a strip mall contaminated with perchloroethylene from an on-site dry cleaner. He managed the cleanup after the plan was approved by both state and local officials.

Stop & Shop, SPCC Services, Freetown, MA
Bill conducted spill prevention and petroleum storage inspections for the equipment maintenance, truck maintenance, and truck fueling facilities at Stop & Shop's commercial warehouse site in southeastern Massachusetts. He prepared the facility's Spill Prevention Control and Countermeasure (SPCC) Plan, Risk Management Plan, and Integrated Contingency Plan and served as a consultant on environmental issues.

Public Works UST/AST Removals, Hanover, MA
For the Hanover Department of Public Works (DPW), Bill managed the removal of seven underground storage tanks (USTs) and aboveground storage tanks (ASTs) from the DPW facility, Fire Department Headquarters, and Town Hall. The tanks, which had contained gasoline, diesel fuel, waste oil, and number 2 fuel oil, ranged in size from 1,000 to 5,000 gallons. He also managed the off-site treatment of soil contaminated by the USTs in accordance with Massachusetts Department of Environmental Protection regulations. Bill designed, permitted, and managed the installation of two 10,000-gallon (gasoline and diesel fuel) double-walled fiberglass USTs, pumps, dispensers, automated fuel management system, and fire suppression system at the DPW facility. In addition, he designed, permitted, and managed the installation of a 500-gallon waste oil and 650-gallon fuel oil AST. The waste oil AST was also the supply for the facility's waste oil heating system.

Swampscott Public Works Garage & Sewer Pump Station SPCC Services, Swampscott, MA
For the Swampscott Department of Public Works, Bill conducted spill prevention and petroleum storage inspections for the garage and maintenance facility and the Sewer Pumping facility. He also prepared Spill Prevention Control and Countermeasure (SPCC) Plan and designed and oversaw the replacement of the AST for fueling town vehicles.

Heather Waldmann, CHMM

Senior Project Manager

Education

BS, Environmental Science, Saint Vincent College, 2006

Registrations/Certifications

Certified Hazardous Materials Manager (Credential Number 17591), 2015

OSHA 10-Hour Construction Safety and Health Certificate, 2019

OSHA 40-Hour Hazwoper Certificate (with annual 8 Hour Refresher), 2006

OSHA 8- Hour Hazwoper Site Supervisor Certificate (8 Hour Training), 2008

DOT Hazmat Ground Shipper Certification, 2019

Heather Waldmann is an accomplished Senior Project Manager and a Certified Hazardous Materials Manager (CHMM) in VHB's Site Investigation and Remediation (SIR) group. With over 13 years of experience in environmental consulting, she provides collaborative management of all aspects of large-scale to small-scale sites from investigation through remediation and construction. Heather specializes in construction soil management activities, contaminated site remediation, regulatory agency coordination, Spill investigation and remediation, Phase I and Phase II ESA oversight, underground storage tank removal projects and vapor intrusion investigations for private and public clients throughout the New York metropolitan area. Heather is also responsible for staff mentoring, project financial management, management and coordination of field staff and contractors, client management and business development.

13 years of professional experience

IS 98 Bay Academy Underground Storage Tank Removal, Brooklyn, New York
Heather was the Senior Project Manager for underground storage tank (UST) removal and site remediation activities at the IS 98 Bay Academy in Brooklyn. In addition to the preparation of an Excavated Materials Disposal Plan (EMDP) and Tank Closure Plan, she prepared a Community Air Monitoring Plan (CAMP) and Health and Safety Plan (HASP), and provided technical review and coordination of the project from the initial planning stages and waste characterization through tank removal and remediation to facilitate closure of a documented New York State Department of Environmental Conservation (NYSDEC) spill attributed to a release from a No. 4 fuel oil UST.

Southside Hospital Construction Project, Bayshore, New York
Heather is providing project management in association with an expansion project associated with Southside Hospital in Bayshore, New York. She has coordinated and managed UIC investigation and remediation activities, waste characterization sampling, and is currently providing third-party soil management review during construction activities. She has also prepared an Excavated Materials Handling Plan (EMHP) documenting waste management protocols and providing review and technical guidance regarding permitted transport and disposal facilities in order to ensure all applicable regulations are followed by the on-site contractors.

Verizon Wireless Phase I and Phase II Environmental Site Assessments, and Soil Management Plans, New York
Heather prepares, manages and reviews Phase I and Phase II Environmental Site Assessments throughout Long Island and New York City for Verizon Wireless service expansions. In support of construction activities, she prepares Soil and Groundwater Management Plans (S/GWMP) in association with on-site contamination and manages all aspects of the site investigation and remediation activities, including agency and contractor coordination.

Retail Gasoline Station Remediations, New York
Prior to joining VHB, Heather served as Case Manager managing a portfolio of retail gasoline station remediation sites throughout Long Island, New York City, Westchester

County, Dutchess County and Putnam County. She communicated with clients, regulators and subcontractors on a daily basis, scheduled and coordinated all project work and meetings, and managed subcontractors. She completed Phase I and Phase II Environmental Site Assessments, Underground Injection Control (UIC) structure investigation and remediation activities, provided oversight for UST removals and remediation system installation activities, provided waste management activities (including soil excavation and removal), conducted soil and groundwater sampling and prepared investigation and summary reports. She was responsible for budget management of all assigned projects, and trained junior staff with field work, report writing, regulatory requirements and budget management.

Smithtown Concrete Site Study and Remediation, Smithtown, New York
Heather conducted field activities and technical review in association with the assessment and remediation of a 23-acre former concrete manufacturing facility with municipal and private landfill. Investigation activities included test pits, soil and groundwater sampling and soil vapor investigation. She also provided oversight and management in association with a No. 6 fuel oil release, including delineation activities and installation and O&M of two belt-skimmer remediation systems to facilitate NYSDEC Spill closure.

Southampton Schools Maintenance Facility, Southampton, New York
Heather provided oversight during the removal of a leaking fuel oil UST. Following removal of the UST, she conducted soil and groundwater investigation activities in order to delineate and determine the extent of subsurface impacts as the result of the fuel oil release, coordinated with the NYSDEC case manager and facilitated the closure of the associated NYSDEC Spill number.

Mercury-Contaminated Venturi Meter Chamber Consulting Services, Brooklyn and Staten Island, New York
Heather provided project management activities for the investigation of three New York City Department of Environmental Protection (NYCDEP) venturi meter chambers. The concrete walls and floors within these chambers had formerly been determined to be contaminated at potentially hazardous levels in association with releases from former mercury-containing equipment. Heather provided technical guidance for the collection of concrete chip samples from the three venturi meter chambers, which included specific precautions and procedures associated with potentially hazardous mercury concentrations. Heather also provided oversight and mercury vapor monitoring during confined space entry activities to collect samples of the concrete walls and floors of the chambers. Following the sampling activities, she provided compared analytical results to applicable hazardous waste regulations and advised the client accordingly.

Gateway National Recreation Area, Brooklyn, New York
Heather provided project management and oversight for the investigation of coal ash beneath a deteriorated roadway in the Gateway National Recreation Area. The investigation included the installation of soil borings within the roadway to delineate the vertical and horizontal extent of the coal ash and the collection of samples in order to evaluate the potential hazardous nature of the coal ash. Heather provided technical review of the analytical data and provided guidance to the National Park Service regarding health and safety protocols, and excavation and disposal of the coal ash.

Deepwater Wind, East Hampton, New York
Heather prepared a hazardous materials assessment for a proposed approximately 13-mile utility corridor route in support of the Deepwater Wind project. In addition, Heather has managed and reviewed several Phase I ESAs for potential landing locations and is managing upcoming soil sampling activities in preparation for soil management associated with future construction activities.

sPower Solar Farms, Various, New York
Heather has managed site investigation activities at various proposed sPower solar farm properties on Long Island, New York. Activities have included Phase I and Phase II Environmental Site Assessments and an evaluation of potential environmental constraints for ground-based solar photovoltaic facilities and associated utility corridor routes, including a site with an active SWF/LF registration.

The Oaks at Mill River UIC Investigation and UST Removal, Upper Brookville, New York
Heather provided management and oversight in association with a residential redevelopment project. Activities included identification and remediation of UIC structures, removal of two fuel oil USTs and one gasoline UST, impact delineation activities, tank grave remediation and endpoint sampling activities. She provided agency coordination, management of field staff and contractors, technical review and report preparation.

Gasoline Service Station Phase I and Phase II ESAs, Lawrence, NY
Heather completed Phase I and Phase II Environmental Site Assessments on a former gasoline service station that was utilized as an automotive service station. Phase II Environmental Site Assessment activities included sub-slab soil vapor and indoor air monitoring activities in accordance with New York State Department of Health (NYSDOH) protocols, soil sampling, groundwater monitoring well installation activities and groundwater sampling. Heather also conducted supplemental New York State Environmental Conservation (NYSDEC) spill investigation at the site in order to determine the point source of groundwater contamination.

Appendix D – Health and Safety Plan

Project Health and Safety Plan

57 Alexander Street
Yonkers, New York 10701

NYSDEC Index Number C360194

Prepared for:

57 Alexander JV LLC
c/o Rose Associates, Inc.
777 Third Avenue
New York, NY

Prepared by:

VHB Engineering, Surveying, Landscape Architecture and Geology, P.C.
1 Penn Plaza
Suite 715
New York, NY 10119

January 2020

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	Hospital Information and Map
	Field Accident Report

Glossary of Common Acronyms

ACGIH - American Conference of Governmental Industrial Hygienists
ANSI - American National Standards Institute
APR - Air Purifying Respirator
C&D – Construction and Demolition
CFR - Code of Federal Regulations
CGI - Combustible Gas Indicator
CSEP - Confined Space Entry Permit
DECON – Decontamination
ESA - Environmental Site Assessment
ESI – Environmental Site Investigation
FID - Flame Ionization Detector
HEPA – High Efficiency Particulate Air
HASP - Health and Safety Plan
IDLH - Immediately Dangerous to Life and Health
LEL - Lower Explosive Limit
MSDS - Material Safety Data Sheets
NIOSH - National Institute for Occupational Safety and Health
OSHA - Occupational Safety and Health Administration
OVA - Organic Vapor Analyzer
PID - Photoionization Detector
PEL - Permissible Exposure Limit
PPB – Parts Per Billion
PPE - Personal Protective Equipment
PPM – Parts Per Million
REC – Recognized Environmental Condition
SCBA - Self Contained Breathing Apparatus
SOP - Standard Operating Procedure
SPCC - Spill Prevention Controls and Countermeasures
SVOC - Semi-Volatile Organic Compound
TLV - Threshold Limit Value
TWA - Time Weighted Average
UEL - Upper Explosive Limit
UIC - Underground Injection Control

Statement of Commitment

On-site employees may be exposed to risks from hazardous conditions related to site investigation and remediation activities to be conducted in association with the 57 Alexander Street site in the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP), located at 47-71 Alexander Street, in the City of Yonkers, Westchester County, State of New York (the "BCP site" or the "site"). The BCP site encompasses a land area of approximately 4.26 acres being developed into a multi-family residential building and is identified on the Westchester County tax maps as landward portions of Block 2605, Lot 51, and Block 2610, Lots 50, 53, and 73.

VHB's policy is to minimize the possibility of work-related injury through aware and qualified supervision, health and safety training, medical monitoring, use of appropriate personal protective equipment, and the activity-specific safety protocols contained in this Health and Safety Plan (HASP). VHB has established a guidance program to implement this policy in a manner that protects personnel to the maximum reasonable extent.

This HASP, which applies to personnel actually or potentially exposed to safety or health hazards, describes emergency response procedures for actual and potential physical and chemical hazards. This HASP is also intended to inform and guide all personnel entering the work area or exclusion zone. All persons are to acknowledge that they understand the potential hazards and the contents of this HASP by signing off upon notice of availability of the document. A copy of that Site Safety Plan Acknowledgement Form is included in Attachment B of this HASP. Contractors and suppliers are retained as independent contractors and are responsible for ensuring the health and safety of their own employees.

VHB may require that its personnel, subcontractors, clients and visitors take certain precautions in accordance with this HASP.

1.0

Introduction and Site Entry Requirements

VHB has prepared this HASP for activities associated with site investigation and remediation activities to be conducted in association with the 57 Alexander Street site in the NYSDEC BCP, located at 47-71 Alexander Street, in the City of Yonkers, Westchester County, State of New York (the "BCP site" or the "site"). The BCP site encompasses a land area of approximately 4.26 acres being developed into a multi-family residential building and is identified on the Westchester County tax maps as landward portions of Block 2605, Lot 51, and Block 2610, Lots 50, 53, and 73.

This HASP addresses the potential physical and chemical hazards that VHB's workers may face while performing the planned site activities. It establishes procedures to minimize worker's exposures through personal protective equipment and safe work practices. The protocols and procedures outlined herein will be used for all planned field activities at the site. A copy of the HASP will be available on site during all field activities and all personnel will be familiar with the document and its requirements.

This HASP has been developed to meet the requirements of the Occupational Safety and Health Administration (OSHA) regulation, Title 29, Code of Federal Regulations. It is intended for the protection of our workers for Scope of Work activities. All others, such as subcontractors, clients and visitors will review the HASP and follow its procedures.

This site-specific HASP is based on information available at the time the plan was prepared. The HASP will be revised when new information is received or as conditions change. A written amendment will be prepared for any activities not covered herein and document all changes made to the HASP. A copy of the Site Safety Plan Amendment form is included in Attachment C of this HASP. The Site Safety Officer (a.k.a. the SSO) and Project Manager (as identified within this HASP) will acknowledge all amendments to the HASP.

1.1 Site Safety Plan Acceptance Acknowledgement

The Project Manager will be responsible for providing a copy of this plan to all personnel that are or may reasonably be expected to work at the site and will request that each person sign the Safety Plan Acknowledgment Form in Attachment B. By signing the Site Safety Plan Acknowledgment Form, personnel are recognizing the actual or potential on-site hazards and the policies and procedures that design personnel will take to minimize exposure and risk. Site Safety Plan Acknowledgment Forms will also be signed for any Safety Plan Amendments that may be completed during this work. Safety Plan Amendment forms are included in Attachment C.

1.2 Daily Safety Meetings

Each day before work begins, the Site Safety Officer will hold safety (tailgate or tool box) meetings to ensure that all on-site personnel understand the site conditions and operating procedures, to ensure that personal protective equipment is being used correctly and to address safety questions and concerns. Meeting minutes and attendance will be recorded. All personnel eligible to enter the exclusion and decontamination zones must attend the meetings. Project staff will discuss and remedy any health and safety issues at these meetings.

1.3 Key Personnel

The following identifies the key personnel involved with the work, their title, and contact telephone number:

Personnel	Title	Firm	Telephone
Stephen Kaplan	Health and Safety Manager	VHB	(631) 787-3400
Jessica Collins	Project Manager	VHB	(646) 809-8042
Christopher Rooney	Site Safety Officer	VHB	(631) 787-3473

If VHB replaces any of the above, the HASP will be modified accordingly.

1.4 Roles and Responsibilities

The VHB Project Manager is responsible for overall project administration and, with guidance from the VHB Health and Safety Manager, for supervising the implementation of this HASP. When the Project Manager is absent from the site, the Site Safety Officer will assume the on-site responsibilities of the Project Manager. All

relevant OSHA health and safety standards will apply. The Site Safety Officer will conduct daily (tail gate or tool box) safety meetings at the project site and oversee daily safety issues. Each subcontractor and supplier (defined as an OSHA employer) is also responsible for the health and safety of its employees. If there is any dispute about health and safety or project activities, on-site personnel will attempt to resolve the issue. If the issue cannot be resolved at the site, the Project Manager will be consulted.

The VHB Site Safety Officer is also responsible for coordinating and enforcing health and safety activities on-site. The Site Safety Officer must meet the emergency response and hazardous materials training requirements of OSHA 29 CFR Part 1910.120, must have completed OSHA supervisor training, pursuant to 29 CFR 1910.120 (e) 4; and must have appropriate experience to the related site work. The Site Safety Officer is authorized to suspend the site work based on safety concerns, and is responsible for the following:

- Educating personnel about all of the information in this HASP and any other safety requirements to be observed during site operations, including, but not limited to, decontamination procedures, designation of work zones and levels of protection, air monitoring, fit testing, and emergency procedures dealing with fire and first aid.

- Coordinating site safety decisions with the project superintendent and the Project Manager.

- Designating exclusion, decontamination and support zones on a daily basis.

- Monitoring the condition and status of known on-site hazards and maintaining and implementing the air quality monitoring program specified in this HASP.

- Maintaining the exclusion zone entry/exit log and site entry/exit log.

- Maintaining records of safety problems, corrective measures and documentation of any chemical exposures or physical injuries (the Site Safety Officer will document these conditions in a bound notebook and maintain a copy of the notebook on-site).

Any person who observes safety concerns and potential hazards that have not been addressed in the daily safety meetings should immediately report their observations/concerns to the Site Safety Officer or appropriate key personnel.

1.5 Training Requirements

All personnel entering the exclusion zone or decontamination zone must meet the training requirements for hazardous waste site operations and emergency response operations in accordance with OSHA 29 CFR 1910.120(e). VHB site personnel must have completed a 40 hour OSHA HAZWOPER training program. If the 40 hour training program was completed more than 12 months prior to commencement of site work, then VHB personnel must have completed an 8 hour refresher training class at a point during the prior 12 month period. A wallet-size copy of the most recent HAZWOPER training certificate must be available at the site at all times.

Each subcontractor and supplier working on the job must provide the Site Safety Officer with training documentation for its personnel. This documentation will be reviewed by the Site Safety Officer to ensure compliance with site-specific health and safety rules. The Site Safety Officer may require modifications to the subcontractor or suppliers safety training documentation if it does not conform to site-specific requirements.

1.6 Medical Monitoring Requirements

All personnel and visitors entering the exclusion zone or decontamination zone must have completed appropriate medical monitoring required under OSHA 29 CFR 1910.120(f). Medical monitoring enables a physician to monitor each employee's health, physical condition, and his fitness to wear respiratory protective equipment and carry out on-site tasks.

Evidence of compliance with any additional medical monitoring requirements for this site must also be included. Subcontractors and suppliers working on the job must provide the Site Safety Officer with documentation on their medical monitoring programs.

1.7 Fit-Testing Requirements

All personnel and visitors entering the exclusion zone or decontamination zone using a negative pressure air purifying respirator (APR) must have successfully passed a qualitative respirator fit test in accordance with OSHA 29 CFR 1910.134 or the American National Standards Institute (ANSI).

Fit testing documentation is the responsibility of each subcontractor. Documentation of VHB's personnel fit-testing is maintained on file.

2.0

Site Background and Scope of Work

2.1 Site Background

The BCP site is currently improved with six industrial/manufacturing warehouse buildings, an attached sales office/caretaker residence, one condemned former residence/Hudson Pilot dispatch office, and two storage sheds. The industrial warehouse buildings were most recently utilized for assembling, renting, and repairing stage lighting equipment as well as storage. The remaining portions of the Site are improved with asphalt-paved parking areas, landscaped areas, including a dog-run, and wooden piers extending into the Hudson River. Access to the Site can be obtained via three curb-cuts along Alexander Street or via piers/docks on the Hudson River.

Previous environmental site assessment activities identified the presence of volatile and semi-volatile organic compounds (VOCs and SVOCs) and heavy metals and metalloids in shallow soil and fill material at concentrations which exceed the NYSDEC Part 375 Track One and Track Two Soil Cleanup Objectives (SCOs). Further, pesticide and polychlorinated biphenyls (PCBs) were reported in fill material (surficial and at depth) on western inland portions of the site at concentrations which exceed their respective NYSDEC Part 375 Track One and Track Two SCOs. In addition, concentrations of several chlorinated VOCs including trichloroethylene (TCE) and tetrachloroethylene (PCE) were reported in soil vapor beneath the BCP site as well as in sediments collected from a storm drain on southern portions of the site. Groundwater beneath the BCP site is also impacted with petroleum related VOC compounds, SVOCs, metals and metalloids limited to antimony, iron, magnesium, manganese, iron and sodium as well as pesticides and PCBs at concentrations in contravention of applicable NYDEC standards.

The BCP site is located in an urban area and zoned for industrial use. In May 2009, the City of Yonkers adopted the Alexander Street Master Plan and Urban Renewal Plan for the entire Alexander Street corridor. These plans permit residential development

with a Planned Urban Development (PUR) Special Use Permit, which the Volunteer procured through Zoning Resolution No. 58-2019. The Master Plan laid out a new roadway system to create development blocks within which a mix of residential, retail, commercial, and open space uses are contemplated. Overall, the Master Plan reflects a vision of the Alexander Street waterfront area as a transit-oriented development that is a vibrant mixed-use district of residences and parks. Surrounding property uses currently consists primarily of new multi-family residential buildings improving the adjacent properties to the north and northeast with an active bakery and further redevelopment continuing beyond. Industrial/commercial properties are present adjacent to the east of the subject property with the Metro-North Amtrak railroad tracks and associated Yonkers Station, beyond. The former City of Yonkers Jail is situated adjacent to the southeast of the subject property and is currently utilized as a private art gallery. An education center and an associated park are located adjacent to the south of the subject property with commercial properties, beyond. The Hudson River is located adjacent to the west of the subject property.

The Volunteer is proposing to redevelop the BCP site with a multi-family residential building Depending on the results of the remedial investigation, the Volunteer may revise the site plans.

VHB previously prepared a Phase I Environmental Site Assessment (ESA) for the subject and overall property, dated December 2019. As part of the Phase I ESA, VHB was able to establish a history for the BCP site dating back to 1887, when the BCP site was improved with dwellings and stables. By 1896, an additional dwelling and barn were constructed on the central portions of the BCP site. Between 1903 and 1911, a brick oven baking company was constructed on the south-central portions of the BCP site. Between 1911 and 1931, the property was substantially reconfigured with the addition of a cabinet shop, automotive shop and garages as well as repurposing a dwelling to a blacksmith shop and the bakery to a wood working facility. In addition, a structure labelled “oils” and another circular unspecified structure were proximate the wood working facility in the 1931 Sanborn map depiction. By 1951, the BCP site was cleared of all structures, with the exception of the blacksmith shop, which had been extended east and repurposed as an automotive facility. Between 1996 and 2003, the remaining structure was demolished and the BCP site was utilized as parking lots situated between an interstate highway to the north and railroad tracks to the south as well as variable uses to the east and west. The City of New Rochelle acquired the 24 Garden Street lot in 1966 and the 11 Garden Street lot in 1998. The City has operated these parcels as municipal parking lots since their respective acquisition dates.

A summary of additional relevant site history is provided below.

VHB Phase I ESA

As previously indicated, VHB prepared a Phase I ESA for the Site, dated December 2019. The following recognized environmental conditions (RECs) and business environmental risks (BERs) were identified in the aforementioned Phase I ESA:

- Elevated concentrations of VOCs, SVOCs, PCBs, and metals were confirmed present in soil, groundwater, and soil vapor at the Site, as per the 2018 VHB Phase II ESA. NYSDEC Spill Numbers (Nos.) 07-02708 and 12-03845, although closed, have likely contributed to contamination onsite, as well as previous site operations.
- Offsite, adjacent properties subject to various State regulatory programs, i.e., NYSDEC BCP, Voluntary Cleanup Program (VCP), Environmental Restoration Program (ERP) and State Superfund, contain documented contamination which may have impacted the subsurface of the subject property.
- Surficial staining was observed on southeastern portions of the Site formerly utilized for parking school buses. Given the analytical data provided in the VHB Phase II ESA, soil in this area is contaminated with VOCs.
- Based upon laboratory data obtained as part of the documented VHB Phase II ESA investigation, the presence of petroleum-related and solvent-related vapors were confirmed in the subsurface at concentrations above their respective New York State Department of Health (NYSDOH) 75th percentile for Indoor Air. These compounds include 1,1,1- trichloroethane (1,1,1-TCA), 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, acetone, benzene, chloroform, cyclohexane, ethyl alcohol, ethylbenzene, methylene chloride, n-hexane, o-xylene, p/m-xylene, styrene, PCE, tetrahydrofuran, toluene and TCE. Given the elevated concentrations of these compounds, a vapor encroachment condition (VEC) is confirmed at the subject property.
- VHB's Phase II ESA investigation conducted at the Site identified PCBs at concentrations exceeding their respective Ambient Water Quality Standards and Guidance Values (AWQSGVs) in the two (2) groundwater samples collected proximate to the existing bulkhead. Although the potential for secondary sources has not been ruled out, detection of PCBs in shallow soil at the Site at boring locations B-3 and B-7 indicate the historic placement of fill material or other activities at the Site as a likely source of this contamination.
- Prior to 1917, the western portions of the Site consisted of coastline and was underwater prior to being filled and bulkheaded. Based upon VHB's 2018 Phase II ESA investigation conducted at the Site, representative soil samples collected from this portion of the Site are contaminated with SVOCs, metals, pesticides and PCBs at concentrations above regulatory standards.
- Multiple buildings formerly occupied the western portions of the Site. There is no information indicating if there were USTs or onsite sanitary systems associated

with these structures. Based upon the unknown statuses, there is a potential for underlying soil and groundwater associated with these structures to be impacted.

- A previously undocumented Application for the Erection of Small Structures and Small Alterations pertaining to the construction of a gasoline station on Lot 50 of Block 2610, dated June 27, 1946, shows a Site plan depicting a small building and an oblong-shaped pump island off-set from Alexander Street, dated June 19, 1946.
- FEMA [Federal Emergency Management Agency] FIRMs [Flood Insurance Rate Maps] were reviewed to determine if the Site is located within the 100-year or 500-year flood zones. The FIRM showing the Site (No. 36119C0309F) indicates that portions of the Site are located within the flood zone AE with a base flood elevation determined at seven feet amsl. This indicates that there is a risk of flooding at the Site.
- The Site is located along the eastern bank of the Hudson River. As such, wetland permitting and/or setbacks may be required for future on-site redevelopment.
- Based upon the likely shallow groundwater conditions at the Site, on-site stormwater likely discharges into the Hudson River as well as the City of Yonkers storm sewer system.
- Based upon the ages of the on-site buildings there is a potential for ACM [asbestos containing material] and LBP [lead-based paint] to present.

VHB Phase II ESA

VHB conducted Phase II ESA activities at the Site on October 9, 10 and 11, 2018, which were summarized in a Phase II ESA Report, dated February 26, 2019. The Phase II ESA included the installation of 16 soil borings and the collection of multi-depth soil samples from each boring location, as well as the collection of ten (10) groundwater samples, two (2) sediment samples, and two (2) soil vapor samples. The results of the Phase II ESA are summarized below:

Soil

Sixteen soil borings were pre-cleared during the geophysical survey. The soil borings were installed utilizing a Geoprobe® 7822DT direct push rig. All field equipment associated with the Geoprobe® was decontaminated between boring locations using an Alconox detergent/potable water wash and potable water rinse. The soil borings were advanced to a depth of 10 feet bgs, below the average depth to groundwater. Continuous soil samples were collected utilizing factory-new macrocore soil sampling tubes from each soil boring location from the surface to the terminal boring depth. A total of 32 soil samples were collected and submitted for laboratory analysis in association with the 16 soil borings. Specifically, two (2) samples were collected from each boring from zero-to-two feet bgs and eight-to-ten feet bgs. Soil impacts were observed and evaluated for suspect characteristics (e.g., staining, odors, PID responses, etc.) in the field.

All soil samples were collected in accordance with NYSDEC DER-10, and were transferred directly into laboratory-supplied glassware, stored in an ice-packed cooler and transported to York, an NYSDOH Environmental Laboratory Accreditation Program (ELAP) and National Environmental Laboratory Accreditation Program (NELAP)-approved laboratory under appropriate chain-of-custody protocols. Soil samples were analyzed for the following analyses:

- Target Compound List (TCL) VOCs using United States Environmental Protection Agency (USEPA) Method 8260;
- TCL SVOCs using USEPA Method 8270;
- TAL metals using USEPA Method 6010 and 7471;
- Pesticides using USEPA Method 8081; and
- PCBs using USEPA Method 8082.

Soil sample analytical results were compared to the 6 NYCRR §375-6.8(a) Unrestricted Use Soil Cleanup Objectives (UUSCOs) (aka Track One SCOs) and NYSDEC 6 NYCRR § 375-6.8(b) Restricted Use Restricted Residential SCOs (RRUSCOs) (also known as Track Two SCOs).

Arsenic, cadmium, lead, and mercury were detected in shallow and deep soil across the Site at concentrations in excess of NY Part 375 Restricted Residential Soil Cleanup Objectives (RRSCOs), with maximum concentrations of 17.5 milligram per kilogram (mg/kg) (arsenic), 10.5 mg/kg (cadmium), 2,100 mg/kg (lead), and 27.4 mg/kg (mercury). VOCs, specifically BTEX constituents, were detected in soil at concentrations in excess of RRSCOs, specifically maximum concentrations of 1,2,4-trimethylbenzene at 740 mg/kg, 1,3,5-trimethylbenzene at 180 mg/kg, benzene at 200 mg/kg, ethylbenzene at 360 mg/kg, naphthalene at 14,000 mg/kg, and xylenes at 1,000 mg/kg. SVOCs, specifically polycyclic aromatic hydrocarbons (PAHs) ranging in concentration from 11 mg/kg (indeno[1,2,3-cd]pyrene) to 1,400 mg/kg (naphthalene). PCBs were detected in soil at concentrations ranging from 0.464 mg/kg to 51.8 mg/kg, significantly exceeding RRSCOs. Dieldrin was detected in soil at concentrations ranging from 0.01 mg/kg to 2,.93 mg/kg. Two onsite storm drains with the potential to drain in-situ , were sampled and analyzed during the Phase II investigation. No metals were detected in either of the two (2) on-site storm drains exceeding their respective UUSCOs. VOCs were detected at concentrations exceeding their respective UUSCOs in each storm drain. In addition, storm drain SD-2 contained concentrations of VOCs exceeding their respective RRSCOs, specifically the chlorinated VOCs, 1,1,1-trichloroethane, cis-1,2-dichloroethene, trichloroethene and vinyl chloride. Furthermore, SVOCs were detected in both storm drains, exceeding their respective UUSCOs and/or RRSCOs.

Groundwater

Based upon historic Site usage, ten (10) groundwater samples were collected from temporary monitoring wells at the Site during the Phase II ESA in order to determine

representative groundwater conditions. Groundwater samples were analyzed for the following:

- TCL VOCs using USEPA Method 8260;
- TCL SVOCs using USEPA Method 8270;
- TAL metals (total and dissolved) using USEPA Methods 6010 and 7471;
- Pesticides using USEPA Method 8081; and
- PCBs using USEPA Method 8082.

Groundwater sampling results were compared to the NYSDEC Technical and Operation Guidance Series (TOGS) 1.1.1 list of AWQSGVs and Groundwater Effluent Limitations, June 1998. Three VOCs were detected in groundwater samples, specifically 1,2,34,5-tetramethylbenzene at maximum concentration of 56 ug/L, benzene at 1.3 ug/L, and sec-butylbenzene at 5.6 ug/L, slightly to moderately exceeding their respective AWQSGVs. PAHs were detected in groundwater at concentrations ranging from 2.7 ug/L to 39 ug/L, significantly exceeding the AWQSGVs. Pesticides, specifically chlordane and dieldrin were detected in groundwater at maximum concentrations of 2.01 ug/L and 0.02 ug/L, respectively, exceeding AWQSGVs. PCBs were detected in groundwater ranging from 0.732 ug/L to 6.15 ug/L, significantly exceeding the AWQSGVs.

Soil Vapor

Consistent with NYSDOH guidance governing soil vapor intrusion, a soil vapor investigation of the Site was conducted to determine if a vapor encroachment condition (VEC) is present. As such, soil vapor sampling was implemented during the Phase II ESA subsurface investigation. VHB collected one (1) sub-slab soil vapor sample beneath one of the onsite buildings, one (1) soil vapor sample at five-feet bgs located to the south of the building, and one (1) ambient indoor air sample located within the building. The soil vapor samples were analyzed for VOCs using USEPA Method TO-15.

The analytical results are compared to the New York State (NYS) Homes – Indoor 1997 to 2003 reference values provided in Final NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006 (hereinafter, the "NYSDOH Guidance"). Several chlorinated VOCs that are subject to the NYSDOH matrices, including 1,1,1-trichloroethane, methylene chloride, tetrachloroethene, and trichloroethene, were detected in soil vapor samples and one associated indoor air sample. Based upon the soil vapor concentrations of same, the NYSDOH guidance recommends "No Further Action" for the majority of these compounds and their corresponding concentrations. However, according to NYSDOH Matrix B, TCE concentrations identified in sub-slab sample and the corresponding indoor air sample indicate that "Monitor" is a minimum requirement. It should also be noted that the sampling was conducted prior to the start of the heating season, so it is likely that detections of VOCs in soil vapor/indoor air are artificially low.

2.2 Scope of Work

Tasks to be performed at the BCP site under this HASP include the investigation and remediation. More specifically, planned work will consist of the following:

- The advancement of soil borings, installation of temporary groundwater monitoring wells, and installation of soil vapor points;
- The collection of soil, groundwater, and soil vapor data sufficient to define the nature and extent of impacted media and current Site conditions;
- The performance of a qualitative exposure assessment (EA) to identify exposure pathways and evaluate contaminant fate and transport;
- Future remedial activities, which may include excavation of impacted soils at the BCP site.

This HASP can be updated, as necessary, to reflect the proposed remedial activities and site conditions

Activity-specific hazards associated with site operations and the standard operating procedures (SOPs) that will be implemented to reduce these hazards are discussed in Section 3.0 (Hazard Assessment) below.

3.0

Hazard Assessment

This Hazard Assessment identifies the activity-specific hazards associated with site operations and the SOPs that will be implemented to reduce the hazards. This section identifies general physical hazards that can be expected, and presents an analysis of documented or potential chemical hazards likely to be encountered at the site. Every effort will be made to reduce or eliminate these hazards. Hazards that cannot be eliminated must be managed through engineering controls and/or personal protective equipment.

3.1 Activity-Specific Hazards and Standard Operating Procedures

3.1.1 Operation of Heavy Equipment

OSHA guidelines will be followed for operating heavy equipment as outlined in 29 CFR 1926.602.

3.1.2 Excavation/Earthwork

According to the site-specific scope of work, drilling/probing and excavation/earthwork will occur. VHB follows the earthwork protocols described below for excavation activities.

The OSHA 29 CFR 1926.651 (February 20, 1990) established construction industry standards relating to excavation work. These standards include shoring and cutback requirements, equipment specifications, entry requirements, etc. To avoid exposure to site-specific contaminants and to ensure acceptable atmospheric conditions, the following additional requirements apply:

- Air quality will be tested before employees enter excavations over four feet deep if a hazardous atmosphere exists or is suspected to exist. If the Site Safety Officer determines that excavations are, by OSHA's definition, "confined space," the confined space entry policy (Section 8.0) will be followed.

- Open excavations will be backfilled as soon as practicable. While excavations remain open, appropriate warnings will be posted and barricades will be erected to protect pedestrian and worker safety. Where possible, excavation side walls will be cut at a gradual slope to maximize egress and access. Workers will not enter excavations unless necessary.

- To ensure atmospheric quality, tests shall be conducted as often as necessary as determined by the Site Safety Officer. This includes tests for flammable gas and oxygen deficiency.

- When the Site Safety Officer identifies hazardous atmospheres, emergency rescue equipment and PPE must be on the work site (Level C PPE) and readily accessible to employees (29 CFR 1926.651(g)(2)(i)).

- Daily site safety inspections will be conducted by the Site Safety Officer.

3.1.3 Work in Extreme Temperatures

Work under extremely hot or cold weather conditions requires special protocols to minimize the chance that employees will be affected by heat or cold stress. VHB follows the heat and cold stress safety protocols described in Attachment D.

3.1.4 Drilling, Probing and Excavation Operations

Drilling and probing are included in the site-specific scope of work. All drill operators and site personnel should wear, at a minimum, hard hats, steel-toe safety shoes or boots, gloves and safety glasses. Additional clothing and protective equipment may be required as determined by the Site Safety Officer. Clothing must be close fitting, without loose ends, straps, draw strings or belts or other unfastened parts that might catch on moving machinery.

VHB follows the additional drill rig operation safety protocols described in Attachment E.

3.1.5 Dust Control and Monitoring During Earthwork

Dust generated during site activities may contain contaminants associated with the site characteristics. VHB will have its subcontractors implement dust control measures, including wetting of soils with water, and applying calcium chloride if the problem cannot be controlled with water. Air monitoring and dust control techniques are specified in a site-specific Community Air Monitoring Plan (CAMP). Site workers will not be required to wear APRs unless dust concentrations are consistently over 150 $\mu g/m^3$ in the breathing zone, (as measured by a dust monitor) unless the Site Safety Officer directs workers to wear APRs. The Site Safety Officer will use visible dust as an indicator to implement the dust control measures specified in the CAMP. The primary sources of dust will be equipment, vehicular traffic, and drilling activities.

3.2 General Site Hazards

Although not all of these hazards may be encountered at the site, employees should be aware of the potential of encountering these hazards during site work:

Fire/ Explosion

VHB will not perform or allow any act on the property which involves the creation of a fire or explosion hazard. Non-sparking tools and fire extinguishers shall be used or available as appropriate. Sources of ignition shall be removed from work areas. When necessary, explosion proof instruments and/or bonding and grounding will be used.

Electricity

Applicable OSHA 29 CFR 1910.120(m) standards for illumination shall apply. All work is to be conducted during daylight hours whenever possible.

Overhead and underground utilities shall be identified and/or inspected prior to conducting operations involving potential contact or interference. As per OSHA 1910.333, for unqualified persons working on the ground near overhead energized lines, the minimum permissible distance requirements are as follows:

- For voltages to ground 50kV or below – 10 feet
- For voltages to ground over 50kV - 10 feet plus 4 inches for every 10kV over 50 kV

Live power sources will be locked and tagged out by authorized personnel. In these instances, verification that power sources have been appropriately de-energized will be provided by Con Edison. All drilling equipment will be securely grounded when working within or around the electrical substation.

All electrical power to the work site must run through a ground fault circuit interrupter as an integral part of the circuit. All equipment must be suitable and approved for the class of hazard. Applicable OSHA 29 CFR 1926 Subpart K standards for electrical use shall apply.

Trip/Fall Hazards

Work, where a fall of over four feet is possible, will be performed by appropriately using ladders and/or fall protection (i.e. body harness, lifeline, and suitable anchorage).

The Site Safety Officer shall incorporate awareness of trip/fall hazards into the daily tailgate safety meetings and conduct periodic inspections of the site to identify potential trip/fall hazards. In addition, following the completion of the daily activities, the Site Safety Officers shall inspect the site for excavations and other trip/fall hazards. If identified, the Site Safety Officer will be responsible for having these areas secured.

Poison Ivy

Although it is recommended that workers learn to recognize the poison ivy plant, in practice, it is hard to do, since poison ivy and its relatives are often mixed in with other vegetation and not noticed until after an exposure has occurred. Keeping the skin covered in situations in which exposure is hard to avoid is the best way to prevent the problem. Long pants and long sleeves will be worn while working in vegetated areas.

Ticks

Ticks like to rest on low-lying brush and 'catch a ride' on a passing animal or person. Workers should exercise caution when working in vegetated wilderness areas where ticks may be present. To reduce the chance of getting a tick-bite, workers should wear light-colored clothing and conduct frequent tick-checks. Light-colored clothing allows ticks to be seen more easily on clothing and gives the opportunity to remove them before they can attach to the skin and feed. As required above, long-sleeve shirt and long pants will also aid in the prevention of tick bites by reducing the amount of skin exposed to the ticks. Also, shirts should be tucked into the pants and pants legs tucked into the socks. This keeps the ticks on the outside of the clothing and restricts the tick's efforts to crawl onto the skin. Frequent tick-checks should be conducted which include a visual inspection of the clothing and exposed skin, followed by a naked, full-body examination in a private location. Workers should be sure to check the scalp, behind and in the ears, and behind any joints.

High Traffic Area

Vehicular traffic represents one of the most common hazards that cause serious injury or death when working at the sites. Risk from vehicular traffic may be minimized by safe operating practices by the employee during Site work. Site personnel will wear highly visibility orange safety vests in areas of heavy traffic. Employees should make an effort to be aware of their surroundings and potentially dangerous traffic areas at all times. If work is being done that will in any way inhibit the employees' ability to continuously be aware of their surroundings, such as crouching down to sample a monitoring well or taking notes, tall orange cones should be placed around the employee to make motorists aware of their presence. Tall orange traffic cones should also be placed in work areas considered to be highly dangerous traffic areas. Any work performed in a road or on the shoulder of the road should require a police detail to monitor worker safety in vehicular traffic in addition to the use of orange vests and orange traffic cones.

Water Hazards

During the storms or work along the existing bulkhead, the tide can be a potential hazard. A personal flotation device (PFD) must be worn and/or a life saver/life buoy must be available whenever a worker is present along the northeastern seawall in order to prevent drowning. In addition, the buddy system must be utilized during bulkhead and/or rip-rap maintenance activities in order to reduce the risk of drowning.

No additional physical hazards are anticipated. However, if additional hazards are identified, they will be documented in the HASP, as appropriate.

3.2.1 Miscellaneous Tasks

The following work tasks require specific SOPs and safety measures:

- site geophysical inspection
- opening drums and overpacks
- drum staging and overpacking
- work around heavy equipment (including drill rigs)
- flammable/combustible liquid transfer
- soil excavation (drilling/probing)
- soil/groundwater/soil vapor sampling
- drum handling

The safety hazards associated with these and other work tasks and the SOPs followed by VHB are contained in Appendices E and F.

Should a change in the scope of the work activities include additional work tasks, an amendment to this HASP will be prepared.

3.3 Chemical Hazards

Previous environmental site assessment activities identified the presence of volatile and VOCs and SVOCs and heavy metals and metalloids in shallow soil and fill material at concentrations which exceed the NYSDEC Part 375 Track One and Track Two SCOs. Further, pesticide and PCBs were reported in fill material (surficial and at depth) on western inland portions of the site at concentrations which exceed their respective NYSDEC Part 375 Track One and Track Two SCOs. In addition, concentrations of several chlorinated VOCs including TCE and PCE were reported in soil vapor beneath the BCP site as well as in sediments collected from a storm drain on southern portions of the site. Groundwater beneath the BCP site is also impacted with petroleum related VOC compounds, SVOCs, the metalloid, metal elements antimony, iron, magnesium, manganese, iron and sodium as well as pesticides and PCBs at concentrations in contravention of applicable NYSDEC standards. Accordingly, all drilling and sampling activities will be performed in Level D or Level C protection, as determined by the Site Safety Officer.

Furthermore, the presence of non-aqueous petroleum liquid has been documented at surrounding sites. NAPL at surrounding sites has been observed sitting on top of the silty/clayey riverbed sediments beneath the fill layer (at approximately 12-25 feet below grade surface [ft bgs]). Deep NAPL was observed in two locations at depths around 100 ft bgs, likely sitting on top of bedrock. Despite the consideration that piles will be driven to depths of 80 to 130 ft bgs, only areas of NAPL above river sediments would be a concern at this time. It should be noted that all petroleum identification analyses that were previously performed (by others) on the NAPL that sits above river sediments came back inconclusive, although there was one reference to coal tar as the NAPL at the adjacent Polychrome East site. Accordingly, all drilling and sampling activities will be performed in Level D or Level C protection, as determined by the Site Safety Officer.

As described in Sections 3.3.2 and 5.1, and as further described in the CAMP, air monitoring with a PID will be conducted by the Site Safety Officer during all drilling activities, in order to determine if organic vapor concentrations are present and exceed action levels. Although it is not anticipated, if air monitoring results indicate that work cannot proceed because of atmospheric conditions, the work will be stopped in accordance with the procedures specified in the CAMP and an amendment to this HASP will be prepared to include procedures for engineering controls and increased levels of personal protection.

The following chemical hazards associated with heavy equipment operation may be expected at the site during work activities:

1. Diesel fuel
2. Hydraulic fluid
3. Alkaline and nickel-cadmium batteries
4. Gasoline

Copies of the MSDS for each of these chemicals, as well as known site specific chemical hazards which may be encountered during site investigation and remediation activities are included in Attachment G.

Attachment G will be supplemented if additional site-specific chemicals are identified.

Potential routes of exposure of these materials include:

- Inhalation of airborne particulate and vapor
- Dermal contact
- Incidental ingestion

3.3.1 Respirable Dust

Dust may be generated from vehicular traffic, construction and/or excavation activities. If visible observation monitoring detects concentrations greater than 150 micrograms per cubic meter ($\mu g/m^3$) over daily background, the Site Safety Officer will take corrective actions as defined herein, including increasing the amount of water applied to the material and if this is not effective, requiring workers to wear APRs with efficiency particulate air (HEPA) cartridges. Further information is outlined in the site-specific CAMP.

3.3.2 Organic Vapors

Site investigation and excavation activities can cause the release of organic vapors to the atmosphere. The VHB Site Safety Officer will monitor organic vapors with a PID, when appropriate, during excavation and soil sampling activities involving contaminated or potentially-contaminated soils to determine whether organic vapor concentrations exceed action levels.

Additional information regarding air monitoring activities is included in Section 5.1, below, and is outlined in the CAMP.

4.0

Personal Protective Equipment

Personal protective equipment (PPE) shall be selected in accordance with the site air monitoring program, OSHA 29 CFR 1910.120(c), (g), and 1910.132. Protective equipment shall be NIOSH and/or ANSI-approved (as appropriate) and respiratory protection shall conform to OSHA 29 CFR Part 1910.133 and 1910.134 specifications; head protection shall conform to 1910.135; eye and face protection shall conform to 1910.133; and foot protection shall conform to 1910.136. The only significant difference among the levels of protection from D thru B is the addition of the type of respiratory protection.

4.1 Activity-Specific Levels of Personal Protection

The required level of PPE is specific to the activity being conducted, the contaminants expected to be encountered (Section 3.3) and may be based on air monitoring results (Section 5.0).

Based upon the historic site use and the nature of the work to be performed, the scope of work will be performed in Level D or Level C protection, as determined by the Site Safety Officer. Air monitoring with a PID will be conducted by the Site Safety Officer during drilling activities, in order to determine if organic vapor concentrations are present and exceed action levels. The results will be monitored and recorded, in order to determine whether acceptable atmospheric conditions are being sustained. If determined necessary by the Safety Officer, air monitoring may be amended to also include the concentrations of oxygen (O_2), the concentrations of flammable gases with respect to the lower explosive limit (LEL) and the concentration of carbon monoxide (CO) and hydrogen sulfide (H_2S).

Although it is not anticipated, if air monitoring results indicate that work cannot proceed because of atmospheric conditions, the work will be stopped as outlined in the CAMP, and an amendment to this HASP will be prepared to include procedures for engineering controls and increased levels of personal protection.

4.2 General PPE

4.2.1 Level D

Level D PPE shall be donned when the atmosphere contains no known hazards and work functions preclude splashes, immersion, or the potential for inhalation of, or contact with, hazardous concentrations of harmful chemicals. Level D PPE consists of:

- standard work uniform, coveralls, or Tyvek, as needed
- steel toe and steel shank work boots
- hard hat
- gloves, as needed
- safety glasses
- hearing protection
- equipment replacements available, as needed

4.2.2 Level C

Level C PPE shall be donned when the concentrations of measured total organic vapors in the breathing zone exceed background concentrations (using a portable OVA, or equivalent), but are less than 5 parts per million (ppm), or otherwise when required by SOPs or VHB's Respiratory Protection Policy. The specifications on the APR filters used must be appropriate for contaminants identified or expected to be encountered. Level C PPE shall be donned when the identified contaminants have adequate warning properties and criteria for using APR have been met. Level C PPE consists of:

- chemical resistant or coated Tyvek coveralls
- steel-toe and steel-shank work boots
- chemical resistant overboots or disposable boot covers
- disposable inner gloves (surgical gloves)
- disposable outer gloves
- full-face APR fitted with organic vapor/dust and mist filters or filters appropriate for the identified or expected contaminants
- hard hat
- splash shield, as needed
- ankles/wrists taped with duct tape

The Site Safety Officer can verify if Level C is appropriate by checking organic vapor concentrations using a PID or compound and/or class-specific detector tubes.

4.2.3 Level B

Level B PPE shall be donned when the contaminants have not been identified and/or the concentrations of unknown measured total organic vapors in the breathing zone exceed 5 ppm (using a portable OVA, or equivalent). Level B PPE shall be donned if the IDLH of a known contaminant is exceeded. If a contaminant is identified or is expected to be encountered for which NIOSH and/or OSHA recommend the use of a positive pressure self-contained breathing apparatus (SCBA) when that contaminant is present, Level B PPE shall be donned even though the total organic vapors in the breathing zone may not exceed 5 ppm. Level B shall be donned for confined space entry, and when the atmosphere is oxygen deficient (oxygen less than 19.5%) or potentially oxygen deficient. If Level B PPE is required for a task, at least three people shall be donned in Level B at any one time during that task. PPE shall only be donned at the direction of the Site Safety Officer. Level B PPE consists of:

- supplied air SCBA or air line system with five minute egress system
- chemical resistant coveralls
- steel-toe and steel-shank work boots
- chemical resistant overboots or disposable boot covers
- disposable inner gloves
- disposable outer gloves
- hard hat
- ankles/wrists taped

The exact PPE ensemble is decided on a site-by-site basis by the VHB Site Safety Officer with the intent to provide the most protective and efficient worker PPE.

5.0

Air Monitoring and Action Levels

Pursuant to 29 CFR 1910.120(h), air monitoring shall be conducted to identify and quantify levels of airborne hazardous substances and health hazards, and to determine the appropriate level of worker protection.

5.1 Air Monitoring Requirements

Based upon current and former site uses of the BCP site and the nature of the work to be performed, air monitoring will be conducted by the Site Safety Officer during all intrusive site investigation and remediation activities. Monitoring will be conducted using direct-reading instruments to evaluate the conditions in the work area. Based on current knowledge of the work operations and potential site conditions, the testing will be conducted using the following instrument:

- A PID calibrated to detect of VOCs at a minimum concentration of 0.1 ppm. The PID will be used during drilling and soil/groundwater sampling activities.

If determined necessary by the Site Safety Officer, air monitoring may be amended to also include the following instrument:

- Four Gas Meter (0_2/LEL/CO/H2S) or equivalent, to determine the concentrations of O_2, the concentrations of flammable gases with respect to the LEL and the concentration of CO and H_2S. The PID will be used during drilling and soil/groundwater sampling activities, if determined necessary by the Site Safety Officer.

All air monitoring data will be documented in a site logbook. Air monitoring instruments will be calibrated and maintained by or under the supervision of the VHB Site Safety Officer in accordance with the manufacturer's specifications. When tasks are performed, the concentration of contaminants (for example, VOCs) shall be measured in employees' breathing zones several times during the task using the direct reading instrument. The specific frequency of the monitoring shall vary with

the task to be performed; more frequently during operations having a greater potential for exposure.

Measurements with the PID and Four Gas Meter will also be taken prior to personnel entering a confined space, however, based upon the site-specific scope of work, confined space entries will not be necessary. Should the scope of work be amended to include confined space entry, an amendment to this HASP will be prepared.

5.2 Air Monitoring Results and Actions

The results of the air monitoring and sampling will be compared, for most stressors, to applicable OSHA Permissible Exposure Limits (PELs). The following table identifies applicable OSHA criteria and the action levels used to make decisions about changing the requirements for personal protective equipment.

Stressor	OSHA PEL	Action Level
Flammable Gases	0 – 1% of the LEL	Work continues
	1 – 10% of the LEL	Work continues; increase monitoring frequency
	> 10% of the LEL	Work stops
Oxygen	<19%	Leave area immediately
	19 – 23.5%	Work continues
	> 23.5%	Work stops; ventilate area before returning.
VOCs	1 ppm sustained for 5 min.	Screen for benzene using Draeger tubes
	10 ppm sustained for 5 min.	Work stops; ventilate area before returning.
	10 ppm sustained for 30 min.	Upgrade to Level C.
Carbon Monoxide	35 ppm	25 ppm - Leave area and ventilate
Hydrogen Sulfide	10 ppm	10 ppm - Leave area and ventilate

Additional air monitoring requirements are specified in the site-specific CAMP. Although it is not anticipated, if air monitoring results indicate that work cannot proceed because of atmospheric conditions, the work will be stopped and an amendment to this HASP will be prepared to include procedures for engineering controls and increased levels of personal protection.

6.0
Site Control

6.1 Work Zones

The primary purpose of site controls is to establish the perimeter of a hazardous area, to reduce the migration of contaminants into clean areas, and to prevent access or exposure to hazardous materials by unauthorized persons. When operations are to take place involving hazardous materials, the Site Safety Officer will establish an exclusion zone, a decontamination zone, and a support zone. These zones can "float" (move around the site) depending on the tasks being performed on any given day. The Site Safety Officer will outline these locations before work begins and when zones change. The Site Safety Officer records this information in the site log book.

Tasks requiring OSHA 40-hour Hazardous Waste Operations and Emergency Response Operations training are carried out in the exclusion zone. The exclusion zone is defined by the Site Safety Officer but will typically be a 50-foot area around work activities. Alternatively, the entire landward site may be designated an exclusion zone with the exception of an access road for ingress and egress and also serving as decontamination and support zones. Gross decontamination (as determined by the Site Safety Officer) is conducted in the exclusion zone; all other decontamination is performed in the decontamination zone or trailer.

Protective equipment is removed in the decontamination zone. Disposable protective equipment is stored in receptacles staged in the decontamination zone, and non-disposable equipment is decontaminated according to the procedures outlined in Section 7.0. All personnel and equipment shall exit the exclusion zone through the decontamination zone. If a decontamination trailer is provided the first aid equipment, an eye wash unit, and drinking water are kept in the decontamination trailer.

The support zone is used for vehicle parking, daily safety meetings, and supply storage. Eating, drinking, and smoking are permitted only in the support zone. When a decontamination trailer is not provided, the eye wash unit, first aid

equipment, and drinking water are kept at a central location designated by the Site Safety Officer.

6.2 General Field Safety and Standard Operating Procedures

VHB's policy is to control hazards at all site areas by limiting entrance to exclusion zones to essential personnel and by implementing the following rules:

- Non-essential (as judged by the Site Safety Officer) personnel and unauthorized persons will not enter the exclusion or decontamination zone.

- Before entering the exclusion or decontamination zones, all personnel must be familiar with emergency response procedures (Section 9.0), site safety locations, first aid and communication equipment, and the location of the map to the hospital and the list of emergency telephone numbers.

- No one is to perform work within the exclusion zone alone. Non-essential personnel will require an escort if entering the exclusion zone. When in Level D or C, visual contact or radio contact shall be maintained at all times. In Level B, visual contact shall be maintained at all times, and radio contact shall be maintained with the decontamination and/or support zone.

- Contact with contaminated and potentially contaminated surfaces should be avoided. Walk around (not through) puddles and discolored surfaces. Do not kneel on the ground or place equipment on the ground. Protect equipment from contamination.

- All personnel exiting the exclusion zone must exercise the decontamination procedures described in Section 7.0 of this HASP.

- Beards or other facial hair that interferes with respirator fit will preclude admission to the exclusion zone when APRs are required (as determined by the Site Safety Officer). Contact lenses shall not be worn without eye protection in the exclusion or decontamination zones, or if the worker may be expected to enter these zones during site activities with the potential to generate fugitive dust under routine or emergency situations.

- Eating, drinking, or smoking is permitted only in designated areas in the support zone.

- Each worker must be supplied with and maintain his/her own personal protective equipment.

Note: These policies will be enforced by the designated Site Safety Officer.

7.0

Decontamination Procedures

Prior to the start of the field activities, the Site Safety Officer will be responsible for the designation of the work zone (inclusive of the exclusion zone), decontamination and support zone, and clean zone. The work zone will be an area surrounding the immediate work being performed where the greatest potential hazards exist. Only the necessary workers required to perform the work will be permitted in this zone. A support zone will be established for the storage of equipment and personnel decontamination. A clean zone will be established for site control of visitors, equipment deliveries, and communications.

In general, everything that may come in contact with contaminated media must either be decontaminated or discarded prior to exit. In addition to worker protection, care must be taken to avoid cross-contamination of samples and other facility areas.

All support and sampling equipment which has or may have contacted contaminated materials will be cleaned with detergent/water solution and rinsed with water in wash tubs or buckets. Monitoring equipment that comes into the site will be decontaminated according to manufacturer specifications. Decontamination is done in the exclusion or decontamination zones. Rented equipment is photographed after decontamination.

Disposable PPE and equipment will be properly bagged and disposed of as commercial waste.

Employees will wash their hands and faces with detergent and water prior to eating or smoking. Smoking will not be permitted in the work and support zones.

The minimum measures for Level B doffing and decontamination are:

- deposit equipment on plastic drop cloths.
- scrub outer boots and gloves with a water and detergent solution and rinse.
- remove outer boots and outer gloves. Discard disposable outer garments in receptacle provided.

- remove SCBA and face piece and place on rack provided
- remove Tyvek/outer garment and place in receptacle provided
- remove inner gloves and deposit in receptacle provided
- shower/wash face and hands

The minimum measures for Level C doffing and decontamination are:

- deposit equipment on plastic drop cloths.
- scrub outer boots and gloves (if worn) with a water and detergent solution and rinse.
- remove outer boots and outer gloves. Discard disposable outer garments in receptacle provided.
- remove Tyvek/outer garment and place in receptacle provided.
- remove first pair of inner gloves
- remove respirator (using "clean" inner gloves) and place on rack provided
- remove last pair of inner gloves and deposit in receptacle provided
- shower/wash face and hands

The second to last item to be removed is the APR, and the last item to be removed is the last of several pairs of surgical gloves. Wearing several pairs of inner gloves permits layers to be removed as needed during various stages of the doffing procedure, and if the APR inadvertently becomes contaminated, inner gloves guard against bare hands contacting the APR.

8.0

Confined Space

According to OSHA 29 CFR 1910.146, a confined space is a space which is large enough and so configured that an employee can bodily enter and perform assigned work, has limited or restricted means for entry or exit, and is not designed for employee occupancy. Based upon the site-specific scope of work, confined space entries may not be necessary. However, should the scope of work be amended to include confined space entry, an amendment to this HASP will be prepared. The following protocol will apply when employees must enter a confined space:

- The Site Safety Officer evaluates the space and site conditions to determine whether the space must be considered "confined". In particular, the potential for a hazardous atmosphere will be considered.
- If so, the Site Safety Officer monitors the space for hazardous atmospheres prior to entry and fills out a pre-entry checklist (Attachment H) to determine whether an entry-permit is required.
- If there is no hazardous atmosphere, the space will be routinely monitored, as appropriate, during the entry to assure that the atmosphere remains non-hazardous.
- If the space contains a hazardous atmosphere, an entry permit (Attachment H) will be prepared and the space will only be entered in accordance with 29 CFR 1910.146.

8.1 Rescue and Emergency Services

When practical, non-entry rescue is the preferred method of rescue, even for horizontal entries. To help permit-required confined space non-entry rescue, each authorized entrant will use a full body or chest harness with a retrieval line attached to a mechanical device or fixed point outside the permit-required confined space.

Mechanical devices to retrieve personnel will be used for vertical spaces more than five feet deep.

8.1.1 On-Site Rescue Services

Qualified personnel will be available on-site to conduct confined space entry rescue, if needed. All essential equipment (SCBA/air lines, hoist, etc.) needed to effect rescue will also be staged on-site during all confined space activities. Rescue personnel will extract the confined space worker to the nearest available safe location so that emergency first aid may be performed. In the event of a confined space rescue, the Attendant will be responsible to notify First Responder Medical Care, the Site Safety Officer, and the Project Manager immediately.

8.1.2 Subcontractor Entry Operations

Based on the site-specific scope of work, personnel will not have to enter confined spaces. However, in the event that completing the work requires personnel to enter a confined space, entry will only be made by personnel who have received the training required to correctly perform their assigned duties.

9.0

Contingency Plan/Emergency Response Plan

It is essential that site personnel be prepared for an emergency. Emergencies can take many forms; sudden illnesses or injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in the weather.

A list of emergency telephone numbers and hospital travel routes to the nearest hospital with an emergency capacity will be posted on site in the field vehicle. Site personnel must be familiar with the emergency incident procedures, and the locations of site safety, first aid, and communication equipment.

9.1 Emergency Equipment On-Site

Private Telephones:	Site Personnel
Two-way Radios	Site Personnel (where necessary)
Emergency Alarms:	On-site vehicle horns*
First Aid Kits:	On-site vehicle/heavy equipment
Fire Extinguisher:	On-site vehicle/heavy equipment

*Horns – Air Horns will be supplied to personnel at the discretion of the Project Manager or Site Safety Officer.

9.2 Emergency Telephone Numbers and Hospital Information

Emergency telephone numbers and routes to the nearest hospital with an emergency capacity are as follows:

General Emergencies:	911
Yonkers Police Department	911 or 1-914-377-7900
Fire Department	911
First Responder Medical Care:	911
National Response Center	1-800-424-8802
Poison Control Center	1-800-222-1222
NYS Spill Hotline:	1-800-457-7362
Westchester County Department of Health	1-914-813-5000
Health and Safety Officer – Stephen Kaplan	1-631-787-3400 or 1-631-316-4892
Project Manager – Jessica Collins	1-646-809-8042
SSO – Christopher Rooney	1-631-787-3473

For Non-Emergency Care – (Emergencies must call 911)

Nearest Hospital: Saint John's Riverside Hospital
2 Park Avenue
Yonkers, New York 10703
1-914-964-7300

Directions to Saint John's Riverside Hospital (Approximately 1.0 mile from the site):

Head north (left) on Alexander Street and in approximately 0.2 mile turn right onto Ashburn Avenue and in approximately 0.5 mile, take the fifth left onto Park Avenue to arrive at the hospital.

A map showing the route to the nearest hospital is provided in Attachment A, Figure 2.

The emergency telephone numbers and hospital route presented above are also included in Attachment I.

9.3 Personnel Responsibilities During an Emergency

As the administrator of the project, the Project Manager has primary responsibility for responding to and correcting emergency situations. In the absence of the Project Manager, the senior person on-site (e.g., the Site Safety Officer) shall act as the Project Manager's on-site designee. Their responsibilities include:

- Take appropriate measures to protect personnel including: evacuating and securing the site or up-grading or down-grading the level of protective clothing and respiratory protection.

- Ensure that the client and appropriate Federal, State and local agencies are informed, and emergency response plans are coordinated; in the event of fire or explosion, the local fire department should be summoned immediately. In the event of an air release of toxic materials, the local authorities and client must be informed in order to assess the need for evacuation. In the event of spill or on-land release of hazardous or toxic materials, the Project Manager will be contacted immediately. The Project Manager will contact the client to determine reporting requirements to the appropriate agency.

- Ensure appropriate decontamination treatment or testing for exposed or injured personnel.

- If possible, determine the cause of the incident and make recommendations to prevent recurrence.

- Ensure that all required reports which may be required by the client and/or regulatory agencies have been prepared and filed.

9.4 Medical Emergencies

Any on-site person who becomes ill or injured must be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination should be completed and first aid (if a qualified and trained provider is part of the field team) administered prior to transport. First aid will be administered while waiting for an ambulance or paramedics. A Field Accident Report (Attachment I) must be filled out for any injury.

Any person transporting an injured/exposed person to the hospital for treatment should follow the route to Saint John's Riverside Hospital (Approximately 1.0 mile from the site):

> **Head north (left) on Alexander Street and in approximately 0.2 mile turn right onto Ashburn Avenue and in approximately 0.5 mile, take the fifth left onto Park Avenue to arrive at the hospital.**

A map showing the route to the nearest hospital is provided in Attachment A, Figure 2.

9.5 Fire or Explosion

In the event of a fire or explosion, the fire department should be summoned immediately. Upon their arrival, the senior staff on-site will advise the fire

commander of the location and nature of on-site hazardous materials that the senior staff is aware of. If it is safe to do so, site personnel may:

- Use firefighting equipment available on site.
- Remove or isolate flammable or other hazardous materials that may contribute to the fire.

9.6 Evacuation Routes

Evacuation routes established by work area locations for each site will be reviewed prior to commencing site operations. As the work areas change, the evacuation routes will be altered accordingly, and the new route will be reviewed.

Under extreme emergency conditions, evacuation is to be immediate without regard for equipment. The evacuation signal will be a continuous blast of a vehicle horn, if possible, and/or by verbal/radio communication. When evacuating the site, personnel will follow these instructions:

- Keep upwind of smoke, vapors, or spill location.
- Exit through the decontamination corridor if possible.
- If evacuation through the decontamination corridor is not possible, personnel should remove contaminated clothing once they are in a safe location and leave it near the exclusion zone or in a safe place.
- The Site Safety Officer will conduct a head count to ensure that all personnel have been evacuated safely. The head count will be correlated to the site and/or exclusion zone entry/exit log.
- If emergency site evacuation is necessary, all personnel are to escape the emergency situation and decontaminate to the maximum extent practical.

9.7 Spill Control Procedures

In order to prevent releases, secondary containment will be utilized around generators and other fuel powered equipment, as appropriate. In addition, booms should be placed around any equipment utilized seaward during seawall/ bulkhead and/or rip-rap maintenance. In the event of a leak or a release, site personnel will:

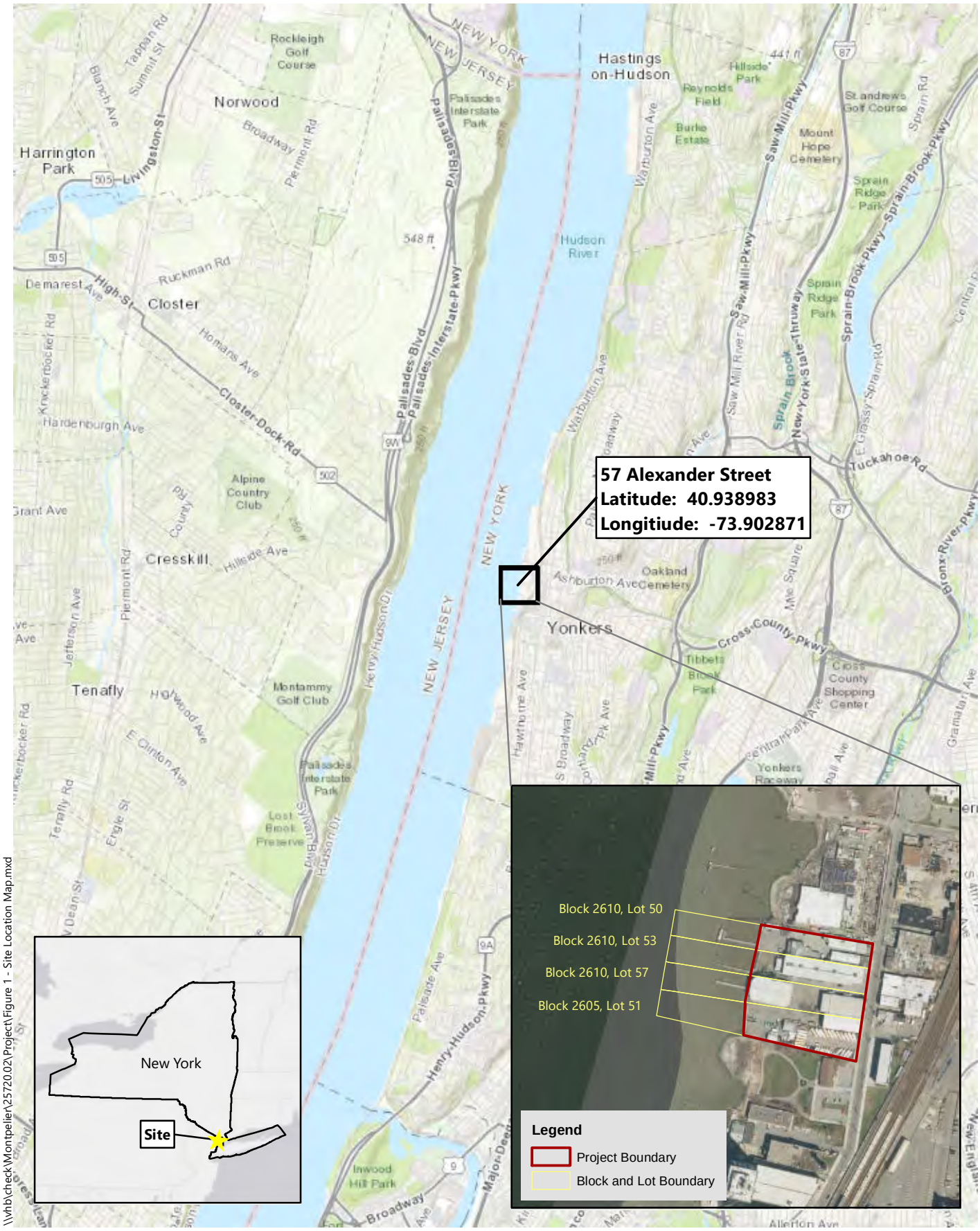
- Move to a safe distance and inform their supervisor immediately.
- Locate the source of the spillage and stop the flow if it can be done safely.
- Begin containment and recovery of the spilled materials.

Subcontractors utilizing heavy equipment will be responsible for maintaining containment equipment, emergency spill kits and oil booms in the immediate vicinity

of the work site to address any release of diesel or hydraulic fluid from the equipment.

In the event of a leak or a release, site personnel will immediately inform the Project Manager. The Project Manager will immediately notify the client and, if appropriate, any regulatory agencies. Within 48 hours of this verbal notification, the Project Manager will provide the client with a written report. The report will include the events that transpired, and any action taken by VHB to protect health and safety as well as the environment. The report will list all those who were notified of the release.

Attachment A
Figures



\\vhb\check\Montpelier\25720.02\Project\Figure 1 - Site Location Map.mxd

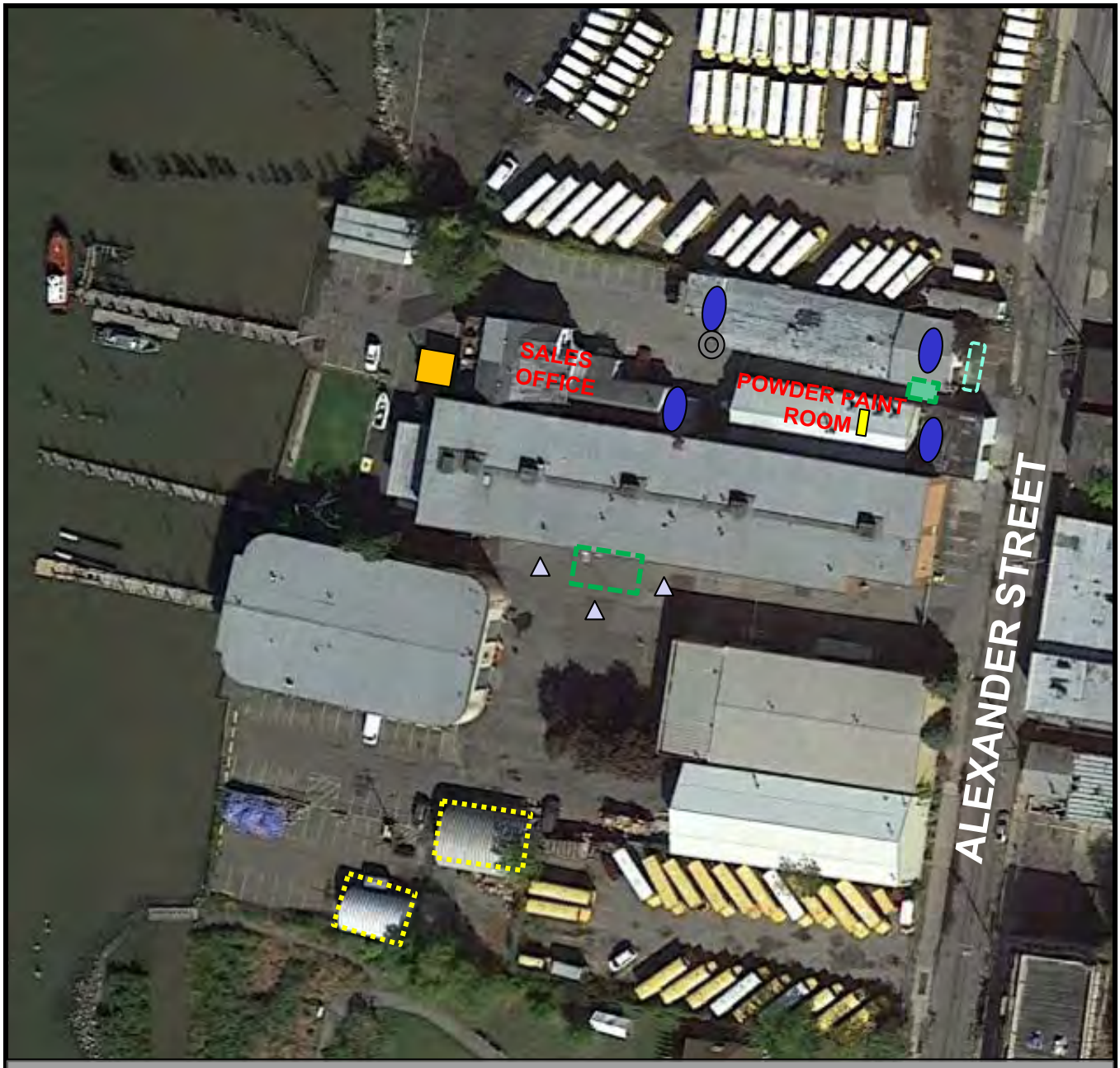
0 1 2 Miles

57 Alexander Street
Remedial Investigation Work Plan

Yonkers, New York

Sources:
ESRI World Topographic Base Map (2020)
ESRI/Digital Globe Imagery Base Map (2019)

Site Location Map



LEGEND:

- FORMER LOCATION OF 5,000-GALLON UST
- STORAGE SHEDS
- SUSPECT LOCATION OF FORMER PUMP ISLAND
- EXISTING 275-GALLON AST
- EXISTING CLN AST
- OUT-OF-SERVICE INCINERATOR
- ABANDONED IN-PLACE 550-GALLON UST
- EXISTING MONITORING WELL
- WATER-BASED DEGREASER

FIGURE 2 – SITE FEATURES

SITE NAME: 57 Alexander Street
STREET ADDRESS: 47-71 Alexander Street
CITY, STATE, ZIP: Yonkers, NY 10701
PROJECT: 25720.02
BASE MAP SOURCE: Google Earth

PROJECT NORTH

vhb

Attachment B
Site Safety Plan Acknowledgement Form

SITE SAFETY PLAN ACKNOWLEDGMENT FORM

I have been informed and understand the procedures set forth in the Safety and Health Plan/Site Safety Plan for: 57 Alexander Street, Yonkers, New York:

Printed Name	Signature	Representing	Date

SITE SAFETY PLAN ACKNOWLEDGMENT FORM

I have been informed and understand the procedures set forth in the Safety and Health Plan/Site Safety Plan for: 57 Alexander Street, Yonkers, New York:

Printed Name	Signature	Representing	Date

By signing the Site Safety Plan Acknowledgment Form, personnel are recognizing the actual or potential on-site hazards and the policies and procedures that design personnel will take to minimize exposure and risk.

SITE SAFETY PLAN ACKNOWLEDGMENT FORM

I have been informed and understand the procedures set forth in the Safety and Health Plan/Site Safety Plan for: 57 Alexander Street, Yonkers, New York:

Printed Name	Signature	Representing	Date

SITE SAFETY PLAN ACKNOWLEDGMENT FORM

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I have been informed and understand the procedures set forth in the Safety and Health Plan/Site Safety Plan for: 57 Alexander Street, Yonkers, New York:

Printed Name	Signature	Representing	Date

SITE SAFETY PLAN ACKNOWLEDGMENT FORM

I have been informed and understand the procedures set forth in the Safety and Health Plan/Site Safety Plan for: 57 Alexander Street, Yonkers, New York:

Printed Name	Signature	Representing	Date

Attachment C
Site Safety Plan Amendments

SITE SAFETY PLAN AMENDMENT #____:

A Site Safety Plan Acknowledgement Form must be signed by the site personnel for each Site Safety Plan Amendment.

SITE NAME: 57 Alexander Street, Yonkers, New York

REASON FOR AMENDMENT:

_____
_____
_____

ALTERNATE PROCEDURES:

_____
_____
_____
_____

REQUIRED CHANGES IN PPE:

_____
_____
_____

_____ _____
PROJECT MANAGER (DATE)

_____ _____
SITE SAFETY OFFICER (DATE)

_____ _____
TECHNICAL SAFETY MANAGER (DATE)

Attachment D
Heat/Cold Stress Protocols

HEAT RELATED EMERGENCIES

Good judgment is essential. Pace yourself by knowing your limitations. Avoid over exertion. You are your best gauge for heat related emergencies.

HEAT EXPOSURE

The human body stubbornly defends its constant core temperature of 98.6°F. To maintain this constant temperature, heat loss must equal heat gain. If heat loss exceeds heat gain, the body temperature will fall; conversely, if heat production exceeds heat loss, the temperature will rise. In a heat related emergency, the body's mechanisms for temperature regulation are overwhelmed. The body can no longer regulate core temperature, and the core temperature begins to rise. As this rise occurs, the body will begin to show the signs and symptoms of heat related stress. The sequence of illness may start with heat Cramps and progress into a more severe case or may go straight to Heat Stroke. The degree of illness will vary from person to person, depending on the nature of the exposure, physical conditioning and inherited traits.

PREVENTION

General

- While not mandated by corporate requirements, employees should attempt to maintain good physical conditioning and control blood pressure (avoid weight gain, smoking, etc.).
- Eat regularly and properly. Increase salt intake through food consumption during the hot season or hot spells and avoid the use of salt tablets, if possible.
- Avoid alcohol intake the night before if you are going to be working in hot environments, either from ambient conditions or by wearing Chemical Protective Clothing.
- If you are on medication or have a chronic medical history, consult a physician prior to working in a high temperature environment.

On-Site/Scene

- Sufficient quantities of water (at least 2 to 4 ounces of water prior to commencing work and during every rest period) should be consumed to help avoid heat related emergencies. A recommended alternative to water is an electrolyte drink split 50/50 with water

HEAT RELATED EMERGENCIES
SIGNS AND SYMPTOMS
EMERGENCY CARE

Heat Rash

Also known as prickly heat, this is a condition affecting the skin. The condition occurs in situations where the skin remains wet most of the time. The sweat ducts become plugged, and a skin rash soon appears.

Signs and Symptoms

1. Skin rash over affected areas of the body.
2. Tingling or prickling sensation on the affected areas.

Emergency Care

1. Take shower after working in heat.
2. Dry the skin thoroughly.
3. Change underwear as needed.
4. Stay in cool place after work hours.
5. Adjust clothing to wear materials that wick moisture away from body (cotton or Gore-Tex, etc.).

Heat Cramps

Heat cramps are muscle pains, usually in the lower extremities, the abdomen, or both, which occur secondary to profuse sweating with accompanying salt depletion. Heat cramps most often afflict people in good physical condition, who overwork in conditions of high temperature and humidity. Untreated, heat cramps may progress to heat exhaustion.

Treatment of heat cramps is aimed at eliminating the exposure and restoring the loss of salt and water.

Signs and Symptoms

1. Cramps in the extremities and abdomen which come on suddenly during vigorous activity. Heat cramps can be mild with only slight abdominal cramping and tingling in the extremities, but more commonly present intense and incapacitating pain in the abdomen and extremities.
2. Respiration rate will increase, decreasing after the pain subsides.
3. Pulse rate will increase.
4. Skin will be pale and moist.
5. Body temperature will be normal.
6. Loss of consciousness or airway maintenance are seldom problems with this condition.
7. Generalized weakness will be noted as the pain subsides.

Emergency Care

1. Move the worker to a cool environment. Have the worker lie down if the worker feels faint.
2. If the worker is not nauseated, the worker may be given 1 or 2 glasses of an electrolyte solution. Have the worker drink slowly. The use of salt tablets is not recommended, as they may precipitate nausea.
3. If the worker is nauseated, avoid giving anything by mouth until the nausea subsides.
4. Avoid massaging the cramping muscles. This rarely helps and may actually aggravate the pain.
5. As the salt and water level is replenished, the worker's pain will subside. The Worker may wish to return to work, however, this is NOT recommended for a period of 12 hours. Further exertion may lead to heat exhaustion or heat stroke.

HEAT EXHAUSTION

Heat exhaustion represents a somewhat more severe response to salt and water loss, as well as an initial disturbance in the body's heat-regulating system. Like heat cramps, heat exhaustion tends to occur in persons working in hot environments. Heat exhaustion is likely in dehydrated and hypertensive people. Untreated Heat Exhaustion may progress to Heat Stroke.

Treatment of heat exhaustion is similar in principle to that of heat cramps.

Signs and Symptoms

1. Heat Exhaustion may come on suddenly or may be felt as headache, fatigue, dizziness, and nausea with occasional abdominal cramping.
2. Sweating will be profuse.
3. Pulse will be rapid and weak.
4. Respiration rate will be rapid and shallow.
5. The skin will be pale and clammy.
6. The body temperature will be normal or decreased.
7. The worker could be irritable and restless.

Emergency Care

1. Move the worker to a cool environment, take off as much of the worker’s clothing as possible, and place the worker in a supine position with the worker’s legs elevated.
2. Sponge the worker with cool water. If you fan the worker, avoid chilling. When the body chills, the muscles generate energy. When the body shivers, this energy is released as heat and actually can increase the body temperature.
3. If this is a true medical emergency, prompt intervention by Emergency Medical Services is recommended.
4. Monitor the worker's level of consciousness and airway.

HEAT STROKE

Heat Stroke is caused by a severe disturbance in the body's heat-regulating mechanism and is a profound emergency, with a mortality rate ranging from 25 to 50 percent. It is most common in men over 40, especially in alcoholics. It can also occur in people of any age having too much exposure to the sun or prolonged confinement in a hot atmosphere. Heat stroke comes on suddenly. As the sweating mechanism fails, the body temperature begins to rise precipitously, reaching 106°F (41°C) or higher within 10 to 15 minutes. If the situation is not corrected rapidly, the body cells - especially the very vulnerable cells of the brain - are literally cooked, and irreversible central nervous system damage occurs.

The treatment for Heat Stroke is aimed at maintaining vital functions and causing as rapid a temperature fall as possible.

Signs and Symptoms

1. The worker's pulse will be strong and pounding.
2. The skin will be hot, dry and flushed.
3. The worker may experience headache, dizziness, and dryness of mouth.
4. Seizures and coma occur.
5. Loss of consciousness and airway maintenance problems can occur.

Emergency Care

1. Establish an open airway.
2. Move the worker to a cool environment. Take off as much clothing as possible, and place the worker in a semi-reclining position with the head elevated.
3. Use any means to cool the worker. Improvise with whatever is available. A bathtub filled with cold water and ice cubes is ideal. Remember, speed is essential; delay may result in permanent brain damage. Vigorous efforts to cool the worker must continue until the body temperature is below 103°F (38.9°C).
4. This is a true medical emergency; prompt intervention by Emergency Medical Services is required.

These are only guidelines for the care of Heat Related Emergencies. Actual training in emergency medical care or basic first aid is recommended.

HEAT STRESS

1. Heart rate (HR) should be monitored by the radial pulse for 30 seconds as soon as possible in the resting period.

   If at the beginning of the rest period a worker's radial pulse is measured and his heart rate exceeds 100 beats per minute, the worker's next work period should be reduced by 33%. Therefore, if the original work period was one hour, the following work cycle should be reduced to 40 minutes.

2. Administering salt tablets to prevent heat stress is not recommended due to a number of reasons: (a) sweat is hypotonic, therefore, adding salt to the body would only increase the body's need for water; (b) additional salt may interfere with a worker's predisposed physical condition (i.e., high blood pressure); and (c) increasing the sodium content in the body may cause an imbalance in the body's potassium content. Unless a physician recommends the use of salt tablets, individuals naturally obtain the necessary salt in their normal diet.

3. Heat Stroke is a true medical emergency. First aid should be directed toward immediate measures to cool the body quickly, as well as seeing that the victim receives medical attention as soon as possible.

   Prior to medical treatment, remove as much clothing as possible and proceed to cool the victim's body, taking care not to overchill the victim once his temperature falls below 102°F. One of the following cooling measures should be taken: (1) sponge the bare skin with cool water; (b) apply cold packs continuously; (c) wrap the victim in a sheet soaked with water; or (d) immerse the victim in a tub of cold water, while closely monitoring the victim's level of consciousness.

4. Prior to site activity, the field team leader will make arrangements for heat stress monitoring (i.e., monitoring heart rate, body temperature and body water loss) during actual site work if conditions warrant these measures. In addition, the worker would want to ensure that the team members have been acclimatized to the particular environmental conditions and that personnel are aware of the signs and symptoms of heat illness and have been adequately trained in first aid procedures. As field team leader, one could also make sure there is sufficient personnel on site, so as to rotate work assignments, schedule work during hours of reduced temperatures, and ensure personnel drink moderate levels of an electrolyte solution and eat well prior to commencing site work.

5. The worker could be experiencing a condition of heat rash. Allow workers to rest and relieve the itching associated with heat rash rather than return to work too soon. Itching workers may not follow stringent decon procedures or risk cross contamination.

   Keeping the skin clean and dry will reduce the incidence of heat rash. This can be accomplished by adjusting clothing to wear materials that wick moisture away from the body (cotton, Gore-Tex or other similar materials) underneath protective clothing. Upon removal of the protective clothing, the worker should wash and dry his skin thoroughly.

6. The sense of thirst is not an adequate regulator of water replacement during heat exposure. Therefore, as a general rule, the amount of water administered should replace the amount of water lost, and it should be administered at regular intervals throughout the day. It is not practical to measure water loss in the field; however, water should be replaced by drinking 2-4 ounce servings during every rest period. A recommended alternative to water is an electrolyte drink split 50/50 with water.

7. Although there is no specific test given during a baseline physical that would identify a person's tolerance to heat, there are physical factors and personal habits which may indicate possible intolerance to heat, such as, whether or not an individual smokes, one's dietary habit, body weight, as well as predisposed physical conditions such as high blood pressure, heart conditions, diabetes, or medication, that may influence an individual's ability to tolerate excessive heat.

8. First aid treatment: remove victim to a cool place and give sips of salted water (1 teaspoon of salt to 1 quart of water) - 4 ounces every 15 minutes over a period of one hour. A commercial preparation, e.g., Gatorade, may be used if split 50/50 with water.

The salted water or solution should mitigate the cramps. Manual pressure should not be applied to the cramped muscles.

TABLE C-1[1]

REQUIRED FREQUENCY OF HEAT STRESS MONITORING

FOR WORKERS IN IMPERMEABLE CLOTHING

Adjusted[2] Temperature (°F)	Work Time Allowed Before Monitoring Break (min.)
90 or above	15
87.5-90	30
82.5-87.5	60
77.5-82.5	90
72.5-77.5	120

(1) Adapted from Eastern Research Group and National Institute for Occupational Safety and Health, Occupational Safety and Health Guidance Manual for Super Activities. September 26, 1984, pp. 8-75.

(2) Calculate the adjusted air temperature (Ta adj) by using this equation:

$$\text{Ta adj °F} = \text{Ta °F} + (13 \times \% \text{ sunshine})$$

Measure air temperature (Ta) with a standard thermometer, with the bulb shielded from radiant heat. Then estimate percent sunshine (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows).

TABLE C-2

Heat Stress Indicator	When to Measure	If Exceeds . . .	Action
heart rate (pulse)	beginning of rest period	110 beats per minute	shorten next work period by 33%
oral temperature	beginning of rest period	99°F (after thermometer is under tongue for 3 minutes) 100.6°F	shorten next work period by 33% prohibit work in impermeable clothing
body weight	1. before workday begins (a.m.) 2. after workday ends (p.m.)		increase fluid intake

COLD STRESS (HYPOTHERMIA)

Cold stress is a function of cold, wetness and wind. A worker's susceptibility to cold stress can vary according to his/her physical fitness, degree of acclimatization to cold weather, age, and diet.

Prevention

Institute the following steps to prevent overexposure of workers to cold:

1. Maintain body core temperature at 96.8°F or above by encouraging workers to drink warm liquids during breaks (preferably not coffee) and wear several layers of clothing. Wool is recommended since it can keep the body warm even when the wool is wet.

2. Avoid frostbite by adequately covering hands, feet, and other extremities. Clothing such as insulated gloves or mittens, earmuffs, and hat liners should be worn. To prevent contact frostbite (from touching metal and cold surfaces below 20°F), workers should wear anti-contact gloves. Tool handles and control bars should be covered with insulating material.

3. Adjust work schedules if necessary, providing adequate rest periods. When feasible, rotate personnel and perform work during the warmer hours of the day.

4. Provide a heated enclosure for workers close to their work area. Workers should remove their outer layer(s) of clothing while in the shelter to allow for sweat evaporation.

5. In the event that wind barriers are constructed around an intrusive operation (such as drilling), the enclosure must be properly vented to prevent the build-up of toxic or explosive gasses or vapors. Care must be taken to keep any heat source away from flammable substances.

6. Using a wind chill chart such as the one in Table C-4, obtain the equivalent chill temperature (ECT) based on actual wind speed and temperature. Refer to the ECT when setting up work warm-up schedules, planning appropriate clothing, etc. Workers should use warming shelters at regular intervals at or below an ECT of 20°F. For exposed skin, continuous exposure should not be permitted at or below an ECT of -25°F.

7. Workers who become immersed in water or whose clothing becomes wet (from perspiration, rain, etc.) must immediately be provided a change of dry clothing whenever the air temperature is 25.6°F or below.

8. Although not mandated by corporate requirements, employees should strive to maintain an optimal level of worker fitness by encouraging regular exercise, proper diet, etc.

Monitoring

Personnel should be aware of the symptoms of cold stress. If the following symptoms of systemic hypothermia are noticed in any worker, he/she should immediately go to a warm shelter:

- heavy, uncontrollable shivering;
- excessive fatigue or drowsiness;
- loss of coordination;
- difficulty in speaking; and,
- frostbite (see below).

Frostbite is the generic term for local injury resulting from cold. The stages of frostbite and their symptoms are as follows:

1. frostbite or incipient frostbite:
    - sudden blanching or whitening of the skin.

2. superficial frostbite:
    - waxy or white skin which is firm to the touch (tissue underneath is still resilient).

3. deep frostbite:
    - tissues are cold, pale, and solid.

TABLE C-4[1]

COOLING POWER OF WIND ON EXPOSED FLESH EXPRESSED AS AN EQUIVALENT TEMPERATURE (UNDER CALM CONDITIONS)

Estimated Wind Speed (in mps)	Actual Temperature Reading (°F)P											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER In < hr with dry skin. Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute.			GREAT DANGER Flesh may freeze within 30 seconds				
	Trenchfoot and immersion foot may occur at any point on this chart.											

Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.

(1) Reproduced from American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices for 1985-1986, p. 01.

Attachment E
Drilling Protocols

DRILLING PROTOCOLS

Safety procedures during the operation of drilling machines include, but are not limited to the following:

- All site personnel should know the location of the drill rig emergency shut-off switch prior to beginning operations.
- The drill rig should be inspected prior to operation to ensure that it is in proper working condition and that all safety devices are functioning.
- Each drill rig should have a first-aid kit and fire extinguisher which should be inspected to ensure that they are adequate.
- All operators should wear, at a minimum, hard hats, steel-toe safety shoes or boots, gloves and safety glasses. Additional clothing and protective equipment may be required at sites where hazardous conditions are likely. Clothing must be close fitting, without loose ends, straps, draw strings or belts or other unfastened parts that might catch on moving machinery.
- Work areas should be kept free of materials, debris and obstruction, and substances such as grease or oil that could cause a surface to become slick or otherwise hazardous.
- Prior to drilling, the site must be checked to determine whether it can accommodate the drill rig and supplies and provide a safe working area.
- The drill rig mast (derrick) must be lowered prior to moving between drilling locations.
- The drill rig mast should not be raised if the rig will not be at least 20 feet away from overhead utilities.
- The location of underground utilities should be determined prior to erecting the drill rig.
- The drill rig must be properly erected, leveled and stabilized prior to drilling.
- The operator must shut down the drill engine before leaving the vicinity of the machine.
- All personnel not directly involved in operating the rig or in sampling should remain clear of the drilling equipment when it is in operation.
- All unattended boreholes must be adequately covered or otherwise protected to prevent trip and fall hazards. All open boreholes should be covered, protected or backfilled as specified in local or state regulations.
- When climbing to or working on a derrick platform that is higher than 20 feet, a safety climbing device should be used.

- The user of wire line hoists, wire rope and hoisting hardware should be as stipulated by the American Iron and Steel Institute Wire Rope Users Manual.

- The drill rig should be operated in a manner which is consistent with the manufacturers' ratings of speed, force, torque, pressure, flow, etc. The drill rig and tools should be used for the purposes for which they were intended.

Attachment F
Miscellaneous Task SOPs and Safety Measures

TASK SAFETY AND HEALTH RISK ANALYSIS

TASK SAFETY AND HEALTH RISK ANALYSIS

This Hazard Assessment identifies the general hazards associated with various work tasks and presents an analysis of documented or potential hazards associated with each, including site-specific work tasks identified from the scope of work (as indicated by asterisks [*]). Every effort must be made to reduce or eliminate these hazards. Those which cannot be eliminated must be guarded against by use of engineering controls and/or personal protective equipment.

Work Tasks

*Geophysical Site Inspection
*Drum Handling
*Opening Drums and Overpacks
*Drum Staging and Overpacking
Compatibility Testing and Compositing of Samples
*Working Around Heavy Equipment
Corrosive Liquid Transfer
*Flammable/Combustible Liquid Transfer
Lab Packing and Lab Inventory
*Soil Excavation
Drum Sampling
Use of a High Pressure Water Cleaner
Drum Excavation
*Soil/Groundwater/UIC Sampling
High Pressure Washer During Vat Cleaning
Compressed Gas Cylinders
Empty Drum Crushing

Work Task Hazards and SOPs

*Hazards and SOPs Associated with Geophysical Site Inspection:

Hazards

1. Slip/trip/fall hazards from debris and holes, trenches in floor.
2. Injury from unstable overhead and falling building materials/debris.
3. Gas release hazards.
4. Direct skin contact and/or inhalation of contaminants.
5. Biological hazards.

SOPs

1. Be sure that all areas of entry have or are provided with adequate lighting.
2. All personnel should wear hard hats at all times when inside buildings and hot zones.
3. Be sure that all manholes/floor drains are covered and marked.
4. Be sure that stairways are structurally sound.
5. Be sure that all rooms are checked for loose or unstable overhead structures/debris.
6. Minimize slip/trip/fall hazards by keeping work areas clean and being aware of unstable or loose footing.
7. Air monitoring is to be conducted prior to inspection.
8. Proper level of protection.
9. Be aware of and avoid potential biological hazards.

*Hazards and SOPs Associated with Drum Handling:

Hazards

1. Injury from slip/trip/fall due to unstable ground conditions.
2. Cuts or abrasions from sharp or jagged metal during drum handling.
3. Potential for crushed fingers and toes, strained muscles, and back injury from moving heavy objects.
4. Operation of heavy equipment (e.g. backhoe with drum grappler).
5. Direct skin contact and/or inhalation of contaminants.

SOPs

1. Personnel are to be aware of footing as well as heavy equipment operating in the area.
2. Personnel should wear leather gloves and steel-toed boots.
3. Moving and opening drums is to be in accordance with 29 CFR 1910.120 (j).
4. Level B or C respiratory protection should be used when handling drums.

5. All heavy equipment to have backup alarms and ground spotters to assist operators. Eye to eye contact with the operator is to be made before approaching moving equipment.

*Hazardous and SOPs Associated with Opening Drums and Overpacks Hazards

Hazards

1. The presence of air-reactive chemicals.
2. The presence of water-reactive chemicals, particularly when it is raining.
3. Direct skin contact, ingestion, and inhalation of contaminants.
4. Opening drums of unknown waste.
5. Splashing wastes.
6. Cuts from sharp metal edges.
7. Air lines tangled among the drums.
8. Slip/trip/fall.
9. Pinch points.
10. Bulging or visually unstable drums.

SOPs

1. Open drums and overpacks in Level B respiratory protection.
2. Be alert for bulging drums and chemical reactions.
3. Avoid allowing rain to enter drums.
4. Regular, periodic air monitoring is to be performed with the rad meter, monitor units, HNU and CGI to ensure a safe environment.
5. Keep fire extinguishers in the area.
6. Keep absorbent materials immediately available.
7. If a drum is bulging or difficult to open, use remote opening techniques.
8. Level B will be used when opening unknown drums, and when handling drums that are in poor physical condition.

*Hazards and SOPs Associated with Drum Staging and Overpacking:

Hazards

1. Direct skin contact and inhalation, ingestion threat from hazardous materials.
2. Poor physical condition of drums. Rusty metal and holes indicate a high potential for spills and splashes during drum handling.
3. Routine heavy equipment hazards.
4. Physical hazards associated with drum handling operations - potential for crushed fingers and toes, strained muscles, and back injury from moving/lifting heavy objects.
5. Operation of heavy equipment (e.g. backhoe with drum grappler).

SOPs

1. Use of Level B or Level C personal protective equipment. Chemical resistant coveralls, gloves, splash shields, hard hats, and steel-toed boots should be used when handling drums, and in the vicinity of open drums.
2. Keep absorbents and emergency spill materials immediately available in the exclusion zone.
3. Use safe work practices to prevent physical injury.
4. Drums will be staged on a polyethylene-lined containment pad.

Hazards and SOPs Associated with Compatibility Testing and Compositing of Samples:

Hazards:

1. Inhalation of hazardous fumes.
2. Mixing incompatible materials.
3. Splashing or spilling samples.

SOPs

1. Personnel not involved with compatibility testing procedures should not be in the area.
2. Personnel will wear safety glasses, gloves, and acid shields.
3. Containers should be clearly marked.
4. Chemicals should be added slowly an in small amounts with constant observation.
5. Personnel should evacuate the area in the event of uncontrolled chemical reactions.
6. All compatibility tests will be performed by an on-site chemist.

*Hazards and SOPs Associated with Working Around Heavy Equipment:

Hazards

1. Equipment movements.
2. Overhead and underground utility lines.
3. Unstable slopes and open pits.

SOPs

1. All equipment must have operational backup alarms.
2. Personnel must make eye-to-eye contact with the operator before approaching operating equipment.
3. Operators must be aware of personnel in the area and use proper hand signals when communicating.
4. Operators must use caution when handling containers of hazardous materials.
5. Operators must wear hard hats if the machine does not have an enclosed cab or cage cover.

6. Operators must wear hard hats when going to and from their machines.
7. Ground spotters are to assist heavy machine operators.

Hazards and SOPs Associated with Corrosive Liquid Transfer:

Hazards

1. Direct skin contact with corrosive materials.
2. Potential for spills or leaks during transfer operations.
3. Potential for chemical reaction from mixing incompatible liquids or from contact with transfer equipment.
4. Potential splashing of corrosive liquids during transfer operations.
5. Slip/trip/fall around transfer hoses and equipment.

SOPs

1. Wear protective corrosive resistant clothing (e.g., acid suits, splash shields). Be sure gloves and boots are taped to protective clothing. Take precautions to ensure that no skin surfaces are exposed.
2. Wear appropriate level of respiratory protection.
3. Keep absorbents and spill containment materials nearby in the event of a spill or leak.
4. Monitor transfers continuously for changes in conditions (e.g. reactivity, pressure buildup, fire). Personnel monitoring the pumping and receiving vessel must have clear and continuous communication. If necessary, install a remote shutoff on the transfer pump.
5. Make sure the transfer equipment (e.g. hoses, fittings, pumps, and receiving vessels) are compatible with the corrosive material and that they are clean.
6. Be aware of the locations of emergency showers and eye washes, which should be placed nearby during operations.
7. Have an emergency escape route and contingency plan.
8. Be sure that all drums are characterized and adequately and appropriately marked to avoid mixing incompatible materials.
9. Make transfer with caution, remembering that corrosives may react violently, even explosively, with a wide variety of chemicals.
10. Provide adequate ventilation to area of transfer activities.

*Hazards and SOPs Associated with Flammable/Combustible Liquid Transfer:

Hazards

1. Direct skin contact, inhalation, ingestion.
2. Potential for fire or explosion during transfer.
3. Potential for spills during transfer.
4. Potential for chemical reaction during transfer.
5. Slip/trip/fall around transfer hoses and equipment.

SOPs

1. Use chemical resistant coveralls such as Saranex or butyl rubber when working with flammable/combustible liquids or when in the vicinity of open liquids.
2. Use Level B respiratory protection when opening tanks, when monitoring intake vacuum hoses when ambient organic concentrations exceed 5 ppm or while engaged in other high hazard/contact activities.
3. Level C may be sufficient for non-intrusive perimeter activities if ambient concentrations are less than 5 ppm.
4. Keep fire extinguishers in readily accessible locations.
5. Ground or bond the tank and tanker truck prior to beginning transfer operations.
6. Clear the area of all open flames or other ignition sources, and all flammable and combustible materials.
7. Use spark-proof tools and equipment.
8. Keep absorbents and spill containment equipment nearby in the event of a spill or leak.
9. Conduct air monitoring for organics, flammable/explosive vapors and oxygen as appropriate. Air monitoring equipment can be left in the work area unattended and programmed to sound an alarm if dangerous levels are encountered.
10. Have an emergency escape route planned and a contingency plan in case of an accident.
11. Be sure that all tanks are characterized and appropriately marked to avoid bulking of incompatible tanks.
12. Conduct the transfer with extreme caution, remembering that striking surfaces may cause sparks.

Hazards and SOPs Associated with Lab Packing and Lab Inventory:

Hazards

1. Possible skin contact with leaking bottles.
2. Mixing of incompatible materials.
3. Presence of shock sensitive materials.
4. Sudden release of dangerous vapors.

SOPs

1. Wear appropriate personal protective equipment, Level B, (e.g. splash shields, acid suits, hard hats, chemical resistant gloves).
2. Clearly mark containers.
3. Non-essential personnel must be restricted from area.
4. Have appropriate firefighting equipment present.
5. Review information files for possible chemical data.
6. Carefully follow lab packing guidelines specifically for the acceptable disposal facility.
7. Have sorbent materials on hand to quickly clean up any spills.

*Hazards and SOPs Associated with Soil Excavation (Drilling/Probing):

Hazards

1. Movement of heavy equipment during soil excavation.
2. Direct skin contact with contaminated soil.
3. Damaging drums while excavating which could release unknown contaminants.
4. Inhalation of contaminated dusts.
5. Loose footing and slip/trip/fall hazards.

SOPs

1. Personnel are to be aware of working locations of heavy equipment.
2. All equipment must have operational back-up alarms.
3. Personnel should make eye-to-eye contact with the operator before approaching heavy equipment.
4. Personnel should wear appropriate respiratory equipment.

*Hazards and SOPs Associated with Drum Sampling:

Hazards

1. Direct skin contact, ingestion and inhalation of contaminants.
2. Potential for chemical splash and mixing of incompatible materials, air or water reaction.
3. Poor physical condition of drums.
4. Slip/trip/fall hazards associated with slick surfaces or high or elevated work areas.

SOPs

1. Use chemical resistant coveralls such as Saranex or butyl rubber during sampling.
2. Use Level B respiratory protection for opening tanks or unknown materials, for sampling solvent tanks, or when ambient organic concentrations exceed 5 ppm.
3. Use Level C respiratory protection for re-sampling known materials and ambient organic concentrations are less than 5 ppm.
4. Keep fire extinguishers immediately available.
5. Keep absorbent materials immediately available.
6. Use a new drum thief to sample each drum or container.
7. Frequent air monitoring will be performed to ensure the quality of the ambient air.
8. If a drum is bulging or difficult to open, use remote opening techniques.

Hazards and SOPs Associated with the Use of High Pressure Water Cleaner:

Hazards

1. Body parts being injured/severed due to high pressure (3,000 psi) water stream.

2. Slip/trip/fall associated with water over spray and hose.
3. Control of high pressure nozzle.
4. Exposure to contaminants.

SOPs

1. Level C will be worn along with splash suit and shield.
2. No hands, feet, arms, or legs will be within three feet of high pressure nozzle.
3. Splash shields and rain protection should be worn over minimum level of protection.
4. Skin and ear protection may be required.
5. Operators are to be aware of other personnel or equipment in the area.
6. No personnel are to hold material being cleaned.

Hazards Associated with Drum Excavation:

Hazards

1. Drums may contain unknown hazardous substances.
2. Moving of drums may disturb otherwise intact hazardous materials.
3. Containers may be pressurized and subject to violent release of contents.

SOPs

1. Containers (other than empty containers) should be moved only by remote mechanical devices.
2. Where applicable polyethylene sheeting shall be placed in such a manner as to contain any spilled material.
3. Containers should not be handled by personnel until the contents and condition of the containers are recognized as safe to handle. (Level B protection applies.)
4. Use OVA or HNU and Radmeter for initial hazard identification of containers.

*Hazards and SOPs Associated with Soil/Groundwater/UIC Sampling:

Hazards

1. Contact with or inhalation of contaminants, potentially in high concentrations in sampling media.
2. Back strain and muscle fatigue due to lifting, shoveling and auguring techniques.
3. Contact with or inhalation of decontamination solutions.
4. Trip/fall hazards.

SOPs

1. Proper awareness of chemical contaminants and review of suspected contaminants should be completed. Appropriate PPE should be worn

2. Proper lifting (pre-lift weight assessment, use of legs, multiple personnel) techniques will prevent back strain. Use slow easy motions when shoveling, augering, and digging to decrease muscle strain.
3. Material Safety Data Sheets for all decon solutions should be included with each Site Health and Safety Plan.
4. As the proposed work activities may include sampling of UIC structures, the Site Safety Officer shall incorporate awareness of trip/fall hazards into the daily tailgate safety meetings and conduct periodic inspections of the site to identify potential trip/fall hazards. In addition, following the completion of the daily activities, the Site Safety Officers shall inspect the site for open UIC structures, excavations and other trip/fall hazards. If identified, the Site Safety Officer will be responsible for having these areas secured.

Hazards and SOPs Associated with the Use of as High Pressure Washer During Vat Cleaning:

Hazards

1. Body parts being injured/severed due to high pressure water stream.
2. Slip/trip/fall associated with water over spray and hose.
3. Control of high pressure nozzle.
4. Vat handling to facilitate cleaning.
5. Exposure to contaminants.

SOPs

1. No hands, feet, arms, or legs will be within three feet of high pressure nozzle.
2. Splash shields and rain protection should be worn over minimum level of protection.
3. Operators are to be constantly aware of other personnel/equipment in the area.
4. Personnel will not hold or be near vats while cleaning with high pressure washer is ongoing. If necessary, vats will be maneuvered with heavy equipment.

Hazards and SOPs Associated with Compressed Gas Cylinders:

Hazards

1. Sudden release of dangerous gases from unknown cylinders.
2. Slip/trip/fall from hidden or obstructed cylinders.
3. Possible sudden explosion from ruptured valves.

SOPs

1. To the extent possible, initial activities on site will involve locating and clearly marking the location of all unknown cylinders on site.
2. Equipment operators will be assisted by ground spotters when segregating drums and debris and during soil excavation activities.

3. When a damaged or corroded cylinder is found, it should not be moved or handled and extreme caution should be exercised in staying clear of the valve stem.
4. All identified cylinders will be examined and evaluated by an experienced and qualified person prior to moving any cylinders.
5. If a cylinder leaks or ruptures, all personnel will evacuate the area.

Hazards and SOPs Associated with Empty Drum Crushing:

Hazards

1. General hazards associated with heavy equipment operations.
2. Slip/trip/fall hazards.
3. Physical contact from splashing of any residual material that remains in drums.
4. Physical contact from flying metal pieces.

SOPs

1. Wear hard hats, face shields, safety goggles, and steel toed work boots at all times.
2. All personnel not necessary for the operation of equipment should stay clear of drum crushing activities.
3. Equipment operators are to be constantly aware of all other personnel/equipment in the area during operation.

Attachment G
Chemical Hazards

SAFETY DATA SHEET

Version 5.4
Revision Date 02/28/2015
Print Date 05/01/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : 4,4′-DDT

Product Number : C8894
Brand : Sigma
Index-No. : 602-045-00-7

CAS-No. : 50-29-3

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

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 3), H301
Acute toxicity, Dermal (Category 3), H311
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure, Oral (Category 1), H372
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H301 + H311 Toxic if swallowed or in contact with skin
H351 Suspected of causing cancer.
H372 Causes damage to organs through prolonged or repeated exposure if swallowed.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and

	understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing.
P281	Use personal protective equipment as required.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician. Rinse mouth.
P302 + P352 + P312	IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or doctor/ physician if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P361	Remove/Take off immediately all contaminated clothing.
P363	Wash contaminated clothing before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	$C_{14}H_9Cl_5$
Molecular weight	:	354.49 g/mol
CAS-No.	:	50-29-3
EC-No.	:	200-024-3
Index-No.	:	602-045-00-7

Hazardous components

Component	Classification	Concentration
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane		
	Acute Tox. 3; Carc. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H301 + H311, H351, H372, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.

Recommended storage temperature 2 - 8 °C
Storage class (TRGS 510): Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	TWA	1.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Liver damage Confirmed animal carcinogen with unknown relevance to humans		

		TWA	0.500000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		TWA	1.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		

8.2 Exposure controls

Appropriate engineering controls
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odour	No data available
c)	Odour Threshold	No data available

d)	pH	No data available
e)	Melting point/freezing point	107.0 - 109.0 °C (224.6 - 228.2 °F)
f)	Initial boiling point and boiling range	260.0 °C (500.0 °F)
g)	Flash point	72.0 - 77.0 °C (161.6 - 170.6 °F)
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	0.0000021 hPa (0.0000016 mmHg) at 20.0 °C (68.0 °F)
l)	Vapour density	No data available
m)	Relative density	0.99 g/cm3
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	log Pow: 6.91
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Oxidizing agents, Iron and iron salts.

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 87.0 mg/kg

Inhalation: No data available

LD50 Dermal - Rabbit - 300.0 mg/kg
Remarks: Behavioral:Tremor. Behavioral:Muscle weakness. Behavioral:Ataxia.

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

Limited evidence of carcinogenicity in animal studies

IARC:	2B - Group 2B: Possibly carcinogenic to humans (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)
NTP:	Reasonably anticipated to be a human carcinogen (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
Ingestion - Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard
No data available

Additional Information
RTECS: KJ3325000

CNS stimulation.

Pancreas. -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 0.01 mg/l - 96.0 h
	LC50 - Lepomis macrochirus (Bluegill) - 0.01 mg/l - 96.0 h
	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.003400 mg/l - 96.0 h
	LOEC - Oncorhynchus mykiss (rainbow trout) - 150 mg/l - 3.0 d
	NOEC - Oncorhynchus mykiss (rainbow trout) - 113 mg/l - 3.0 d
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 0.00108 mg/l - 48 h
Toxicity to algae	LC100 - Scenedesmus quadricauda (Green algae) - > 20 mg/l - 7 d

12.2 Persistence and degradability

12.3 Bioaccumulative potential

Bioaccumulation Oncorhynchus mykiss (rainbow trout) - 20 d
- 0.001 mg/l

Bioconcentration factor (BCF): 46,670

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solids, organic, n.o.s. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)
Reportable Quantity (RQ): 1 lbs
Marine pollutant:yes
Poison Inhalation Hazard: No

IMDG

UN number: 2811 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)
Marine pollutant:yes

IATA

UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solid, organic, n.o.s. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	1993-04-24

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	2008-06-17

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	2008-06-17

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H301	Toxic if swallowed.
H301 + H311	Toxic if swallowed or in contact with skin
H311	Toxic in contact with skin.
H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure if swallowed.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	2
Reactivity Hazard:	0

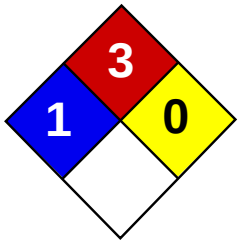
Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.4 Revision Date: 02/28/2015 Print Date: 05/01/2016



Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Acetone MSDS

Section 1: Chemical Product and Company Identification

Product Name: Acetone

Catalog Codes: SLA3502, SLA1645, SLA3151, SLA3808

CAS#: 67-64-1

RTECS: AL3150000

TSCA: TSCA 8(b) inventory: Acetone

CI#: Not applicable.

Synonym: 2-propanone; Dimethyl Ketone; Dimethylformaldehyde; Pyroacetic Acid

Chemical Name: Acetone

Chemical Formula: C3-H6-O

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Acetone	67-64-1	100

Toxicological Data on Ingredients: Acetone: ORAL (LD50): Acute: 5800 mg/kg [Rat]. 3000 mg/kg [Mouse]. 5340 mg/kg [Rabbit]. VAPOR (LC50): Acute: 50100 mg/m 8 hours [Rat]. 44000 mg/m 4 hours [Mouse].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Reproductive system/toxin/male [SUSPECTED]. The substance is toxic to central nervous system (CNS). The substance may be toxic to kidneys, the reproductive system, liver, skin. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

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

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

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

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 465°C (869°F)

Flash Points: CLOSED CUP: -20°C (-4°F). OPEN CUP: -9°C (15.8°F) (Cleveland).

Flammable Limits: LOWER: 2.6% UPPER: 12.8%

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

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

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of open flames and sparks, of oxidizing materials, of acids.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards: Vapor may travel considerable distance to source of ignition and flash back.

Special Remarks on Explosion Hazards:
Forms explosive mixtures with hydrogen peroxide, acetic acid, nitric acid, nitric acid + sulfuric acid, chromic anydride, chromyl chloride, nitrosyl chloride, hexachloromelamine, nitrosyl perchlorate, nitryl perchlorate, permonosulfuric acid, thiodiglycol + hydrogen peroxide, potassium ter-butoxide, sulfur dichloride, 1-methyl-1,3-butadiene, bromoform, carbon, air, chloroform, thitriazylperchlorate.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

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

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, acids, alkalis.

Storage:
Store in a segregated and approved area (flammables area) . Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Keep away from direct sunlight and heat and avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
TWA: 500 STEL: 750 (ppm) from ACGIH (TLV) [United States] TWA: 750 STEL: 1000 (ppm) from OSHA (PEL) [United States] TWA: 500 STEL: 1000 [Austalia] TWA: 1185 STEL: 2375 (mg/m3) [Australia] TWA: 750 STEL: 1500 (ppm) [United Kingdom (UK)] TWA: 1810 STEL: 3620 (mg/m3) [United Kingdom (UK)] TWA: 1800 STEL: 2400 from OSHA (PEL) [United States]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Fruity. Mint-like. Fragrant. Ethereal

Taste: Pungent, Sweetish

Molecular Weight: 58.08 g/mole

Color: Colorless. Clear

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

Boiling Point: 56.2°C (133.2°F)

Melting Point: -95.35 (-139.6°F)

Critical Temperature: 235°C (455°F)

Specific Gravity: 0.79 (Water = 1)

Vapor Pressure: 24 kPa (@ 20°C)

Vapor Density: 2 (Air = 1)

Volatility: Not available.

Odor Threshold: 62 ppm

Water/Oil Dist. Coeff.: The product is more soluble in water; log(oil/water) = -0.2

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, ignition sources, exposure to moisture, air, or water, incompatible materials.

Incompatibility with various substances: Reactive with oxidizing agents, reducing agents, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

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

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 3000 mg/kg [Mouse]. Acute toxicity of the vapor (LC50): 44000 mg/m3 4 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Reproductive system/toxin/male [SUSPECTED]. Causes damage to the following organs: central nervous system (CNS). May cause damage to the following organs: kidneys, the reproductive system, liver, skin.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May affect genetic material (mutagenicity) based on studies with yeast (S. cerevisiae), bacteria, and hamster fibroblast cells. May cause reproductive effects (fertility) based upon animal studies. May contain trace amounts of benzene and formaldehyde which may cancer and birth defects. Human: passes the placental barrier.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause skin irritation. May be harmful if absorbed through the skin. Eyes: Causes eye irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury. Inhalation: Inhalation at high concentrations affects the sense organs, brain and causes respiratory tract irritation. It also may affect the Central Nervous System (behavior) characterized by dizziness, drowsiness, confusion, headache, muscle weakeness, and possibly motor incoordination, speech abnormalities, narcotic effects and coma. Inhalation may also affect the gastrointestinal tract (nausea, vomiting). Ingestion: May cause irritation of the digestive (gastrointestinal) tract (nausea, vomiting). It may also

affect the Central Nevous System (behavior), characterized by depression, fatigue, excitement, stupor, coma, headache, altered sleep time, ataxia, tremors as well at the blood, liver, and urinary system (kidney, bladder, ureter) and endocrine system. May also have musculoskeletal effects. Chronic Potential Health Effects: Skin: May cause dermatitis. Eyes: Eye irritation.

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 5540 mg/l 96 hours [Trout]. 8300 mg/l 96 hours [Bluegill]. 7500 mg/l 96 hours [Fatthead Minnow]. 0.1 ppm any hours [Water flea].

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Acetone UNNA: 1090 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (male) which would require a warning under the statute: Benzene California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Benzene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Benzene, Formaldehyde Connecticut hazardous material survey.: Acetone Illinois toxic substances disclosure to employee act: Acetone Illinois chemical safety act: Acetone New York release reporting list: Acetone Rhode Island RTK hazardous substances: Acetone Pennsylvania RTK: Acetone Florida: Acetone Minnesota: Acetone Massachusetts RTK: Acetone Massachusetts spill list: Acetone New Jersey: Acetone New Jersey spill list: Acetone Louisiana spill reporting: Acetone California List of Hazardous Substances (8 CCR 339): Acetone TSCA 8(b) inventory: Acetone TSCA 4(a) final test rules: Acetone TSCA 8(a) IUR: Acetone

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

Other Classifications:

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

DSCL (EEC):
R11- Highly flammable. R36- Irritating to eyes. S9- Keep container in a well-ventilated place. S16- Keep away from sources of ignition - No smoking. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 1

Flammability: 3

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References:
-Material safety data sheet issued by: la Commission de la SantÃ© et de la SÃ©curitÃ© du Travail du QuÃ©bec. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. LOLI, RTECS, HSDB databases. Other MSDSs

Other Special Considerations: Not available.

Created: 10/10/2005 08:13 PM

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

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Ascent Battery Supply, LLC
1325 Walnut Ridge Drive
Hartland, Wisconsin 53029

Safety Data Sheet (SDS) — Alkaline Batteries

The information and recommendations below are believed to be accurate at the date of document preparation. Ascent Battery Supply makes no warranty or merchantability or any other warranty, express or implied, with respect to this information and assumes no liability resulting from its use. This SDS provides guidelines for safe use and handling of product. It does not, and cannot, advise all possible situations. All specific uses of this product must be evaluated by the end user to determine if additional safety precautions should be taken.

SECTION 1 - IDENTIFICATION

Product Name	Alkaline Batteries – Mercury Free
Common Name(s)	Alkaline
Synonyms	Primary Battery
DOT Description	Dry Battery
Chemical Name	Manganese Dioxide
Distributed By	Ascent Battery Supply, LLC 1325 Walnut Ridge Drive
Address	Hartland, Wisconsin 53029
Emergency Number	INFOTRAC (800) 535-5053
Overseas Emergency Number	INFOTRAC (352) 323-3500 (Collect)

SECTION 2 – HAZARD(S)

Unusual Fire and Explosion Hazards Cells may rupture when exposed to excessive heat. This could result in the release of flammable or corrosive materials.

SECTION 3 – COMPOSITION

Chemical Name	CAS No.	Percentage %
Manganese Dioxide	1313-13-9	32-40
Stainless Steel	7439-89-6	19-23
Zinc	7440-66-6	10-25
Potassium Hydroxide	1310-58-3	5-10
Graphite	7782-42-5	1-5
Barium Sulfate	7727-43-7	<5
Water, Paper, Plastic, other inert	N/A	balance

SECTION 4 – FIRST AID MEASURES

For Manganese Dioxide Chemicals:

Inhalation Get fresh air. If symptoms persist seek medical attention

Eyes and Skin **Skin:** Flush with copious quantities of flowing lukewarm water for a minimum of 15 minutes; wash with soap and water

Eyes: Flush with copious quantities of flowing lukewarm water for a minimum of 15 minutes; get immediate medical attention.

Ingestion Ingestion of battery chemicals can be harmful. Call The National Battery Ingestion Hotline (202-625-3333) 24 hours a day, for procedures treating ingestion of chemicals. Do not induce vomiting.

SECTION 5 – FIRE-FIGHTING MEASURES

Extinguisher Media Use water, foam or dry powder

Special Fire Fighting Procedures Wear self-contained breathing apparatus to avoid inhalation of hazardous decomposition products.

SECTION 6 – ACCIDENTAL RELEASE MEASURES

In case of accidental rupture or release: prevent skin and eye contact and collect all released material in a plastic lined metal container. See also: sections 4, 5, and 8.

SECTION 7 – HANDLING AND STORAGE

1. Store in a dry place.
2. Do not store unpacked cells together: to avoid cells shorting to one another.
3. If packing materials are not available, please masking tape on the (+) and (–) ends of the cells.

SECTION 8 – EXPOSURE/PERSONAL PROTECTION

Respiratory Protection	None required under normal handling conditions
Gloves	Wear gloves if cell is ruptured, corroded, or leaking materials
Safety Glasses	Always wear safety glasses with working with battery cells

SECTION 9 – PHYSICAL/CHEMICAL PROPERTIES

Boiling Point	N/A	**Melting Point**	N/A
Vapor Pressure	N/A	**Vapor Density**	N/A
Specific Gravity	N/A	**Evaporation Rate**	N/A
Solubility in Water	N/A	**Appearance and Odor**	Geometric, solid object

SECTION 10 – STABILITY & REACTIVITY

Reactivity in Water	N/A	**Auto-Ignition Temperature**	N/A
Flash Point	N/A	**Flammable Limits in Air, by vol.**	N/A
Percent Volatile By Volume	N/A		
Stable	Avoid electrically shorting the cell		
Incompatibility (materials to avoid)	N/A		

SECTION 11 – TOXICOLOGICAL INFORMATION

Threshold Limit Value	N/A
Signs and Symptoms of Exposure	None. (In fire or rupture situations, refer to sections 4, 5, & 8.)
Medical Conditions Generally Caused by Exposure	Chemicals may cause burns to skin, eyes, gastrointestinal tract and mucous membranes.
Routes of Entry	Skin, Eyes, Ingestion (swallowing)

SECTION 12 – ECOLOGICAL INFORMATION

Hazardous Decomposition Products	N/A
Hazardous Polymerization	Will not occur

Under normal use these batteries do not release internal ingredients into the environment. Damaged or abused batteries may release small amounts of zinc, manganese, and potassium hydroxide. Do not carelessly discard, as small amounts of zinc may be released into storm or surface water. Do not discard batteries into a fire. Dispose of properly or recycle.

SECTION 13 - DISPOSAL

1. Alkaline (Manganese Dioxide) batteries have no hazardous waste characteristics and can be landfilled.

SECTION 14 – TRANSPORT

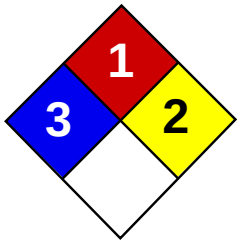
Alkaline Batteries are considered dry-cell batteries and are not considered ‘hazardous’ or ‘dangerous’ goods for transportation. These batteries must be packed in a way to prevent short circuits or generation of a dangerous quantity of heat.

SECTION 15 – REGULATORY INFORMATION

IATA Not considered to be 'dangerous goods'.
DOT Not considered to be a 'hazardous material'.

SECTION 16 - OTHER

Document Control No:	SDS20001 – Ascent SDS for Alkaline Batteries	**Revision:**	2	**Effective Date:**	12-05-2014



Health	3
Fire	1
Reactivity	2
Personal Protection	E

Material Safety Data Sheet
Arsenic MSDS

Section 1: Chemical Product and Company Identification

Product Name: Arsenic

Catalog Codes: SLA1006

CAS#: 7440-38-2

RTECS: CG0525000

TSCA: TSCA 8(b) inventory: Arsenic

CI#: Not applicable.

Synonym:

Chemical Name: Arsenic

Chemical Formula: As

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Arsenic	7440-38-2	100

Toxicological Data on Ingredients: Arsenic: ORAL (LD50): Acute: 763 mg/kg [Rat]. 145 mg/kg [Mouse].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, lungs, the nervous system, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

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

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

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks, of heat, of oxidizing materials.

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

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits highly toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable

protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids, moisture.

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

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

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

Exposure Limits:
TWA: 0.01 from ACGIH (TLV) [United States] [1995] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 74.92 g/mole

Color: Silvery.

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

Boiling Point: Not available.

Melting Point: Sublimation temperature: 615°C (1139°F)

Critical Temperature: Not available.

Specific Gravity: 5.72 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents, acids, moisture.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 145 mg/kg [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH. Causes damage to the following organs: kidneys, lungs, the nervous system, mucous membranes.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

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

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Arsenic UNNA: UN1558 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Arsenic California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Arsenic Pennsylvania RTK: Arsenic Massachusetts RTK: Arsenic TSCA 8(b) inventory: Arsenic

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

Other Classifications:

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

DSCL (EEC):
R22- Harmful if swallowed. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 2

Personal Protection: E

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

Health: 3

Flammability: 1

Reactivity: 2

Specific hazard:

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

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec. -Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

Created: 10/09/2005 04:16 PM

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

Barium Metal

MSDS # 84.00

Section 1: Product and Company Identification

Barium Metal

Synonyms/General Names: Barium
Product Use: For educational use only
Manufacturer: Columbus Chemical Industries, Inc., Columbus, WI 53925.

24 Hour Emergency Information Telephone Numbers

CHEMTREC (USA): 800-424-9300 **CANUTEC (Canada): 613-424-6666**

ScholAR Chemistry; 5100 W. Henrietta Rd, Rochester, NY 14586; (866) 260-0501; www.Scholarchemistry.com

Section 2: Hazards Identification

Soft, silvery, lustrous metal immersed in heavy mineral oil; no odor.

HMIS (0 to 4)

Health	3
Fire Hazard	3
Reactivity	2

WARNING! Flammable solid, dangerous when wet, highly toxic by ingestion.
Flammable solid, keep away from all ignition sources. Contact with water produces flammable gas.
Target organs: Central nervous system, kidneys.

This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Section 3: Composition / Information on Ingredients

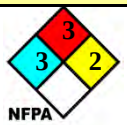
Barium Metal (7440-39-3), 100%

Section 4: First Aid Measures

Always seek professional medical attention after first aid measures are provided.

Eyes: Immediately flush eyes with excess water for 15 minutes, lifting lower and upper eyelids occasionally.
Skin: Immediately flush skin with excess water for 15 minutes while removing contaminated clothing.
Ingestion: Call Poison Control immediately. Rinse mouth with cold water. Give victim 1-2 tbsp of activated charcoal mixed with 8 oz water.
Inhalation: Remove to fresh air. If not breathing, give artificial respiration.

Section 5: Fire Fighting Measures



Flammable solid. When heated to decomposition, emits acrid fumes and explosive hydrogen gas.
Protective equipment and precautions for firefighters: Do Not Use carbon dioxide, foam, water or halogenated extinguishing agents. Use class D extinguisher or smother with dry sand, dry clay, dry ground limestone or dry graphite. Firefighters should wear full fire fighting turn-out gear and respiratory protection (SCBA). Material is not sensitive to mechanical impact or static discharge.

Section 6: Accidental Release Measures

Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Remove all ignition sources and ventilate area. Sweep up spill and place material in a dry container for disposal. See Section 13 for disposal information.

Section 7: Handling and Storage Red

Handling: Use with adequate ventilation and do not breathe dust or vapor. Avoid contact with skin, eyes, or clothing. Wash hands thoroughly after handling.
Storage: Store in Flammable Area [Red Storage] with other flammable materials and away from any strong oxidizers. Store in a dedicated flammables cabinet. Store in a cool, dry, well-ventilated, locked store room away from incompatible materials.

Section 8: Exposure Controls / Personal Protection

Use ventilation to keep airborne concentrations below exposure limits. Have approved eyewash facility, safety shower, and fire extinguishers readily available. Wear chemical splash goggles and chemical resistant clothing such as gloves and aprons. Wash hands thoroughly after handling material and before eating or drinking. Use NIOSH-approved respirator with a dust cartridge. Exposure guidelines: Barium compounds: OSHA PEL: 0.5 mg/m^3 and ACGIH TLV: 0.5 mg/m^3, STEL: N/A.

Section 9: Physical and Chemical Properties

Molecular formula	Ba.	**Appearance**	Silver metal in heavy mineral oil.
Molecular weight	137.33.	**Odor**	No odor.
Specific Gravity	3.62 g/mL @ 20°C..	**Odor Threshold**	N/A.
Vapor Density (air=1)	N/A.	**Solubility**	Reacts violently with water.
Melting Point	850°C.	**Evaporation rate**	N/A *(Butyl acetate = 1).*
Boiling Point/Range	1695°C.	**Partition Coefficient**	N/A *(log P_{OW}).*
Vapor Pressure (20°C)	N/A.	**pH**	N/A.
Flash Point:	N/A.	**UEL**	N/A.
Autoignition Temp.:	N/A.	**LEL**	N/A.

N/A = Not available or applicable

Section 10: Stability and Reactivity

Avoid heat and ignition sources
Stability: Stable under normal conditions of use.
Incompatibility: Water, acids, chlorine, iodine, bromine and oxidizing agents.
Shelf life: Indefinite if stored properly.

Section 11: Toxicology Information

Acute Symptoms/Signs of exposure: ***Eyes***: Stinging pain, burns, watering of eyes, inflammation of eyelids and conjunctivitis. Avoid looking at burning magnesium. ***Skin***: Irritation, redness, burns. Powdered metal ignites readily on skin causing burns. ***Ingestion***: Nausea, vomiting and headache. ***Inhalation***: Rapid irregular breathing, headache, burns to mucous membranes. Inhalation of dust or fumes causes metal fume fever.
Chronic Effects: Repeated/prolonged skin contact may cause dryness or rashes.
Sensitization: none expected
Barium: LD50 [oral, rat]; Not Available; LC50 [rat]; Not Available; LD50 Dermal [rabbit]; Not Available
Material has not been found to be a carcinogen nor produce genetic, reproductive, or developmental effects.

Section 12: Ecological Information

Ecotoxicity (aquatic and terrestrial): LC50 – 500mg/l – 96h – Cyprinodon variegates.

Section 13: Disposal Considerations

Check with all applicable local, regional, and national laws and regulations. Local regulations may be more stringent than regional or national regulations. Use a licensed chemical waste disposal firm for proper disposal.

Section 14: Transport Information

DOT Shipping Name:	Barium.	**Canada TDG:**	Barium .
DOT Hazard Class:	4.3, pg II.	**Hazard Class:**	4.3, pg II.
Identification Number:	UN1400.	**UN Number:**	UN1400.

Section 15: Regulatory Information

EINECS: Listed (231-149.1) .
WHMIS Canada: B6:D2B: Reactive Flammable: Toxic Material.
TSCA: All components are listed or are exempt.
California Proposition 65: Not listed.
The product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

Section 16: Other Information

Current Issue Date: September 22, 2012
Disclaimer: Scholar Chemistry and Columbus Chemical Industries, Inc., ("S&C") believes that the information herein is factual but is not intended to be all inclusive. The information relates only to the specific material designated and does not relate to its use in combination with other materials or its use as to any particular process. Because safety standards and regulations are subject to change and because S&C has no continuing control over the material, those handling, storing or using the material should satisfy themselves that they have current information regarding the particular way the material is handled, stored or used and that the same is done in accordance with federal, state and local law. ***S&C makes no warranty, expressed or implied, including (without limitation) warranties with respect to the completeness or continuing accuracy of the information contained herein or with respect to fitness for any particular use.***

SAFETY DATA SHEET

Version 5.6
Revision Date 02/28/2015
Print Date 03/11/2015

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Benz[*a*]anthracene

Product Number : B2209
Brand : Aldrich
Index-No. : 601-033-00-9

CAS-No. : 56-55-3

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

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Carcinogenicity (Category 1B), H350
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H350 May cause cancer.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P273 Avoid release to the environment.
P281 Use personal protective equipment as required.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P391 Collect spillage.
P405 Store locked up.

P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : 1,2-Benzanthracene
Tetraphene

Formula : $C_{18}H_{12}$
Molecular weight : 228.29 g/mol
CAS-No. : 56-55-3
EC-No. : 200-280-6
Index-No. : 601-033-00-9

Hazardous components

Component	Classification	Concentration
Benz[a]anthracene		
	Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H350, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Nature of decomposition products not known.

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 157 - 159 °C (315 - 318 °F)
f)	Initial boiling point and boiling range	437.6 °C (819.7 °F)
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Inhalation: No data available

Dermal: No data available

LD50 Intravenous - Rat - > 200 mg/kg

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Benz[a]anthracene)
NTP:	Reasonably anticipated to be a human carcinogen (Benz[a]anthracene)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Benz[a]anthracene)
Marine pollutant:yes

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benz[a]anthracene)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.6 Revision Date: 02/28/2015 Print Date: 03/11/2015

Material Safety Data Sheet

Benzo[a]pyrene, 98%

MSDS# 37175

Section 1 - Chemical Product and Company Identification

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

Company Identification:	Acros Organics BVBA Janssen Pharmaceuticalaan 3a 2440 Geel, Belgium
Company Identification: (USA)	Acros Organics One Reagent Lane Fair Lawn, NJ 07410
For information in the US, call:	800-ACROS-01
For information in Europe, call:	+32 14 57 52 11
Emergency Number, Europe:	+32 14 57 52 99
Emergency Number US:	201-796-7100
CHEMTREC Phone Number, US:	800-424-9300
CHEMTREC Phone Number, Europe:	703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#:	50-32-8
Chemical Name:	Benzo[a]pyrene
%:	>96
EINECS#:	200-028-5

Hazard Symbols: T N

Risk Phrases: 45 46 60 61 43 50/53

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

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

Potential Health Effects

Eye:	May cause eye irritation.
Skin:	May cause skin irritation. May be harmful if absorbed through the skin. May cause an allergic reaction in certain individuals.
Ingestion:	May cause irritation of the digestive tract. The toxicological properties of this substance have not been fully investigated. May be harmful if swallowed.
Inhalation:	May cause respiratory tract irritation. The toxicological properties of this substance have not been fully investigated. May be harmful if inhaled.

Chronic: May cause cancer in humans. May cause reproductive and fetal effects. Laboratory experiments have resulted in mutagenic effects.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.

Ingestion: Never give anything by mouth to an unconscious person. Get medical aid. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.

Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician:

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or appropriate foam.

Autoignition Temperature: Not available.

Flash Point: Not available

Explosion Limits: Lower: Not available

Explosion Limits: Upper: Not available

NFPA Rating: health: 2; flammability: 0; instability: 0;

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.

Storage: Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Benzo[a]pyrene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA	0.2 mg/m3 TWA (benzene soluble fraction) (listed under Coal tar pitches).

OSHA Vacated PELs: Benzo[a]pyrene: 0.2 mg/m3 TWA (benzene soluble fraction) (listed under Coal tar pitches)

Engineering Controls:

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

Exposure Limits

Personal Protective Equipment

Eyes:	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin:	Wear appropriate protective gloves to prevent skin exposure.
Clothing:	Wear appropriate protective clothing to prevent skin exposure.
Respirators:	A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State:	Powder
Color:	yellow to brown
Odor:	faint aromatic odor
pH:	Not available
Vapor Pressure:	Not available
Vapor Density:	Not available
Evaporation Rate:	Not available
Viscosity:	Not available
Boiling Point:	495 deg C @ 760 mm Hg (923.00°F)
Freezing/Melting Point:	175 - 179 deg C
Decomposition Temperature:	Not available
Solubility in water:	1.60x10-3 mg/l @25°C
Specific Gravity/Density:	
Molecular Formula:	C20H12
Molecular Weight:	252.31

Section 10 - Stability and Reactivity

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

Section 11 - Toxicological Information

RTECS#:	CAS# 50-32-8: DJ3675000
LD50/LC50:	RTECS: Not available.
Carcinogenicity:	Benzo[a]pyrene - ACGIH: A1 - Confirmed Human Carcinogen (Coal tar pitches). California: carcinogen, initial date 7/1/87 NTP: Suspect carcinogen IARC: Group 1 carcinogen
Other:	The toxicological properties have not been fully investigated.

Section 12 - Ecological Information

Not available

Section 13 - Disposal Considerations

Dispose of in a manner consistent with federal, state, and local regulations.

Section 14 - Transport Information

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

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

Section 15 - Regulatory Information

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: T N

Risk Phrases:

R 45 May cause cancer.

R 46 May cause heritable genetic damage.

R 61 May cause harm to the unborn child.

R 43 May cause sensitization by skin contact.

R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

R 60 May impair fertility.

Safety Phrases:

S 53 Avoid exposure - obtain special instructions before use.

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

S 60 This material and its container must be disposed of as hazardous waste.

S 61 Avoid release to the environment. Refer to special instructions/safety data sheets.

WGK (Water Danger/Protection)

CAS# 50-32-8: Not available

Canada

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

Canadian WHMIS Classifications: D2A, D2B

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

CAS# 50-32-8 is listed on Canada's Ingredient Disclosure List

US Federal

TSCA

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

Section 16 - Other Information

MSDS Creation Date: 9/02/1997

Revision #8 Date 7/20/2009

SAFETY DATA SHEET

Version 5.5
Revision Date 02/28/2015
Print Date 03/11/2015

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Benzo[*b*]fluoranthene

Product Number : 275336
Brand : Aldrich
Index-No. : 601-034-00-4

CAS-No. : 205-99-2

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

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Carcinogenicity (Category 1B), H350
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H350 May cause cancer.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P273 Avoid release to the environment.
P281 Use personal protective equipment as required.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P391 Collect spillage.
P405 Store locked up.

P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : 3,4-Benzofluoranthene
Benz[e]acephenanthrylene
2,3-Benzfluoranthene
3,4-Benz[e]acephenanthrylene
Benzo[b]fluoranthene
Benzo[e]fluoranthene
NSC 89265

Formula : $C_{20}H_{12}$
Molecular weight : 252.31 g/mol
CAS-No. : 205-99-2
EC-No. : 205-911-9
Index-No. : 601-034-00-4

Hazardous components

Component	Classification	Concentration
Benz[e]acephenanthrylene		
	Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H350, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid formation of dust and aerosols.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 163 - 165 °C (325 - 329 °F) - lit.
f)	Initial boiling point and boiling range	No data available
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available

s) Explosive properties No data available

t) Oxidizing properties No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
TDLo Oral - Mouse - 7.57 mg/kg
Remarks: Liver:Changes in liver weight. Endocrine:Changes in thymus weight.

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Benz[e]acephenanthrylene)

NTP: Reasonably anticipated to be a human carcinogen (Benz[e]acephenanthrylene)

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - > 1.024 mg/l - 24 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Benz[e]acephenanthrylene)
Marine pollutant:yes

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benz[e]acephenanthrylene)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.5 Revision Date: 02/28/2015 Print Date: 03/11/2015

SAFETY DATA SHEET

Version 3.9
Revision Date 02/28/2015
Print Date 03/11/2015

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Benzo[*k*]fluoranthene

Product Number : 392251
Brand : Aldrich
Index-No. : 601-036-00-5

CAS-No. : 207-08-9

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

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Carcinogenicity (Category 1B), H350
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H350 May cause cancer.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P273 Avoid release to the environment.
P281 Use personal protective equipment as required.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P391 Collect spillage.
P405 Store locked up.

P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	$C_{20}H_{12}$
Molecular weight	:	252.31 g/mol
CAS-No.	:	207-08-9
EC-No.	:	205-916-6
Index-No.	:	601-036-00-5

Hazardous components

Component	Classification	Concentration
Benzo[k]fluoranthene		
	Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H350, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: crystalline
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 215 - 217 °C (419 - 423 °F) - lit.
f)	Initial boiling point and boiling range	No data available
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

Carcinogenicity - Rat - Implant
Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Lungs, Thorax, or Respiration:Tumors.
Tumorigenic:Tumors at site or application.

Carcinogenicity - Mouse - Skin
Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Skin and Appendages: Other: Tumors.
Tumorigenic:Tumors at site or application.

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Benzo[k]fluoranthene)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	Reasonably anticipated to be a human carcinogen (Benzo[k]fluoranthene)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: DF6350000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Benzo[k]fluoranthene)
Reportable Quantity (RQ): 5000 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Benzo[k]fluoranthene)
Marine pollutant:yes

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benzo[k]fluoranthene)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Benzo[k]fluoranthene	207-08-9	1994-04-01

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benzo[k]fluoranthene	207-08-9	1994-04-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benzo[k]fluoranthene	207-08-9	1994-04-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Benzo[k]fluoranthene	207-08-9	1994-04-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No.	Revision Date
Benzo[k]fluoranthene	207-08-9	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

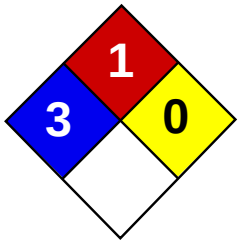
Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling

or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 3.9 Revision Date: 02/28/2015 Print Date: 03/11/2015



Health	3
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Cadmium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Cadmium

Catalog Codes: SLC3484, SLC5272, SLC2482

CAS#: 7440-43-9

RTECS: EU9800000

TSCA: TSCA 8(b) inventory: Cadmium

CI#: Not applicable.

Synonym:

Chemical Name: Cadmium

Chemical Formula: Cd

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Cadmium	7440-43-9	100

Toxicological Data on Ingredients: Cadmium: ORAL (LD50): Acute: 2330 mg/kg [Rat.]. 890 mg/kg [Mouse]. DUST (LC50): Acute: 50 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant). Severe over-exposure can result in death.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, lungs, liver. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact: No known effect on eye contact, rinse with water for a few minutes.

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

Serious Skin Contact: Not available.

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

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 570°C (1058°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Non-flammable in presence of open flames and sparks, of heat, of oxidizing materials, of reducing materials, of combustible materials, of moisture.

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

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Highly toxic or infectious materials should be stored in a separate locked safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

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

Exposure Limits:
TWA: 0.01 (ppm) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 112.4 g/mole

Color: Silvery.

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

Boiling Point: 765°C (1409°F)

Melting Point: 320.9°C (609.6°F)

Critical Temperature: Not available.

Specific Gravity: 8.64 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity: Reacts violently with potassium.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 890 mg/kg [Mouse]. Acute toxicity of the dust (LC50): 229.9 mg/m3 4 hour(s) [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP. The substance is toxic to kidneys, lungs, liver.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: An allergen. 0047 Animal: embryotoxic, passes through the placental barrier.

Special Remarks on other Toxic Effects on Humans: May cause allergic reactions, exzema and/or dehydration of the skin.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification:

Identification:

Special Provisions for Transport:

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Cadmium California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Cadmium Pennsylvania RTK: Cadmium Massachusetts RTK: Cadmium TSCA 8(b) inventory: Cadmium SARA 313 toxic chemical notification and release reporting: Cadmium CERCLA: Hazardous substances.: Cadmium

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

Other Classifications:

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

DSCL (EEC):
R26- Very toxic by inhalation. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

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

Health: 3

Flammability: 1

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec. -Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

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

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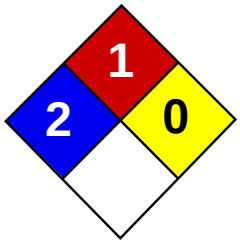

Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Chromium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Chromium

Catalog Codes: SLC4711, SLC3709

CAS#: 7440-47-3

RTECS: GB4200000

TSCA: TSCA 8(b) inventory: Chromium

CI#: Not applicable.

Synonym: Chromium metal; Chrome; Chromium Metal Chips 2" and finer

Chemical Name: Chromium

Chemical Formula: Cr

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Chromium	7440-47-3	100

Toxicological Data on Ingredients: Chromium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, lungs, liver, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

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

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

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 580°C (1076°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

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

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Moderate fire hazard when it is in the form of a dust (powder) and burns rapidly when heated in flame. Chromium is attacked vigorously by fused potassium chlorate producing vivid incandescence. Pyrophoric chromium unites with nitric oxide with incandescence. Incandescent reaction with nitrogen oxide or sulfur dioxide.

Special Remarks on Explosion Hazards:
Powdered Chromium metal +fused ammonium nitrate may react violently or explosively. Powdered Chromium will explode spontaneously in air.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids, alkalis.

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

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

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

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

Exposure Limits:
TWA: 0.5 (mg/m3) from ACGIH (TLV) [United States] TWA: 1 (mg/m3) from OSHA (PEL) [United States] TWA: 0.5 (mg/m3) from NIOSH [United States] TWA: 0.5 (mg/m3) [United Kingdom (UK)] TWA: 0.5 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 52 g/mole

Color: Silver-white to Grey.

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

Boiling Point: 2642°C (4787.6°F)

Melting Point: 1900°C (3452°F) +/- !0 deg. C

Critical Temperature: Not available.

Specific Gravity: 7.14 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Insoluble in cold water, hot water. Soluble in acids (except Nitric), and strong alkalies.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, acids, alkalis.

Corrosivity: Not available.

Special Remarks on Reactivity:
Incompatible with molten Lithium at 180 deg. C, hydrogen peroxide, hydrochloric acid, sulfuric acid, most caustic alkalies and alkali carbonates, potassium chlorate, sulfur dioxide, nitrogen oxide, bromine pentafluoride. It may react violently or ignite with bromine pentafluoride. Chromium is rapidly attacked by fused sodium hydroxide + potassium nitrate. Potentially hazardous incompatibility with strong oxidizers.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: kidneys, lungs, liver, upper respiratory tract.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause cancer based on animal data. There is no evidence that exposure to trivalent chromium causes cancer in man.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: May cause skin irritation. Eyes: May cause mechanical eye irritation. Inhalation: May cause irritation of the respiratory tract and mucous membranes of the respiratory tract. Ingestion: May cause gastrointestinal tract irritation with nausea, vomiting, diarrhea. Chronic Potential Health Effects: Inhalation: The effects of chronic exposure include irritation , sneezing, reddness of the throat, bronchospasm, asthma, cough, polyps, chronic inflammation, emphysema, chronic bronchitis, pharyngitis, bronchopneumonia, pneumoconoisis. Effects on the nose from chronic chromium exposure include irritation, ulceration, and perforation of the nasal septum. Inflammation and ulceration of the larynx may also occur. Ingestion or Inhalation: Chronic exposure may cause liver and kidney damage.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Chromium Illinois toxic substances disclosure to employee act: Chromium Illinois chemical safety act: Chromium New York release reporting list: Chromium Rhode Island RTK hazardous substances: Chromium Pennsylvania RTK: Chromium Minnesota: Chromium Michigan critical material: Chromium Massachusetts RTK: Chromium Massachusetts spill list: Chromium New Jersey: Chromium New Jersey spill list: Chromium Louisiana spill reporting: Chromium California Director's List of Hazardous Substances: Chromium TSCA 8(b) inventory: Chromium SARA 313 toxic chemical notification and release reporting: Chromium CERCLA: Hazardous substances.: Chromium: 5000 lbs. (2268 kg)

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

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):
R40- Limited evidence of carcinogenic effect S36/37/39- Wear suitable protective clothing, gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

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

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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

SAFETY DATA SHEET

Version 5.8
Revision Date 03/07/2015
Print Date 05/01/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : CHRYSENE, 98%

Product Number : 245186
Brand : Aldrich

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

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Germ cell mutagenicity (Category 2), H341
Carcinogenicity (Category 1B), H350
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H341 Suspected of causing genetic defects.
H350 May cause cancer.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P273 Avoid release to the environment.
P281 Use personal protective equipment as required.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P391 Collect spillage.
P405 Store locked up.

P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula : $C_{18}H_{12}$

Molecular weight : 228.29 g/mol

Hazardous components

Component	Classification	Concentration
Chrysene		
	Muta. 2; Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H341, H350, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
	Remarks	Cancer Substances for which there is a Biological Exposure Index or Indices (see BEI® section), see BEI® for Polycyclic Aromatic Hydrocarbons (PAHs) Exposure by all routes should be carefully controlled to levels as low as possible. Confirmed animal carcinogen with unknown relevance to humans		
Chrysene	218-01-9	TWA	0.200000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.200000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		1910.1002 As used in §1910.1000 (Table Z-1), coal tar pitch volatiles include the fused polycyclic hydrocarbons which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the 'coal tar pitch volatiles' standard OSHA specifically regulated carcinogen		
		TWA	0.100000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar products. cyclohexane-extractable fraction See Appendix C See Appendix A		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Chrysene	218-01-9	1-Hydroxypyrene (1-HP)		Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid Colour: white, light yellow
b)	Odour	No data available
c)	Odour Threshold	No data available

d)	pH	No data available
e)	Melting point/freezing point	253.0 °C (487.4 °F)
f)	Initial boiling point and boiling range	448.0 °C (838.4 °F)
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	insoluble
o)	Partition coefficient: n-octanol/water	log Pow: 5.73
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Inhalation: No data available

Dermal: No data available

LD50 Intraperitoneal - Mouse - > 320 mg/kg

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
Laboratory experiments have shown mutagenic effects.
In vitro tests showed mutagenic effects

Carcinogenicity

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Chrysene)
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	OSHA specifically regulated carcinogen (Chrysene)

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 1.90 mg/l - 2 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Chrysene)
Reportable Quantity (RQ): 100 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Chrysene)
Marine pollutant:yes

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Chrysene)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Chrysene	218-01-9	1994-04-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Chrysene	218-01-9	1994-04-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Chrysene	218-01-9	1994-04-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer. Chrysene	CAS-No. 218-01-9	Revision Date 2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H341	Suspected of causing genetic defects.
H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	0
Fire Hazard:	0
Reactivity Hazard:	0

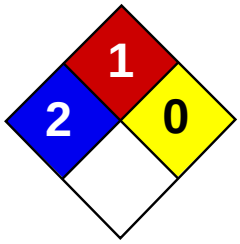
Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.8 Revision Date: 03/07/2015 Print Date: 05/01/2016



Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Copper MSDS

Section 1: Chemical Product and Company Identification

Product Name: Copper

Catalog Codes: SLC4939, SLC2152, SLC3943, SLC1150, SLC2941, SLC4729, SLC1936, SLC3727, SLC5515

CAS#: 7440-50-8

RTECS: GL5325000

TSCA: TSCA 8(b) inventory: Copper

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: Cu

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Copper	7440-50-8	100

Toxicological Data on Ingredients: Copper LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

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

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

Serious Skin Contact: Not available.

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

Serious Inhalation: Not available.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Not available.

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

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not breathe dust. Avoid contact with eyes Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If you feel unwell, seek medical attention and show the label when possible.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

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

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

Exposure Limits:
TWA: 1 (mg/m3) from ACGIH [1990] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 63.54 g/mole

Color: Not available.

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

Boiling Point: 2595°C (4703°F)

Melting Point: 1083°C (1981.4°F)

Critical Temperature: Not available.

Specific Gravity: 8.94 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

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

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: The substance is toxic to lungs, mucous membranes.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Human: passes through the placenta, excreted in maternal milk.

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

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Copper Massachusetts RTK: Copper TSCA 8(b) inventory: Copper CERCLA: Hazardous substances.: Copper

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

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC): R36- Irritating to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

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

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 04:58 PM

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

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

MATERIAL SAFETY DATA SHEET

Date Printed: 11.03.2015
Date Updated: 07.05.2009
Version 1.4

Section 1 - Product and Company Information

Product Name	1,2:5,6-DIBENZANTHRACENE, 97% (NO BULK ORDERS ALLOWED)
Product Number	D31400
Brand	ALDRICH
Company	Sigma-Aldrich
Address	3050 Spruce Street SAINT LOUIS MO 63103 US
Technical Phone:	800-325-5832
Fax:	800-325-5052
Emergency Phone:	314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
1,2:5,6-DIBENZANTHRACENE	53-70-3	Yes

Formula	C22H14
Synonyms	1,2:5,6-Benzanthracene * DB(a,h)A * 1,2,5,6-Dba * 1,2,5,6-Dibenzanthraceen (Dutch) * 1,2:5,6-Dibenzanthracene * 1,2:5,6-Dibenz(a)anthracene * Dibenzo(a,h)anthracene * 1,2:5,6-Dibenzoanthracene * RCRA waste number U063
RTECS Number:	HN2625000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Toxic. Dangerous for the environment.
May cause cancer. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Target organ(s): Lungs. Liver. Calif. Prop. 65 carcinogen.

HMIS RATING

HEALTH: 2*
FLAMMABILITY: 0
REACTIVITY: 0

NFPA RATING

HEALTH: 2
FLAMMABILITY: 0
REACTIVITY: 0

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If breathing becomes difficult, call a physician.

DERMAL EXPOSURE
In case of contact, immediately wash skin with soap and copious amounts of water.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT
N/A

AUTOIGNITION TEMP
N/A

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves. Wear disposable coveralls and discard them after use.

METHODS FOR CLEANING UP
Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe dust. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE

Suitable: Keep tightly closed.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS

Use only in a chemical fume hood. Safety shower and eye bath.

PERSONAL PROTECTIVE EQUIPMENT

Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES

Wash contaminated clothing before reuse. Wash thoroughly after handling.

EXPOSURE LIMITS

Country	Source	Type	Value
Poland		NDS	0.004 MG/M3
Poland		NDSCh	-
Poland		NDSP	-

Section 9 - Physical/Chemical Properties

Appearance: Physical State: Solid

Property	Value	At Temperature or Pressure
Molecular Weight	278,3500 AMU	
pH	N/A	
BP/BP Range	524,000 °C	760,000 mmHg
MP/MP Range	262,000 °C	
Freezing Point	N/A	
Vapor Pressure	N/A	
Vapor Density	N/A	
Saturated Vapor Conc.	N/A	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	N/A	
Explosion Limits	N/A	
Flammability	N/A	
Autoignition Temp	N/A	
Refractive Index	N/A	
Optical Rotation	N/A	
Miscellaneous Data	N/A	

Solubility N/A

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Materials to Avoid: Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: May cause skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: May cause eye irritation.
Inhalation: Material may be irritating to mucous membranes and upper respiratory tract. May be harmful if inhaled.
Ingestion: May be harmful if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)
Lungs. Liver.

SIGNS AND SYMPTOMS OF EXPOSURE
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

CHRONIC EXPOSURE - CARCINOGEN
Result: This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Species: Rat
Route of Application: Intratracheal
Dose: 100 MG/KG
Result: Tumorigenic:Carcinogenic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors.

Species: Mouse
Route of Application: Oral
Dose: 4160 MG/KG
Exposure Time: 26W
Frequency: I
Result: Lungs, Thorax, or Respiration:Tumors. Tumorigenic:Carcinogenic by RTECS criteria.

Species: Mouse
Route of Application: Skin
Dose: 1200 MG/KG
Exposure Time: 50W
Frequency: I
Result: Tumorigenic:Tumors at site or application. Tumorigenic:Carcinogenic by RTECS criteria. Skin and Appendages: Other: Tumors.

Species: Mouse
Route of Application: Subcutaneous
Dose: 445 UG/KG
Result: Skin and Appendages: Other: Tumors.
Tumorigenic:Carcinogenic by RTECS criteria. Tumorigenic:Tumors
at site or application.

Species: Mouse
Route of Application: Intravenous
Dose: 40 MG/KG
Result: Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax,
or Respiration:Tumors. Liver:Tumors.

Species: Mouse
Route of Application: Implant
Dose: 80 MG/KG
Result: Kidney, Ureter, Bladder:Tumors. Tumorigenic:Carcinogenic
by RTECS criteria.

Species: Mouse
Route of Application: Multiple
Dose: 40 MG/KG
Exposure Time: 12D
Frequency: I
Result: Tumorigenic:Tumors at site or application. Lungs,
Thorax, or Respiration:Tumors. Tumorigenic:Equivocal tumorigenic
agent by RTECS criteria.

Species: Guinea pig
Route of Application: Subcutaneous
Dose: 250 MG/KG
Exposure Time: 24D
Frequency: I
Result: Tumorigenic:Equivocal tumorigenic agent by RTECS
criteria. Tumorigenic:Tumors at site or application. Lungs,
Thorax, or Respiration:Tumors.

Species: Guinea pig
Route of Application: Intravenous
Dose: 30 MG/KG
Result: Tumorigenic:Tumors at site or application. Lungs,
Thorax, or Respiration:Tumors. Tumorigenic:Equivocal tumorigenic
agent by RTECS criteria.

Species: Pigeon
Route of Application: Intramuscular
Dose: 6 MG/KG
Result: Tumorigenic:Carcinogenic by RTECS criteria.
Liver:Tumors. Tumorigenic:Tumors at site or application.

Species: Frog
Route of Application: Intrarenal
Dose: 12 MG/KG
Result: Kidney, Ureter, Bladder:Kidney tumors. Lungs, Thorax, or
Respiration:Tumors. Tumorigenic:Neoplastic by RTECS criteria.

Species: Mouse
Route of Application: Implant
Dose: 14 MG/KG

Result: Tumorigenic:Neoplastic by RTECS criteria.
Tumorigenic:Tumors at site or application.

Species: Mouse
Route of Application: Subcutaneous
Dose: 78 UG/KG
Result: Tumorigenic:Neoplastic by RTECS criteria.
Tumorigenic:Tumors at site or application.

Species: Mouse
Route of Application: Oral
Dose: 4520 MG/KG
Exposure Time: 36W
Frequency: C
Result: Tumorigenic:Carcinogenic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors. Gastrointestinal:Tumors.

Species: Mouse
Route of Application: Implant
Dose: 200 MG/KG
Result: Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration:Bronchiogenic carcinoma. Tumorigenic:Tumors at site or application.

Species: Mouse
Route of Application: Skin
Dose: 6 UG/KG
Result: Tumorigenic:Neoplastic by RTECS criteria. Skin and Appendages: Other: Tumors.

Species: Mouse
Route of Application: Subcutaneous
Dose: 6 MG/KG
Result: Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Tumorigenic:Tumors at site or application.

Species: Mouse
Route of Application: Skin
Dose: 400 MG/KG
Exposure Time: 40W
Frequency: I
Result: Tumorigenic:Neoplastic by RTECS criteria. Skin and Appendages: Other: Tumors.

Species: Mouse
Route of Application: Implant
Dose: 100 MG/KG
Result: Tumorigenic:Carcinogenic by RTECS criteria. Kidney, Ureter, Bladder:Tumors. Tumorigenic:Tumors at site or application.

Species: Rat
Route of Application: Subcutaneous
Dose: 135 MG/KG
Exposure Time: 9W
Frequency: I
Result: Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors. Tumorigenic:Tumors at site or application.

Species: Mouse

Route of Application: Subcutaneous
Dose: 400 MG/KG
Exposure Time: 10W
Frequency: I
Result: Tumorigenic:Neoplastic by RTECS criteria.
Tumorigenic:Tumors at site or application.

IARC CARCINOGEN LIST

Rating: Group 2A

NTP CARCINOGEN LIST

Rating: Anticipated to be a carcinogen.

CHRONIC EXPOSURE - MUTAGEN
Result: Laboratory experiments have shown mutagenic effects.

Species: Human
Dose: 360 NMOL/L
Cell Type: Embryo
Mutation test: DNA

Species: Human
Dose: 100 UMOL/L
Cell Type: fibroblast
Mutation test: Unscheduled DNA synthesis

Species: Human
Dose: 10 MG/L
Cell Type: Other cell types
Mutation test: Unscheduled DNA synthesis

Species: Human
Dose: 100 NMOL/L
Cell Type: HeLa cell
Mutation test: Unscheduled DNA synthesis

Species: Human
Dose: 54 UG/L
Cell Type: lymphocyte
Mutation test: Mutation in mammalian somatic cells.

Species: Rat
Route: Intratracheal
Dose: 25500 UG/KG
Exposure Time: 16H
Mutation test: Micronucleus test

Species: Rat
Route: Oral
Dose: 200 MG/KG
Mutation test: Morphological transformation.

Species: Rat
Dose: 100 UG/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Rat

Route: Intratracheal
Dose: 25560 UG/KG
Mutation test: DNA

Species: Rat
Route: Intratracheal
Dose: 51150 UG/KG
Mutation test: Sister chromatid exchange

Species: Mouse
Route: Intraperitoneal
Dose: 500 MG/KG
Mutation test: Micronucleus test

Species: Mouse
Dose: 4250 UG/L (+S9)
Cell Type: lymphocyte
Mutation test: Mutation in microorganisms

Species: Mouse
Dose: 500 UG/L
Cell Type: fibroblast
Mutation test: Morphological transformation.

Species: Mouse
Dose: 100 UG/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Mouse
Dose: 6 UMOL/L
Cell Type: liver
Mutation test: DNA

Species: Mouse
Route: Skin
Dose: 40 UMOL/KG
Mutation test: DNA

Species: Mouse
Dose: 1 MG/L
Cell Type: Other cell types
Mutation test: DNA

Species: Mouse
Dose: 1 MG/L
Cell Type: Other cell types
Mutation test: Other mutation test systems

Species: Mouse
Dose: 510 NMOL/L
Cell Type: Embryo
Mutation test: DNA

Species: Mouse
Dose: 510 NMOL/L
Cell Type: Embryo
Mutation test: Other mutation test systems

Species: Hamster

Dose: 56400 NMOL/L (+S9)
Cell Type: lung
Mutation test: Mutation in microorganisms

Species: Hamster
Dose: 2500 UG/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Hamster
Dose: 25 UG/L
Cell Type: kidney
Mutation test: Morphological transformation.

Species: Hamster
Dose: 5 MG/L
Exposure Time: 24H
Cell Type: fibroblast
Mutation test: DNA damage

Species: Hamster
Dose: 360 NMOL/L
Cell Type: Embryo
Mutation test: DNA

Species: Hamster
Dose: 5 MG/L
Cell Type: kidney
Mutation test: DNA damage

Species: Hamster
Dose: 1 MG/L
Cell Type: lung
Mutation test: DNA

Species: Hamster
Dose: 1 MG/L
Cell Type: lung
Mutation test: Other mutation test systems

Species: Hamster
Dose: 1 MMOL/L
Cell Type: fibroblast
Mutation test: Cytogenetic analysis

Species: Hamster
Route: Intraperitoneal
Dose: 900 MG/KG
Exposure Time: 24H
Mutation test: Sister chromatid exchange

Species: Hamster
Dose: 500 UG/L
Cell Type: lung
Mutation test: Mutation in mammalian somatic cells.

Species: Mammal
Dose: 2 NMOL/L
Cell Type: lymphocyte
Mutation test: DNA damage

Section 12 - Ecological Information

No data available.

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Observe all federal, state, and local environmental regulations. (DN)Requires special label: "Contains a substance which is regulated by Dannish work environmental law due to the risk of carcinogenic properties."

Section 14 - Transport Information

DOT
Proper Shipping Name: Environmentally hazardous substances, solid, n.o.s.
UN#: 3077
Class: 9
Packing Group: Packing Group III
Hazard Label: Class 9
PIH: Not PIH

IATA
Proper Shipping Name: Environmentally hazardous substance, solid, n.o.s
IATA UN Number: 3077
Hazard Class: 9
Packing Group: III

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION
Symbol of Danger: T-N
Indication of Danger: Toxic. Dangerous for the environment.
R: 45-50/53
Risk Statements: May cause cancer. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
S: 53-45-60-61
Safety Statements: Restricted to professional users. Attention - Avoid exposure - obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Toxic. Dangerous for the environment.
Risk Statements: May cause cancer. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Safety Statements: Restricted to professional users. Attention - Avoid exposure - obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Wear suitable protective clothing, gloves, and eye/face protection. This

material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.
US Statements: Target organ(s): Lungs. Liver. Calif. Prop. 65 carcinogen.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: Yes
NOTES: This product is subject to SARA section 313 reporting requirements.
TSCA INVENTORY ITEM: Yes

UNITED STATES - STATE REGULATORY INFORMATION

CALIFORNIA PROP - 65
California Prop - 65: This product is or contains chemical(s) known to the state of California to cause cancer. This product is or contains chemical(s) known to the state of California to cause cancer.

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: No
NDSL: Yes

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909
US GHS

Synonyms: Ultra Low Sulfur Diesel; Low Sulfur Diesel; No. 2 Diesel; Motor Vehicle Diesel Fuel; Non-Road Diesel Fuel; Locomotive/Marine Diesel Fuel

* * * Section 1 - Product and Company Identification * * *

Manufacturer Information

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

Phone: 732-750-6000 Corporate EHS
Emergency # 800-424-9300 CHEMTREC
www.hess.com (Environment, Health, Safety Internet Website)

* * * Section 2 - Hazards Identification * * *

GHS Classification:

Flammable Liquids - Category 3
Skin Corrosion/Irritation – Category 2
Germ Cell Mutagenicity – Category 2
Carcinogenicity - Category 2
Specific Target Organ Toxicity (Single Exposure) - Category 3 (respiratory irritation, narcosis)
Aspiration Hazard – Category 1
Hazardous to the Aquatic Environment, Acute Hazard – Category 3

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

DANGER

Hazard Statements

Flammable liquid and vapor.
Causes skin irritation.
Suspected of causing genetic defects.
Suspected of causing cancer.
May cause respiratory irritation.
May cause drowsiness or dizziness.
May be fatal if swallowed and enters airways.
Harmful to aquatic life.

Precautionary Statements

Prevention

Keep away from heat/sparks/open flames/hot surfaces. No smoking
Keep container tightly closed.
Ground/bond container and receiving equipment.

Use explosion-proof electrical/ventilating/lighting/equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Wear protective gloves/protective clothing/eye protection/face protection.
Wash hands and forearms thoroughly after handling.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Avoid breathing fume/mist/vapours/spray.

Response

In case of fire: Use water spray, fog or foam to extinguish.
IF ON SKIN (or hair): Wash with plenty of soap and water. Remove/Take off immediately all contaminated clothing and wash it before reuse. If skin irritation occurs: Get medical advice/attention.
IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a poison center/doctor if you feel unwell.
If swallowed: Immediately call a poison center or doctor. Do NOT induce vomiting.
IF exposed or concerned: Get medical advice/attention.

Storage

Store in a well-ventilated place. Keep cool.
Keep container tightly closed.
Store locked up.

Disposal

Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 3 - Composition / Information on Ingredients * * *

CAS #	Component	Percent
68476-34-6	Fuels, diesel, no. 2	100
91-20-3	Naphthalene	<0.1

A complex mixture of hydrocarbons with carbon numbers in the range C9 and higher.

* * * Section 4 - First Aid Measures * * *

First Aid: Eyes

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

First Aid: Skin

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or with waterless hand cleanser. Obtain medical attention if irritation or redness develops. Thermal burns require immediate medical attention depending on the severity and the area of the body burned.

First Aid: Ingestion

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

First Aid: Inhalation

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

* * * Section 5 - Fire Fighting Measures * * *

General Fire Hazards

See Section 9 for Flammability Properties.

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

Hazardous Combustion Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

Extinguishing Media

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, and other gaseous agents.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Unsuitable Extinguishing Media

None

Fire Fighting Equipment/Instructions

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment. Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

* * * Section 6 - Accidental Release Measures * * *

Recovery and Neutralization

Carefully contain and stop the source of the spill, if safe to do so.

Materials and Methods for Clean-Up

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal. Caution, flammable vapors may accumulate in closed containers.

Emergency Measures

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Personal Precautions and Protective Equipment

Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

Environmental Precautions

Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Prevention of Secondary Hazards

None

* * * Section 7 - Handling and Storage * * *

Handling Procedures

Handle as a combustible liquid. Keep away from heat, sparks, excessive temperatures and open flame! No smoking or open flame in storage, use or handling areas. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents."

Storage Procedures

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks."

Incompatibilities

Keep away from strong oxidizers.

* * * Section 8 - Exposure Controls / Personal Protection * * *

Component Exposure Limits

Fuels, diesel, no. 2 (68476-34-6)

ACGIH: 100 mg/m3 TWA (inhalable fraction and vapor, as total hydrocarbons, listed under Diesel fuel)
Skin - potential significant contribution to overall exposure by the cutaneous route (listed under Diesel fuel)

Naphthalene (91-20-3)

ACGIH: 10 ppm TWA
15 ppm STEL
Skin - potential significant contribution to overall exposure by the cutaneous route
OSHA: 10 ppm TWA; 50 mg/m3 TWA
NIOSH: 10 ppm TWA; 50 mg/m3 TWA
15 ppm STEL; 75 mg/m3 STEL

Engineering Measures

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

Personal Protective Equipment: Respiratory

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

Personal Protective Equipment: Hands

Gloves constructed of nitrile, neoprene, or PVC are recommended.

Personal Protective Equipment: Eyes

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

Personal Protective Equipment: Skin and Body

Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

* * * Section 9 - Physical & Chemical Properties * * *

Appearance:	Clear, straw-yellow.	**Odor:**	Mild, petroleum distillate odor
Physical State:	Liquid	**pH:**	ND
Vapor Pressure:	0.009 psia @ 70 °F (21 °C)	**Vapor Density:**	>1.0
Boiling Point:	320 to 690 °F (160 to 366 °C)	**Melting Point:**	ND
Solubility (H2O):	Negligible	**Specific Gravity:**	0.83-0.876 @ 60°F (16°C)
Evaporation Rate:	Slow; varies with conditions	**VOC:**	ND
Percent Volatile:	100%	**Octanol/H2O Coeff.:**	ND
Flash Point:	>125 °F (>52 °C) minimum	**Flash Point Method:**	PMCC
Upper Flammability Limit (UFL):	7.5	**Lower Flammability Limit (LFL):**	0.6
Burning Rate:	ND	**Auto Ignition:**	494°F (257°C)

* * * Section 10 - Chemical Stability & Reactivity Information * * *

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources.

Incompatible Products

Keep away from strong oxidizers.

Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

* * * Section 11 - Toxicological Information * * *

Acute Toxicity

A: General Product Information

Harmful if swallowed.

B: Component Analysis - LD50/LC50

Naphthalene (91-20-3)

Inhalation LC50 Rat >340 mg/m3 1 h; Oral LD50 Rat 490 mg/kg; Dermal LD50 Rat >2500 mg/kg; Dermal LD50 Rabbit >20 g/kg

Potential Health Effects: Skin Corrosion Property/Stimulativeness

Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

Potential Health Effects: Eye Critical Damage/ Stimulativeness

Contact with eyes may cause mild irritation.

Potential Health Effects: Ingestion

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

Potential Health Effects: Inhalation

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

Respiratory Organs Sensitization/Skin Sensitization

This product is not reported to have any skin sensitization effects.

Generative Cell Mutagenicity

This material has been positive in a mutagenicity study.

Carcinogenicity

A: General Product Information

Suspected of causing cancer.

Studies have shown that similar products produce skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.

B: Component Carcinogenicity

Fuels, diesel, no. 2 (68476-34-6)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans (listed under Diesel fuel)

Naphthalene (91-20-3)

ACGIH: A4 - Not Classifiable as a Human Carcinogen
NTP: Reasonably Anticipated To Be A Human Carcinogen (Possible Select Carcinogen)
IARC: Monograph 82 [2002] (Group 2B (possibly carcinogenic to humans))

Reproductive Toxicity

This product is not reported to have any reproductive toxicity effects.

Specified Target Organ General Toxicity: Single Exposure

This product is not reported to have any specific target organ general toxicity single exposure effects.

Specified Target Organ General Toxicity: Repeated Exposure

This product is not reported to have any specific target organ general toxicity repeat exposure effects.

Aspiration Respiratory Organs Hazard

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

* * * Section 12 - Ecological Information * * *

Ecotoxicity

A: General Product Information

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations.

B: Component Analysis - Ecotoxicity - Aquatic Toxicity

Fuels, diesel, no. 2 (68476-34-6)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	35 mg/L [flow-through]	

Naphthalene (91-20-3)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	5.74-6.44 mg/L [flow-through]	
96 Hr LC50 Oncorhynchus mykiss	1.6 mg/L [flow-through]	
96 Hr LC50 Oncorhynchus mykiss	0.91-2.82 mg/L [static]	
96 Hr LC50 Pimephales promelas	1.99 mg/L [static]	

96 Hr LC50 Lepomis macrochirus	31.0265 mg/L [static]
72 Hr EC50 Skeletonema costatum	0.4 mg/L
48 Hr LC50 Daphnia magna	2.16 mg/L
48 Hr EC50 Daphnia magna	1.96 mg/L [Flow through]
48 Hr EC50 Daphnia magna	1.09 - 3.4 mg/L [Static]

Persistence/Degradability
No information available.

Bioaccumulation
No information available.

Mobility in Soil
No information available.

* * * Section 13 - Disposal Considerations * * *

Waste Disposal Instructions
See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment recommendations.

Disposal of Contaminated Containers or Packaging
Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 14 - Transportation Information * * *

DOT Information
Shipping Name: Diesel Fuel
NA #: 1993 **Hazard Class:** 3 **Packing Group:** III
Placard:

* * * Section 15 - Regulatory Information * * *

Regulatory Information

Component Analysis

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4).

Naphthalene (91-20-3)

CERCLA: 100 lb final RQ; 45.4 kg final RQ

SARA Section 311/312 – Hazard Classes

Acute Health	Chronic Health	Fire	Sudden Release of Pressure	Reactive
X	X	X	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product may contain listed chemicals below the de minimis levels which therefore are not subject to the supplier notification requirements of Section 313 of the Emergency Planning and Community Right- To-Know Act (EPCRA) of 1986 and of 40 CFR 372. If you may be required to report releases of chemicals listed in 40 CFR 372.28, you may contact Hess Corporate Safety if you require additional information regarding this product.

State Regulations

Component Analysis - State

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA	RI
Fuels, diesel, no. 2	68476-34-6	No	No	No	Yes	No	No
Naphthalene	91-20-3	Yes	Yes	Yes	Yes	Yes	No

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.

Component Analysis - WHMIS IDL

No components are listed in the WHMIS IDL.

Additional Regulatory Information

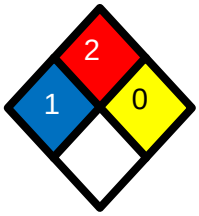
Component Analysis - Inventory

Component	CAS #	TSCA	CAN	EEC
Fuels, diesel, no. 2	68476-34-6	Yes	DSL	EINECS
Naphthalene	91-20-3	Yes	DSL	EINECS

* * * Section 16 - Other Information * * *

NFPA® Hazard Rating

Health	1
Fire	2
Reactivity	0



HMIS® Hazard Rating

Health	1*	Slight
Fire	2	Moderate
Physical	0	Minimal
		*Chronic

Key/Legend

ACGIH = American Conference of Governmental Industrial Hygienists; ADG = Australian Code for the Transport of Dangerous Goods by Road and Rail; ADR/RID = European Agreement of Dangerous Goods by Road/Rail; AS = Standards Australia; DFG = Deutsche Forschungsgemeinschaft; DOT = Department of Transportation; DSL = Domestic Substances List; EEC = European Economic Community; EINECS = European Inventory of Existing Commercial Chemical Substances; ELINCS = European List of Notified Chemical Substances; EU = European Union; HMIS = Hazardous Materials Identification System; IARC = International Agency for Research on Cancer; IMO = International Maritime Organization; IATA = International Air Transport Association; MAK = Maximum Concentration Value in the Workplace; NDSL = Non-Domestic Substances List; NFPA = National Fire Protection Association; NOHSC = National Occupational Health & Safety Commission; NTP = National Toxicology Program; STEL = Short-term Exposure Limit; TDG = Transportation of Dangerous Goods; TLV = Threshold Limit Value; TSCA = Toxic Substances Control Act; TWA = Time Weighted Average

Literature References

None

Other Information

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

End of Sheet

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

EMERGENCY OVERVIEW
DANGER!
EXTREMELY FLAMMABLE - EYE AND MUCOUS MEMBRANE IRRITANT - EFFECTS CENTRAL NERVOUS SYSTEM - HARMFUL OR FATAL IF SWALLOWED - ASPIRATION HAZARD

NFPA 704 (Section 16)

High fire hazard. Keep away from heat, spark, open flame, and other ignition sources.

If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs). Contact may cause eye, skin and mucous membrane irritation. Harmful if absorbed through the skin. Avoid prolonged breathing of vapors or mists. Inhalation may cause irritation, anesthetic effects (dizziness, nausea, headache, intoxication), and respiratory system effects.

Long-term exposure may cause effects to specific organs, such as to the liver, kidneys, blood, nervous system, and skin. Contains benzene, which can cause blood disease, including anemia and leukemia.

1. CHEMICAL PRODUCT and COMPANY INFORMATION

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

EMERGENCY TELEPHONE NUMBER (24 hrs): **CHEMTREC (800)424-9300**
COMPANY CONTACT (business hours): Corporate Safety (732)750-6000
MSDS (Environment, Health, Safety) Internet Website www.hess.com

SYNONYMS: Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded Motor or Automotive Gasoline

See Section 16 for abbreviations and acronyms.

2. COMPOSITION and INFORMATION ON INGREDIENTS *

INGREDIENT NAME (CAS No.)	CONCENTRATION PERCENT BY WEIGHT
Gasoline (86290-81-5)	100
Benzene (71-43-2)	0.1 - 4.9 (0.1 - 1.3 reformulated gasoline)
n-Butane (106-97-8)	< 10
Ethyl Alcohol (Ethanol) (64-17-5)	0 - 10
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Tertiary-amyl methyl ether (TAME) (994-05-8)	0 to 17.2
Toluene (108-88-3)	1 - 25
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 - 15

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol or MTBE and/or TAME).

Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

3. HAZARDS IDENTIFICATION

EYES
Moderate irritant. Contact with liquid or vapor may cause irritation.

SKIN
Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

INGESTION
The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

INHALATION
Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY
Contains benzene, a regulated human carcinogen. Benzene has the potential to cause anemia and other blood diseases, including leukemia, after repeated and prolonged exposure. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with systemic toxicity. See also Section 11 - Toxicological Information.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash). Chronic respiratory disease, liver or kidney dysfunction, or pre-existing central nervous system disorders may be aggravated by exposure.

4. FIRST AID MEASURES

EYES
In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

SKIN
Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION
Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASH POINT:	-45 ^{o}F (-43^{o}C)
AUTOIGNITION TEMPERATURE:	highly variable; > 530 ^{o}F (>280 ^{o}C)
OSHA/NFPA FLAMMABILITY CLASS:	1A (flammable liquid)
LOWER EXPLOSIVE LIMIT (%):	1.4%
UPPER EXPLOSIVE LIMIT (%):	7.6%

FIRE AND EXPLOSION HAZARDS
Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA
SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or Halon.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

During certain times of the year and/or in certain geographical locations, gasoline may contain MTBE and/or TAME. Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration - refer to NFPA 11 “Low Expansion Foam - 1994 Edition.”

FIRE FIGHTING INSTRUCTIONS
Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

6. ACCIDENTAL RELEASE MEASURES

ACTIVATE FACILITY SPILL CONTINGENCY or EMERGENCY PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE

HANDLING PRECAUTIONS

******USE ONLY AS A MOTOR FUEL******
******DO NOT SIPHON BY MOUTH******

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

8. EXPOSURE CONTROLS and PERSONAL PROTECTION

EXPOSURE LIMITS

Component (CAS No.)	Source	TWA (ppm)	STEL (ppm)	Exposure Limits Note
Gasoline (86290-81-5)	ACGIH	300	500	A3
Benzene (71-43-2)	OSHA	1	5	Carcinogen
	ACGIH	0.5	2.5	A1, skin
	USCG	1	5	
n-Butane (106-97-8)	ACGIH	1000	--	Aliphatic Hydrocarbon Gases Alkane (C1-C4)
Ethyl Alcohol (ethanol) (64-17-5)	OSHA	1000	--	
	ACGIH	1000	--	A4
Ethyl benzene (100-41-4)	OSHA	100	--	
	ACGIH	100	125	A3
n-Hexane (110-54-3)	OSHA	500	--	
	ACGIH	50	--	Skin
Methyl-tertiary butyl ether [MTBE] (1634-04-4)	ACGIH	50		A3
Tertiary-amyl methyl ether [TAME] (994-05-8)				None established
Toluene (108-88-3)	OSHA	200		Ceiling: 300 ppm; Peak: 500 ppm (10 min.)
	ACGIH	20	--	A4
1,2,4- Trimethylbenzene (95-63-6)	ACGIH	25	--	
Xylene, mixed isomers (1330-20-7)	OSHA	100	--	
	ACGIH	100	150	A4

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile or neoprene are recommended. Chemical protective clothing such as that made of of E.I. DuPont Tychem ®, products or equivalent is recommended based on degree of exposure.

Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

RESPIRATORY PROTECTION

A NIOSH-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection and limitations.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

9. PHYSICAL and CHEMICAL PROPERTIES

APPEARANCE

A translucent, straw-colored or light yellow liquid

ODOR
A strong, characteristic aromatic hydrocarbon odor. Oxygenated gasoline with MTBE and/or TAME may have a sweet, ether-like odor and is detectable at a lower concentration than non-oxygenated gasoline.

ODOR THRESHOLD

	Odor Detection	Odor Recognition
Non-oxygenated gasoline:	0.5 - 0.6 ppm	0.8 - 1.1 ppm
Gasoline with 15% MTBE:	0.2 - 0.3 ppm	0.4 - 0.7 ppm
Gasoline with 15% TAME:	0.1 ppm	0.2 ppm

BASIC PHYSICAL PROPERTIES

BOILING RANGE:	85 to 437 ^{o}F (39 to 200 ^{o}C)
VAPOR PRESSURE:	6.4 - 15 RVP @ 100 ^{o}F (38 ^{o}C) (275-475 mm Hg @ 68 ^{o}F (20 ^{o}C)
VAPOR DENSITY (air = 1):	AP 3 to 4
SPECIFIC GRAVITY (H_2O = 1):	0.70 – 0.78
EVAPORATION RATE:	10-11 (n-butyl acetate = 1)
PERCENT VOLATILES:	100 %
SOLUBILITY (H_2O):	Non-oxygenated gasoline - negligible (< 0.1% @ 77 ^{o}F). Gasoline with 15% MTBE - slight (0.1 - 3% @ 77 ^{o}F); ethanol is readily soluble in water

10. STABILITY and REACTIVITY)

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID
Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources

INCOMPATIBLE MATERIALS
Keep away from strong oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS
Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

11. TOXICOLOGICAL PROPERTIES

ACUTE TOXICITY
Acute Dermal LD50 (rabbits): > 5 ml/kg
Acute Oral LD50 (rat): 18.75 ml/kg
Primary dermal irritation (rabbits): slightly irritating
Draize eye irritation (rabbits): non-irritating
Guinea pig sensitization: negative

CHRONIC EFFECTS AND CARCINOGENICITY
Carcinogenicity: OSHA: NO IARC: YES - 2B NTP: NO ACGIH: YES (A3)

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

This product may contain methyl tertiary butyl ether (MTBE): animal and human health effects studies indicate that MTBE may cause eye, skin, and respiratory tract irritation, central nervous system depression and neurotoxicity. MTBE is classified as an animal carcinogen (A3) by the ACGIH.

12. ECOLOGICAL INFORMATION

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations. If released, oxygenates such as ethers and alcohols will be expected to exhibit fairly high mobility in soil, and therefore may leach into groundwater. The API (www.api.org) provides a number of useful references addressing petroleum and oxygenate contamination of groundwater.

13. DISPOSAL CONSIDERATIONS

Consult federal, state and local waste regulations to determine appropriate disposal options.

14. TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME:	Gasoline
DOT HAZARD CLASS and PACKING GROUP:	3, PG II
DOT IDENTIFICATION NUMBER:	UN 1203
DOT SHIPPING LABEL:	FLAMMABLE LIQUID

PLACARD:

15. REGULATORY INFORMATION

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other federal, state, or local regulations; consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a “petroleum exclusion” clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

ACUTE HEALTH	CHRONIC HEALTH	FIRE	SUDDEN RELEASE OF PRESSURE	REACTIVE
X	X	X	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION WT. PERCENT
Benzene (71-43-2)	0.1 to 4.9 (0.1 to 1.3 for reformulated gasoline)
Ethyl benzene (100-41-4)	< 3

n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Toluene (108-88-3)	1 to 15
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 to 15

US EPA guidance documents (www.epa.gov/tri) for reporting Persistent Bioaccumulating Toxics (PBTs) indicate this product may contain the following deminimis levels of toxic chemicals subject to Section 313 reporting:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION - Parts per million (ppm) by weight
Polycyclic aromatic compounds (PACs)	17
Benzo (g,h,i) perylene (191-24-2)	2.55
Lead (7439-92-1)	0.079

CALIFORNIA PROPOSITION 65 LIST OF CHEMICALS

This product contains the following chemicals that are included on the Proposition 65 "List of Chemicals" required by the California Safe Drinking Water and Toxic Enforcement Act of 1986:

INGREDIENT NAME (CAS NUMBER)	Date Listed
Benzene	2/27/1987
Ethyl benzene	6/11/2004
Toluene	1/1/1991

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 2 (Flammable Liquid)
Class D, Division 2A (Very toxic by other means) and Class D, Division 2B (Toxic by other means)

16. OTHER INFORMATION

NFPA® HAZARD RATING	HEALTH:	1	Slight
	FIRE:	3	Serious
	REACTIVITY:	0	Minimal
HMIS® HAZARD RATING	HEALTH:	1 *	Slight
	FIRE:	3	Serious
	PHYSICAL:	0	Minimal
			* CHRONIC

SUPERSEDES MSDS DATED: 07/01/06

ABBREVIATIONS:

AP = Approximately	< = Less than	> = Greater than
N/A = Not Applicable	N/D = Not Determined	ppm = parts per million

ACRONYMS:

ACGIH	American Conference of Governmental Industrial Hygienists	CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act
AIHA	American Industrial Hygiene Association	DOT	U.S. Department of Transportation [General Info: (800)467-4922]
ANSI	American National Standards Institute (212)642-4900	EPA	U.S. Environmental Protection Agency
API	American Petroleum Institute (202)682-8000	HMIS	Hazardous Materials Information System

IARC	International Agency For Research On Cancer	REL	Recommended Exposure Limit (NIOSH)
MSHA	Mine Safety and Health Administration	SARA	Superfund Amendments and Reauthorization Act of 1986 Title III
NFPA	National Fire Protection Association (617)770-3000	SCBA	Self-Contained Breathing Apparatus
NIOSH	National Institute of Occupational Safety and Health	SPCC	Spill Prevention, Control, and Countermeasures
NOIC	Notice of Intended Change (proposed change to ACGIH TLV)	STEL	Short-Term Exposure Limit (generally 15 minutes)
NTP	National Toxicology Program	TLV	Threshold Limit Value (ACGIH)
OPA	Oil Pollution Act of 1990	TSCA	Toxic Substances Control Act
OSHA	U.S. Occupational Safety & Health Administration	TWA	Time Weighted Average (8 hr.)
PEL	Permissible Exposure Limit (OSHA)	WEEL	Workplace Environmental Exposure Level (AIHA)
RCRA	Resource Conservation and Recovery Act	WHMIS	Workplace Hazardous Materials Information System (Canada)

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

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Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

MATERIAL SAFETY DATA SHEET

FILE NO. 9636, 9637, 9638, 9616, 11360
NAME OF PRODUCT: AW Hydraulic Oil ISO 46 **MSDS DATE:** December, 2009

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: AW Hydraulic Oil ISO 46
SYNONYMS: hydraulic fluid
PRODUCT CODES: 9616,9636,9637,9637Tray,9638,11360, CG46AWBlue

MANUFACTURER: CGF INC
DIVISION: N/A
ADDRESS: 317 Peoples Avenue Rockford, IL 61104 USA

EMERGENCY PHONE: 800/424-9300
CHEMTREC PHONE: 800/424-9300
OTHER CALLS: 815-967-4400
FAX PHONE: 815-967-4404

PRODUCT USE: Hydraulic Fluid
PREPARED BY: Irena Larson/Denise Brauer

SECTION 1 NOTES:

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

INGREDIENT: Petroleum base oils, additive package.

CAS NO.	% WT	% VOL	SARA 313 REPORTABLE
64741-88-4	75-85		None
64742-01-4	15-25		None
Proprietary Additive(s)	0.5-1.5		None

SECTION 3: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This material is not considered hazardous according to OSHA criteria.

ROUTES OF ENTRY: Skin contact or inhalation.

POTENTIAL HEALTH EFFECTS

EYES: Contact may cause mild eye irritation including stinging, watering, and redness.

SKIN: Contact may cause mild skin irritation including redness and a burning sensation. Prolonged or repeated contact can defat the skin, causing drying and cracking of the skin and possibly dermatitis (inflammation). No harmful effects from skin absorption are expected.

INGESTION: No harmful effects expected from ingestion.

INHALATION: No information available on acute toxicity.

ACUTE HEALTH HAZARDS: No

CHRONIC HEALTH HAZARDS: No

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: Skin disorders may be aggravated by exposure.

CARCINOGENICITY

OSHA: None **ACGIH: None** **NTP:** None **IARC: None**
OTHER:

SECTION 3 NOTES:

SECTION 4: FIRST AID MEASURES

EYES: If irritation or redness develops, flush eyes with clean water. If symptoms persist, seek medical attention.

SKIN: Remove contaminated shoes and clothing and cleanse affected area(s) thoroughly by washing with a mild soap and water or a waterless hand cleaner. If irritation persists, seek medical attention.

INGESTION: First aid is not normally required; however, if swallowed and symptoms develop, seek medical attention.

INHALATION: If respiratory symptoms develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek medical attention.

NOTES TO PHYSICIANS OR FIRST AID PROVIDERS: High-pressure hydrocarbon injection injuries may produce substantial necrosis of underlying tissue despite an innocuous appearing wound. Often these injuries require emergency surgical debridement and all injuries should be evaluated by a specialist in order to assess the extent of injury.

Acute aspirations of large amounts of mineral oil-laden material may produce serious aspiration pneumonia. Patients who aspirate these oils should be followed for the development of long-term sequelae. Inhalation exposure to oil mists below current workplace exposure limits is unlikely to cause pulmonary abnormalities.

SECTION 4 NOTES:

SECTION 5: FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA: Dry chemical, carbon dioxide, foam, or water spray is recommended.

SPECIAL FIRE FIGHTING PROCEDURES:
Water or foam may cause frothing of materials heated above 212 F. Carbon dioxide can displace oxygen. Use caution when applying dioxide in confined spaces.

SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters muct use self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This material may burn, but will not ignite readily. If container is not properly cooled, it can rupture in the heat of fire.

HAZARDOUS DECOMPOSITION PRODUCTS: No data

Flash Point: C(F) : >210(410) (ASTM D-92)
Flammable Limits (approx. % vol. in air)- LEL: 0.9%, UEL: 7.0%
NFPA HAZARD ID: Health: 1, Flammability: 1, Reactivity: 0

SECTION 6: ACCIDENTAL RELEASE MEASURES

ACCIDENTAL RELEASE MEASURES:
Personal Precautions:
This material may burn, but will not ignite readily. Keep all sources of ignition away from spill/release. The use of explosion-proof electrical equipment is recommended. Stay upwind and away from spill/release. Notify persons downwind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant.
Environmental Precautions: Stop spill/release if it can be done with minimal risk. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Contact appropriate agency for spills into or upon navigable waters that cause a sheen or discoloration on the water surface.

Methods for Containment and Clean Up:
Notify fire authorities and appropriate regulatory authorities. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Spilled material may be absorbed into an appropriate absorbent material.

SECTION 7: HANDLING AND STORAGE

HANDLING AND STORAGE:
Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment. High pressure injection of hydrocarbon fuels, hydraulic oils or greases under the skin may have serious consequences even though no symptoms or injury may be apparent. This can happen accidentally when using high pressure equipment such as high pressure grease guns, fuel injection

apparatus or from pinhole leaks in tubing of high pressure hydraulic oil equipment. Do not enter confined spaces such as tanks or pits without following proper entry procedures. Do not wear contaminated clothing or shoes. "Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Use and store this material in cool, dry, well-ventilated areas away from heat and all sources of ignition. Keep container(s) tightly closed. Store only in approved containers. Keep away from any incompatible material. Protect container(s) against physical damage.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Componet	**ACGIH**	**OSHA**
Lubricant Base Oil-Petroleum	TWA: 5mg/m^3	TWA: 5mg/m^3
	STEL: 10mg/m^3	as Oil mist, if generated
	As oil mist, if generated	

ENGINEERING CONTROLS: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

RESPIRATORY PROTECTION: Where there is potential for airborne exposure above the exposure limit a NIOSH certified air purifying respirator equipped with R or P95 filters may be used. A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use. Air purifying respirators provide limited protection and cannot be used in atmospheres that exceed the maximum use concentration (MUC) as directed by regulation or the manufacturer's instructions, in oxygen deficient (less than 19.5 percent oxygen) situations, or other conditions that are immediately dangerous to life and health (IDLH).

EYE PROTECTION: The use of eye protection that meets or exceeds ANSI Z.87.1 is recommended to protect against potential eye contact, irritation, or injury. Depending on conditions of use, a face shield may be necessary.

SKIN PROTECTION: The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the performance of their products. Suggested protective materials: Nitrile

SECTION 8 NOTES: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Clear Blue Liquid

ODOR: mild petroleum

PHYSICAL STATE: Liquid

pH AS SUPPLIED: Not applicable
pH (Other):
BOILING POINT: No data
F: >600
C: >316

FLASH POINT:
F: >410
C: >210
METHOD USED: (ASTM D-92)

AUTOIGNITION TEMPERATURE:
F: 671
C: 355

MELTING POINT: No data
F:
C:
FREEZING POINT: No data
F:

C:

VAPOR PRESSURE (mmHg): <1
@ 20 C :< 0.1

VAPOR DENSITY (AIR = 1): >2
@
F: 68
C: 20
SPECIFIC GRAVITY (H2O = 1): 0.87
@
F: 60
C: 15.6
EVAPORATION RATE: n/a

BASIS (=1):

SOLUBILITY IN WATER: not soluble

PERCENT SOLIDS BY WEIGHT: n/a

PERCENT VOLATILE: Negligible
BY WT/ BY VOL @
F: 68
C: 20
VOLATILE ORGANIC COMPOUNDS (VOC): no data

WITH WATER: LBS/GAL
WITHOUT WATER: LBS/GAL

MOLECULAR WEIGHT: no data
VISCOSITY:
200-300 SUS @ 100 Degree F
@ 40 C cST 47.25

SECTION 9 NOTES: Data represents typical values and are not intended to be specifications.

SECTION 10: STABILITY AND REACTIVITY

	STABLE	UNSTABLE
STABILITY:	**YES**	

CONDITIONS TO AVOID (STABILITY): Avoid excessive heat, formations of vapors or mists.

INCOMPATIBILITY (MATERIAL TO AVOID): Strong oxidizing agents

HAZARDOUS DECOMPOSITION OR BY-PRODUCTS: None under normal storage.

HAZARDOUS POLYMERIZATION: No

CONDITIONS TO AVOID (POLYMERIZATION): n/a

SECTION 10 NOTES:

SECTION 11: TOXICOLOGICAL INFORMATION

TOXICOLOGICAL INFORMATION:
Carcinogenicity: The petroleum base oils contained in this product have been highly refined by a variety of processes including solvent extraction, hydrotreating, and/or dewaxing to remove aromatics and improve performance characteristics. No components in this formulation have been identified as a carcinogen.

Component	Oral LD50	Dermal LD50	Inhalation LC50
Lubricant Base Oil	**>5g/kg**	**>2g/kg**	**No data**

SECTION 11 NOTES:

SECTION 12: ECOLOGICAL INFORMATION

ECOLOGICAL INFORMATION: Ecotoxicological data have not been determined specifically for this product. Information given is based on knowledge of the components and the ecotoxicology of similar products.
Acute Toxicity: Poorly soluble mixture. May cause physical fouling of aquatic organisms. Expected to be practically non toxic: LL/EL/IL50 > 100 mg/l (to aquatic organisms) (LL/EL50 expressed as the nominal amount of product required to prepare aqueous test extract). Mineral oil is not expected to cause any chronic effects to aquatic organisms at concentrations less than 1 mg/l.
Mobility: Liquid under most environmental conditions. Floats on water. If it enters soil, it will adsorb to soil particles and will not be mobile.
Persistence/degradability: Expected to be not readily biodegradable. Major constituents are expected to be inherently biodegradable, but the product contains components that may persist in the environment.
Bioaccumulation : Contains components with the potential to bioaccumulate.
Other Adverse Effects: Product is a mixture of non-volatile components, which are not expected to be released to air in any significant quantities. Not expected to have ozone depletion potential, photochemical ozone creation potential or global warming potential

SECTION 12 NOTES:

SECTION 13: DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD:
Material Disposal: Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses.
Container Disposal: Dispose in accordance with prevailing regulations, preferably to a recognized collector or contractor. The competence of the collector or contractor should be established beforehand.
Local Legislation: Disposal should be in accordance with applicable regional, national, and local laws and regulations.

SECTION 14: TRANSPORT INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION: Not regulated
PROPER SHIPPING NAME:
HAZARD CLASS:
ID NUMBER:
PACKING GROUP:
LABEL STATEMENT:

WATER TRANSPORTATION: Not regulated
PROPER SHIPPING NAME:
HAZARD CLASS:
ID NUMBER:
PACKING GROUP:
LABEL STATEMENTS:

AIR TRANSPORTATION: Not regulated
PROPER SHIPPING NAME:
HAZARD CLASS:
ID NUMBER:
PACKING GROUP:
LABEL STATEMENTS:

OTHER AGENCIES:

SECTION 14 NOTES:

SECTION 15: REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS

TSCA (TOXIC SUBSTANCE CONTROL ACT): All components of this formulation are listed on the US EPA-TSCA inventory or not regulated under TSCA.

EU Labeling: Product is not dangerous as defined by the European Union Dangerous Substances/Preparations Directives. EU labeling is not required.

Governmental Inventory Status: All components comply with TSCA, EINECS/ELINCS, AICS, METI, DSL, KOREA, and PHILIPPINES.

CERCLA (COMPREHENSIVE RESPONSE COMPENSATION, AND LIABILITY ACT): This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372.

SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT): This product contains no"EXTREMELY HAZARDOUS SUBSTANCES".

311/312 HAZARD CATEGORIES: None
Acute Health: No
Chronic Health: No
Fire Hazard: No
Pressure Hazard: No
Reactive Hazard: No

313 REPORTABLE INGREDIENTS: This material does not contain any chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372.

STATE REGULATIONS: This material does not contain any chemicals with CERCLA Reportable Quantities.

California Proposition 65:
This material does not contain any chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm at concentrations that trigger the warning requirements of California Proposition 65.

INTERNATIONAL REGULATIONS:

Canadian Regulations:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class
None

SECTION 15 NOTES:

SECTION 16: OTHER INFORMATION

OTHER INFORMATION:

PREPARATION INFORMATION: Issue Date: August 2009 Rev. #1

DISCLAIMER:
The information presented herein has been compiled from sources considered to be dependable and accurate to the best of Cutting & Grinding Fluids Inc., knowledge. However, CGF INC., makes no warranty whatsoever expressed or implied of merchantability or fitness for the particular purpose, regarding the accuracy of such data or the results to be obtained from the use thereof. Cutting & Grinding Fluids, Inc. assumes no responsibility for the injury to recipient or to the third persons or for any damage to any property and recipient assumes all such risks.

SAFETY DATA SHEET

Version 5.3
Revision Date 01/02/2015
Print Date 03/11/2015

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Indeno[1,2,3-*cd*]pyrene

Product Number : 48499
Brand : Supelco

CAS-No. : 193-39-5

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

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Carcinogenicity (Category 2), H351

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)
H351 Suspected of causing cancer.

Precautionary statement(s)
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P281 Use personal protective equipment as required.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P405 Store locked up.
P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	$C_{22}H_{12}$
Molecular weight	:	276.33 g/mol
CAS-No.	:	193-39-5
EC-No.	:	205-893-2

Hazardous components

Component	Classification	Concentration
Indeno[1,2,3-cd]pyrene		
	Carc. 2; H351	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): Non Combustible Solids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection
impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	163.6 °C (326.5 °F)
f)	Initial boiling point and boiling range	536.0 °C (996.8 °F)

g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Indeno[1,2,3-cd]pyrene)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	Reasonably anticipated to be a human carcinogen (Indeno[1,2,3-cd]pyrene)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	1993-04-24

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Carc.	Carcinogenicity
H351	Suspected of causing cancer.

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	0

Physical Hazard	0

NFPA Rating

Health hazard:	1
Fire Hazard:	0
Reactivity Hazard:	0

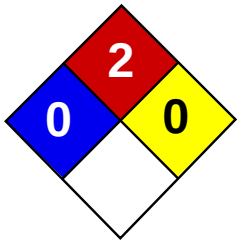
Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.3 Revision Date: 01/02/2015 Print Date: 03/11/2015



Health	2
Fire	2
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Kerosene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Kerosene

Catalog Codes: SLK1048

CAS#: 8008-20-6 or 64742-81-0

RTECS: OA5500000

TSCA: TSCA 8(b) inventory: Kerosene

CI#: Not available.

Synonym: Astral Oil; Coal Oil, Fuel Oil No. 5, Deobase, Astral Oil, Jet A Fuel; Jet Fuel JP-1; JP-5 Navy Fuel; Kerosine, petroleum; Range Oil; K1 Kerosene; Kerosene, hydrodesulfurized; Kerosine

Chemical Name: Kerosene

Chemical Formula: Not available.

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Kerosene	8008-20-6 or	100
	64742-81-0	

Toxicological Data on Ingredients: Kerosene: ORAL (LD50): Acute: 15000 mg/kg [Rat]. 20000 mg/kg [Guinea pig]. 2835 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator). Severe over-exposure can result in death.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to the nervous system. The substance may be toxic to blood, kidneys, liver, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

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

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

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
If swallowed, do NOT induce vomiting. If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 210°C (410°F)

Flash Points: CLOSED CUP: 38°C (100.4°F). (Tagliabue.)

Flammable Limits: LOWER: 0.7% UPPER: 5% - 7%

Products of Combustion: Not available.

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

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

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

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

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

Large Spill:

Toxic flammable liquid, insoluble or very slightly soluble in water. Poisonous liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Oily liquid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: Not available.

Color: Yellow. Clear (Light.)

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

Boiling Point: 149°C (300.2°F) - 325 C

Melting Point: Not available.

Critical Temperature: Not available.

Specific Gravity: 0.775 - .840(Water = 1)

Vapor Pressure: 0.1 kPa (@ 20°C)

Vapor Density: 4.5 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Insoluble in cold water, hot water. Miscible with other petroleum solvents

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources (sparks, flames), incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact.

Toxicity to Animals: Acute oral toxicity (LD50): 2835 mg/kg [Rabbit].

Chronic Effects on Humans:
MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. Causes damage to the following organs: the nervous system. May cause damage to the following organs: blood, kidneys, liver, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: May affect genetic material (mutagenic)

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes moderate to severe skin irritation. It can cause defatting dermatitis. Eyes: May cause eye irritation. Inhalation: May cause respiratory tract and mucous membrane irritation and a burning sensation in the chest. Because of its relatively low volatility, overexposure by inhalation is uncommon, but it can occur in poorly ventilated areas or by inhalation of mists or aerosols. Symptoms of inhalation overexposure include central nevous system (CNS) depression (transient euphora, headache, irritability, excitement, ringing in the ears, weakness, incoordination, confusion, disorientation, drowsiness, tremor, somnolence, hallucinations, seizures, coma, death). May affect the heart (cardiac arrythmias), liver, kidneys, and respiration(asphyxia, apnea, acute pulmonary edema, dyspnea, fibrosis, or cyanosis) Ingestion: Causes gastrointestinal tract irritation with burning sensation in mouth, esophagus, and stomach, a b d o m i n a l p a i n , n a u s e a , v o m i t i n g , h y p e r m o t i l i t y , d i a r r h e a , h e a d a c h e , m a l a i s e . M a y a f f e c t respiration/ trachea/bronchi through accidental pulmonary aspiration which can cause hypoxia, chemical pneumonitis, and noncardiogenic pulmonary edema, pulmonary hemmorrhage, coughing, breathing difficulty, acute or chronic pulmonary edema, emphysema, respiratory stimulation. It may also affect the heart (dysrrhythmias, myocardial depression, tachycardia), liver, endocrine system (pancreas - hypoglycemia), behavior/central nervous system (symptoms similar to that of inhalation). Chronic Potential Health Effects: Inhalation: Repeated or prolonged inhalation may cause respiratory tract irritation and affect behavior/central nervous system with symptoms similar to that of acute inhalation. It may also affect the blood (changes in white blood cell count, changes in serum compositon, pigmented or nucleated red blood cells, leukopenia, normocytic anemia) , cardiovascular

system, respiratory system (trachea, bronchi), and may cause kidney damage. Ingestion: Repeated or prolonged ingestion may affect the liver, endocrine system (adrenal gland, pancreas, spleen), and metabolism (weight loss), and blood. Skin: Repeated or prolonged skin contact may cause defatting dermatitis, erythema, and eczema-like skin lesions, drying and cracking of the skin, and possible burns.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: Not available.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Kerosene UNNA: 1223 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Kerosene Rhode Island RTK hazardous substances: Kerosene Pennsylvania RTK: Kerosene Massachusetts RTK: Kerosene Massachusetts spill list: Kerosene New Jersey: Kerosene TSCA 8(b) inventory: Kerosene

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

Other Classifications:

WHMIS (Canada):
CLASS B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R10- Flammable. R65- Harmful: may cause lung damage if swallowed. S23- Do not breathe gas/fumes/vapour/spray S24- Avoid contact with skin. S62- If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 2

Reactivity: 0

Personal Protection: h

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

Health: 0

Flammability: 2

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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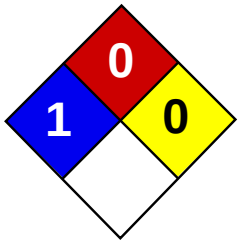
Last Updated: 05/21/2013 12:00 PM



Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Lead MSDS

Section 1: Chemical Product and Company Identification

Product Name: Lead

Catalog Codes: SLL1291, SLL1669, SLL1081, SLL1459, SLL1834

CAS#: 7439-92-1

RTECS: OF7525000

TSCA: TSCA 8(b) inventory: Lead

CI#: Not available.

Synonym: Lead Metal, granular; Lead Metal, foil; Lead Metal, sheet; Lead Metal, shot

Chemical Name: Lead

Chemical Formula: Pb

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Lead	7439-92-1	100

Toxicological Data on Ingredients: Lead LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

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

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

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

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

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: When heated to decomposition it emits highly toxic fumes of lead.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable

protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

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

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

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

Exposure Limits:
TWA: 0.05 (mg/m3) from ACGIH (TLV) [United States] TWA: 0.05 (mg/m3) from OSHA (PEL) [United States] TWA: 0.03 (mg/m3) from NIOSH [United States] TWA: 0.05 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 207.21 g/mole

Color: Bluish-white. Silvery. Gray

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

Boiling Point: 1740°C (3164°F)

Melting Point: 327.43°C (621.4°F)

Critical Temperature: Not available.

Specific Gravity: 11.3 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, excess heat

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Can react vigorously with oxidizing materials. Incompatible with sodium carbide, chlorine trifluoride, trioxane + hydrogen peroxide, ammonium nitrate, sodium azide, disodium acetylide, sodium acetylide, hot concentrated nitric acid, hot concentrated hydrochloric acid, hot concentrated sulfuric acid, zirconium.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

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

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. May cause damage to the following organs: blood, kidneys, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential: Skin: Lead metal granules or dust: May cause skin irritation by mechanical action. Lead metal foil, shot or sheets: Not likely to cause skin irritation Eyes: Lead metal granules or dust: Can irritate eyes by mechanical action. Lead metal foil, shot or sheets: No hazard. Will not cause eye irritation. Inhalation: In an industrial setting, exposure to lead mainly occurs from inhalation of dust or fumes. Lead dust or fumes: Can irritate the upper respiratory tract (nose, throat) as well as the bronchi and lungsby mechanical action. Lead dust can be absorbed through the respiratory system. However, inhaled lead does not accumulate in the lungs. All of an inhaled dose is eventually abssorbed or transferred to the gastrointestinal tract. Inhalation effects of exposure to fumes or dust of inorganic lead may not develop quickly. Symptoms may include metallic taste, chest pain, decreased physical fitness, fatigue, sleep disturbance, headache, irritability, reduces memory, mood and personality changes, aching bones and muscles, constipation, abdominal pains, decreasing appetite. Inhalation of large amounts may lead to ataxia, deliriuim, convulsions/seizures, coma, and death. Lead metal foil, shot, or sheets: Not an inhalation hazard unless metal is heated. If metal is heated, fumes will be released. Inhalation of these fumes may cause "fume metal fever", which is characterized by flu-like symptoms. Symptoms may include metallic taste, fever, nausea, vomiting, chills, cough, weakness, chest pain, generalized muscle pain/aches, and increased white blood cell count. Ingestion: Lead metal granules or dust: The symptoms of lead poisoning include abdominal pain or cramps (lead cholic), spasms, nausea, vomiting, headache, muscle weakness, hallucinations, distorted perceptions, "lead line" on the gums, metallic taste, loss of appetite, insomnia, dizziness and other symptoms similar to that of inhalation. Acute poisoning may result in high lead levels in the blood and urine, shock, coma and death in extreme cases. Lead metal foil, shot or sheets: Not an ingestion hazard for usual industrial handling.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (female) which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (male) which would require a warning under the statute: Lead California prop. 65 (no significant risk level): Lead: 0.0005 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Lead Connecticut hazardous material survey.: Lead Illinois toxic substances disclosure to employee act: Lead Illinois chemical safety act: Lead New York release reporting list: Lead Rhode Island RTK hazardous substances: Lead Pennsylvania RTK: Lead

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

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R20/22- Harmful by inhalation and if swallowed. R33- Danger of cumulative effects. R61- May cause harm to the unborn child. R62- Possible risk of impaired fertility. S36/37- Wear suitable protective clothing and gloves. S44- If you feel unwell, seek medical advice (show the label when possible). S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

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

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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

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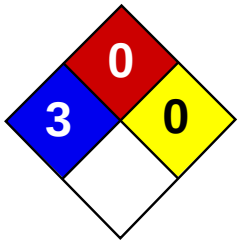

Material Safety Data Sheet
Mercury MSDS

Section 1: Chemical Product and Company Identification

Product Name: Mercury

Catalog Codes: SLM3505, SLM1363

CAS#: 7439-97-6

RTECS: OV4550000

TSCA: TSCA 8(b) inventory: Mercury

CI#: Not applicable.

Synonym: Quick Silver; Colloidal Mercury; Metallic Mercury; Liquid Silver; Hydragyrum

Chemical Name: Mercury

Chemical Formula: Hg

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Mercury	7439-97-6	100

Toxicological Data on Ingredients: Mercury LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation.

Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

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

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

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

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

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
When thrown into mercury vapor, boron phosphodiiodide ignites at once. Flame forms with chlorine jet over mercury surface at 200 deg to 300 deg C. Mercury undergoes hazardous reactions in the presence of heat and sparks or ignition.

Special Remarks on Explosion Hazards:
A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium. CHLORINE DIOXIDE & LIQUID HG, WHEN MIXED, EXPLODE VIOLENTLY. Mercury and Ammonia can produce an

explosive compound. A mixture of the dry carbonyl and oxygen will explode on vigorous shaking with mercury. Methyl azide in the presence of mercury was shown to be potentially explosive.

Section 6: Accidental Release Measures

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

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, metals.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 25°C (77°F).

Section 8: Exposure Controls/Personal Protection

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

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

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

Exposure Limits:
TWA: 0.025 from ACGIH (TLV) [United States] SKIN TWA: 0.05 CEIL: 0.1 (mg/m3) from OSHA (PEL) [United States] Inhalation TWA: 0.025 (mg/m3) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Heavy liquid)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 200.59 g/mole

Color: Silver-white

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

Boiling Point: 356.73°C (674.1°F)

Melting Point: -38.87°C (-38°F)

Critical Temperature: 1462°C (2663.6°F)

Specific Gravity: 13.55 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 6.93 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, metals.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Ground mixtures of sodium carbide and mercury, aluminum, lead, or iron can react vigorously. A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium. Incompatible with boron diiodophosphide; ethylene oxide; metal oxides, metals(aluminum, potassium, lithium, sodium, rubidium); methyl azide; methylsilane, oxygen; oxidants(bromine, peroxyformic acid, chlorine dioxide, nitric acid, tetracarbonynickel, nitromethane, silver perchlorate, chlorates, sulfuric acid, nitrates,); tetracarbonylnickel, oxygen, acetylinic compounds, ammonia, ethylene oxide, methylsiliane, calcium,

Special Remarks on Corrosivity:
The high mobility and tendency to dispersion exhibited by mercury, and the ease with which it forms alloys (amalga) with many laboratory and electrical contact metals, can cause severe corrosion problems in laboratories. Special precautions: Mercury can attack copper and copper alloy materials.

Polymerization: Will not occur.

Section 11: Toxicological Information

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

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May affect genetic material. May cause cancer based on animal data. Passes through the placental barrier in animal. May cause adverse reproductive effects(paternal effects- spermatogenesis; effects on fertility - fetotoxicity, post-implantation mortality), and birth defects.

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Mercury UNNA: 2809 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Mercury California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Mercury Connecticut hazardous material survey.: Mercury Illinois toxic substances disclosure to employee act: Mercury Illinois chemical safety act: Mercury New York acutely hazardous substances: Mercury Rhode Island RTK hazardous substances: Mercury Pennsylvania RTK: Mercury Minnesota: Mercury Massachusetts RTK: Mercury New Jersey: Mercury New Jersey spill list: Mercury Louisiana spill reporting: Mercury California Director's List of Hazardous Substances.: Mercury TSCA 8(b) inventory: Mercury SARA 313 toxic chemical notification and release reporting: Mercury CERCLA: Hazardous substances.: Mercury: 1 lbs. (0.4536 kg)

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

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R23- Toxic by inhalation. R33- Danger of cumulative effects. R38- Irritating to skin. R41- Risk of serious damage to eyes. R50/53- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S2- Keep out of the

reach of children. S7- Keep container tightly closed. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S39- Wear eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S46- If swallowed, seek medical advice immediately and show this container or label. S60- This material and its container must be disposed of as hazardous waste. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

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

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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

Ascent Battery Supply, LLC
1325 Walnut Ridge Drive
Hartland, Wisconsin 53029

Safety Data Sheet (SDS) — Nickel Cadmium (NiCd) Batteries

The information and recommendations below are believed to be accurate at the date of document preparation. Ascent Battery Supply makes no warranty or merchantability or any other warranty, express or implied, with respect to this information and assumes no liability resulting from its use. This SDS provides guidelines for safe use and handling of product. It does not, and cannot, advise all possible situations. All specific uses of this product must be evaluated by the end user to determine if additional safety precautions should be taken.

SECTION 1 - IDENTIFICATION

Product Name	Nickel Cadmium Battery		
Common Name(s)	NiCd, NiCad, Nickel Cadmium		
Synonyms	Nickel Cadmium Rechargeable Battery		
DOT Description	Dry Battery		
Chemical Name	Nickel Cadmium Secondary Battery		
Distributed By	Ascent Battery Supply, LLC	**Emergency Number**	INFOTRAC (800) 535-5053
Address	1325 Walnut Ridge Drive Hartland, Wisconsin 53029	**International Emergency Number**	INFOTRAC (352) 323-3500 (Collect)

SECTION 2 – HAZARD(S)

Unusual Fire and Explosion Hazards Cells may rupture when exposed to excessive heat. This could result in the release of flammable or corrosive materials.

SECTION 3 – COMPOSITION

Chemical Name	CAS No.	Wt. Percentage %
Nickel	7440-02-0	15-22%
Potassium Hydroxide	1310-58-3	1.5-3%
Mercury	7439-79-6	≤5 ppm
Lead	7439-92-1	≤10 ppm
Cadmium	7440-43-9	18-26%
Other/Housing	n/a	balance

SECTION 4 – FIRST AID MEASURES

Inhalation Get fresh air. If symptoms persist seek medical attention

Eyes and Skin **Skin:** Flush with copious quantities of flowing lukewarm water for a minimum of 15 minutes; wash with soap and water

Eyes: Flush with copious quantities of flowing lukewarm water for a minimum of 15 minutes; get immediate medical attention.

Ingestion Ingestion of battery chemicals can be harmful. Call The National Battery Ingestion Hotline (202-625-3333) 24 hours a day, for procedures treating ingestion of chemicals. Do not induce vomiting.

SECTION 5 – FIRE-FIGHTING MEASURES

Extinguisher Media Use CO_2, foam or dry chemical extinguishers. Sand may also be used.

Special Fire Fighting Procedures Wear self-contained breathing apparatus to avoid inhalation of hazardous decomposition products.

SECTION 6 – ACCIDENTAL RELEASE MEASURES

In case of accidental rupture or release: prevent skin and eye contact and collect all released material in a plastic lined metal container. Leaking batteries should be handled with gloves. Wear protective clothing. Use a self-contained breathing apparatus if in the presence of chemical vapor. See also: sections 4, 5, and 8.

SECTION 7 – HANDLING AND STORAGE

1. Store in a dry place with ambient temperature between -20°C(-4°F) and 35°C(95°F).
2. Do not store unpacked cells together: avoid cells shorting to one another – especially in a charged state.
3. Do not mix new and used batteries.
4. Do not disassemble.
5. Do not store with conductive objects.
6. Store away from flame or spark hazards.

SECTION 8 – EXPOSURE/PERSONAL PROTECTION

Respiratory Protection	None required under normal handling conditions
Gloves	Wear gloves if cell is ruptured, corroded, or leaking materials
Safety Glasses	Always wear safety glasses with working with battery cells

SECTION 9 – PHYSICAL/CHEMICAL PROPERTIES

Boiling Point	N/A	**Melting Point**	N/A
Vapor Pressure	N/A	**Vapor Density**	N/A
Specific Gravity	N/A	**Evaporation Rate**	N/A
Solubility in Water	N/A	**Appearance and Odor**	Cylindrical, solid object, odorless

SECTION 10 – STABILITY & REACTIVITY

Reactivity in Water	N/A	**Auto-Ignition Temperature**	N/A
Flash Point	N/A	**Flammable Limits in Air, by vol.**	N/A
Percent Volatile By Volume	N/A		
Stable	Avoid electrically shorting the cell. Under normal conditions this product is stable and will not decompose.		
Incompatibility (materials to avoid)	N/A		

SECTION 11 – TOXICOLOGICAL INFORMATION

Threshold Limit Value	N/A
Signs and Symptoms of Exposure	None. (In fire or rupture situations, refer to sections 4, 5, & 8.)
Medical Conditions Generally Caused by Exposure	Chemicals may cause burns to skin, eyes, gastrointestinal tract and mucous membranes. Inhalation of electrolyte vapors may cause irritation of the upper respiratory tract and lungs.
Routes of Entry	Skin, Eyes, Ingestion (swallowing)

SECTION 12 – ECOLOGICAL INFORMATION

Hazardous Decomposition Products N/A

Hazardous Polymerization Will not occur

Under normal use these batteries do not release internal ingredients into the environment. Damaged or abused batteries may release small amounts of cadmium, nickel or carbon oxides. Do not carelessly discard, as small amounts of cadmium may be released into storm or surface water. Do not discard batteries into a fire. Dispose of properly or recycle.

SECTION 13 - DISPOSAL

Dispose of batteries according to all Federal, State and local laws and regulations.

SECTION 14 – TRANSPORT

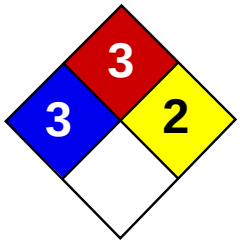
These batteries must be packaged in a way that prevents the dangerous evolution of heat and protects the terminals from short circuit. When properly packaged and labeled, these dry batteries are not subject to dangerous goods regulation for the purpose of transportation and fall under special provision of the agencies listed in Section 15.

SECTION 15 – REGULATORY INFORMATION

IATA Not considered to be 'dangerous goods' when packaged properly
DOT Not considered to be a 'hazardous material' when packaged properly
ICAO Not subject when packaged properly
IMDG Not subject when packaged properly
UN2800 Exempted when packaged properly

SECTION 16 - OTHER

Document Control No:	SDS20008 – Ascent SDS for Nickel Cadmium (NiCd) Batteries	**Revision:**	1	**Effective Date:**	01-02-2015



Material Safety Data Sheet
Sodium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium

Catalog Codes: SLS3505

CAS#: 7440-23-5

RTECS: VY0686000

TSCA: TSCA 8(b) inventory: Sodium

CI#: Not applicable.

Synonym: Natrium

Chemical Name: Sodium

Chemical Formula: Na

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium	7440-23-5	100

Toxicological Data on Ingredients: Sodium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

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

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

Section 4: First Aid Measures

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

Skin Contact:

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

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

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

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

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 115°C (239°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

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

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

Fire Fighting Media and Instructions:
Flammable solid. Moisture reactive material. SMALL FIRE: Obtain advice on use of water. Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Do not use water jet.

Special Remarks on Fire Hazards: When heated to decomposition it emits toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Flammable solid that, in contact with water, emits flammable gases. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:
Keep under inert atmosphere. Keep container dry. Do not breathe dust. Never add water to this product In case of insufficient ventilation, wear suitable respiratory equipment If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes Keep away from incompatibles such as oxidizing agents, acids, moisture.

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

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

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

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

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 22.99 g/mole

Color: Silvery.

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

Boiling Point: 881.4°C (1618.5°F)

Melting Point: 97.8°C (208°F)

Critical Temperature: Not available.

Specific Gravity: 0.97 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances:
Highly reactive with oxidizing agents, acids, moisture. The product reacts violently with water to emit flammable but non toxic gases.

Corrosivity: Not available.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: Not available.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Material is destructive to tissue of the mucous membranes and upper respiratory tract.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 4.3: Material that emits flammable gases on contact with water.

Identification: : Sodium : UN1428 PG: I

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Sodium Massachusetts RTK: Sodium TSCA 8(b) inventory: Sodium CERCLA: Hazardous substances.: Sodium

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

Other Classifications:

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

DSCL (EEC):
R17- Spontaneously flammable in air. R38- Irritating to skin. R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 3

Reactivity: 2

Personal Protection: E

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

Health: 3

Flammability: 3

Reactivity: 2

Specific hazard:

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

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

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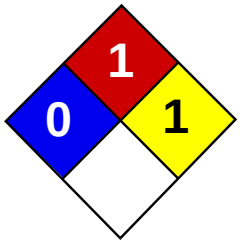
Last Updated: 05/21/2013 12:00 PM



Health	1
Fire	1
Reactivity	1
Personal Protection	E

Material Safety Data Sheet
Zinc Metal MSDS

Section 1: Chemical Product and Company Identification

Product Name: Zinc Metal

Catalog Codes: SLZ1054, SLZ1159, SLZ1267, SLZ1099, SLZ1204

CAS#: 7440-66-6

RTECS: ZG8600000

TSCA: TSCA 8(b) inventory: Zinc Metal

CI#: Not applicable.

Synonym: Zinc Metal Sheets; Zinc Metal Shot; Zinc Metal Strips

Chemical Name: Zinc Metal

Chemical Formula: Zn

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Zinc Metal	7440-66-6	100

Toxicological Data on Ingredients: Zinc Metal LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

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

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

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

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

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 480°C (896°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of open flames and sparks, of heat, of oxidizing materials, of acids, of alkalis, of moisture. Non-flammable in presence of shocks.

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

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

Special Remarks on Fire Hazards:
Zinc + NaOH causes ignition. Oxidation of zinc by potassium proceeds with incandescence. Residues from zinc dust /acetic acid reduction operations may ignite after long delay if discarded into waste bins with paper. Incandescent reaction when Zinc and Arsenic or Tellurium, or Selenium are combined. When hydrazine mononitrate is heated in contact with zinc, a flamming decomposition occurs at temperatures a little above its melting point. Contact with acids and alkali hydroxides (sodium hydroxide, postasium hydroxide, calcium hydroxide, etc.) results in evolution of hydrogen with sufficient heat of reaction to ignite the hydrogen gas. Zinc foil ignites if traces of moisture are present. It is water reactive and produces flammable gases on contact with water. It may ignite on contact with water or moist air.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Flammable solid that, in contact with water, emits flammable gases. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe dust. Keep away from incompatibles such as oxidizing agents, acids, alkalis, moisture.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Keep from any possible contact with water. Do not allow water to get into container because of violent reaction.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

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

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid. Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 65.39 g/mole

Color: Bluish-grey

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

Boiling Point: 907°C (1664.6°F)

Melting Point: 419°C (786.2°F)

Critical Temperature: Not available.

Specific Gravity: Not available.

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol, acetone.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials, moisture

Incompatibility with various substances:
Reactive with oxidizing agents, acids, alkalis. Slightly reactive to reactive with moisture. The product may react violently with water to emit flammable but non toxic gases.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with acids, halogenated hydrocarbons, NH4NO3, barium oxide, Ba(NO3)2, Cadmium, CS2, chlorates, Cl2, CrO3, F2, Hydroxylamine, Pb(N3)2, MnCl2, HNO3, performic acid, KClO3, KNO3, N2O2, Selenium, NaClO3, Na2O2, Sulfur, Te, water, (NH4)2S, As2O3, CS2, CaCl2, chlorinated rubber, catalytic metals, halocarbons, o-nitroanisole, nitrobenzene, nonmetals, oxidants, paint primer base, pentacarbonoyliron, transition metal halides, seleninyl bromide, HCl, H2SO4, (Mg +Ba(NO3)2 +BaO2), (ethyl acetoacetate +tribromoneopentyl alcohol. Contact with Alkali Hydroxides(Sodium Hydroxide, Potassium Hydroxide, Calcium Hydroxide, etc) results in evolution of hydrogen. Ammonium nitrate + zinc + water causes a violent reaction with evolution of steam and zinc oxide. May react with water.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: Not available.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause skin irritation. Dermal exposure to zinc may produce leg pains, fatigue, anorexia and weight loss. Eyes: May cause eye irritation. Ingestion: May be harmul if swallowed. May cause digestive tract irritation with tightness in throat, nausea, vomiting, diarrhea, loss of appetite, malaise, abdominal pain. fever, and chills. May affect behavior/central nervous system and autonomic nervous system with ataxia, lethargy, staggering gait, mild derrangement in cerebellar function, lightheadness, dizzness, irritability, muscular stiffness, and pain. May also affect blood. Inhalation: Inhalation of zinc dust or fumes may cause respiratory tract and mucous membrane irritation with cough and chest pain. It can also cause "metal fume fever", a flu-like condition characterized appearance of chills, headached fever, maliase, fatigue, sweating, extreme thirst, aches in the legs and chest, and difficulty in breathing. A sweet taste may also be be present in metal fume fever, as well as a dry throat, aches, nausea, and vomiting, and pale grey cyanosis. The toxicological properties of this substance have not been fully investisgated.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: Not available.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
New York release reporting list: Zinc Metal Rhode Island RTK hazardous substances: Zinc Metal Pennsylvania RTK: Zinc Metal Florida: Zinc Metal Michigan critical material: Zinc Metal Massachusetts RTK: Zinc Metal New Jersey: Zinc Metal California Director's List of Hazardous Substances: Zinc Metal TSCA 8(b) inventory: Zinc Metal TSCA 12(b) one time export: Zinc Metal SARA 313 toxic chemical notification and release reporting: Zinc Metal CERCLA: Hazardous substances.: Zinc Metal: 1000 lbs. (453.6 kg)

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not Available

DSCL (EEC):
R15- Contact with water liberates extremely flammable gases. R17- Spontaneously flammable in air. S7/8- Keep container tightly closed and dry.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 1

Reactivity: 1

Personal Protection: E

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

Health: 0

Flammability: 1

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 12:18 AM

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

Attachment H
Confined Space Entry Checklist/ Permit

NON-PERMIT REQUIRED CONFINED SPACE

PRE-ENTRY/ENTRY CHECK LIST

Date and Time:
Issued By:
Job Site:
Work to Be Performed:

Date and Time Expire:
Excavation Number:
Job Supervisor:
Work to Be Performed:

Pre-Entry (See Safety Procedures)

1. Atmospheric Checks: Time: ( )
   Oxygen: %
   Explosive: % LEL

2. Source Isolation (No Entry): N/A Yes No

Pumps or lines blinded, disconnected or blocked	( )	( )	( )

3. Ventilation Modification N/A Yes No

Mechanical	( )	( )	( )
Natural Ventilation Only	( )	( )	( )

4. Atmospheric check after isolation and ventilation
   Oxygen _____ % > 19.5%
   Explosive _____ % LEL < 10%
   Toxic _____ PPM < 10 PPM H_2S
   Time _____

5. Rescue Procedure:_____

1. Entry, standby, and backup persons Yes No

Successfully completed required training?	( )	
Is it current?	( )	( )

3. Equipment: N/A Yes No

Direct reading gas monitor-tested	( )	( )	( )
Safety harnesses and life-lines for entry and standby persons?	( )	( )	( )
Hoisting Equipment?	( )	( )	( )
Powered Communications?	( )	( )	( )
SCBAs for Entry and Standby Persons?	( )	( )	( )
Protective Clothing?	( )	( )	( )

If conditions are in compliance with the above requirements and there is no reason to believe conditions may change adversely, then proceed to the Permit Space Pre-entry Check List. Complete and post with this permit. If conditions are not in compliance with the above requirements or there is reason to believe that conditions may change adversely, proceed to the Entry Check List portion of this permit.

We have reviewed the work authorized by this permit and the information contained here-in. Written instructions and safety procedures have been received and are understood. Entry cannot be approved if any squares are marked in the "No" column. This permit is not valid unless all appropriate items are completed.

Permit and Check List Prepared By: _____

Approved By:_____

Reviewed By:_____

(Signature)

A copy of this Pre-Entry Check List must be retained in a bound notebook for each excavation.

If during the work hazardous atmospherics develop in the space, the work must be immediately terminated.

CONFINED SPACE ENTRY PERMIT

_____ Confined Space _____ Hazardous Area _____ Non Permit Required

Note: No work will be performed unless the space meets non permit requirements Permit valid for 8 hours only. All copies of permit will remain at this job site until job is completed.

Site location and description _____

_____

Purpose of Entry _____

Supervisor(s) in charge of crews _____

Type of Crew _____ Phone # _____

_____

Bold denotes minimum requirements to be completed and reviewed prior to entry

Requirements Completed	Date	Time	Requirements Completed	Date	Time
Lock Out/De-energize/try-out	_____	_____	**Full Body Harness w/"D" Ring**	_____	_____
Line(s) Broken-capped-blanked	_____	_____	**Emergency Escape Retrieval**	_____	_____
Purge-Flush and Vent	_____	_____	**Lifelines**	_____	_____
Ventilation	_____	_____	Fire Extinguishers	_____	_____
Secure Area (Post and Flag)	_____	_____	Lighting (Explosive Proof)	_____	_____
Breathing Apparatus	_____	_____	Protective Clothing	_____	_____
Resuscitator-Inhalator	_____	_____	Respirator(s) (Air Purifying)	_____	_____
Standby Safety Personnel	_____	_____	Burning and Welding Permit	_____	_____

Note: Items that do not apply enter N/A in the blank.

** Record Continuous Monitoring Results Every 2 Hours.

Continuous	Permissible	Monitoring Results
Percent of Oxygen	19.5% to 23.5%	
Lower Flammable Limit	Under 10%	
Hydrogen Sulfide	+ 10 PPM * 15	

* Short-term exposure time: Employee can work in the area up to 15 minutes.
+ 8 hour time - Weighted average: Employee can work in area 8 hours (longer with appropriate respiratory protection).
** Record continuous monitoring results every 30 minutes starting ½ hour prior to beginning work.

REMARKS:
Gas Tester Name & Check # Instrument(s) Used Model &/or Type Serial &/or Unit #

_____

_____

Safety standby person is required for all confined space work

Safety standby person(s) Check # Name of Safety Standby Person(s) Check #

_____

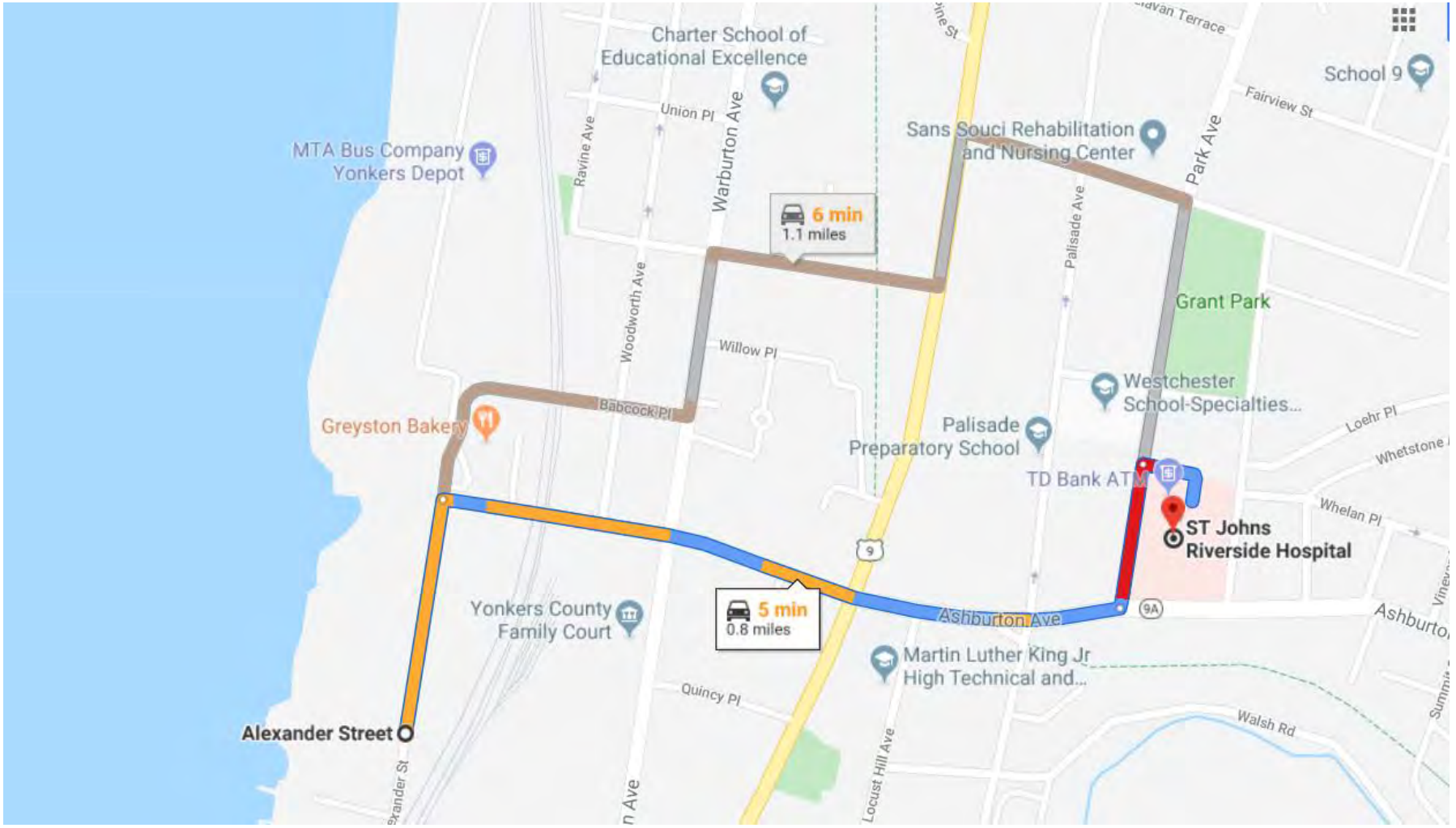
Supervisor Authorizing Entry _____

All Above Conditions Satisfied _____

Emergency number posted in job trailer _____

Note: A single entry permit can be filled out prior to start of daily work.

Attachment I
Emergency Telephone Numbers
Hospital Information
Field Accident Report



ROUTE TO HOSPITAL

STREET ADDRESSES: 57 Alexander Street to 2 Park Avenue
CITY, STATE, ZIP: Yonkers, NY
PROJECT NUMBER: 25720.02
BASE MAP SOURCE: Google Maps

N

EMERGENCY INFORMATION

Emergency telephone numbers and routes to the nearest hospital with an emergency capacity are as follows:

General Emergencies:	911
Yonkers Police Department	911 or 1-914-377-7900
Fire Department	911
First Responder Medical Care:	911
National Response Center	1-800-424-8802
Poison Control Center	1-800-222-1222
NYS Spill Hotline:	1-800-457-7362
Westchester County Department of Health	1-914-813-5000
Health and Safety Officer – Stephen Kaplan	1-631-787-3400 or 1-631-316-4892
Project Manager – Jessica Collins	1-212-857-7350 or 1-516-220-2143
SSO – Christopher Rooney	1-212-857-7350 or 1-631-813-8937

For Non-Emergency Care – (Emergencies must call 911)

Nearest Hospital: Saint John's Riverside Hospital
2 Park Avenue
Yonkers, New York 10703
1-914-964-7300

Directions to Saint John's Riverside Hospital (Approximately 1.0 mile from the site):

Head north (left) on Alexander Street and in approximately 0.2 mile turn right onto Ashburn Avenue and in approximately 0.5 mile, take the fifth left onto Park Avenue to arrive at the hospital.

A map showing the route to the nearest hospital is provided in Attachment A, Figure 2.

VHB Engineering, Surveying, Landscape Architecture and Geology, P.C.

FIELD ACCIDENT REPORT

This report is to be filled out by the designated Site Safety Officer after EVERY accident.

PROJECT NAME _____ PROJECT. NO._____

Date of Accident _____ Time _____ Report By _____

Type of Accident (Check One):

( ) Vehicular ( ) Personal ( ) Property

Name of Injured _____ DOB or Age _____

How Long Employed _____

Names of Witnesses _____

_____

Description of Accident _____

_____

_____

Action Taken _____

_____

_____

Did the Injured Lose Any Time? _____ How Much (Days/Hrs.)? _____

Was Safety Equipment in Use at the Time of the Accident (Hard Hat, Safety Glasses, Gloves, Safety Shoes, etc.)? _____

_____

(If not, it is the EMPLOYEE'S sole responsibility to process his/her claim through his/her Health and Welfare Fund.)

INDICATE STREET NAMES, DESCRIPTION OF VEHICLES, AND NORTH ARROW

Appendix E – Community Air Monitoring Plan

Community Air Monitoring Plan
57 Alexander Street
Yonkers, New York 10701
NYSDEC Index No. C360194

PREPARED FOR

57 Alexander Developer LLC
c/o Rose Associates, Inc.
777 Third Avenue
New York, New York 10017

PREPARED BY

VHB Engineering, Surveying, Landscape Architecture and Geology, P.C.
1 Penn Plaza
Suite 715
New York, New York 10119

JANUARY 2020

Table of Contents

Attachments

1.0

Introduction

1.1 General

VHB has prepared this Community Air Monitoring Plan (CAMP) in association with the 57 Alexander Street project in the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP), located at 47-71 Alexander Street, City of Yonkers, Westchester County, New York (the "Site"). The Site encompasses 4.26 acres and comprises the landward portions of four (4) contiguous tax lots identified as Block 2605, Lot 51, and Block 2610, Lots 50, 53, and 73 on the Westchester County Tax Maps.

Previous environmental site assessment activities identified the presence of heavy metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and pesticides in onsite soil and groundwater in excess of the respective standards and/or guidance values (i.e., NYSDEC Part 375 Track One and Track Two Soil Cleanup Objectives [SCOs] for soil and NYSDEC Technical and Operation Guidance Series [TOGS] 1.1.1 list of Ambient Water Quality Standards and Guidance Values [AWQSGVs] for groundwater); and VOCs in onsite soil vapor. Based upon the aforementioned impacts and the status of the Site as enrolled in the NYSDEC BCP, the preparation of a CAMP is required and will be implemented as part of remedial action at the Site. This CAMP fulfills the requirements set forth by the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan, dated December 2009, and NYSDEC Fugitive Dust Suppression and Particulate Monitoring Program (under the Technical Assistance and Guidance Memorandum [TAGM] – 4031) (Attachments B and C, respectively). The intent of this CAMP is to provide for a measure of protection for downwind communities from potential airborne releases of constituents of concern during on-site remedial activities. These activities will include site investigation activities and future remedial activities which may include excavation and removal of

impacted soils. This CAMP specifies potential air emissions, air monitoring procedures, monitoring schedule and data collection and reporting.

1.2 Site Description and Background

The Site is currently improved with six industrial/manufacturing warehouse buildings, an attached sales office/caretaker residence, one condemned former residence/Hudson Pilot dispatch office, and two storage sheds. The industrial warehouse buildings were most recently utilized for assembling, renting, and repairing stage lighting equipment as well as storage. The remaining portions of the Site are improved with asphalt-paved parking areas, landscaped areas, including a dog-run, and wooden piers extending into the Hudson River. Access to the Site can be obtained via three curb-cuts along Alexander Street or via piers/docks on the Hudson River. As indicated above, previous environmental site assessment activities identified the presence of heavy metals, VOCs, PCBs, and pesticides in soils at concentrations which exceed the NYSDEC Part 375 Track One and Track Two SCOs and in groundwater at concentrations which exceed AWQSGVs. In addition, concentrations of several VOCs including TCE and PCE were reported in soil vapor beneath the Site.

The Site is located in the City of Yonkers Urban Renewal District. Surrounding property use still currently consists primarily of industrial usage on sites with similar brownfield historic uses. However, significant multi-family residential and mixed-use commercial development is occurring in the vicinity of the Site.

The Volunteer is proposing to redevelop the Site through the demolition of existing structures across four contiguous lots comprising 87,120 square feet (sf), and subsequent construction of a seven-story multi-family residential apartment building containing a ground-floor parking garage and lobby, mail room, rubbish room, and package room, second-floor parking garage and residential units along the exteriors of the building, and five upper floors comprising residential units and common area space. The development as a whole will contain 440 residential units. The residential building will consist of three sections connected through common hallways running parallel to Alexander Street. Separating each section will be two outdoor courtyards. Along the proposed rip-rap constructed shoreline, a publicly accessible esplanade will be developed connecting adjacent parcels along the Hudson in conformance with the Alexander Street Master Plan.

The purposes of this CAMP are to monitor air quality during site investigation and remedial action activities in order to minimize any potential inhalation hazards to on-site occupants, and to prevent fugitive dust migration off-site during intrusive site activities.

1.3 Potential Air Emissions Related to Remedial Action Activities

Certain intrusive remedial activities at the Site have the potential to generate localized impacts to air quality. Such activities include the following:

- Site investigation activities, including soil borings, vapor point installation and monitoring well installation
- Exhaust and dust generated from on-site construction vehicles
- Future remedial activities, which may include excavation, on-site storage and load-out of impacted soils
- Installation of footings and building foundations associated with the proposed new building

1.4 Air/Odor Emissions and Control Measures

Air emissions control and fugitive dust suppression techniques will be used during the site investigation and remedial activities identified above, as necessary, to limit the air/odor emissions from the Site. Air monitoring for the specific purpose of protecting the community from site activity impacts will take place during both intrusive and non-intrusive site activities.

During intrusive and non-intrusive site activities, odor and dust control measures will be available at the Site and used when necessary. The following dust and odor suppression measures may be used during these activities, depending upon specific circumstances and air monitoring results:

- Applying water on travel surfaces
- Wetting of equipment
- Restricting vehicle speeds
- Storing materials in tarped or watertight containers
- Polyethylene sheeting (as necessary to cover any soils that may require stockpiling)

Odor and dust control measures will be implemented based on visual or olfactory observations, and the results of airborne particulate and VOC monitoring. Care will be exercised for techniques involving water to prevent excess water and unacceptably wet conditions. Access to water will be available via onsite connection.

2.0

Air Monitoring Procedures

2.1 General

Real time air monitoring will be implemented at the Site for VOCs and particulate matter less than 10 microns in diameter (PM_{10}). A site boundary will be established for the purpose of air monitoring. Upwind and two downwind monitoring locations will be determined, and one unit will be placed at each location. The second downwind monitoring location will be located between the work zone and the nearest occupied building. This will be adjusted on a daily basis. Additional monitoring with photoionization detectors (PIDs)[1] will occur within the remedial investigation (boring/sampling) locations. For the duration of the air monitoring, upwind air monitoring will take place at the commencement of daily activities to establish a daily baseline. The monitoring will then commence at both upwind and downwind locations continuously during all subsurface investigation activities. The CAMP monitoring will be conducted during all intrusive activities.

All monitoring will be electronically logged in the field instruments that record peak, and a time-weighted average of dust particles and PID readings.

2.2 VOC Monitoring

As required by the NYSDOH guidance document, VOCs will be monitored continuously during intrusive site activities, with instrumentation that is equipped

▼

[1] A PID is a handheld instrument capable of detecting a wide range of VOCs. VOCs are quantified in parts per million (ppm).

with electronic data-logging capabilities. A Mini-RAE 3000 PID or equivalent will be used to conduct the real-time VOC monitoring.

2.3 Particulate Matter Monitoring

As required by NYSDOH and NYSDEC guidance, real-time particulate meter will be monitored continuously during intrusive site activities using instrumentation equipped with electronic data-logging capabilities and an audible alarm to indicate exceedances of the action level. A DR-4000 Dust Monitor (or equivalent) will be used to conduct the real-time PM_{10} monitoring.

Fugitive dust migration will be visually assessed during all work activities, and reasonable dust suppression techniques will be used during any site activities that may generate fugitive dust.

2.4 Action Levels

The action levels provided below are to be used to initiate response actions, if necessary.

2.4.1 Action Levels for VOCs

As outlined in the NYSDOH guidance document for CAMPs, if the downwind ambient air concentration of total VOCs exceeds 5 ppm above the background (upwind location) for a 15-minute average, intrusive site activities will be temporarily halted while monitoring continues. If the total VOC concentration readily decreases below 5 ppm above background, then intrusive site activities can resume.

If the downwind ambient air concentrations of total VOCs persist at levels in excess of 5 ppm above background, intrusive site work activities will be halted, the source of the elevated VOC concentration identified, corrective actions to reduce or abate the emissions undertaken, and air monitoring to be continued. Work activities will resume provided that the total VOC concentration is below 5 ppm above background for a 15-minute average.

If total VOC concentrations exceed 25 ppm at the downwind location, all work activities will be suspended.

As previously indicated, at the commencement of daily remediation activities, VHB will begin with an upwind air monitoring location to establish a daily baseline for monitoring operations.

2.4.2 Action Level for PM_{10}

As required by NYSDOH and NYSDEC guidance documents, if the ambient air concentration of PM_{10} at any one (or more) of the sampling locations is noted at levels in excess of 100 micrograms per cubic meter (μ/m^3) above the background (upwind location) for a 15-minute average, or if airborne dust is observed leaving the work area, intrusive site activities will be temporarily halted. The source of the elevated PM_{10} 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 PM_{10} levels do not exceed 150 μ/m^3 over background levels and provided visible dust migration has ceased. If levels continue to be elevated, intrusive site activities will be halted and emissions control measures implemented.

2.5 Meteorological Monitoring

Wind direction will be monitored periodically at the Site using a windsock or other appropriate equipment. Wind direction will be established at the start of each work day and may be re-established at any time during the work day if a significant shift in wind direction is noted.

2.6 Instrument Calibration

Calibration of the VOC and PM_{10} instrumentation will occur in accordance with each of the equipment manufacturer's calibration and quality assurance requirements. The VOC and PM_{10} monitors will be calibrated at least daily, and calibrations will be recorded in the field activity book.

3.0

Monitoring Schedule and Data Collection and Reporting

The proposed monitoring schedule and data collection and reporting requirements are discussed below.

3.1 Monitoring Schedule

Real-time VOC and PM_{10} monitoring will be performed continuously throughout the remedial investigation during intrusive activities. VOC monitoring will also be performed during non-intrusive and/or support-type activities when soils are staged on-site or when the potential exists for migration off-site of VOCs and/or dust.

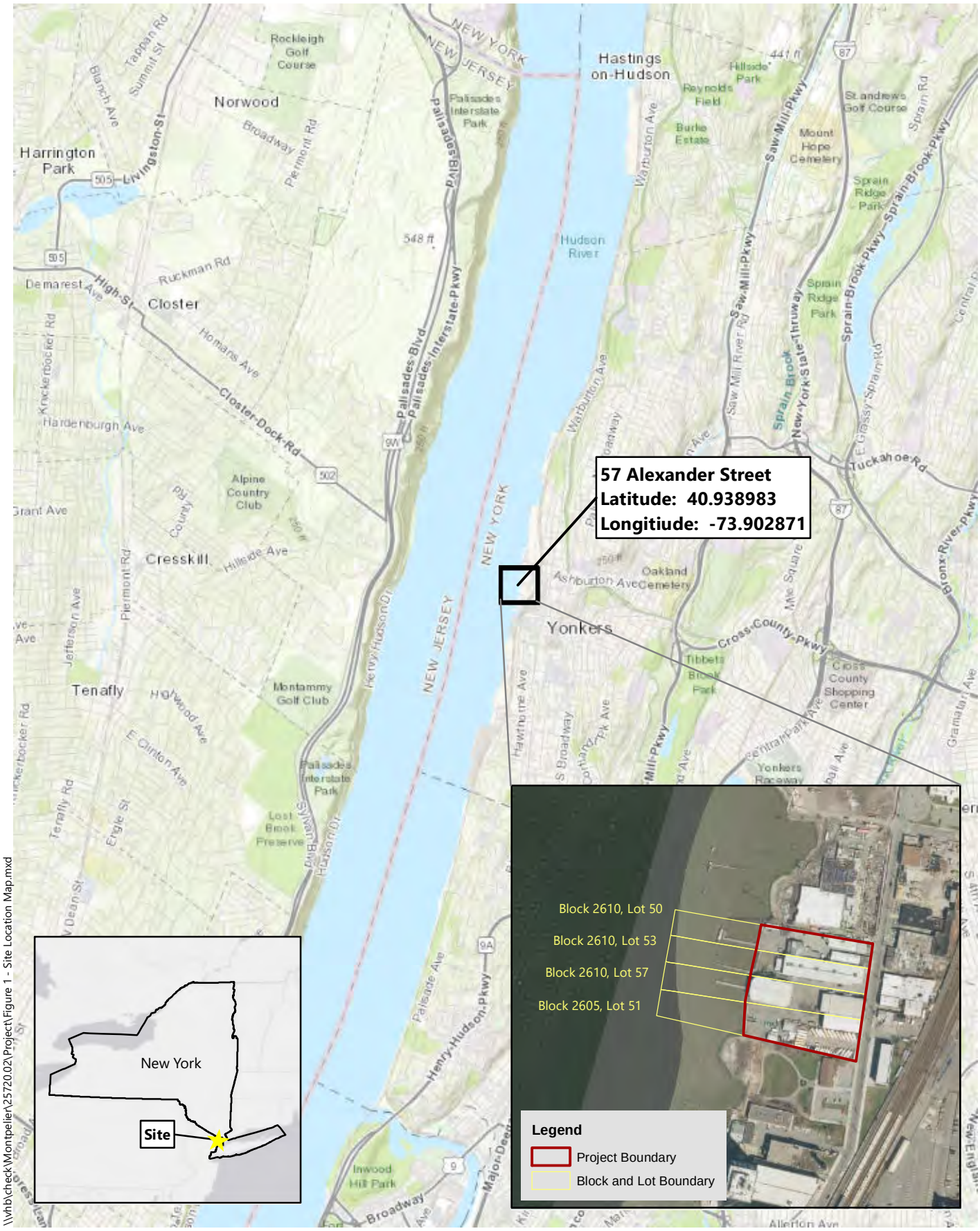
3.2 Data Collection and Reporting

Air monitoring data will be collected continuously from VOC and PM_{10} monitors during intrusive site activities by an electronic data-logging system. A Thermo MIE DR-4000 dust monitor, or equivalent, will be used. The Data Real-Time Aerosol Monitor measures mass concentrations of airborne dust, smoke, mists, haze and fumes and provides continuous real-time readouts. Respirable PM-10 correlated measurements will be logged and recorded over the 8-hour work period. A Mini-RAE 3000 PID, or equivalent, will be used to monitor for VOCs during intrusive field activities.

CAMP data summary tables will be provided to the NYSDEC and NYSDOH on a weekly basis, and notification of action level exceedances will be made to NYSDEC and NYSDOH within 24 hours. CAMP exceedances and related corrective measures

will also be included in the Daily Reports provided to NYSDEC. Air monitoring data will be provided in the Remedial Investigation Report (RIR) as part of reporting requirements, as well.

ATTACHMENT A



\\vhb\check\Montpelier\25720.02\Project\Figure 1 - Site Location Map.mxd

0 1 2 Miles

57 Alexander Street
Remedial Investigation Work Plan

Yonkers, New York

Sources:
ESRI World Topographic Base Map (2020)
ESRI/Digital Globe Imagery Base Map (2019)

Site Location Map

ATTACHMENT B

Appendix 1A
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

ATTACHMENT C

NEW YORK STATE
DEPARTMENT OF
ENVIRONMENTAL CONSERVATION

Fugitive Dust Suppression and Particulate Monitoring Program (TAGM - 4031)

Issuing Authority: Michael J. O'Toole, Jr.
Title: Director, Division of Environmental Remediation
Date Issued: Oct 27, 1989

1. Introduction

Fugitive dust suppression, particulate monitoring, and subsequent action levels for such must be used and applied consistently during remedial activities at hazardous waste sites. This guidance provides a basis for developing and implementing a fugitive dust suppression and particulate monitoring program as an element of a hazardous waste site's health and safety program.

2. Background

Fugitive dust is particulate matter--a generic term for a broad class of chemically and physically diverse substances that exist as discrete particles, liquid droplets or solids, over a wide range of sizes--which becomes airborne and contributes to air quality as a nuisance and threat to human health and the environment.

On July 1, 1987, the United States Environmental Protection Agency (USEPA) revised the ambient air quality standard for particulates so as to reflect direct impact on human health by setting the standard for particulate matter less than ten microns in diameter (PM_{10}); this involves fugitive dust whether contaminated or not. Based upon an examination of air quality composition, respiratory tract deposition, and health effects, PM_{10} is considered conservative for the primary standard--that requisite to protect public health with an adequate margin of safety. The primary standards are 150 ug/m^3 over a 24-hour averaging time and 50 ug/m^3 over an annual averaging time. Both of these standards are to be averaged arithmetically.

There exists real-time monitoring equipment available to measure PM_{10} and capable of integrating over a period of six seconds to ten hours. Combined with an adequate fugitive dust suppression program, such equipment will aid in preventing the off-site migration of contaminated soil. It will also protect both on-site personnel from exposure to high levels of dust and the public around the site from any exposure to any dust. While specifically intended for the protection of on-site personnel as well as the public, this program is not meant to

replace long-term monitoring which may be required given the contaminants inherent to the site and its air quality.

3. Guidance

A program for suppressing fugitive dust and monitoring particulate matter at hazardous waste sites can be developed without placing an undue burden on remedial activities while still being protective of health and environment. Since the responsibility for implementing this program ultimately will fall on the party performing the work, these procedures must be incorporated into appropriate work plans. The following fugitive dust suppression and particulate monitoring program will be employed at hazardous waste sites during construction and other 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. Such activities shall also include the excavation, grading, or placement of clean fill, and control measures therefore should be considered.
3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM_{10}) with the following minimum performance standards:
   Object to be measured: Dust, Mists, Aerosols
   Size range: <0.1 to 10 microns
   Sensitivity: 0.001 mg/m^3
   Range: 0.001 to 10 mg/m^3
   Overall Accuracy: ±10% as compared to gravimetric analysis of stearic acid or reference dust

   Operating Conditions:
   Temperature: 0 to 40°C
   Humidity: 10 to 99% Relative Humidity

   Power: Battery operated with a minimum capacity of eight hours continuous operation

   Automatic alarms are suggested.

   Particulate levels will be monitored immediately downwind at the working site and integrated over a period not to exceed 15 minutes. Consequently, instrumentation shall

require necessary averaging hardware to accomplish this task; the P-5 Digital Dust Indicator as manufactured by MDA Scientific, Inc. or similar is appropriate.

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 entity operating the equipment 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^3 over the integrated period not to exceed 15 minutes. 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^3, the upwind background level must be measured immediately using the same portable monitor. If the working site particulate measurement is greater than 100 ug/m^3 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^3 be exceeded, the Division of Air Resources must be notified in writing within five working days; the notification shall include a description of the control measures implemented to prevent further exceedences.
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_{10} at or above the action level. Since this situation has the potential to migrate 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:
    1. Applying water on haul roads.
    2. Wetting equipment and excavation faces.

3. Spraying water on buckets during excavation and dumping.
4. Hauling materials in properly tarped or watertight containers.
5. Restricting vehicle speeds to 10 mph.
6. Covering excavated areas and material after excavation activity ceases.
7. Reducing the excavation size and/or number of excavations.

Experience has shown that utilizing the above-mentioned dust suppression techniques, within reason as not to create excess water which would result in unacceptable wet conditions, the chance of exceeding the 150 ug/m^3 action level at hazardous waste site remediations is remote. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. If the dust suppression techniques being utilized at the site do not lower particulates to an acceptable level (that is, below 150 ug/m^3 and no visible dust), work must be suspended until appropriate corrective measures are approved to remedy the situation. Also, the evaluation of weather conditions will be 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 appropriate toxics 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.

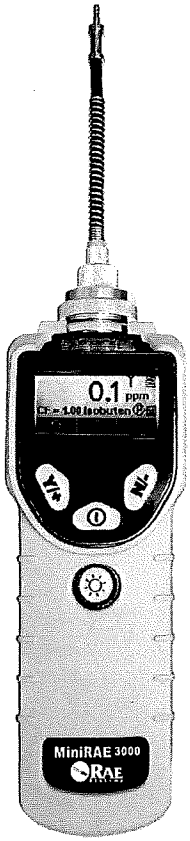
ATTACHMENT D

MiniRAE 3000

Portable Handheld VOC Monitor

The MiniRAE 3000 is the most advanced handheld volatile organic compound (VOC) monitor on the market. Its photoionization detector's (PID) extended range of **0 to 15,000 ppm** makes it an ideal instrument for applications from industrial hygiene to leak detection and HazMat.

The **RF modem allows real-time data transmissions** with a base controller located up to 500 feet away from the MiniRAE 3000 (or two miles with optional RAELink3 portable modem). A personal computer can be used as the base station for a MiniRAE 3000 system. The standard ProRAE Remote software is capable of monitoring the input of up to 64 remotely located monitors, including MiniRAE 3000, AreaRAE, etc.



Wireless

AutoRAE Compatible

Key Features

- **Proven PID technology**
  The patented sensor provides the following unique features:
  - 3-second response time
  - Extended range up to 15,000 ppm with improved linearity
  - Humidity compensation with integral humidity and temperature sensors
- **Real-time wireless** data transmission with built-in RF modem or Bluetooth
- **Designed for simple service** Easy access to lamp and sensor in seconds without tools
- **Big graphic display** for easy overview of gas type, Correction Factor and concentration
- **Field-interchangeable battery pack** replaced in seconds without tools
- **Integrated flashlight** for better view in dark conditions
- **User-friendly screens, including dataplot chart view**
- **Integrated RAE Systems Correction Factors list for more than 200 compounds** to measure more chemicals than any other PID
- **Multi-language support** with 12 languages encoded
- **Rugged housing** withstands use in harsh environments
  - IP67 waterproof design for easy cleaning and decontamination in water
  - Strong protective removable rubber boot

Additional Advantages

- View real-time sensor data and alarm status at headquarters or command center
- Automatic lamp type recognition
- Duty-cycling™ lamp and sensor auto-cleaning technology
- Tough, flexible inlet Flexi-Probe™
- 3 large keys operable with 3 layers of gloves
- Strong, built-in sample pump draws up to 100 feet (30m) horizontally or vertically
- Loud, 95dB audible alarm
- Bright red flashing visual alarm
- Interchangeable drop-In lithium-ion and alkaline battery packs
- Charging cradle doubles as an external battery charger
- Compatible with AutoRAE™ calibration station
- ProRAE Remote software simultaneously controls and displays readings for up to 64 remote detectors
- License-free, ISM band RF transmission with communication range up to 500 feet (2 miles with optional RAELink3 modem)
- Optional RAELink3 modem provides GPS capability to track and display readings from remote detectors and provide up to 2 miles' long-distance transmission
- Datalogging with up to 6 months of data at one-minute intervals
- 3-year 10.6eV lamp warranty

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MiniRAE 3000

Specifications*

Detector Specifications

Size	10" L x 3.0" W x 2.5" H (25.5 cm x 7.6 cm x 6.4 cm)
Weight	26 oz (738 g)
Sensors	Photoionization sensor with standard 10.6 eV or optional 9.8 eV or 11.7 eV lamps
Battery	• Rechargeable, external field-replaceable Lithium-Ion battery pack • Alkaline battery adapter
Operating Hours	16 hours of operation (12 hours with alkaline battery)
Display Graphic	4 lines, 28 x 43 mm, with LED backlight for enhanced display readability
Keypad	1 operation and 2 programming keys, 1 flashlight on/off
Direct Readout	Instantaneous reading • VOCs as ppm by volume • High values • STEL and TWA • Battery and shutdown voltage • Date, time, temperature
Alarms	95 dB (at 30 cm) buzzer and flashing red LED to indicate exceeded preset limits • High: 3 beeps and flashes per second • Low: 2 beeps and flashes per second • STEL and TWA: 1 beep and flash per second • Alarms latching with manual override or automatic reset • Additional diagnostic alarm and display message for low battery and pump stall
EMI/RFI	Highly resistant to EMI/RFI Compliant with EMC Directive 89/336/EEC
IP Rating	• IP67 unit off and without flexible probe • IP65 unit running
Datalogging	Standard 6 months at one-minute intervals
Calibration	Two-point or three-point calibration for zero and span. Calibration memory for 8 calibration gases, alarm limits, span values and calibration dates
Sampling Pump	• Internal, integrated flow rate at 500 cc/mn • Sample from 100' (30m) horizontally and vertically
Low Flow Alarm	• Auto pump shutoff at low-flow condition
Communication	• Download data and upload instrument set-up from PC through charging cradle or optional Bluetooth™ • Wireless data transmission through built-in RF modem
Frequency	902 to 928 MHz (license-free), 2.400 to 2.4835 GHz (license-free), 433 MHz, 869 MHz
RF Range	Up to 500' (900 MHz, 433 Mhz, 869 Mhz), extendable with RAELink3 Repeater to 2 miles
Hazard Area Approval	• **US and Canada:** UL, cUL, Classified as Intrinsically Safe for use in Class I, Division I Groups A, B, C, D • **Europe:** ATEX II 1G EEx ia IIC T4 (pending) • **IECEx:** II 1G EEx ia IIC T4 (pending)
Temperature	-4° to 113° F (-20° to 50° C)
Humidity	0% to 95% relative humidity (non-condensing)
Attachments	Durable bright yellow rubber boot with belt clip
Warranty	Lifetime on non-consumable components (per RAE Systems Standard Warranty), 3-year warranty for 10.6 eV lamp, 1 year for pump and battery

*Specifications are subject to change

Sensor Specifications

Gas Monitor	Range	Resolution	Response Time T90
VOCs	0 to 999.9 ppm 1000 to 15,000 ppm	0.1 ppm 1 ppm	< 3 s < 3 s

Monitor only includes:

- MiniRAE 3000 Monitor, Model PGM-7320
- Wireless communication module built in, as specified
- Datalogging with ProRAE Studio Package for Windows™ 95, 98, 2000, NT, ME & XP
- Charging/download adapter
- RAE UV lamp, as specified
- Flex-I-Probe™
- External filter
- Rubber boot
- Alkaline battery adapter
- Lamp-cleaning kit
- Tool kit
- Operation CD-ROM
- Operation & Maintenance manual
- Soft leather case

Monitor with accessories kit adds:

- Hard transport case with pre-cut foam padding
- Charging/download cradle
- 5 Porous metal filters and O-rings
- Organic vapor zeroing kit
- Gas outlet port adapter and tubing

Optional calibration kit adds:

- 100 ppm isobutylene calibration gas, 34L
- Calibration regulator and flow controller

Optional Guaranteed Cost of Ownership Program:

- 4-year repair and replacement guarantee
- Annual maintenance service

DISTRIBUTED BY:

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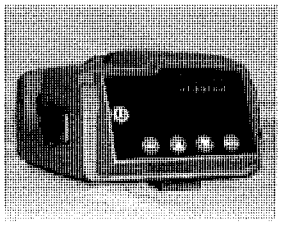
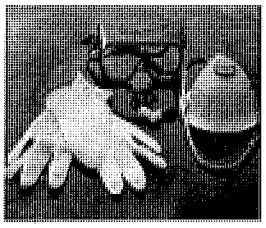
RAE SYSTEMS

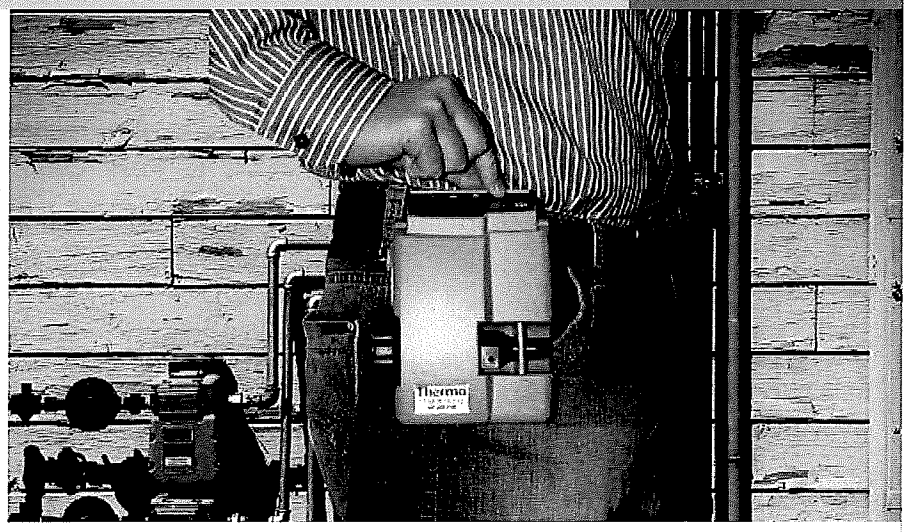
Product Specifications

Thermo Scientific pDR-1500

Active, real-time, personal aerosol monitor/ data logger, with aerodynamic sizing







Key Features / Benefits

- True volumetric flow control
- Interchangeable cyclones for higher accuracy cut points
- Personal aerosol instrument with benchtop performance
- Full compensation for environmental variables
- Flexible data logging routines
- Suitable for NIOSH Methods 0500 and 0600

The pDR-1500 was developed to meet a need for a fully integrated, active sampling personal scale instrument with greater accuracy, increased capabilities, low size and weight, maximum ease-of-use and increased operating time. It was designed for applications such as site remediation, size discrimination, mass validation, exposure modeling, and protection of asthma patients.

A lot gets in the way of accurately measuring aerosol concentration in real-time – temperature, humidity, air pressure and sample representation. The pDR-1500 handles all four – with relative humidity compensation, true volumetric flow control and legacy pDR nephelometry. An integrated sample filter enables post-gravimetric validation of data.

Superior particle-cut points compared to those achievable using impactors are delivered through volumetric flow control and ACGIH traceable cyclones – available in pairs, for PM10 and PM4 or PM2.5 and PM1. A toroidal entrance assures optimized aerosol aspiration and a representative sample even without a cyclone.

Thermo Scientific pDR 1500 Specifications

To maintain optimal product performance, you need immediate access to experts worldwide, as well as priority status when your air quality equipment needs repair or replacement. Thermo Scientific offers comprehensive, flexible support solutions for all phases of the product life cycle. Through predictable, fixed-cost pricing, Thermo services help protect the return on investment (ROI) and total cost of ownership of your Thermo Scientific air quality products.

Concentration Measurement Range	0.001 to 400 mg/m^3 range (auto ranging)[1]
Scattered Coefficient Range	1.5 x 10^{-6} to 0.6 m^{-1} (approx) @ lambda= 880nm (not displayed)
Precision/ Repeatability Over 30 days (2-sigma)[2]	± 2% of reading or ± 0.005 mg/m^3, whichever is larger, for 1 second averaging time
	± 0.5 of reading or ± 0.0015 mg/m^3, whichever is larger, for 10 second averaging time
	± 0.2% of reading or ± 0.0005 mg/m^3, whichever is larger, for 60 second averaging time
Accuracy[1]	± 5% of reading ± precision (traceable to SAE Fine Test Dust)
Resolution	0.1% of reading or 0.001 mg/m^3, whichever is larger
Particle Size Range of Max. Response	0.1 to 10 µm
Flow Rate Range	1.0 to 3.5 liters/minute
Aerodynamic Particle Cut-Point Range	1.0 to 10 µm
Concentration Display Updating Interval	1 second
Concentration Display Averaging Time[3]	1 to 60 seconds (user selectable)
Data logging Averaging Periods[3]	1 second to 1 hour
Total # of Data Points That Can Be Logged in Memory	> 500,000
Number of Data Tags	99 (maximum)
Logged Data	averaging concentration, temperature, RH, barometric pressure, time/date, and data point number
Readout Display	LCD 16 characters (4 mm height) x 2 lines
Serial Interface	USB / RS-232, 19, 200 baud
Computer Requirements	IBM-PC compatible, 486 or higher, Windows 95® or higher, ≥ 8 MB memory, hard disc drive 3.5" floppy, VGA or higher resolution monitor
Real Time Analog Signal	0 to 5V and 4 to 20 mA. Selectable full scale ranges of: 0 - 0.1, 0 - 0.4, 0 -1.0, 0 - 4.0, 0 -10, 0 - 40, 0 -100, and 0 - 400
Internal Battery Run Time with Backlight off	4 AA alkaline, > 24 hr run time, 5 V peak-to-peak @ 1.2 L/min; > 6 hour @ 3.5 L/min
Run Time @25 deg C	run time may vary with temperature
Current Consumption	70 to 450 mA (in Run Mode); 32 mA (in Ready Mode)
Operation Environment	-10°C to 50°C (14°F to 122°F), 10 to 95% RH, non-condensing
Storage Environment	-20°C to 70°C (-4°F to 158°F)
Dimensions (max external)	181 mm (7.1in) H X 143mm (5.6in) W x 84mm (3.3in) D
Weight	1.2kg (41oz)

Notes:

1. Referred to gravimetric calibration wtih SAE Fine (ISO Fine) test dust (mmd = 2 to 3 µm, g = 2.5, as aerosolized)
2. At constant termperature and full battery voltage
3. User selectable

ISO 9001

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