

BOMARC SITE
100 OLD COUNTRY ROAD
WESTHAMPTON, NEW YORK
NYSDEC SITE: 152262

DRAFT
UNDERGROUND INJECTION CONTROL
INTERIM REMEDIAL MEASURE
WORK PLAN

SUBMITTED TO:



New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau A, Section C
625 Broadway
Albany, New York 12233

PREPARED FOR:



Suffolk County Department of Health Services
Office of Pollution Control
15 Horseblock Place
Farmingville, New York 11738

PREPARED BY:



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FIGURES

Figure 1	Site Location
Figure 2	Site Plan

APPENDICES

Appendix A	Health and Safety Plan
Appendix B	Community Air Monitoring Plan

CERTIFICATION

I, Bryan Grogan, certify that I am currently a NYS registered professional engineer, as defined in 6 NYCRR Part 375, and that this Interim Remedial Measure was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Bryan Grogan, PE

PE Name

Bryan Grogan

PE Signature

092523

PE License #

8/4/2022

Date





1.0 INTRODUCTION

This Underground Injection Control (UIC) Interim Remedial Measure (IRM) Work Plan has been prepared by P.W. Grosser Consulting Inc. (PWGC), on behalf of the Suffolk County Department of Health Services (SCDHS), to document the proposed IRM activities planned at the BOMARC Site (Site) located at 100 Old Country Road, Westhampton, New York. A Site Location Map is included as **Figure 1** and a Site Plan is included as **Figure 2**.

An underground injection control (UIC) investigation, performed by the SCDHS from 2019 through 2021, identified seven UIC structures with concentrations of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals and/or polychlorinated biphenyls (PCBs) in contravention of their respective regulatory standards. This IRM is not intended to be considered the final remedy for the site but is being undertaken to remove known contaminated sediments from the on-site drainage systems, septic systems, and former fireworks burn pits, in order to minimize additional impacts to onsite soils and provide protection to the public and environment.

1.1 Site Description

The Site is located at 100 Old Country Road, in the hamlet of Westhampton, New York. The Site is in the Town of Southampton, Suffolk County. The property is identified in the Suffolk County Tax Map as: 0900-331.00-01.00-Lot Nos. 001.100, and 002.000 through 015.000.

The Site measures approximately 186 acres in size and is located to the north of Old Country Road and west of Old Westhampton Road. The property includes 56 structures which originally housed BOMARC missiles, along with other structures utilized by Suffolk County. Large parking lots are also present at the site along with a police firing range. The Site is bounded to the north by undeveloped pine barrens, to the east by commercial/industrial land uses, to the south by Old Country Road, and to the west by recent residential development.

A Vicinity Map is included as **Figure 1**. A Site Plan is included as **Figure 2**.



1.2 Site History

The former BOMARC Missile Base was operated by the US Air Force as one of 10 BOMARC facilities protecting the east coast from a potential Soviet air attack from 1959 until it was decommissioned in 1964. Fifty-six nuclear-tipped missiles were located at this facility which utilized tritium and required frequent maintenance (every 90 days). After decommissioning, the property was turned over to Suffolk County as surplus property in the 1960s.

1.3 Previous Investigations

The following investigations pertinent to this UIC IRM Work Plan were performed at the Site to determine if past activities had impacted the sediment within onsite UIC structures. Results of these Site investigations confirmed the presence of VOCs, SVOCs, metals and PCBs above the SCDHS Action Levels and/or New York State Department of Environmental Conservation (NYSDEC) Part 375 Unrestricted Use Soil Cleanup Objectives (UUSCOs) standards in sediments within UIC structures, requiring remediation at the Site.

1.3.1 PWGC UIC Structure Sampling and Remediation (January 2014)

During the Suffolk County Department of Public Works (SCDPW) UIC Maintenance Program, PWGC investigated the BOMARC property and identified several structures associated with the sitewide sanitary system, as well as several floor drains within the buildings on the property. Each of the accessible UIC structures were sampled in accordance with the SCDHS Standard Operating Procedure (SOP) 9-95 and analyzed for VOCs, SVOCs and metals. Two structures, UIC001 (primary cesspool of the sitewide sanitary system) and UIC004 (Building C0205 floor drain) exhibited levels of SVOCs and/or metals above SCDHS Action Levels.

The sitewide sanitary system consists of the primary cesspool, a septic tank, six junction boxes and three subsurface secondary cesspools located southwest of the primary cesspool. Correspondence between PWGC, SCDHS, and SCDPW personnel concluded that the sitewide sanitary system, due to its elevated levels of chromium (370 mg/kg) in the primary cesspool, should be remediated. In addition, SCDHS indicated that the floor drain located in Building C0205 should be remediated prior to abandonment.

Remediation of the sitewide sanitary system was performed in March 2014. Remedial effort included the following:

- Removal of impacted sediment from six solid bottom junction boxes throughout the site.
- Characterization samples collected from three overflow cesspools associated with the sitewide sanitary system. No impact above SCDHS Action Levels detected.
- Removal of impacted sediment from building C0205 floor drain.
- March 2014 remediation was scheduled to include the sitewide sanitary system septic tank and primary cesspool; however, this was not completed at that time due to a water leak.

1.3.2 BOMARC UIC Data Summary and UIC Remedial Cost Estimate (August 12, 2021)

The SCDHS, under the directive of Resolution 1065-2018 of the Suffolk County Legislature, performed a limited site evaluation at the Site. A total of 25 locations were deemed areas of concern (AOC) based upon a walk-through and a review of historic information from department records. Impacts to UIC structures included presence of VOCs, SVOCs, heavy metals and polychlorinated biphenyls (PCBs) in contravention of SCDHS Action Levels and/or NYSDEC Unrestricted Use Soil Cleanup Objectives (UUSCOs) in seven UIC structures and/or discharge points. As there are no cleanup criteria for PCBs in the SCDHS SOP 9-95, PCB results were compared to NYSDEC UUSCOs. The presence of PCBs, and possibly other contaminants, may be indicative of legacy impacts occurring prior to Suffolk County ownership.

Summary of UIC Data for UICs Requiring Remediation

<u>Structure ID</u>	<u>Description</u>	<u>Sample Date</u>	<u>Suffolk County SOP-9-95 Exceedance</u>			<u>UUSCOs Exceedance for PCBs?</u>	<u>Total PCBs (ppb)</u>	<u>NYSDEC UUSCO</u>
			<u>VOCs</u>	<u>SVOCs</u>	<u>Metals</u>			
S-2	Storm Drain	4/30/19	No	No	No	Yes	4,300	100
S-3	Septic Tank	4/30/19	Yes	No	No	Yes	598	100
S-16	Floor Drain	5/1/19	Yes	Yes	Yes	Yes	593,000	100
S-17	Floor Drain	5/1/19	No	Yes	Yes	Yes	9,560,000	100
S-17OF	Floor Drain Discharge Point	3/23/21	No	No	No	Yes	1,590	100
S-18	Floor Drain	5/1/19	No	No	No	Yes	7,110	100
S-22	Former Burn Pits	5/1/19	Yes	No	Yes	Yes	6,070	100

1.4 Regional Geology/Hydrogeology

The geologic setting of Long Island is well documented and consists of crystalline bedrock composed of schist and gneiss overlain by layers of unconsolidated deposits. Immediately overlying the bedrock is the Raritan Formation, consisting of the Lloyd sand confined by the Raritan clay Member. The Lloyd sand is an aquifer and consists of discontinuous layers of gravel, sand, sandy and silty clay, and solid clay. The Raritan clay is a solid and silty clay with that is gray, red or white in color with few lenses of sand and gravel and abundant lignite and pyrite.

Above the Raritan Clay lies the Magothy Formation. The Magothy aquifer consists of layers of fine to coarse sand of moderate to high permeability, with inter-bedded lenses of silt and clay of low permeability resulting in areas of preferential horizontal flow. Therefore, this aquifer generally becomes more confined with depth. The Magothy Formation is overlain by the Upper Glacial deposits which contains the Upper Glacial aquifer. The Upper Glacial aquifer is the water-table aquifer at this location and is comprised of medium to coarse sand and gravel with occasional thin lenses of fine sand and brown clay. This aquifer extends from the water table to the top of the Magothy and, therefore, is hydraulically connected to the Magothy aquifer.

The aquifer of concern at the former BOMARC site is the Upper Glacial aquifer which is an unconsolidated mixture of sand and gravel. The Upper Glacial aquifer is approximately 100 feet thick (saturated zone) at the site, and has an estimated average horizontal hydraulic conductivity (permeability) of 270 feet/day and a vertical hydraulic conductivity of 27 feet/day (Franke & Cohen, 1972).

Clay layers, such as the Gardiners clay and the “20-Foot-clay,” where present, may act as local confining units, separating the Upper Glacial aquifer from the underlying Magothy aquifer which is the principal source of drinking water in Suffolk County. These clay layers extend throughout much of the south shore of Long Island and are likely present just south of the site.

1.5 Site Features

The project site elevation is approximately 50 feet above mean sea level and is generally level, with the exception of several earthen berms at the northern end of the property associated with the police firing range. The site is



developed with multiple warehouse and office buildings used by Suffolk County, 56 former BOMARC missile bunkers currently used for storage, and a police firing range. There are multiple unpaved parking areas throughout the property used as vehicle impound lots by Suffolk County

1.6 Current and Future Site Use

The site is currently utilized by Suffolk County as a police training facility/firing range, police impound lot, and county storage area. Significant changes in use of the site are not planned for the near future.

2.0 DESCRIPTION OF INTERIM REMEDIAL ACTION

Based upon the findings of the 2021 SCDHS UIC investigation, impacted soil/sediment is present within multiple UIC structures present at the subject property (see Section 1.3.2). This impact will be addressed through implementation of this IRM to provide protection to the public and environment.

On March 23, 2022, PWGC and SCDHS performed an inspection of the Site to identify the impacted UIC structures, as well as additional UIC structures that may require further evaluation.

Based on previous investigations and site reconnaissance, the IRM will consist of:

- Geophysical survey to identify potential UIC structures that have not yet been characterized.
- Collection of characterization samples from additional UIC structures identified by the geophysical survey (as needed).
- Investigation and remediation of former fireworks burn pits.
- Collection of waste characterization samples.
- Submittal of a Self-Implementing Cleanup Plan to the USEPA for the disposal of PCB wastes.
- Removal of impacted sediment and liquids from impacted UIC structures.
- Proper off-site disposal of the removed liquids and sediment.
- Preparation of a IRM Completion Report.

2.1 Geophysical Investigation

In order to evaluate whether additional UIC structures are present at the site and attempt to confirm discharge points of identified floor drains (e.g., S-16 and S-17), a geophysical investigation will be performed where accessible.

2.1.1 Electromagnetic Survey

The electromagnetic (EM) method uses the principle of electromagnetic induction to measure the variability of electrical conductivity of subsurface materials and the presence of buried metal objects. Significant contrasts in the electrical properties between non-indigenous materials and surrounding soil enable accurate delineation of buried waste materials, fill, and air spaces. The large EM response to metal makes this technique particularly

well suited to identifying buried metal objects such as underground storage tanks (USTs), metallic wastes, buried drums, pipelines, reinforced building foundations, or other metal components of buried structures.

A Geonics EM-61 high-resolution time domain metal detector, or equivalent, will be used to conduct the first phase of the investigation. The EM-61 is used to detect both ferrous and non-ferrous metals buried in the upper 10 feet of the subsurface. A powerful transmitter generates a pulsed primary magnetic field, which induces eddy currents in nearby metal objects. The decay of these currents is measured by upper and lower receiver coils mounted in the coil assembly. The responses are recorded and displayed by an integrated data logger as two-channel information. The bottom channel is more sensitive to metallic objects in the shallow (upper few feet) subsurface, and the differential response is more sensitive to metal objects from 3 to 10 feet below ground surface. The EM-61 can detect a single 55-gallon drum at a depth of more than 10 feet beneath the instrument, yet it is relatively insensitive to interference from nearby surface metal such as fencing, buildings, and automobiles. The instrument is pulled along the ground surface by a single operator, and measurements are collected at desired intervals along the ground surface. The terrain at the site may limit the areas where the EM-61 survey can be completed.

A survey of the area will also be performed using a hand held split-box metal detector (Fisher Model TW-6, or equivalent). The TW-6 is a split-box electromagnetic metal detector that is very sensitive to near surface ferrous metal objects and is very useful in detecting the surface expression of subsurface ferrous objects. This instrument is commonly used to identify buried storage tanks and other metallic objects.

Anomalies detected during the EM surveys will be marked on the ground and further investigated using ground-penetrating radar (GPR).

2.1.2 Ground Penetrating Radar Survey

The GPR survey will be performed in areas of anomalies detected by the EM survey. The GPR method is based upon the transmission of repetitive, radio-frequency electromagnetic (EM) pulses into the subsurface. When the transmitted energy of down-going wave contacts an interface of dissimilar electrical character, part of the energy is returned to the surface in the form of a reflected signal. This reflected signal is detected by a receiving transducer and is displayed on the screen of the GPR unit as well as being recorded on the internal hard-drive.

The received GPR response remains constant as long as the electrical contrast between media is present and constant. Lateral or vertical changes in the electrical properties of the subsurface result in equivalent changes in the GPR responses. The system records a continuous image of the subsurface by plotting two-way travel time of the reflected EM pulse versus distance traveled along the ground surface. Two-way travel time values are then converted to depth using known soil velocity functions. Each radar profile will be examined for characteristic GPR signatures that may indicate the presence of buried targets.

Following the geophysical survey, characterization samples will be collected from additional UIC structures and/or floor drain discharge points identified during the survey (as needed).

2.2 Additional Characterization of UIC Structures

Additional UIC structures identified during the geophysical survey that are connected to structures previously identified as impacted and have not been previously sampled by SCDHS OPC, will be characterized in accordance with SCDHS UIC Program procedures. Samples will be collected using a properly decontaminated stainless-steel hand auger and analyzed as follows:

- VOCs by USEPA Method 8260 (SCDHS List)
- SVOCs by USEPA Method 8270 (SCDHS List)
- Metals by USEPA Method 6010/7471 (SCDHS List)
- PCBs by USEPA Method 8082

2.3 Investigation of the Former Burn Pits

Two former concrete fireworks burn pits (~10-feet x 10 feet x 10 feet) were situated on the northwestern portion of the property. The burn pits were utilized to dispose of illegal fireworks in a safe manner. The Suffolk County Department of Public Works (SCDPW) reportedly removed the burn pits and backfilled the area. However, it is unknown if the concrete bottom was removed and if any subsurface impacts were identified. An investigation to determine the location and condition of the former fireworks burn pits will be performed utilizing an excavator (or similar).

Potentially impacted soils (e.g., exhibiting staining or olfactory evidence of impact) encountered during investigation of the fireworks burn pits will be stockpiled in accordance with the methodology specified in Section 3.1.2 for characterization and offsite disposal (as needed).

Characterization samples will be collected from beneath each of the former fireworks burn pits to evaluate whether impact is present and additional soil removal is necessary. Samples will be collected using a properly decontaminated stainless-steel hand auger and analyzed as follows:

- VOCs by USEPA Method 8260 (SCDHS List)
- SVOCs by USEPA Method 8270 (SCDHS List)
- Metals by USEPA Method 6010/7471 (SCDHS List)
- PCBs by USEPA Method 8082

2.4 Waste Characterization Sampling

Waste characterization will be performed by collecting soil/sediment and/or liquid samples from UIC structures containing impact exceeding SCDHS Action Levels and/or NYSDEC UUSCOs (for PCBs). Sample analysis will be as specified by the requirements of the disposal facility's (to be determined) waste acceptance criteria. After the results of the analysis are complete, the remediation contractor will prepare the necessary forms for submittal to the waste disposal/treatment facility. Forms will then be submitted to the waste disposal facility for evaluation and final approval. Analysis for waste characterization will be provided in a results-only format.

Copies of waste characterization results and waste profiles submitted to the selected disposal facility(ies), as well as waste approvals will be provided to NYSDEC for review prior to the start of remedial activities.

2.5 Self-Implementing Cleanup Plan

Following completion of additional characterization sampling and waste characterization sampling as described in Sections 2.2, 2.3 and 2.4, a Self-Implementing Cleanup Plan (SICP) will be prepared in accordance with Title 40 of the Code of Federal Regulations (40 CFR) Part 761.61. The SICP will detail the proposed cleanup, disposal requirements and verification sampling required to document remediation of PCB impacted wastes. In accordance with 40 CFR Part 761.61, the SICP will be submitted to USEPA at least 30 calendar days prior to the start of cleanup activities.

2.6 Remedial Activities

2.6.1 UIC Structures

Remediation of UIC structures will include the removal of impacted sludge/sediment from the base of impacted structures until visibly clean, native material is encountered, until additional sediment removal is limited by access and/or structural concerns, or a solid bottom is encountered. Standing liquids, if present will be removed utilizing a pump truck prior to sludge/sediment removal.

2.6.2 Floor Drains

The concrete slab will be saw cut around the floor drains in order to remove subsurface soil. Remediated soil will be remediated via hand tools and/or guzzler and properly staged onsite in 55-gallon drums and/or stockpiled in accordance with the methodology specified in Section 3.1.2 in preparation of waste characterization sampling and offsite disposal.

2.6.3 Former Fireworks Burn Pits

In the event that investigation of the former fireworks burn pits identifies impact exceeding regulatory standards beneath the pits, impacted soils will be removed utilizing an excavator (or similar) until acceptable confirmatory endpoint samples (see Section 2.6.4) are obtained. Impacted soils will be stockpiled in accordance with the methodology specified in Section 3.1.2. in preparation of waste characterization sampling and offsite disposal.

2.6.4 Verification Sampling

Following completion of remedial activities, confirmatory endpoint samples to verify the effectiveness of remediation will be collected as follows:

- UIC structures – one three-point composite sample from the base of the remediated structure. Solid bottom (non-leaching) UIC structures will not require confirmatory sampling.
- Floor drains – one grab sample from the base of each floor drain excavation.
- Former fireworks burn pits – one bottom sample per 900 square feet of bottom area, and one sample from the base of each sidewall.

Verification sample analysis will be limited to the suite of analytes that exceeded regulatory standards prior to remediation.

2.6.5 Waste Disposal

Contaminated soil, sludge/sediment, and liquids will be transported off-site to a permitted facility(ies) for disposal in accordance with local, state, and federal regulations. If liquids are present within the structures to be remediated, they will be removed and disposed of prior to soil/sediment disposal (as necessary).

Offsite transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

2.7 Reporting

2.7.1 IRM Completion Report

An IRM Completion Report will be prepared and submitted to the NYSDEC following completion of remedial activities. The Report will detail:

- Summary of previous investigations and findings.
- Summary of IRM and findings.
- Description of Remedial Action Performed.
- Laboratory data for characterization samples, waste characterization and endpoint samples.
- Copies of waste approvals and waste manifests.

3.0 ENGINEERING SPECIFICATIONS AND CONTROLS

3.1 Engineering Specifications

3.1.1 Mobilization and Site Preparation

Mobilization will include the delivery of equipment and materials to the site. Site workers will receive site orientation and training in accordance with the site-specific Health and Safety Plan, Community Air Monitoring Plan and established policies and procedures to be followed during the implementation of the Interim Remedial Measure. The remediation contractor and all associated subcontractors will each receive a copy of the IRM Work Plan, Site Specific HASP and CAMP and will be briefed on their contents.

Site security will be maintained by utilizing construction and/or safety fencing around open excavations (as needed) and the existing facility perimeter fence.

3.1.2 Soil Stockpile Area Construction and Maintenance

In the event that excavated soils will be stockpiled on site prior to disposal, stockpiles will be confined to a designated area (to be determined). The preferred method for storing soils on site will be in roll-off containers, covered with polyethylene sheeting, and/or DOT approved 55-gallon drums. Should it be necessary to stockpile soils on the ground, the stockpile area will be lined with 20-mil polyethylene sheeting and surrounded by a silt fence. Stockpiled material will be covered with 20-mil polyethylene sheeting and secured until it is removed from the site.

3.1.3 Soil/Sludge/Sediment Disposal

Excavated soil/sludge/sediment will be sampled in accordance with the procedures described under Section 2.4 of this document to meet the waste acceptance criteria of the disposal facility. Impacted material sediment to be removed from the site will be transported in one of the following:

- Guzzler truck
- Roll off container
- Dump truck/dump trailer
- 55-gallon drums.

Loading will be performed with a back-hoe, excavator, or other appropriate equipment. Loaded containers will be covered with a tarp.

3.1.4 Liquid Disposal

Liquids pumped from UIC structures, if present, will be sampled in accordance with the procedures described under Section 2.4 of this document to meet the waste acceptance criteria of the disposal facility. During remedial activities, liquid wastes will be pumped directly into a tanker truck (or equivalent) for transport to the disposal facility.

3.1.5 Backfill and Site Restoration

Following removal of impacted soils, excavated areas will be backfilled with clean fill, as needed. Clean fill, as defined by 6NYCRR Part 360, may be brought in from off-site to backfill the excavations and will be in compliance with Section 5.4(e) of the Division of Environmental Remediation's *Draft DER-10 – Technical Guidance for Site Investigation and Remediation* (December 2010). The NYSDEC will be consulted, and must approve in advance, the return of excavated soil and the use of off-site fill.

3.1.6 Demobilization

Following the completion of interim remedial activities at the site, equipment and remedial structures will be dismantled and removed from the site. Solid wastes generated during IRM activities (i.e., polyethylene sheeting) will be properly disposed of.

3.2 Engineering Controls

3.2.1 Dust Suppression

Dust generation from IRM activities will be monitored as described under Section 4.0. If dust generation approaches action levels, suppression will be accomplished by one or more of the following:

- Covering/capping exposed soil area with mulch, rubber mats, etc.
- Wetting equipment and excavations;
- Water spray dust suppression;
- Hauling materials in properly covered containers; and,
- Restricting vehicle speeds to 10 mph.

Atomizing sprays will be used to prevent overly wet conditions, conserve water, and offer an effective means of suppressing fugitive dust. Whenever possible, impacted soils will be loaded directly into trucks for immediate off-site disposal.

3.2.2 Odor Control

In the event that odor suppression becomes necessary, techniques to be implemented for control of odors from stockpiled soil or from the open excavation will include one or more of the following:

- Cover stockpiled/exposed contaminated soil with plastic sheeting and/or tarps.
- Limit working hours to favorable wind and temperature conditions

3.2.3 Sediment and Erosion Control

Erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff will be placed to protect the excavation work and adjacent areas during excavation activities, if necessary. Storm water control measures, such as straw hay bales or silt fence, will be utilized during excavation activities to prevent storm water runoff from impacting excavation areas and soil stockpiles.

Straw bales and/or silt fence may be placed at locations up gradient of excavation areas to minimize water flow and soil from entering excavations, and down gradient of excavation areas, where possible, to prevent soil from the excavations from migrating to other areas of the site.



4.0 MONITORING AND MAINTENANCE

4.1 Construction Phase Monitoring

Monitoring during sediment removal will be performed to protect the health of site workers and the surrounding community. A Health and Safety Plan (HASP) has been developed for this project. This plan specifies the monitoring procedures, action levels, and contingency measures that are required to protect public health and site workers. In addition, a community air monitoring will be performed in accordance with the NYSDOH Generic Community Air Monitoring Plan (CAMP) specified in Appendix 1A of Division of Environmental Remediation's *Draft DER-10 – Technical Guidance for Site Investigation and Remediation* (December 2010). Generally, air monitoring would include real-time measurement of volatile emissions and dust levels.

4.2 Waste Characterization

Waste characterization will be performed by collecting samples of sediment and liquid removed during the IRM as specified in Section 2.4. Sample analysis will be as specified by the requirements of the disposal facility's (to be determined) waste acceptance criteria.

Copies of waste characterization results and waste profiles submitted to the selected disposal facility(ies), as well as waste approvals will be provided to NYSDEC for review prior to the start of remedial activities.

5.0 QUALITY ASSURANCE PROJECT PLAN

This Quality Assurance Project Plan (QAPP) presents the objectives, functional activities, methods, and QA/QC requirements associated with sample collection and laboratory analysis for characterization activities. The QAPP follows requirements detailed in DER-10, Section 2.

5.1 Laboratory Analysis

Requirements for sample analysis are described below. All samples will be submitted to a NYSDOH ELAP certified laboratory (Alpha Analytical) for analysis. Analytical methods, preservation, container requirements, and holding times are summarized below:

ANALYTICAL METHODS (SOIL)

Analyte/ Analyte Group	Matrix	Method/ SOP	Container(s) (number, size & type per sample)	Preservation	Preparation Holding Time	Analytical Holding Time	Estimated Number of Samples to be Collected
TAL Metals	Soil	EPA 6010C	1 x 2 oz, glass	Metals ex	6 months	6 months	10 to 12
TCL VOCs	Soil	EPA 8260C	3 x 40 ml VOA, glass vial	1 x Methanol 2 x DI H ₂ O Cool ≤ 6 °C	48 hours	14 Days	23 to 31
TCL SVOCs	Soil	EPA 8270D	1 x 8 oz, glass	Cool ≤ 6 °C	14 days	40 days	16 to 24
PCBs	Soil	EPA 8082A	1 x 8 oz, glass	Cool ≤ 6 °C	14 days	40 Days	10 to 12

5.1.1 Soil Samples

Characterization and confirmatory endpoint soil samples will be collected as described in Section 2.0. Analysis will conform to NYSDEC Analytical Services Protocol (ASP) Category B data deliverables in accordance with NYSDEC DER-10, Appendix 2B, 1.0 (b), including calibration standards, surrogate recoveries, and chromatograms.

Waste characterization sample analysis will conform to NYSDEC ASP Category A data deliverables, unless otherwise required by the disposal facility(ies).

5.2 Field/Laboratory Data Control Requirements

Quality Control (QC) procedures will be followed in the field and at the laboratory to facilitate that reliable data are obtained. When performing field sampling, care shall be taken to prevent the cross-contamination of sampling equipment, sample bottles, and other equipment that could compromise sample integrity. QC samples will include the following:

- Blind Duplicates – one per 20 environmental samples for each matrix sampled.
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) - one per 20 environmental samples for each matrix sampled.
- Equipment Blank – one per day for each matrix sampled.
- Trip Blank – one per day.

ESTIMATED QA/QC SAMPLE FREQUENCY

QA/QC Sample Type	Est. Total Soil Samples	Est. Days of Soil Sampling	Est. Total Soil QA/QC Samples
Blind Duplicate	7	1	1
MS/MSD	7	1	1
Equipment Blank	7	1	1
Trip Blank	7	1	1

QA/QC sample analysis will conform to NYSDEC ASP Category B data deliverables in accordance with NYSDEC DER-10, Appendix 2B, 1.0 (b), including calibration standards, surrogate recoveries, and chromatograms.

QA/QC sample analysis will not be performed on waste characterization samples unless otherwise required by the disposal facility(ies).

5.3 Sample Identification

Each sample will be identified with a set of information relating individual sample characteristics. Required information consists of Sample Designation, Depth, Date, Time, and Matrix. Examples of sample IDs are shown below.

- UIC001 – UIC Structure Sample

Sample frequency, locations, depths, and nomenclature may change subject to field decisions and professional judgment.

5.4 Chain-of-Custody, Sample Packaging and Shipment

Each day that samples are collected, a chain-of-custody/request for analysis form will be completed and submitted to the laboratory with samples to be analyzed. A copy of the chain-of-custody will be retained by the Project Manager. The chain-of-custody will include the project name, sampler's signature, sample IDs, date and time of sample collection, and analysis requested.

Samples will be packaged and shipped in a manner that maintains sample preservation requirements during transport (i.e., ice to keep samples cool until receipt at the laboratory), ensures that sample holding times can be achieved by the laboratory, and prevents samples from being tampered with.

If a commercial carrier ships samples, a bill of lading (waybill) will be used as documentation of sample custody. Receipts for bills of lading and other documentation of shipment shall be maintained as part of the permanent custody documentation. Commercial carriers are not required to sign the chain-of-custody as long as it is enclosed in the shipping container and evidence tape (custody seal) remains in place on the shipping container.

5.5 Data Usability and Validation

The main purpose of the data is for use in defining the extent of contamination at the site, to aid in evaluation of potential human health and ecological exposure assessments, and to support remedial action decisions. Based upon this, data usability and validation will be performed as described below. Complete data packages will be archived in the project files, and if deemed necessary additional validation can be performed using procedures in the following sections.

Data validation will not be performed on waste characterization samples unless otherwise required by the disposal facility(ies).

5.5.1 Data Usability and Validation Requirements

Data usability and validation are performed on analytical data sets, primarily to confirm that sampling and chain-of-custody documentation are complete, sample IDs can be tied to specific sampling locations, samples were analyzed within the required holding times, and analyses are reported in conformance with NYSDEC ASP, Category B data deliverable requirements as applicable to the method utilized.

5.5.2 Data Usability and Validation Methods

A designee of the PWGC Project Manager will complete a data usability evaluation for the data collected during the RI and a data usability summary report (DUSR) will be prepared. The DUSR will be prepared in accordance with NYSDEC DER-10, Appendix 2B.

Independent third-party data validation will be performed on 5% of the sample data, or on one sample from each sample delivery group (SDG), whichever is greater. Data validation will be performed by a qualified subcontractor independent of the project.

5.6 Field Equipment Calibration

Equipment will be inspected and approved by the Field Team Leader before being used. Equipment will be calibrated to factory specifications, if required. Monitoring equipment will be calibrated following manufacturers recommended schedules. Daily field response checks and calibrations will be performed as necessary (i.e. PID calibrations) following manufacturers standard operating procedures. Equipment calibrations will be documented in a designated field logbook.

5.7 Equipment Decontamination

In order to minimize the potential for cross-contamination, non-dedicated drilling and sampling equipment shall be properly decontaminated prior to and between sampling/drilling locations.

5.7.1 General Procedures

Drilling equipment will be decontaminated in a designated area. Sampling equipment and probes will be decontaminated in an area covered with plastic sheeting near the sampling location. Waste material generated during decontamination activities will be containerized, stored and disposed of in accordance with the procedures detailed in Section 5.9. Decontamination of sampling equipment shall be kept to a minimum, and wherever possible, dedicated sampling equipment shall be used. Personnel directly involved in equipment decontamination shall wear appropriate personal protective equipment (PPE).

5.7.2 Sampling Equipment

Sampling equipment (i.e., trowels, knives, split-spoons, bowls, hand augers, etc...) will be decontaminated prior to each use as follows:

- Laboratory-grade glassware detergent and tap water scrub to remove visual contamination
- Generous tap water rinse
- Distilled water rinse

5.7.3 Meters and Probes

All meters and probes that are used in the field (other than those used solely for air monitoring purposes, e.g., PID meters) will be decontaminated between uses as follows:

- Laboratory-grade detergent and tap water solution wash
- Tap water rinse
- Distilled water rinse (triple rinse)

5.8 Field Documentation

Documentation will take place on either appropriate forms or in a dedicated site logbook. Permanent black or blue ink will be used to record information in the logbook. Errors in field documentation will be lined through, initialed, dated, and corrected. Forms will be kept by the PWGC Field Team Leader during the field activities. Field activities will be documented in the field logbook. The logbook will contain waterproof pages that are consecutively numbered and be permanently bound with a hard cover. Upon completion of daily activities, unused portions of pages will be lined-through and initialed.



The primary purpose of the field logbook is to document the daily field activities and to provide descriptions of each activity. All entries in the field logbook will be recorded and dated by person making the entry.



6.0 HEALTH AND SAFETY PLAN

The Health and Safety Plan (HASP) takes into account the specific hazards inherent to the site and presents the minimum requirements which are to be met by PWGC, its subcontractors, and other on-site personnel in order to avoid and, if necessary, protect against health and/or safety hazards. A HASP has been prepared and is provided in **Appendix A**.

PWGC sub-contractors will have the option of adopting this HASP or developing their own site-specific document. If a subcontractor chooses to prepare their own HASP, it must meet the minimum requirements as detailed in the site HASP prepared by PWGC and must be made available to PWGC and NYSDEC.

Activities performed under the HASP will comply with applicable parts of OSHA Regulations, primarily 29 CFR Parts 1910 and 1926, and the PWGC Corporate Environmental Health and Safety policy. Modifications to the HASP may be made with the approval of the PWGC Health and Safety Manager (HSM) and/or Project Manager (PM).



7.0 COMMUNITY AIR MONITORING PLAN

Community air monitoring provides measures for protection of the downwind community (i.e., off-site receptors including residences, businesses, and on-site workers not directly involved in the remedial work) from potential airborne contaminant releases resulting from remedial activities.

Community air monitoring will be performed in accordance with the NYSDOH Generic Community Air Monitoring Plan (CAMP) specified in Appendix 1A of Division of Environmental Remediation's *Draft DER-10 – Technical Guidance for Site Investigation and Remediation* (December 2010). The action levels specified require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that the remedial work did not spread contamination off-site through the air.



8.0 REFERENCES

6 NYCRR Part 375 – Environmental Remediation Programs, December 2006

NYSDEC, Division of Environmental Restoration, May 2004, Draft Brownfield Program Cleanup Guide.

NYSDEC, Division of Environmental Restoration, December 2002, Draft DER-10, Technical Guidance for Site Investigation and Remediation.

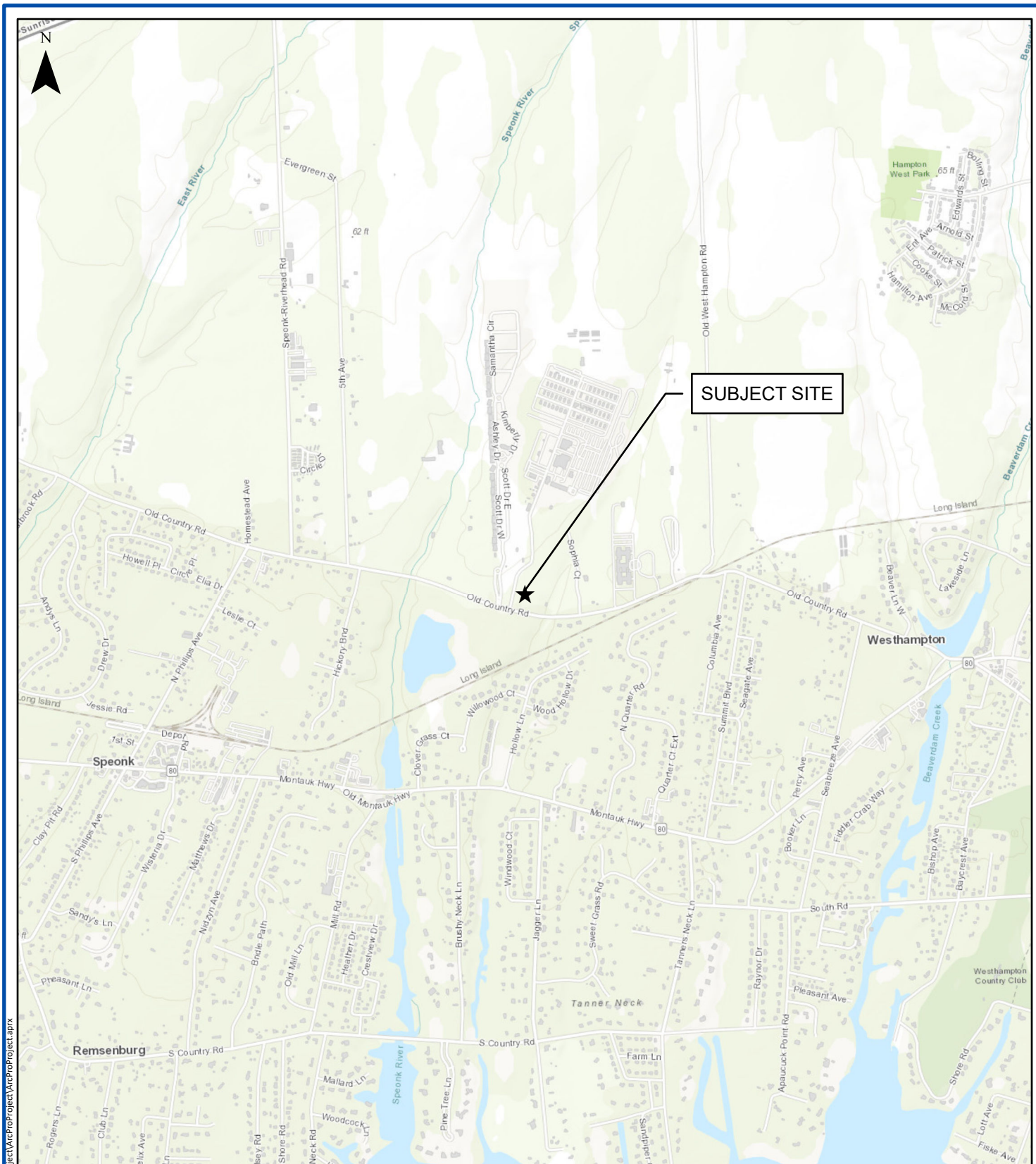
NYSDEC, Division of Technical and Administrative Guidance, October 27, 1989, Memorandum #4031 - Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites.

PWGC, UIC Structure Sampling and Remediation, January 2014.

SCDHS, UIC Data Summary and UIC Remedial Cost Estimate, August 12, 2021.

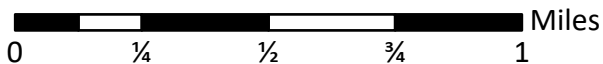


FIGURES



SITE LOCATION

98 Old Country Road
Westhampton, NY



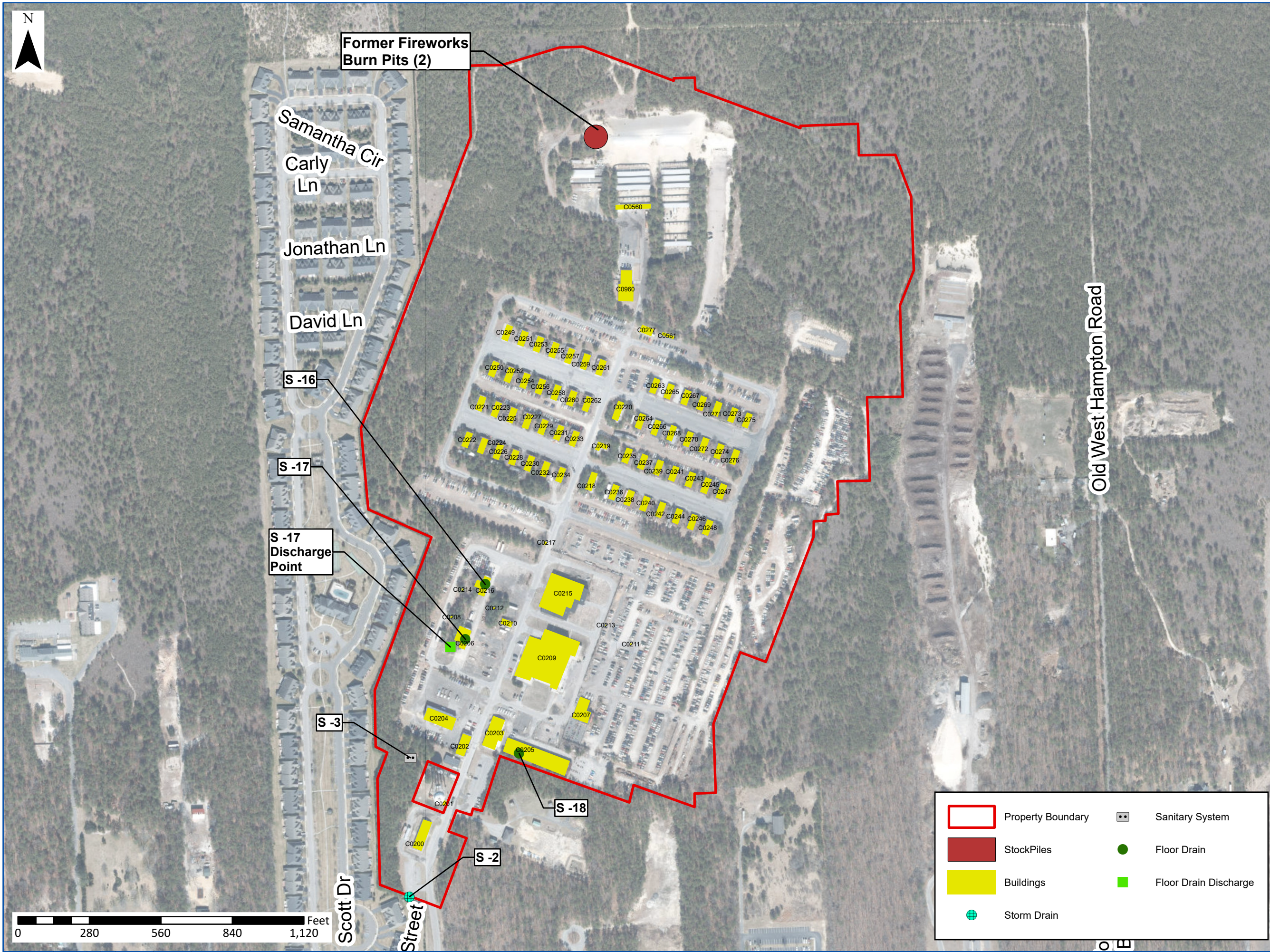
Project:	SHD2201
Date:	4/4/2022
Designed by:	JP
Drawn by:	OA
Approved by:	JP
Figure No:	1



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REVISION	DATE	INITIAL	COMMENTS

DRAWING INFORMATION:

Project:	SHD2201	Designed by:	JP
Date:	4/6/2022	Drawn by:	OA
Scale:	AS SHOWN	Approved by:	JP

**IMPACTED
UIC
STRUCTURES**

98 Old Country Road
Westhampton, NY

FIGURE NO:



APPENDIX A HEALTH AND SAFETY PLAN

**BOMARC SITE
100 OLD COUNTRY ROAD
WESTHAMPTON, NEW YORK
NYSDEC SITE: 152262**

HEALTH AND SAFETY PLAN

SUBMITTED TO:



New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, NY 12233-7016

PREPARED FOR:

Suffolk County
H. Lee Dennison Building
Hauppauge, New York 11788

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PWGC Project Number: SHD2201

MAY 2022

P.W. GROSSER CONSULTING, INC.
PROJECT No. SHD2201

HEALTH AND SAFETY PLAN

BOMARC Site
100 Old Country Road
Westhampton, New York
Site No.: 152262

SUBMITTED:

August 2022

PREPARED FOR:

New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, New York 12233

ON BEHALF OF:

Suffolk County
H. Lee Dennison Building
Hauppauge New York 11788

PREPARED BY:

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HEALTH AND SAFETY PLAN
BOMARC SITE
100 OLD COUNTRY ROAD
WESTHAMPTON, NEW YORK
SITE NO.: 152262

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APPENDIX D	HEAT AND COLD STRESS SAFETY
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STATEMENT OF COMMITMENT

This Health and Safety Plan (HASP) has been prepared to ensure that workers are not exposed to chemical, biological and physical hazards during the planned Interim Remedial Measure (IRM) to be performed at the site known as the BOMARC Site located at 100 Old Country Road, Westhampton, New York. P.W. Grosser Consulting Inc.'s (PWGC's) policy is to minimize the possibility of work-related exposure through awareness and qualified supervision, health and safety training, medical monitoring, use of appropriate personal protective equipment, and the following activity specific safety protocols contained in this HASP. PWGC 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 persons present at the site actually or potentially exposed to safety or health hazards, describes emergency response procedures for actual and potential physical, biological and chemical hazards. This HASP is also intended to inform and guide personnel entering the work area or exclusion zone. Persons are to acknowledge that they understand the potential hazards and the contents of this Health and Safety policy.

1.0 INTRODUCTION AND SITE ENTRY REQUIREMENTS

This document describes the health and safety guidelines developed by P.W. Grosser Consulting, Inc. (PWGC) at the request of Suffolk County for the proposed IRM to be performed at the Site to protect on-site personnel, visitors, and the public from exposure to hazardous materials or wastes. In accordance with the Occupational Safety and Health Administration (OSHA) 29 CFR Part 1910.120 Hazardous Waste Operations and Emergency Response Final rule, this HASP, including the attachments, addresses safety and health hazards relating to this phase of site operations and is based on the best information available. The HASP may be revised by PWGC at the request of Suffolk County upon receipt of new information regarding site conditions. Changes will be documented by written amendments.

1.1 Site Safety Plan Acceptance, Acknowledgement and Amendments

The project manager and the site safety officer are responsible for informing personnel entering the work area of the contents of this plan and ensuring that each person signs the safety plan acknowledging the on-site hazards and procedures required to minimize exposure to adverse effects of these hazards. A copy of the Acknowledgement Form is included in **Appendix A**.

Site conditions may warrant an amendment to the HASP. Amendments to the HASP are acknowledged by completing forms included in **Appendix B**.

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 on-site personnel understand the site conditions and operating procedures and to address safety questions and concerns. Meeting minutes and attendance will be recorded. Project staff will discuss and remedy health and safety issues at these meetings.

1.3 Key Personnel – Roles and Responsibilities

The following key personnel are planned for this project:

- Project Manager (PM)
- Site Safety Officer (SSO)

The project manager is responsible for overall project administration and, with guidance from the site safety officer, for supervising the implementation of this HASP. 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, then the project manager will be consulted.

The Site Safety Office is responsible for the following:

1. Educating personnel about information in this HASP and other safety requirements to be observed during site operations, including, but not limited to, designation of work zones and levels of protection and emergency procedures dealing with fire and first aid.
2. Coordinating site safety decisions with the project manager.
3. Monitoring the condition and status of known on-site hazards specified in this HASP.
4. Maintaining the work zone entry/exit log and site entry/exit log.
5. Maintaining records of safety problems, corrective measures and documentation of 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).

The 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.

2.0 SITE BACKGROUND AND SCOPE OF WORK

The Site is identified in the Suffolk County Tax Map as: 0900-331.00-01.00-Lot Nos. 001.100, and 002.000 through 015.000. The Site measures approximately 186 acres in size and is located to the north of Old Country Road and west of Old Westhampton Road. The property includes 56 structures which originally housed BOMARC missiles, along with other structures utilized by Suffolk County. Large parking lots are also present at the site along with a shooting range. The Site is bounded to the north by undeveloped pine barrens, to the east by commercial/industrial land uses, to the south by Old Country Road, and to the west by recent residential development.

The former BOMARC Missile Base was operated by the US Air Force as one of 10 BOMARC facilities protecting the east coast from a potential Soviet air attack from 1959 until it was decommissioned in 1964. Fifty-six nuclear-tipped missiles were located at this facility which utilized tritium and required frequent maintenance (every 90 days). After decommissioning, the property was turned over to Suffolk County as surplus property in the 1960s.

Volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), heavy metals and/or polychlorinated biphenyls (PCBs) were identified in bottom sediments or surficial soils associated with underground injection control (UIC) structures or discharge points in contravention of their regulatory standards. In order to prevent the discharge of VOCs, SVOCs, heavy metals and PCBs into the subsurface, contaminated sediment and soils will be removed and transported off-site for disposal.

3.0 POTENTIAL HAZARDS OF THE SITE

This section presents an assessment of the chemical, biological, and physical hazards that may be encountered. Additional information can be found in **Appendix C** - Safety Data Sheets.

3.1 Chemical Hazards

Review of historical information from the site indicates that the VOCs, SVOCs, heavy metals, and PCBs were detected above their respective Suffolk County Department of Health Services (SCDHS) Action Levels and/or New York State Department of Environmental Conservation (NYSDEC) unrestricted use soil cleanup objectives (UUSCOs) in sediment and surficial soil at the site. These compounds may present an occupational exposure hazard during site operations.

The chemicals identified above may have fetal effects and effects on the eyes, skin, respiratory tract, kidneys, liver, central nervous system, and reproductive organs. Acute exposure symptoms may include skin and eye irritation, nausea, headache, shortness of breath, muscle weakness, abdominal pain, mood swings, central nervous system depression, vomiting, lung damage and liver damage. Specific information on the chemicals identified at the Site can be found in Table 5-1 as well as on the Safety Data Sheets found in **Appendix C**.

Table 5-1
Chemical Hazards

COMPOUND	CAS#	TLV	ROUTES OF EXPOSURE	SYMPTOMS OF EXPOSURE	TARGET ORGANS	PHYSICAL DATA
Benzene	71-43-2	0.5 ppm	Inhalation Ingestion Skin/Eye	Short Term: Sore throat, redness and pain on skin, redness, eye irritation, dizziness, headache, abdominal pain, nausea, vomiting and diarrhea. Long Term: Causes damage to organs through prolonged or repeated exposure. May cause cancer and genetic defects.	Respiratory tract, eyes and skin	Clear liquid
Benzo(b)fluoranthene	205-99-2	50 ppm	Inhalation Ingestion Skin/Eye	Harmful if swallowed. Causes skin irritation, serious eye irritation. May cause cancer or respiratory irritation.	Respiratory tract, eyes and skin	Colorless liquid
Chrysene	218-01-9	0.2 mg/m ³	Inhalation Ingestion Skin/Eye	May cause eye irritation, skin irritation, gastrointestinal irritation with nausea, vomiting and diarrhea, and respiratory tract irritation. Chronic exposure may cause cancer.	Liver and skin	Light beige solid
Barium	7440-39-3	0.2 mg/m ³	Inhalation Ingestion Skin/Eye	Eye irritation, muscular stimulation, skin irritation, and gastrointestinal irritation. Not classifiable as a human carcinogen.	Respiratory tract, eyes and skin	Grey solid pieces
Cadmium	7440-43-9	0.01 mg/m ³	Inhalation Ingestion Skin/Eye	Fatal if inhaled and harmful if swallowed or in contact with skin. May cause respiratory irritation, genetic defects, and cancer. Suspected of damaging fertility, unborn child, and organs through prolonged or repeated exposure.	Respiratory track and kidneys	Silver solid

COMPOUND	CAS#	TLV	ROUTES OF EXPOSURE	SYMPTOMS OF EXPOSURE	TARGET ORGANS	PHYSICAL DATA
Chromium	7440-47-3	0.5 mg/m ³	Inhalation Ingestion Skin/Eye	Irritation to upper respiratory tract, skin, and eyes. Digestive disorders, lung damage, kidney damage, tearing, vomiting, stomach pain and dizziness.	Kidneys, lungs, liver, and upper respiratory tract.	Silver-white to grey solid
Copper	7440-50-8	0.2 mg/m ³	Inhalation Ingestion Skin/Eye	Short Term: Irritation, nausea, headache and shortness of breath. Long Term: chronic copper poisoning including hepatic cirrhosis, brain damage and demyelination, Wilson's disease, hemolytic anemia and arteriosclerosis. Inhalation of fumes may cause fume fever.	Brain and kidneys	Red-to-brown solid
Lead	7439-92-1	0.5 mg/m ³	Inhalation Ingestion Skin/Eye	Short Term: Pain, muscle weakness, paraneesthesia, abdominal pain, nausea, vomiting, diarrhea, constipation, poor appetite, weight loss, inflammation of the brain, hemolysis, and kidney damage. Long Term: Loss of short-term memory or concentration, depression, nausea, abdominal pain, loss of coordination, numbness and tingling in the extremities, fatigue, problems with sleep, headache, slurred speech, anemia, burton line, high blood pressure, mood disorders, reduced sperm count, miscarriage or premature birth.	Brain, kidneys, reproductive organs	Bluish-white, silver-grey solid

COMPOUND	CAS#	TLV	ROUTES OF EXPOSURE	SYMPTOMS OF EXPOSURE	TARGET ORGANS	PHYSICAL DATA
Mercury	7439-97-6	0.025 mg/m ³	Inhalation Ingestion Skin/Eye	Tremors, mood swings, insomnia, neuromuscular changes, headaches, disturbances in sensations, changes in nerve responses, poor performance on tests of mental function, and kidney and respiratory failure.	Central nervous system and kidneys	Silver liquid
Aroclor 1254	11097-69-1	0.001 mg/m ³	Inhalation Ingestion Skin/Eye	Short Term: central nervous system depression, headache, dizziness, nausea, vomiting, anorexia, incoordination and unconsciousness. Skin and eye Irritation, lung damage and liver damage. Long Term: rash, itching, hair loss, digestive issues, headache, dizziness, impotence, coma, reproductive effects, hyperactivity, menstrual disorders and cancer.	Central nervous system, lung, liver, kidneys and reproductive organs	Clear, yellow liquid

Abbreviations

C = Ceiling limit, not to be exceeded

CNS = Central Nervous System

TVL=Threshold limit values

ppm = parts per million

TWA = Time-weighted average (8 hours)

3.1.1 *Additional Chemical Hazards*

Based upon the presence of VOCs and SVOCs in onsite sediments and soils, there is the potential to come in contact with petroleum related VOC's and semi-VOC's given the past and existing storage of petroleum products and the nature of the activities at the site. Additionally, metals are commonly found in subsurface soils. For these reasons, specific information regarding the compounds most anticipated to be encountered can be found in the Safety Data Sheets in **Appendix C. Additional compounds will be added should sampling activities planned at the site document their presence.**

3.2 **Biological Hazards**

Work will be performed within vacant buildings and highly vegetated areas. During the project, there is potential for workers to come into contact with biological hazards such as animals, insects and plants.

3.2.1 *Animals*

The Site is located in a predominantly developed area is surrounded with undeveloped wooded areas. It is possible that deer, dogs, cats, rats and mice may be present. Workers shall use discretion and avoid all contact with animals.

3.2.2 *Insects*

Insects, such as mosquitoes, ticks, bees and wasps may be present during certain times of the year. Workers will be encouraged to wear appropriate repellents and PPE, if deemed necessary, when working in areas where insects are expected to be present.

During the months of April through October, caution must be exercised to minimize exposure to deer ticks and the potential for contracting Lyme disease. Given the nature of the compounds of concern, certain sampling equipment, field clothing and PPE should be avoided, if possible. Specific precautionary work practices that are recommended include the following:

- Cover your body as much as possible. Wear long pants and long-sleeved shirts. Light color clothing makes spotting of ticks easier.
- Try to eliminate possible paths by which the Deer Tick may reach unprotected skin. For example, tuck bottoms of pants into socks or boots and sleeves into gloves. (Duct tape may be utilized to help seal cuffs and ankles). If heavy concentrations of ticks or insects are anticipated or encountered, Tyvek coveralls may be utilized for added protection when the potential for heat stress is not a concern.

- Conduct periodic and frequent, (e.g., hourly), surveys of your clothing for the presence of ticks. Remove any tick, save it and report to the clinic with the tick.
- Certain types of Insect repellents may be used and are listed below.
 - Jason Natural Quit Bugging Me, Repel Lemon Eucalyptus Insect Repellent, Herbal Armor, California Baby Natural Bug Spray, BabyGanics.

3.2.3 *Plants*

Poison ivy, sumac and oak may be present on site. The PM/SSO should identify the susceptible individuals. Worker shall avoid all contact with these plants.

3.3 **Physical Hazards**

During the project, there is potential for workers to come into contact with physical hazards such as heat stress, cold stress, noise, fire and explosions.

3.3.1 *Temperature Extremes*

Heat Stress

Heat stress is a significant potential hazard, which is greatly exacerbated with the use of PPE in hot environments. The potential hazards of working in hot environments include dehydration, cramps, heat rash, heat exhaustion, and heat stroke.

Cold Stress

At certain times of the year, workers may be exposed to the hazards of working in cold environments. Potential hazards in cold environments include frostbite, trench foot or immersion foot, hypothermia as well as slippery surfaces, brittle equipment, and poor judgment.

PWGC's Heat/Cold Stress Protocols are specified in **Appendix D**.

3.3.2 *Noise*

Noise is a potential hazard associated with the operation of heavy equipment, guzzler, pumps and engines. Workers will wear hearing protection while in the work zone when these types of machinery are operating.

3.3.3 *Fire and Explosion*

When conducting excavation or drilling activities, the opportunity of encountering fire and explosion hazards may exist from encountering underground utilities, from the use of diesel engine equipment, propane, liquefied

petroleum gas and other potential ignition sources. During dry periods there is an increased chance of forest and brush fires starting at the job site. If these conditions occur no smoking will be permitted at the site and all operations involving potential ignition sources will be monitored continuously (fire watch).

3.3.4 *Manual Lifting/Material Handling*

Manual lifting of heavy objects may be required. Failure to follow proper lifting technique can result in back injuries and strains. Back injuries are a serious concern as they are the most common work place injury, often resulting in lost or restricted work time, and long treatment and recovery periods.

3.3.5 *Slips, Trips and Falls*

Working in and around the site will pose slip, trip and fall hazards due to slippery surfaces that may be oil covered, or from rough terrain, surfaces that are steep inclines, surfaced debris, or surfaces which are wet from rain or ice. Falls may result in twisted ankles, broken bones, head trauma or back injuries.

3.3.6 *Heavy Equipment Operation*

Guzzlers and pump trucks and an excavator/backhoe may be used to break up concrete excavate where required. Working with or near heavy equipment poses many potential hazards, including electrocution, fire/explosion, being struck by or against, or pinched/caught/crushed by, and can result in serious physical harm.

3.3.7 *Electrocution*

Encountering underground utilities may pose electrical hazards to workers. Additionally, overhead electrical lines can be a concern during drilling operations. Potential adverse effects of electrical hazards include burns and electrocution, which could result in death.

4.0 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) shall be selected in accordance with OSHA 29 CFR 1910.120(c), (g), and 1910.132. Protective equipment shall be NIOSH approved 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 true difference among the levels of protection from D through B is the addition of the type of respiratory protection. **It is anticipated that work will be performed in Level D PPE.**

4.1 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. Given the nature of the compounds of concern, certain sampling equipment, field clothing and PPE should be avoided, if possible. Level D PPE consists of:

- standard work uniform, coveralls, or tyvek, as needed;
- steel toe work that do not contain Gore-Tex. boots;
- hard hat;
- gloves, as needed;
- safety glasses;
- hearing protection;
- equipment replacements are available as needed.

4.2 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 PID, or equivalent), but are less than 5 ppm. 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. Given the nature of the compounds of concern, certain sampling equipment, field clothing and PPE should be avoided, if possible. Level C PPE consists of:

- chemical resistant or coated tyvek coveralls;
- steel-toe work boots that do not contain Gore-Tex;
- chemical resistant over boots 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; and,
- ankles/wrists taped with duct tape.

The site safety officer will verify if Level C is appropriate by checking organic vapor concentrations using compound and/or class-specific detector tubes.

4.3 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 PID, 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. Given the nature of the compounds of concern, certain sampling equipment, field clothing and PPE should be avoided, if possible. Level B PPE consists of:

- supplied air SCBA or airline system with five-minute egress system;
- chemical resistant coveralls;
- steel-toe work boots that do not contain Gore-Tex;
- chemical resistant over boots or disposable boot covers;
- disposable inner gloves;
- disposable outer gloves;
- hard hat; and,
- ankles/wrists taped.

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

5.0 AIR MONITORING

Air monitoring will be performed for protection for on-site workers and the downwind community (i.e., off-site receptors including residences, businesses, and on-site workers not directly involved in the remedial investigation work) from potential airborne contaminant releases resulting from remedial activities at the site. Air monitoring will be used to help to confirm that the remedial investigation work will not spread contamination off-site through the air. The primary concerns for this site are dust particulates and VOCs. Site monitoring with a photo-ionization detector (PID) and particulate dust/aerosol meter will be performed during any invasive activities.

Real-time monitoring for dust and VOCs will be conducted both within the work area, and along the site perimeter, during intrusive activities such as excavation and drilling activities.

Detailed information on the types, frequency and location of real-time monitoring and community air monitoring requirements are provided in the Community Air Monitoring Plan (CAMP) specified in Appendix 1A of *Division of Environmental Remediation's Draft DER-10 – Technical Guidance for Site Investigation and Remediation (December 2010)*.

6.0 TRAINING AND MEDICAL SURVEILLANCE

Site workers that have the potential of coming in contact with site contaminants will have the following training and medical surveillance

6.1 Annual Eight-Hour Refresher Training

Annual eight-hour refresher training will be required of site field personnel directly involved with site activities whom may come in contact with site contaminants. The training will cover a review of 1910.120 requirements and related company programs and procedures.

6.2 Medical Surveillance

Site field personnel directly involved with site activities whom may come in contact with site contaminants are required to have passed a complete medical surveillance examination in accordance with 29 CFR 1910.120(f).

7.0 CONTINGENCY PLAN/EMERGENCY RESPONSE PLAN

Site personnel must be prepared in the event of an emergency. Emergencies can take many forms: illnesses, injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in the weather.

Emergency telephone numbers and a map to the hospital (**Figure 1**) will be posted on-site. Site personnel should be familiar with the emergency procedures, and the locations of site safety, first aid, and communication equipment. These will be outlined in the site specific HASP.

7.1 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, in vehicles or office.
Fire extinguisher:	On-site, in office or on equipment.

7.2 Emergency Telephone Number

General Emergencies	911
Suffolk County Police	911
Peconic Bay Medical Center	1-631-548-6000
NYSDEC Spills Division	1-800-457-7362
NYSDEC Hazardous Waste Division	1-718-482-4994
Suffolk County Department of Health	1-631-854-0000
Westhampton Beach Fire Department	911
National Response Center	1-800-424-8802
Poison Control	1-212-340-4494
Project Manager	1-631-589-6353
Health & Safety Officer	1-631-589-6353
Alternate Health & Safety Officer	1-631-589-6353

7.3 Personnel Responsibilities during an Emergency

The project manager is primarily responsible for responding to and correcting any emergency situations. However, in the absence of the project manager, the site safety officer shall act as the project manager's on-site designee and perform the following tasks:

- Take appropriate measures to protect personnel;
- Ensure that 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. If toxic materials are released to the air, the local authorities should be informed in order to assess the need for evacuation;
- Ensure appropriate decontamination, treatment, or testing for exposed or injured personnel;
- Determine the cause of incidents and make recommendations to prevent recurrence; and,
- Ensure that all required reports have been prepared.

7.4 Medical Emergencies

A person who becomes ill or injured, first aid will be administered while waiting for an ambulance or paramedics. A Field Accident Report (**Appendix E**) must be filled out for any injury.

A person transporting an injured/exposed person to a clinic or hospital for treatment will take the directions to the hospital and information on the chemical(s) to which they may have been exposed.

7.5 Fire or Explosion

In the event of a fire or explosion, the local fire department will be summoned immediately. The site safety officer or his designated alternate will advise the fire commander of the location, nature and identification of the hazardous materials on-site. If it is safe to do so, site personnel may:

- use firefighting equipment available on site; or,
- remove or isolate flammable or other hazardous materials that may contribute to the fire.

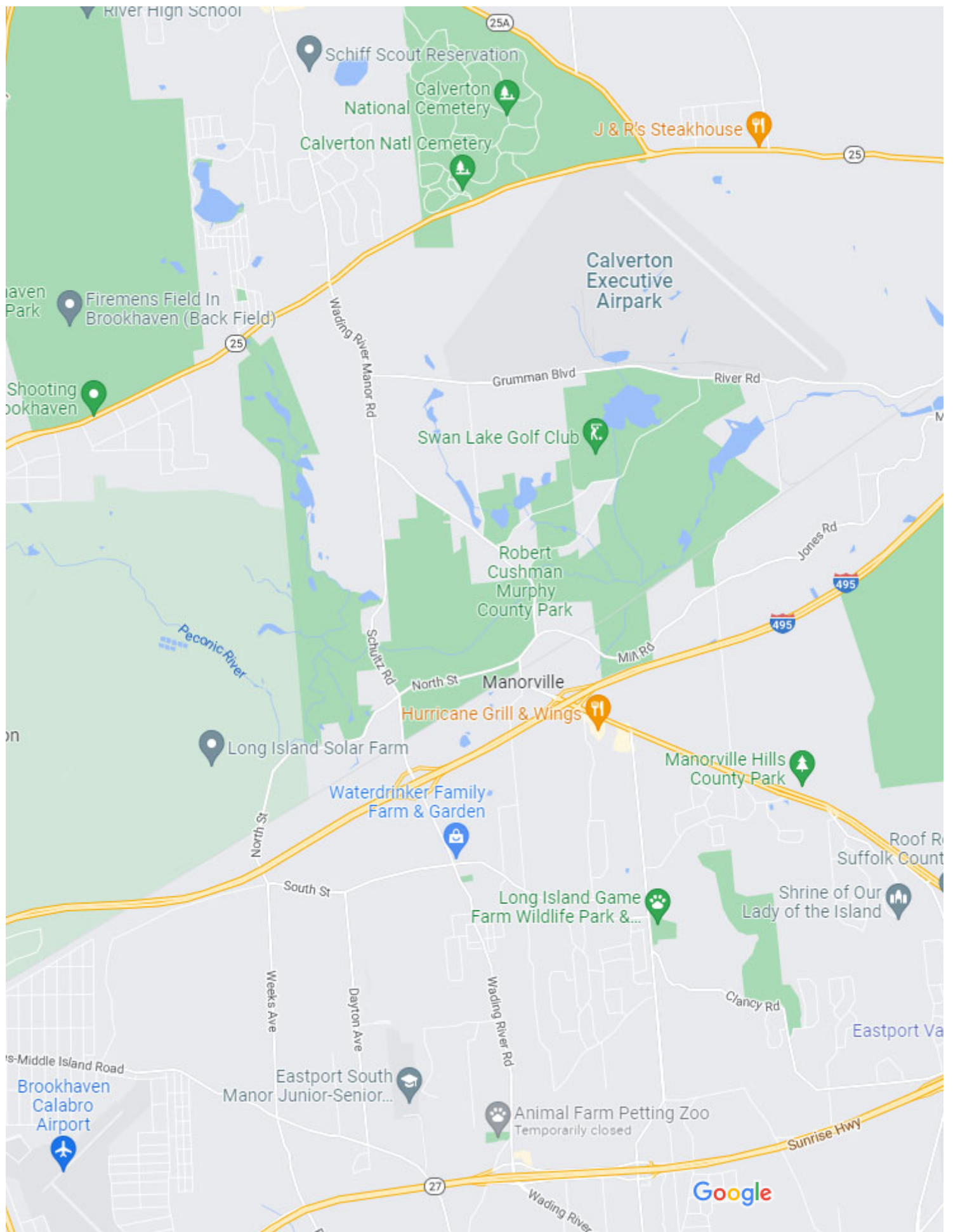
7.6 Evacuation Routes

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.

FIGURES



100 Old Country Rd
Westhampton, NY 11977

Take Speonk Riverhead Rd to County Rd 51 N/Moriches-Riverhead Rd in Northampton

-
- 6 min (4.5 mi)
1. Head west on Old Country Rd
-
- 0.6 mi
2. Turn right onto Speonk Riverhead Rd
-
- 3.9 mi

Continue on County Rd 51 N to Riverhead

-
- 5 min (3.3 mi)
3. Turn right onto County Rd 51 N/Moriches-Riverhead Rd
- i Continue to follow County Rd 51 N**
-
- 2.9 mi
4. Turn right onto Nugent Dr
-
- 0.2 mi
5. At the traffic circle, take the 4th exit onto Peconic Ave
-
- 0.2 mi
6. Turn right onto E Main St
-
- 115 ft

Follow Roanoke Ave to Old Country Rd

-
- 4 min (1.4 mi)
7. Turn left after Cucina 25 (on the left)
-
- 1.3 mi
8. At the traffic circle, take the 1st exit onto Old Country Rd
-
- 466 ft

Peconic Bay Medical Center
1300 Roanoke Ave, Riverhead, NY 11901

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.



HEALTH AND SAFETY WORK PLAN

APPENDIX A

Site Safety Plan Acknowledgement Form

HEALTH AND SAFETY WORK PLAN

APPENDIX B

Site Safety Plan Amendment Form



SITE SAFETY PLAN AMENDMENT FORM

Site Safety Plan Amendment # _____

Site Name: _____

Reason for Amendment:

Alternative Procedures: _____

Required Changes in PPE: _____

Project Superintendent

Date

Health & Safety Consultant

Date

Site Safety Officer

Date

HEALTH AND SAFETY WORK PLAN

APPENDIX C **Safety Data Sheets**

SAFETY DATA SHEET

Version 3.10
Revision Date 10/02/2017
Print Date 10/19/2018

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Barium

Product Number : 474711

Brand : Aldrich

CAS-No. : 7440-39-3

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

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

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Substances and mixtures, which in contact with water, emit flammable gases (Category 2), H261

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)

H261

In contact with water releases flammable gases.

Precautionary statement(s)

P223

Do not allow contact with water.

P231 + P232

Handle under inert gas. Protect from moisture.

P280

Wear protective gloves/ eye protection/ face protection.

P335 + P334

Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.

P370 + P378

In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.

P402 + P404

Store in a dry place. Store in a closed container.

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 : Ba
Molecular weight : 137.33 g/mol
CAS-No. : 7440-39-3
EC-No. : 231-149-1

Hazardous components

Component	Classification	Concentration
Barium	Water-react. 2; H261	90 - 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

Dry powder

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

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

Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Do not flush with water. 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

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. Keep away from sources of ignition - No smoking. 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.

Never allow product to get in contact with water during storage.

Store under inert gas.

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
Barium	7440-39-3	TWA	0.500000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Eye, skin, & Gastrointestinal irritation Muscular stimulation Not classifiable as a human carcinogen		
		TWA	0.500000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.500000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Eye irritation Muscular stimulation Skin irritation Gastrointestinal irritation Not classifiable as a human carcinogen		
		TWA	0.500000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	0.5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Eye irritation Muscular stimulation Skin irritation Gastrointestinal irritation Not classifiable as a human carcinogen		

		TWA	0.5 mg/m3	USA. NIOSH Recommended Exposure Limits
		PEL	0.5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

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

Flame retardant protective 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: Pieces
Colour: grey |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 725 °C (1,337 °F) - lit. |

f) Initial boiling point and boiling range	1,640 °C (2,984 °F) - lit.
g) Flash point	Not applicable
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	3.6 g/cm ³ at 25 °C (77 °F)
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

Reacts violently with water.

10.4 Conditions to avoid

Exposure to moisture

10.5 Incompatible materials

Oxidizing agents, Water, acids, Oxygen, Chlorinated solvents, Carbon dioxide (CO₂), Halogens, Halogenated hydrocarbon, Alcohols, Sulphur compounds, Hydrogen sulfide gas

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Barium oxide

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 is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: CQ8370000

Stomach/intestinal disorders, Nausea, Vomiting, Drowsiness, Dizziness, Gastrointestinal disturbance, Weakness, Tremors, Seizures.

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 fish	mortality NOEC - Cyprinodon variegatus (sheepshead minnow) - 500 mg/l - 96 h
	LC50 - Cyprinodon variegatus (sheepshead minnow) - > 500 mg/l - 96 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

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1400 Class: 4.3 Packing group: II
Proper shipping name: Barium
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1400 Class: 4.3 Packing group: II EMS-No: F-G, S-O
Proper shipping name: BARIUM

IATA

UN number: 1400 Class: 4.3 Packing group: II
Proper shipping name: Barium

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
Barium	7440-39-3	2007-07-01

SARA 311/312 Hazards

Reactivity Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Barium	7440-39-3	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Barium	7440-39-3	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Barium	7440-39-3	2007-07-01

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

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

H261 In contact with water releases flammable gases.

Water-react. Substances and mixtures, which in contact with water, emit flammable gases

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	
Flammability:	3
Physical Hazard	1

NFPA Rating

Health hazard:	0
Fire Hazard:	3
Reactivity Hazard:	1
Special hazard.I:	W

Further information

Copyright 2016 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only.
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: 3.10

Revision Date: 10/02/2017

Print Date: 10/19/2018

Safety Data Sheet – Benzene

Revision Nr: 3
Issue date: 15/12/2014
Supersedes: 12/08/2011

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Chemical name : benzene
 EC Index : 601-020-00-8
 EC No : 200-753-7
 CAS No. : 71-43-2
 REACH registration No. : 01-2119447106-44
 Formula : C₆H₆

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

Specific use(s) : Use as an intermediate
 The substance/product is registered with strictly controlled conditions as defined in Article 18(4) of Regulation (EC) No. 1907/2006 (REACH Regulation) and must therefore be handled as such.

1.3. Details of the supplier of the safety data sheet

Company : Transcor Energy
 Parc de L'Alliance, Boulevard de France 7
 1420 Braine-L'Alleud, Belgium
 Telephone +32 2 663 19 00
 Telefax: +32 2 675 49 99
 E-mail: reach@transcor.be

1.4. Emergency telephone number

Emergency telephone : +32 3 575 03 30 (This telephone number is available 24 hours per day, 7 days per week.)

IRELAND (REPUBLIC OF)
 National Poisons Information Centre
 Beaumont Hospital : +353 18 37 99 64/+353 1 809 21 66
 UNITED KINGDOM
 National Poisons Information Service
 (Newcastle Centre) : 0844 892 0111 (UK only, Monday to Friday, 08.00 to 18.00 hours)
 Regional Drugs and Therapeutics Centre,
 Wolfson Unit

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

2.1.1. Classification according to Regulation (EU) 1272/2008

CLP-Classification : The product is classified as hazardous in accordance with Regulation (EC) No. 1272/2008.

Flam. Liq. 2 H225
 Skin Irrit. 2 H315
 Eye Irrit. 2 H319
 Muta. 1B H340
 Carc. 1A H350
 STOT RE 1 H372
 Asp. Tox. 1 H304

Safety Data Sheet – Benzene

Revision Nr: 3
Issue date: 15/12/2014
Supersedes: 12/08/2011

Full text of H-phrases: see section 16

2.1.2. Classification according to EU Directives 67/548/EEC or 1999/45/EC

Classification : This substance is classified as hazardous according to 67/548/EEC.
 F; R11
 Xn; R65
 T; R48/23/24/25
 Xi; R36/38
 Carc.Cat.1; R45
 Muta.Cat.2; R46

Full text of R-phrases: see section 16

2.2. Label elements

2.2.1. Labelling according to Regulation (EU) 1272/2008

Hazard pictograms :



GHS02

GHS07

GHS08

Signal word :

Danger

Hazard statements :

H225 - Highly flammable liquid and vapour.
 H304 - May be fatal if swallowed and enters airways.
 H315 - Causes skin irritation.
 H319 - Causes serious eye irritation.
 H340 - May cause genetic defects.
 H350 - May cause cancer.
 H372 - Causes damage to organs through prolonged or repeated exposure.
 P202 - Do not handle until all safety precautions have been read and understood.
 P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
 P243 - Take precautionary measures against static discharge.
 P280 - Wear protective gloves/protective clothing/eye protection/face protection.
 P301+P310 - IF SWALLOWED: Immediately call a POISON CENTER/doctor/.
 P303+P361+P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
 P331 - Do NOT induce vomiting.

2.2.2. Labelling according to Directives (67/548 - 1999/45)

Not relevant

2.3. Other hazards

Other hazards : Vapours can form explosive mixtures with air.
 Results of PBT and vPvB assessment :
 Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substances

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Substance name	Product identifier	%	Classification according to Directive 67/548/EEC
Benzene	(CAS No.) 71-43-2 (EC No) 200-753-7 (EC Index) 601-020-00-8 (REACH-no) 01-2119447106-44-0099	100	F; R11 Xn; R65 T; R48/23/24/25 Xi; R36/38 Carc. Cat. 1; R45 Muta. Cat. 2; R46

Substance name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Benzene	(CAS No.) 71-43-2 (EC No) 200-753-7 (EC Index) 601-020-00-8 (REACH-no) 01-2119447106-44-0099	100	Flam. Liq. 2, H225 Skin Irrit. 2, H315 Eye Irrit. 2, H319 Muta. 1B, H340 Carc. 1A, H350 STOT RE 1, H372 Asp. Tox. 1, H304

Full text of R- and H-phrases: see section 16

3.2. Mixtures

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

- | | |
|----------------------|--|
| Inhalation | : Remove person to fresh air and keep comfortable for breathing.
When in doubt or if symptoms are observed, get medical advice.
If breathing is irregular or stopped, administer artificial respiration.
Get medical advice/attention. |
| Skin contact | : Take off contaminated clothing.
Gently wash with plenty of soap and water.
Get medical advice/attention. |
| Eye contact | : Rinse immediately carefully and thoroughly with eye-bath or water.
Remove contact lenses, if present and easy to do. Continue rinsing.
Get immediate medical advice/attention. |
| In case of ingestion | : Rinse mouth thoroughly with water.
Do NOT induce vomiting.
Get immediate medical advice/attention. |
| Additional advice | : First aider: Pay attention to self-protection!
Personal protection equipment: see section 8
Never give anything by mouth to an unconscious person or a person with cramps.
When in doubt or if symptoms are observed, get medical advice.
Show this safety data sheet to the doctor in attendance.
Treat symptomatically. |

4.2. Most important symptoms and effects, both acute and delayed

- | | |
|------------|---|
| Inhalation | : Causes damage to organs through prolonged or repeated exposure. The following symptoms may occur: Dizziness Drowsiness Unconsciousness Headache Nausea Convulsions Shortness of breath. |
|------------|---|

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- | | |
|-----------------------|--|
| Skin contact | : Causes skin irritation. Causes damage to organs through prolonged or repeated exposure. The following symptoms may occur: Dry skin Pain erythema (redness). |
| Eye contact | : Causes serious eye irritation. The following symptoms may occur: Redness, pain. |
| Ingestion | : May be fatal if swallowed and enters airways. Causes damage to organs through prolonged or repeated exposure. The following symptoms may occur: Abdominal pain Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea. Sore throat. |
| Other adverse effects | : Causes damage to organs through prolonged or repeated exposure. May cause cancer. May cause genetic defects. |

4.3. Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1. Extinguishing media

- | | |
|---|---|
| Suitable extinguishing media | : Water spray, alcohol resistant foam, Dry extinguishing powder, Carbon dioxide |
| Extinguishing media which must not be used for safety reasons | : Strong water jet |

5.2. Special hazards arising from the substance or mixture

- | | |
|------------------|--|
| Fire hazard | : Highly flammable liquid and vapour. |
| Specific hazards | : Heating causes rise in pressure with risk of bursting.
Vapours can form explosive mixtures with air.
Vapours are heavier than air, spread along floors and form explosive mixtures with air.
Vapours can travel considerable distances to a source of ignition where they can ignite, flash back, or explode.
Hazardous combustion products:
Carbon oxides
Nitrogen oxides (NOx)
Volatile organic compounds |

5.3. Advice for firefighters

- | | |
|-------------------------|--|
| Advice for firefighters | : Special protective equipment for firefighters.
In case of fire: Wear self-contained breathing apparatus.
Use water spray jet to protect personnel and to cool endangered containers.
Do not allow run-off from fire-fighting to enter drains or water courses.
Dispose according to legislation.
Evacuate area. |
|-------------------------|--|

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

- | | |
|-----------------------------|--|
| For non-emergency personnel | : Evacuate area.
Stay upwind/keep distance from source.
Provide adequate ventilation.
Use personal protective equipment as required.
Personal protection equipment: see section 8
Do not breathe vapour/spray.
Avoid contact with skin, eyes and clothes.
Keep away from heat, hot surfaces, sparks, open flames and other ignition |
|-----------------------------|--|

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For emergency responders : sources. No smoking.
Ensure that the equipment is adequately grounded.
Use explosion-proof machinery, apparatus, ventilation facilities, tools etc.
Use only non-sparking tools.
: Ensure procedures and training for emergency decontamination and disposal are in place.
Personal protection equipment: see section 8.

6.2. Environmental precautions

Environmental precautions : Do not allow to enter into ground-water, surface water or drains.
If the product contaminates rivers and lakes or drains inform respective authorities.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up : Use foam on spills to minimise vapours.
Stop leak if safe to do so.
Dam up.
Clean-up methods - small spillage: Absorb with liquid-binding material (e.g. sand, diatomaceous earth, acid- or universal binding agents)., Collect in closed and suitable containers for disposal.
Absorb with liquid-binding material (e.g. sand, diatomaceous earth, acid- or universal binding agents).
Sweep or shovel spills into appropriate container for disposal
Clean-up methods - large spillage: Large spills should be collected mechanically (remove by pumping) for disposal., Collect in closed and suitable containers for disposal.
Large spills should be collected mechanically (remove by pumping) for disposal.
Use only explosion-proof equipment.
Dispose of waste product or used containers according to local regulations.

6.4. Reference to other sections

Personal protection equipment: see section 8
Disposal: see section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Handling : Provide adequate ventilation.
Use personal protective equipment as required.
Personal protection equipment: see section 8
Do not breathe vapour/spray.
Avoid contact with skin, eyes and clothes.
Take any precaution to avoid mixing with incompatible materials.
See also section 10
Ensure proper process control to avoid excess waste discharge (temperature, concentration, pH value, time).
Do not allow contact with soil, surface or ground water.
Obtain special instructions before use.
(Do not handle until all safety precautions have been read and understood.)
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Ensure that the equipment is adequately grounded.
Use explosion-proof machinery, apparatus, ventilation facilities, tools etc.
Use only non-sparking tools.

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The substance/product is registered with strictly controlled conditions as defined in Article 18(4) of Regulation (EC) No. 1907/2006 (REACH Regulation) and must therefore be handled as such.

Advices on general occupational hygiene : Keep good industrial hygiene.
Wash hands before breaks and immediately after using the product.
When using do not eat, drink or smoke.
Keep away from food, drink and animal feedingstuffs.
Keep work clothes separately.
Take off contaminated clothing.
Wash contaminated clothing before reuse.

7.2. Conditions for safe storage, including any incompatibilities

Storage : Keep in a dry, cool and well-ventilated place.
Do not store near or with any of the incompatible materials listed in section 10.
Bund storage facilities to prevent soil and water pollution in the event of spillage.
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Packaging materials : Keep/Store only in original container.

7.3 Specific end use(s)

Intermediate.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Exposure limit values :

Benzene (71-43-2)		
Belgium	Limit value (mg/m ³)	3,25 mg/m ³
Belgium	Limit value (ppm)	1 ppm
Bulgaria	OEL TWA (mg/m ³)	3,25 mg/m ³
Croatia	GVI (granična vrijednost izloženosti) (mg/m ³)	3,25 mg/m ³
Croatia	GVI (granična vrijednost izloženosti) (ppm)	1 ppm
Cyprus	OEL TWA (mg/m ³)	3,25 mg/m ³
Cyprus	OEL TWA (ppm)	1 ppm
France	VME (mg/m ³)	3,25 mg/m ³ (restrictive limit)
France	VME (ppm)	1 ppm (restrictive limit)
Greece	OEL TWA (mg/m ³)	3,19 mg/m ³
Greece	OEL TWA (ppm)	1,0 ppm
Italy - Portugal - USA ACGIH	ACGIH TWA (ppm)	0,5 ppm
Italy - Portugal - USA ACGIH	ACGIH STEL (ppm)	2,5 ppm
Italy	OEL TWA (mg/m ³)	3,25 mg/m ³
Italy	OEL TWA (ppm)	1 ppm
Latvia	OEL TWA (mg/m ³)	3,25 mg/m ³
Latvia	OEL TWA (ppm)	1 ppm
Spain	VLA-ED (mg/m ³)	3,25 mg/m ³ (manufacturing, commercialization, and use restrictions under REACH; worker protection to carcinogens in the workplace)

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Spain	VLA-ED (ppm)	1 ppm (manufacturing, commercialization, and use restrictions under REACH; worker protection to exposure to carcinogens and mutagens in the workplace)
Switzerland	VME (mg/m ³)	1,6 mg/m ³
Switzerland	VME (ppm)	0,5 ppm
Netherlands	Grenswaarde TGG 8H (mg/m ³)	3,25 mg/m ³
United Kingdom	WEL TWA (mg/m ³)	3,25 mg/m ³
United Kingdom	WEL TWA (ppm)	1 ppm
United Kingdom	WEL STEL (mg/m ³)	9,75 mg/m ³ (calculated)
United Kingdom	WEL STEL (ppm)	3 ppm (calculated)
Czech Republic	Expoziční limity (PEL) (mg/m ³)	3 mg/m ³
Denmark	Grænseværdie (langvarig) (mg/m ³)	1,6 mg/m ³
Denmark	Grænseværdie (langvarig) (ppm)	0,5 ppm
Finland	HTP-arvo (8h) (mg/m ³)	3,25 mg/m ³
Finland	HTP-arvo (8h) (ppm)	1 ppm
Hungary	MK-érték	3 mg/m ³
Ireland	OEL (8 hours ref) (mg/m ³)	3 mg/m ³
Ireland	OEL (8 hours ref) (ppm)	1 ppm
Ireland	OEL (15 min ref) (mg/m ³)	9 mg/m ³ (calculated)
Ireland	OEL (15 min ref) (ppm)	3 ppm (calculated)
Lithuania	IPRV (mg/m ³)	3,25 mg/m ³
Lithuania	IPRV (ppm)	1 ppm
Lithuania	TPRV (mg/m ³)	19 mg/m ³
Lithuania	TPRV (ppm)	6 ppm
Norway	Gjennomsnittsverdier (AN) (mg/m ³)	3 mg/m ³
Norway	Gjennomsnittsverdier (AN) (ppm)	1 ppm
Norway	Gjennomsnittsverdier (Kortidsverdi) (mg/m ³)	6 mg/m ³
Norway	Gjennomsnittsverdier (Kortidsverdi) (ppm)	3 ppm
Poland	NDS (mg/m ³)	1,6 mg/m ³
Romania	OEL TWA (mg/m ³)	3,25 mg/m ³
Romania	OEL TWA (ppm)	1 ppm
Sweden	nivågränsvärde (NVG) (mg/m ³)	1,5 mg/m ³
Sweden	nivågränsvärde (NVG) (ppm)	0,5 ppm
Sweden	kortidsvärde (KTV) (mg/m ³)	9 mg/m ³
Sweden	kortidsvärde (KTV) (ppm)	3 ppm

Recommended monitoring procedures : Personal air monitoring
 Room air monitoring

8.2. Exposure controls

Personal protection equipment : The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection : In case of insufficient ventilation, wear suitable respiratory equipment.
 Half-face mask (EN 140)
 Full face mask (EN 136)
 Filter type: AP (EN 141)
 The filter class must be suitable for the maximum contaminant

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	concentration (gas/vapour/aerosol/particulates) that may arise when handling the product. If the concentration is exceeded, self-contained breathing apparatus must be used. (EN 137)
Hand protection	: Wear chemically resistant gloves (tested to EN374) ,Suitable material:;NBR (Nitrile rubber) (> 0.45 mm, BTT > 30 min.),PVA (Polyvinyl alcohol) (BTT > 480 min.),Fluoropolymers (BTT > 480 min.),The quality of the protective gloves resistant to chemicals must be chosen as a function of the specific working place concentration and quantity of hazardous substances.
Eye protection	: Use suitable eye protection. (EN166): Goggles
Body protection	: Wear suitable protective clothing. Wear suitable coveralls to prevent exposure to the skin. Chemical resistant safety shoes
Thermal hazard protection	: Not required under normal use. Use dedicated equipment.
Engineering control measures	: The substance/product is registered with strictly controlled conditions as defined in Article 18(4) of Regulation (EC) No. 1907/2006 (REACH Regulation) and must therefore be handled as such. Provide adequate ventilation. Organisational measures to prevent /limit releases, dispersion and exposure Safe handling: see section 7 . Transfer and handle product only in closed systems. Guarantee that the eye flushing systems and safety showers are closely located to the working place. Store locked up. Take precautionary measures against static discharges. Ensure that the equipment is adequately grounded. Use explosion-proof machinery, apparatus, ventilation facilities, tools etc.
Environmental exposure controls	: Do not allow contact with soil, surface or ground water. Comply with applicable Community environmental protection legislation.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance	: liquid
Colour	: clear
Odour	: characteristic
Odour threshold	: No data available
pH	: No data available
Melting point/freezing point	: 5,49 °C
Initial boiling point and boiling range	: 80,09 °C
Flash point	: 11 °C
Evaporation rate	: No data available
Flammability (solid, gas)	: Not applicable, liquid
Upper/lower flammability or explosive limits	: < No data available
Vapour pressure	: 10 kPa (20 °C) 100 kPa (79.9 °C)
Vapour density	: No data available

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Density	: 0,8765 g/cm ³ (20 °C)
Relative density	: No data available
Water solubility	: ≈ 1,88 g/l (23.5 °C)
Solubility in different media	: Justification for data waiving not relevant
Partition coefficient n-octanol/water	: 2,13
Auto-ignition temperature	: 498 °C
Decomposition temperature	: No data available
Viscosity	: 0,604 mPa.s (25 °C)
Explosive properties	: Not applicable The study does not need to be conducted because there are no chemical groups associated with explosive properties present in the molecule.
Oxidising properties	: Not applicable The classification procedure needs not to be applied because there are no chemical groups present in the molecule which are associated with oxidising properties.

9.2. Other information

Surface tension	: Justification for data waiving not relevant
-----------------	---

SECTION 10: Stability and reactivity

10.1. Reactivity

Reactivity	: Highly flammable liquid and vapour. Reference to other sections: 10.4 & 10.5
------------	---

10.2. Chemical stability

Stability	: The product is stable under storage at normal ambient temperatures.
-----------	---

10.3. Possibility of hazardous reactions

Possibility of hazardous reactions	: Vapours can form explosive mixtures with air.
------------------------------------	---

10.4. Conditions to avoid

Conditions to avoid	: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Safe handling: see section 7
---------------------	--

10.5. Incompatible materials

Incompatible materials	: Oxidising substances, Strong acids, Halogens, Safe handling: see section 7
------------------------	--

10.6. Hazardous decomposition products

Hazardous decomposition products	: Reference to other sections: 5.2
----------------------------------	------------------------------------

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	: Not classified (Based on available data, the classification criteria are not met.)
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Benzene (71-43-2)	
LD50/oral/rat	> 2000 mg/kg
LD50/dermal/rabbit	> 5000 mg/kg
ATE CLP (vapours)	44,5 mg/l/4h

Skin corrosion/irritation	: Causes skin irritation. pH: No data available
Serious eye damage/eye irritation	: Causes serious eye irritation. pH: No data available
Respiratory or skin sensitisation	: Not classified (Based on available data, the classification criteria are not met.)
Germ cell mutagenicity	: May cause genetic defects.
Carcinogenicity	: May cause cancer. LOAEL, Oral, Rat: 25 mg/kg bw/day
Reproductive toxicity	: Not classified (Based on available data, the classification criteria are not met.) NOAEC, Inhalation: 960 mg/m ³ NOAEC, Developmental toxicity, Inhalation, Rat: 32 mg/m ³
STOT-single exposure	: Not classified (Based on available data, the classification criteria are not met.)
STOT-repeated exposure	: Causes damage to organs through prolonged or repeated exposure.
Aspiration hazard	: May be fatal if swallowed and enters airways.

Other information

Reference to other sections: 4.2, Symptoms related to the physical, chemical and toxicological characteristics, For further information see section 4

SECTION 12: Ecological information

12.1. Toxicity

Benzene (71-43-2)	
LC50 fish 1	eco mg/l (96 h)
EC50 Daphnia 1	10 mg/l (48h)
ErC50 (algae)	100 mg/l (72 h)
LOEC (chronic)	1,6 mg/l
NOEC (chronic)	3 mg/l Invertebrates.
NOEC chronic fish	0,8 mg/l
NOEC chronic crustacea	3 mg/l
NOEC chronic algae	≈
Additional information	ErC10, Biomass, 72h, algae: 10 mg/l ErC10, Growth rate, 72h, algae: 34 mg/l IC50, 24h, micro-organisms: 13 mg/l

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12.2. Persistence and degradability

Persistence and degradability : Readily biodegradable.

12.3. Bioaccumulative potential

Bioaccumulation : Low potential
 Partition coefficient n-octanol/water : 2,13
 Bioconcentration factor (BCF) : < 10

12.4. Mobility in soil

Mobility :
 Surface tension : Justification for data waiving

12.5. Results of PBT and vPvB assessment

PBT/vPvB data :

12.6. Other adverse effects

Other information :

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Product waste: : Do not allow contact with soil, surface or ground water.
 Dispose of empty containers and wastes safely.
 Safe handling: see section 7
 Refer to manufacturer/supplier for information on recovery/recycling
 Recycling is preferred to disposal or incineration
 If recycling is not possible, eliminate in accordance with local valid waste disposal regulations

 Contaminated packaging : Never use pressure to empty container.
 Do not pierce or burn, even after use.
 Handle contaminated packages in the same way as the substance itself.
 Dispose according to legislation.

 List of proposed waste codes/waste designations in accordance with EWC : This material and its container must be disposed of as hazardous waste.
 Waste codes should be assigned by the user based on the application for which the product was used.

SECTION 14: Transport information

14.1. UN number

UN number : 1114

14.2. UN proper shipping name

Proper Shipping Name : BENZENE
 Proper Shipping Name (IATA) : BENZENE
 Proper Shipping Name (IMDG) : BENZENE
 Proper Shipping Name (ADN) : BENZENE

14.3. Transport hazard class(es)

14.3.1. Overland transport

Class(es) : 3 - Flammable liquid
 Hazard identification number (Kemler No.) : 33
 Classification code : F1

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ADR/RID-Labels : 3 - Flammable liquid



14.3.2. Inland waterway transport (ADN)

Class (UN) : 3

14.3.3. Transport by sea

Class or Division : 3 - flammable liquids

14.3.4. Air transport

Class or Division : 3 - flammable liquids

14.4. Packing group

Packing group : II

14.5. Environmental hazards

Other information : No supplementary information available.

14.6. Special precautions for user

Special precautions for user : No data available.

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

No data available

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

15.1.1. EU-Regulations

The following restrictions are applicable according to Annex XVII of the REACH Regulation (EC) No 1907/2006 :

3. Liquid substances or mixtures which are regarded as dangerous in accordance with Directive 1999/45/EC or are fulfilling the criteria for any of the following hazard classes or categories set out in Annex I to Regulation (EC) No 1272/2008 : Benzene

5. Benzene : Benzene

28. Substances which appear in Part 3 of Annex VI to Regulation (EC) No 1272/2008 classified as Carcinogen category 1A or 1B (Table 3.1) or Carcinogen category 1 or 2 (Table 3.2) and listed as follows: Carcinogen category 1A (Table 3.1)/Carcinogen category 1 (Table 3.2) listed in Appendix 1 Carcinogen category 1B (Table 3.1)/Carcinogen category 2 (Table 3.2) listed in Appendix 2 : Benzene

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29. Substances which appear in Part 3 of Annex VI to Regulation (EC) No 1272/2008 classified as Germ cell Mutagen category 1A or 1B (Table 3.1) or Mutagen category 1 or 2 (Table 3.2) and listed as follows: Mutagen category 1A (Table 3.1)/Mutagen category 1 (Table 3.2) listed in Appendix 3 Mutagen category 1B (Table 3.1)/Mutagen category 2 (Table 3.2) listed in Appendix 4 : Benzene

40. Substances classified as flammable gases category 1 or 2, flammable liquids categories 1, 2 or 3, flammable solids category 1 or 2, substances and mixtures which, in contact with water, emit flammable gases, category 1, 2 or 3, pyrophoric liquids category 1 or pyrophoric solids category 1, regardless of whether they appear in Part 3 of Annex VI to Regulation (EC) No 1272/2008 or not. : Benzene

This product contains an ingredient according to the candidate list of Annex XIV of the REACH Regulation 1907/2006/EC. : none
 Authorisations : Not applicable

15.1.2. National regulations

DE : WGK : 3
 NL : ABM : 2 - May cause heritable genetic damage., 3 - May cause cancer.
 NL : NeR (Nederlandse emissie Richtlijn) : Organic substances in vapour or gaseous form

15.2. Chemical safety assessment

Chemical Safety Assessment : For this substance a chemical safety assessment has been carried out.

SECTION 16: Other information

Full text of R-, H- and EUH-phrases:

Asp. Tox. 1	: Aspiration hazard, Category 1
Carc. 1A	: Carcinogenicity, Category 1A
Eye Irrit. 2	: Serious eye damage/eye irritation Category 2
Flam. Liq. 2	: Flammable liquids, Category 2
Muta. 1B	: Germ cell mutagenicity, hazard categories 1B
Skin Irrit. 2	: Skin corrosion/irritation, Category 2
STOT RE 1	: Specific target organ toxicity — Repeated exposure, Category 1
H225	: Highly flammable liquid and vapour.
H304	: May be fatal if swallowed and enters airways.
H315	: Causes skin irritation.
H319	: Causes serious eye irritation.
H340	: May cause genetic defects.
H350	: May cause cancer.
H372	: Causes damage to organs through prolonged or repeated exposure.
R11	: Highly flammable.
R36/38	: Irritating to eyes and skin.
R45	: May cause cancer.
R46	: May cause heritable genetic damage.
R48/23/24/25	: Toxic: danger of serious damage to health by prolonged exposure through inhalation,

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in contact with skin and if swallowed.
 R65 : Harmful: may cause lung damage if swallowed.
 F : Highly flammable
 T : Toxic
 Xi : Irritant
 Xn : Harmful

Key literature references and sources : CSR
for data

Safety datasheet sections which have : 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16
been updated

Abbreviations and acronyms : ABM = Algemene beoordelingsmethodiek
 ADN = Accord Européen relatif au Transport International des Marchandises
 Dangereuses par voie de Navigation du Rhin
 ADR = Accord européen relatif au transport international des marchandises
 Dangereuses par Route
 CLP = Classification, Labelling and Packaging Regulation according to 1272/2008/EC
 IATA = International Air Transport Association
 IMDG = International Maritime Dangerous Goods Code
 LEL = Lower Explosive Limit/Lower Explosion Limit
 UEL = Upper Explosive Limit/Upper Explosion Limit
 REACH = Registration, Evaluation, Authorisation and Restriction of Chemicals
 BTT = Breakthrough time (maximum wearing time)
 DMEL = Derived minimal effect level
 DNEL = Derived No Effect Level
 EC50 = Median Effective Concentration
 EL50 = Median effective level
 ErC50 = EC50 in terms of reduction of growth rate
 ErL50 = EL50 in terms of reduction of growth rate
 EWC = European Waste Catalogue
 LC50 = Median lethal concentration
 LD50 = Median lethal dose
 LL50 = Median lethal level
 NA = Not applicable
 NOEC = No observed effect concentration
 NOEL: no-observed-effect level
 NOELR = No observed effect loading rate
 NOAEC = No observed adverse effect concentration
 NOAEL = No observed adverse effect level
 N.O.S. = Not Otherwise Specified
 OEL = Occupational Exposure Limits - Short Term Exposure Limits (STELs)
 PNEC = Predicted No Effect Concentration
 Quantitative structure-activity relationship (QSAR)
 STOT = Specific Target Organ Toxicity
 TWA = time weighted average
 VOC = Volatile organic compounds
 WGK = Wassergefährdungsklasse (Water Hazard Class under German Federal Water
 Management Act)

The contents and format of this SDS are in accordance with EEC Commission Directive 1999/45/EC, 67/548/EC, 1272/2008/EC and EEC Commission Regulation 1907/2006/EC (REACH) Annex II.

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handling, storage, use or disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of the product. This SDS was prepared and is to be used only for this product. If the product is used as a component in another product, this SDS information may not be applicable.

SAFETY DATA SHEET

1. Identification

Product identifier	Benzo(b)fluoranthene		
Other means of identification			
Item	N-11165		
Recommended use	For Laboratory Use Only		
Recommended restrictions	None known.		
Manufacturer/Importer/Supplier/Distributor information			
Manufacturer			
Company name	Chem Service, Inc.		
Address	660 Tower Lane West Chester, PA 19380 United States		
Telephone	Toll Free	800-452-9994	
	Direct	610-692-3026	
Website	www.chemservice.com		
E-mail	info@chemservice.com		
Emergency phone number	Chemtrec US	800-424-9300	
	Chemtrec outside US	+1 703-527-3887	

2. Hazard(s) identification

Physical hazards	Not classified.	
Health hazards	Carcinogenicity	Category 1
Environmental hazards	Hazardous to the aquatic environment, acute hazard	Category 1
	Hazardous to the aquatic environment, long-term hazard	Category 1
OSHA defined hazards	Not classified.	
Label elements		



Signal word	Danger	
Hazard statement	May cause cancer. Very toxic to aquatic life. Very toxic to aquatic life with long lasting effects.	
Precautionary statement		
Prevention	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection.	
Response	If exposed or concerned: Get medical advice/attention. Collect spillage.	
Storage	Store locked up.	
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.	
Hazard(s) not otherwise classified (HNOC)	None known.	
Supplemental information	Not applicable.	

3. Composition/information on ingredients

Substances

Chemical name	Common name and synonyms	CAS number	%
Benzo(b)fluoranthene		205-99-2	100

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

4. First-aid measures

Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	Wash off with soap and water. Get medical attention if irritation develops and persists.
Eye contact	Rinse with water. Get medical attention if irritation develops and persists.
Ingestion	Rinse mouth. Get medical attention if symptoms occur.
Most important symptoms/effects, acute and delayed	Direct contact with eyes may cause temporary irritation.
Indication of immediate medical attention and special treatment needed	Provide general supportive measures and treat symptomatically. Keep victim under observation. Symptoms may be delayed.
General information	IF exposed or concerned: Get medical advice/attention. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO ₂).
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions	Use water spray to cool unopened containers.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	No unusual fire or explosion hazards noted.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep out of low areas. Wear appropriate personal protective equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	This material is classified as a water pollutant under the Clean Water Act and should be prevented from contaminating soil or from entering sewage and drainage systems which lead to waterways. Stop the flow of material, if this is without risk. Collect spillage. Following product recovery, flush area with water. For waste disposal, see section 13 of the SDS.
Environmental precautions	Avoid release to the environment. Contact local authorities in case of spillage to drain/aquatic environment. Prevent further leakage or spillage if safe to do so. Do not contaminate water. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Provide adequate ventilation. Wear appropriate personal protective equipment. Observe good industrial hygiene practices. Avoid release to the environment. Do not empty into drains.
Conditions for safe storage, including any incompatibilities	Store locked up. Store in original tightly closed container. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits	No exposure limits noted for ingredient(s).
Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.
Individual protection measures, such as personal protective equipment	
Eye/face protection	Use personal protective equipment as required.

Skin protection	
Hand protection	Use personal protective equipment as required.
Other	Use personal protective equipment as required.
Respiratory protection	Use personal protective equipment as required.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance

Physical state	Solid.
Form	Solid. Crystalline Solid
Color	Pale yellow
Odor	Not available.
Odor threshold	Not available.
pH	Not available.
Melting point/freezing point	334.4 °F (168 °C)
Initial boiling point and boiling range	Not available.
Flash point	Not available.
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	0.0000001 kPa at 25 °C
Vapor density	Not available.
Relative density	Not available.
Solubility(ies)	
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	6.6
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.
Other information	
Molecular formula	C20-H12
Molecular weight	252.32 g/mol

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Contact with incompatible materials.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Inhalation	No adverse effects due to inhalation are expected.
Skin contact	No adverse effects due to skin contact are expected.
Eye contact	Direct contact with eyes may cause temporary irritation.
Ingestion	Expected to be a low ingestion hazard.

Symptoms related to the physical, chemical and toxicological characteristics	Direct contact with eyes may cause temporary irritation.
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Information on toxicological effects

Acute toxicity	Not available.
Skin corrosion/irritation	Prolonged skin contact may cause temporary irritation.
Serious eye damage/eye irritation	Direct contact with eyes may cause temporary irritation.

Respiratory or skin sensitization

Respiratory sensitization	Not available.
Skin sensitization	This product is not expected to cause skin sensitization.

Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
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Carcinogenicity	May cause cancer.
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IARC Monographs. Overall Evaluation of Carcinogenicity

Benzo(b)fluoranthene (CAS 205-99-2) 2B Possibly carcinogenic to humans.

US. National Toxicology Program (NTP) Report on Carcinogens

Benzo(b)fluoranthene (CAS 205-99-2) Reasonably Anticipated to be a Human Carcinogen.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure	Not classified.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	Not available.
Chronic effects	Prolonged exposure may cause chronic effects.

12. Ecological information

Ecotoxicity	Very toxic to aquatic life with long lasting effects. Accumulation in aquatic organisms is expected.
Persistence and degradability	No data is available on the degradability of this product.
Bioaccumulative potential	Not available.

Partition coefficient n-octanol / water (log Kow)

6.6

Mobility in soil	No data available.
Other adverse effects	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. This material and its container must be disposed of as hazardous waste. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products

Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging

Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information**DOT**

UN number	UN3077
UN proper shipping name	Environmentally hazardous substances, solid, n.o.s. (Benzo(b)fluoranthene RQ = 1 LBS)
Transport hazard class(es)	
Class	9
Subsidiary risk	-
Label(s)	9
Packing group	III
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Special provisions	8, 146, 335, A112, B54, IB8, IP3, N20, T1, TP33
Packaging exceptions	155
Packaging non bulk	213
Packaging bulk	240

IATA

UN number	UN3077
UN proper shipping name	Environmentally hazardous substance, solid, n.o.s. (Benzo(b)fluoranthene)
Transport hazard class(es)	
Class	9
Subsidiary risk	-
Packing group	III
Environmental hazards	No.
ERG Code	9L
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Other information	
Passenger and cargo aircraft	Allowed.
Cargo aircraft only	Allowed.

IMDG

UN number	UN3077
UN proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Benzo(b)fluoranthene)
Transport hazard class(es)	
Class	9
Subsidiary risk	-
Packing group	III
Environmental hazards	
Marine pollutant	No.
EmS	F-A, S-F
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable.

DOT; IATA; IMDG**General information**

DOT Regulated Marine Pollutant. IMDG Regulated Marine Pollutant.

15. Regulatory information

US federal regulations

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
One or more components are not listed on TSCA.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Benzo(b)fluoranthene (CAS 205-99-2) Listed.

SARA 304 Emergency release notification

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate Hazard - No
Delayed Hazard - Yes
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
Benzo(b)fluoranthene	205-99-2	100

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Benzo(b)fluoranthene (CAS 205-99-2)

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Clean Water Act (CWA) Section 112(r) (40 CFR 68.130)

Priority pollutant
Toxic pollutant

Safe Drinking Water Act (SDWA)

Not regulated.

US state regulations

US - New Jersey RTK - Substances: Listed substance

Benzo(b)fluoranthene (CAS 205-99-2)

US - Pennsylvania RTK - Hazardous Substances: Special hazard

Benzo(b)fluoranthene (CAS 205-99-2)

US. California Controlled Substances. CA Department of Justice (California Health and Safety Code Section 11100)

Not listed.

US. California. Candidate Chemicals List. Safer Consumer Products Regulations (Cal. Code Regs, tit. 22, 69502.3, subd. (a))

Benzo(b)fluoranthene (CAS 205-99-2)

US. Massachusetts RTK - Substance List

Benzo(b)fluoranthene (CAS 205-99-2)

US. New Jersey Worker and Community Right-to-Know Act

Benzo(b)fluoranthene (CAS 205-99-2)

US. Pennsylvania RTK - Hazardous Substances

Benzo(b)fluoranthene (CAS 205-99-2)

US. Pennsylvania Worker and Community Right-to-Know Law

Benzo(b)fluoranthene (CAS 205-99-2)

US. Rhode Island RTK

Benzo(b)fluoranthene (CAS 205-99-2)

US. California Proposition 65

WARNING: This product contains a chemical known to the State of California to cause cancer.

US - California Proposition 65 - CRT: Listed date/Carcinogenic substance

Benzo(b)fluoranthene (CAS 205-99-2)

Listed: July 1, 1987

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	No
Canada	Domestic Substances List (DSL)	No
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	No
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	No
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	No
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	No

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 04-29-2015

Version # 01

NFPA ratings Health: 0
Flammability: 0
Instability: 0

Disclaimer

The above information is believed to be correct on the date it was last revised and must not be considered all inclusive. The information has been obtained only by a search of available literature and is only a guide for handling the chemicals. OSHA regulations require that if other hazards become evident, an upgraded SDS must be made available to the employee within three months. RESPONSIBILITY for updates lies with the employer and not with CHEM SERVICE, Inc.

Persons not specifically and properly trained should not handle this chemical or its container. This product is furnished FOR LABORATORY USE ONLY! Our products may NOT BE USED as drugs, cosmetics, agricultural or pesticide products, food additives or as household chemicals.

This Safety Data Sheet (SDS) is intended only for use with Chem Service, Inc. products and should not be relied on for use with materials from any other supplier even if the chemical name(s) on the product are identical! Whenever using an SDS for a solution or mixture the user should refer to the SDS for every component of the solution or mixture. Chem Service warrants that this SDS is based upon the most current information available to Chem Service at the time it was last revised. THIS WARRANTY IS EXCLUSIVE, AND CHEM SERVICE, INC. MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. This SDS is provided gratis and CHEM SERVICE, INC. SHALL NOT BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR CONTINGENT DAMAGES.

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This product is furnished FOR LABORATORY USE ONLY.

SAFETY DATA SHEET

Revision Date 17-Jan-2018

Revision Number 3

1. Identification

Product Name Cadmium

Cat No. : C3-500

CAS-No 7440-43-9
Synonyms No information available

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company

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

Emergency Telephone Number

CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable solids	Category 2
Acute oral toxicity	Category 4
Acute dermal toxicity	Category 4
Acute Inhalation Toxicity - Dusts and Mists	Category 2
Germ Cell Mutagenicity	Category 2
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Kidney, Blood.	
Combustible dust	Yes

Label Elements

Signal Word

Danger

Hazard Statements

Flammable solid
May form combustible dust concentrations in air
Fatal if inhaled
Harmful if swallowed
Harmful in contact with skin
May cause respiratory irritation
Suspected of causing genetic defects
May cause cancer
Suspected of damaging fertility. Suspected of damaging the unborn child
Causes damage to organs through prolonged or repeated exposure

**Precautionary Statements****Prevention**

Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment

Response

IF exposed or concerned: Get medical attention/advice

Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Immediately call a POISON CENTER or doctor/physician

Skin

IF ON SKIN: Wash with plenty of soap and water
Wash contaminated clothing before reuse
Call a POISON CENTER or doctor/physician if you feel unwell

Ingestion

IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth

Fire

Fight fire with normal precautions from a reasonable distance
Evacuate area

Storage

Store locked up
Store in a well-ventilated place. Keep container tightly closed

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

Very toxic to aquatic life with long lasting effects
WARNING. Cancer and Reproductive Harm - <https://www.p65warnings.ca.gov/>.

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
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Cadmium	7440-43-9	100
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4. First-aid measures

General Advice	Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.
Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.
Inhalation	Move to fresh air. If not breathing, give artificial respiration. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required.
Ingestion	Do not induce vomiting. Call a physician or Poison Control Center immediately.
Most important symptoms and effects	None reasonably foreseeable. . Kidney disorders: May cause harm to the unborn child: Blood disorders
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Unsuitable Extinguishing Media	No information available
Flash Point	No information available
Method -	No information available
Autoignition Temperature	No information available
Explosion Limits	
Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Thermal decomposition can lead to release of irritating gases and vapors. Fine dust dispersed in air may ignite. Dust can form an explosive mixture in air. Pyrophoric properties of solids and liquids. Do not allow run-off from fire fighting to enter drains or water courses.

Hazardous Combustion Products

Highly toxic fumes

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
4	1	0	N/A

6. Accidental release measures

Personal Precautions	Ensure adequate ventilation. Use personal protective equipment. Avoid dust formation. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas.
Environmental Precautions	Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained.

Methods for Containment and Clean Up Sweep up or vacuum up spillage and collect in suitable container for disposal. Avoid dust formation.

7. Handling and storage

Handling Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Avoid dust formation. Use only under a chemical fume hood. Do not breathe vapors/dust. Do not ingest.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Store under an inert atmosphere.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Cadmium	TWA: 0.01 mg/m ³ TWA: 0.002 mg/m ³	Ceiling: 0.3 mg/m ³ Ceiling: 0.6 mg/m ³ (Vacated) STEL: 0.3 ppm TWA: 0.1 mg/m ³ TWA: 0.2 mg/m ³ TWA: 5 µg/m ³	IDLH: 9 mg/m ³	TWA: 0.01 mg/m ³ TWA: 0.002 mg/m ³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eyeface Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Long sleeved clothing.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures When using, do not eat, drink or smoke. Provide regular cleaning of equipment, work area and clothing. Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product. Keep away from food, drink and animal feeding stuffs.

9. Physical and chemical properties

Physical State	Solid
Appearance	Silver
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	321 °C / 609.8 °F

Boiling Point/Range	765 °C / 1409 °F @ 760 mmHg
Flash Point	No information available
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	Not applicable
Specific Gravity	8.64 @ 25°C
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	Cd
Molecular Weight	112.40

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under recommended storage conditions. Moisture sensitive. Air sensitive.
Conditions to Avoid	Incompatible products. Excess heat. Avoid dust formation. Exposure to air or moisture over prolonged periods.
Incompatible Materials	Strong oxidizing agents, Strong acids, Sulfur oxides
Hazardous Decomposition Products	Highly toxic fumes
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Cadmium	LD50 = 2330 mg/kg (Rat)	Not listed	LC50 = 25 mg/m ³ (Rat) 30 min

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Cadmium	7440-43-9	Group 1	Known	A2	X	A2

IARC: (International Agency for Research on Cancer)

IARC: (International Agency for Research on Cancer)

Group 1 - Carcinogenic to Humans

Group 2A - Probably Carcinogenic to Humans

Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)

NTP: (National Toxicity Program)

ACGIH: (American Conference of Governmental Industrial Hygienists)

Known - Known Carcinogen

Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

A1 - Known Human Carcinogen

A2 - Suspected Human Carcinogen

A3 - Animal Carcinogen

ACGIH: (American Conference of Governmental Industrial Hygienists)

Mutagenic Effects	Possible risk of irreversible effects
Reproductive Effects	Possible risk of impaired fertility. May cause harm to the unborn child.
Developmental Effects	No information available.
Teratogenicity	No information available.
STOT - single exposure	Respiratory system
STOT - repeated exposure	Kidney Blood
Aspiration hazard	No information available
Symptoms / effects, both acute and delayed	Kidney disorders: May cause harm to the unborn child: Blood disorders
Endocrine Disruptor Information	No information available
Other Adverse Effects	The toxicological properties have not been fully investigated.

12. Ecological information



Ecotoxicity

The product contains following substances which are hazardous for the environment. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Cadmium	Not listed	LC50: 0.0004 - 0.003 mg/L, 96h (Pimephales promelas) LC50: = 0.016 mg/L, 96h (Oryzias latipes) LC50: = 21.1 mg/L, 96h flow-through (Lepomis macrochirus) LC50: = 0.24 mg/L, 96h static (Cyprinus carpio) LC50: = 4.26 mg/L, 96h semi-static (Cyprinus carpio) LC50: = 0.002 mg/L, 96h (Cyprinus carpio) LC50: = 0.006 mg/L, 96h static (Oncorhynchus mykiss) LC50: = 0.003 mg/L, 96h	Not listed	EC50: = 0.0244 mg/L, 48h Static (Daphnia magna)

		flow-through (Oncorhynchus mykiss)		
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Persistence and Degradability No information available

Bioaccumulation/ Accumulation No information available.

Mobility No information available.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No UN2930
 Proper Shipping Name TOXIC SOLIDS, FLAMMABLE, ORGANIC, N.O.S.
 Proper technical name Cadmium
 Hazard Class 6.1
 Subsidiary Hazard Class 4.1
 Packing Group I

TDG

UN-No UN2930
 Proper Shipping Name TOXIC SOLID, FLAMMABLE, ORGANIC, N.O.S.
 Hazard Class 6.1
 Subsidiary Hazard Class 4.1
 Packing Group I

IATA

UN-No UN2930
 Proper Shipping Name TOXIC SOLID, FLAMMABLE, ORGANIC, N.O.S.
 Hazard Class 6.1
 Subsidiary Hazard Class 4.1
 Packing Group I

IMDG/IMO

UN-No UN2930
 Proper Shipping Name TOXIC SOLID, FLAMMABLE, ORGANIC, N.O.S.
 Hazard Class 6.1
 Subsidiary Hazard Class 4.1
 Packing Group I

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Cadmium	X	X	-	231-152-8	-		X	-	X	X	KE-0439 7

Legend:

X - Listed

E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.

P - Indicates a commenced PMN substance

R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule

T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.

XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).

Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Cadmium	7440-43-9	100	0.1

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

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Cadmium	-	-	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depleters	Class 2 Ozone Depleters
Cadmium	X		-

OSHA Occupational Safety and Health Administration
Not applicable

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Cadmium	5 µg/m³ TWA 2.5 µg/m³ Action Level	-

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Cadmium	10 lb	-

California Proposition 65 This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Cadmium	7440-43-9	Carcinogen Developmental Male Reproductive	0.05 µg/day	Developmental Carcinogen

U.S. State Right-to-Know Regulations

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

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security

This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By	Regulatory Affairs Thermo Fisher Scientific Email: EMSDS.RA@thermofisher.com
Revision Date	17-Jan-2018
Print Date	17-Jan-2018
Revision Summary	This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

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

End of SDS



Fisher Scientific

Part of Thermo Fisher Scientific

SAFETY DATA SHEET

Revision Date 10-Feb-2015

Revision Number 1

1. Identification

Product Name Chrysene, 98%

Cat No. : AC224140010; AC224140050; AC224145000

Synonyms Benzo(a)phenanthrene; 1,2,5,6-Dibenzonaphthalene.; 1,2-Benzophenanthrene

Recommended Use Laboratory chemicals.

Uses advised against No Information available

Details of the supplier of the safety data sheet

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

Entity / Business Name
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01
/ **Europe** call: +32 14 57 52 11
Emergency Number **US**:001-201-796-7100 /
Europe: +32 14 57 52 99
CHEMTREC Tel. No.**US**:001-800-424-9300 /
Europe:001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Germ Cell Mutagenicity
Carcinogenicity

Category 2
Category 1B

Label Elements

Signal Word
Danger

Hazard Statements
Suspected of causing genetic defects
May cause cancer



Precautionary Statements
Prevention

Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required

Response

IF exposed or concerned: Get medical attention/advice

Storage

Store locked up

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

Very toxic to aquatic life with long lasting effects

3. Composition / information on ingredients

Component	CAS-No	Weight %
Chrysene	218-01-9	98

4. First-aid measures

Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes.
Inhalation	Move to fresh air.
Ingestion	Do not induce vomiting.
Most important symptoms/effects	No information available.
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Unsuitable Extinguishing Media	No information available
Flash Point	
Method -	No information available
Autoignition Temperature	No information available
Explosion Limits	
Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products

None known

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health
0

Flammability
1

Instability
0

Physical hazards
N/A

6. Accidental release measures

Personal Precautions
Environmental Precautions

Ensure adequate ventilation. Use personal protective equipment.
See Section 12 for additional ecological information. Avoid release to the environment.
Collect spillage.

Methods for Containment and Clean Up No information available.

7. Handling and storage**Handling**

Ensure adequate ventilation.

Storage

Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure controls / personal protection**Exposure Guidelines**

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Chrysene		TWA: 0.2 mg/m ³	

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Chrysene			TWA:

Legend

OSHA - Occupational Safety and Health Administration

Engineering Measures

Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment**Eye/face Protection**

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection

Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection

Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Solid
Appearance	Light cream
Odor	No information available
Odor Threshold	No information available
pH	
Melting Point/Range	250 255 °C
Boiling Point/Range	°C @ 760 mmHg
Flash Point	
Evaporation Rate	No information available
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	No information available
Relative Density	No information available
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available

Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C18H12
Molecular Weight	228.29

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under normal conditions.
Conditions to Avoid	Incompatible products.
Incompatible Materials	Strong oxidizing agents
Hazardous Decomposition Products	None under normal use conditions
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Component Information

Toxicologically Synergistic Products	No information available
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Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation	No information available
Sensitization	No information available
Carcinogenicity	The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Chrysene	218-01-9	Group 2B	Not listed	A3	X	Not listed

Mutagenic Effects	No information available
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Reproductive Effects	No information available.
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Developmental Effects	No information available.
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Teratogenicity	No information available.
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STOT - single exposure	None known
STOT - repeated exposure	None known

Aspiration hazard	No information available
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Symptoms / effects, both acute and delayed	No information available
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Endocrine Disruptor Information	No information available
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Other Adverse Effects	The toxicological properties have not been fully investigated.
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12. Ecological information

Ecotoxicity

Do not empty into drains.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Chrysene	Not listed	Not listed	Not listed	1.9 mg/L EC50 = 2 h

Persistence and Degradability No information available

Bioaccumulation/ Accumulation No information available.

Mobility No information available.

Component	log Pow
Chrysene	5.91

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Chrysene - 218-01-9	U050	-

14. Transport information

DOT

UN-No UN3077
 Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE,SOLID, N.O.S.
 Hazard Class 9
 Packing Group III

TDG

UN-No UN3077
 Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE,SOLID, N.O.S.
 Hazard Class 9
 Packing Group III

IATA

UN-No UN3077
 Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE,SOLID, N.O.S.
 Hazard Class 9
 Packing Group III

IMDG/IMO

UN-No UN3077
 Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE,SOLID, N.O.S.
 Hazard Class 9
 Packing Group III

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Chrysene	X	X	-	205-923-4	-		-	-	X	-	X

Legend:

X - Listed

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F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.

P - Indicates a commenced PMN substance

R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule

T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.

XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).

Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Chrysene	218-01-9	98	1.0 0.1

SARA 311/312 Hazardous Categorization

Acute Health Hazard	No
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

Clean Water Act

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Chrysene	-	-	X	X

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA

Not applicable

Component	Hazardous Substances RQs	CERCLA EHS RQs
Chrysene	100 lb	-

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

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Chrysene	218-01-9	Carcinogen	0.35 µg/day	Carcinogen

State Right-to-Know

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

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security

This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Canada

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class D2A Very toxic materials



16. Other information

Prepared By

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

Revision Date

10-Feb-2015

Print Date

10-Feb-2015

Revision Summary

This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Disclaimer

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

End of SDS

SAFETY DATA SHEET

Creation Date 28-Jul-2014

Revision Date 17-Jan-2018

Revision Number 4

1. Identification

Product Name Copper, Dust (Laboratory)

Cat No. : C431-500

CAS-No 7440-50-8
Synonyms No information available

Recommended Use Laboratory chemicals.
Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company

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

Emergency Telephone Number

CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable solids	Category 2
Acute oral toxicity	Category 4
Acute Inhalation Toxicity - Dusts and Mists	Category 3
Skin Corrosion/irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Liver, Kidney.	
Combustible dust	Yes

Label Elements

Signal Word

Danger

Hazard Statements

Flammable solid
May form combustible dust concentrations in air
Toxic if inhaled
Harmful if swallowed
Causes serious eye irritation

Causes skin irritation
May cause respiratory irritation
May cause damage to organs through prolonged or repeated exposure



Precautionary Statements

Prevention

Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Do not eat, drink or smoke when using this product

Response

Get medical attention/advice if you feel unwell

Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician

Skin

IF ON SKIN: Wash with plenty of soap and water
If skin irritation occurs: Get medical advice/attention
Take off contaminated clothing and wash before reuse

Eyes

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention

Ingestion

Rinse mouth

IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell

Fire

In case of fire: Use CO₂, dry chemical, or foam for extinction

Storage

Store in a well-ventilated place. Keep container tightly closed
Store locked up

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

Very toxic to aquatic life with long lasting effects

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Copper	7440-50-8	100

4. First-aid measures

Eye Contact

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

Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Get medical attention if symptoms occur.
Inhalation	Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required.
Ingestion	Do not induce vomiting. Call a physician or Poison Control Center immediately.
Most important symptoms and effects	No information available.
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
Unsuitable Extinguishing Media	No information available
Flash Point	Not applicable
Method -	No information available
Autoignition Temperature	No information available
Explosion Limits	
Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Flammable. Dust can form an explosive mixture in air. Fine dust dispersed in air may ignite. Thermal decomposition can lead to release of irritating gases and vapors. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products

Copper oxides

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health
2

Flammability
2

Instability
1

Physical hazards
N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment. Remove all sources of ignition. Avoid dust formation. Avoid contact with skin, eyes and clothing. Avoid inhalation of the product. Keep people away from and upwind of spill/leak.
Environmental Precautions	Should not be released into the environment. See Section 12 for additional ecological information.
Methods for Containment and Clean Up	Remove all sources of ignition. Sweep up or vacuum up spillage and collect in suitable container for disposal. Avoid dust formation.

7. Handling and storage

Handling	Wear personal protective equipment. Ensure adequate ventilation. Use spark-proof tools and explosion-proof equipment. Keep away from open flames, hot surfaces and sources of ignition. Avoid contact with skin, eyes and clothing. Avoid ingestion and inhalation. Avoid dust formation.
-----------------	---

Storage

Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition. Flammables area.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Copper	TWA: 0.2 mg/m ³ TWA: 1 mg/m ³	(Vacated) TWA: 0.1 mg/m ³ TWA: 0.1 mg/m ³ TWA: 1 mg/m ³	IDLH: 100 mg/m ³ TWA: 1 mg/m ³ TWA: 0.1 mg/m ³	TWA: 0.2 mg/m ³ TWA: 1 mg/m ³ STEL: 2 mg/m ³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures

Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment**Eye/face Protection**

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection

Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection

Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Powder Solid
Appearance	Red brown
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	1083 °C / 1981.4 °F
Boiling Point/Range	2595 °C / 4703 °F
Flash Point	Not applicable
Evaporation Rate	No information available
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	1 mmHg @ 1628 °C
Vapor Density	No information available
Specific Gravity	8.92
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	Cu

Molecular Weight 63.54

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Moisture sensitive. Air sensitive.
Conditions to Avoid	Avoid dust formation. Incompatible products. Exposure to air. Exposure to moisture. Keep away from open flames, hot surfaces and sources of ignition.
Incompatible Materials	Strong oxidizing agents
Hazardous Decomposition Products	Copper oxides
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information	The toxicological properties have not been fully investigated
LD50 Oral VALUE	472 mg/kg (Rat)
LC50 Inhalation (DUST) VALUE	0.73 mg/l (male rats)
Component Information	
Toxicologically Synergistic Products	No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation	Irritating to eyes, respiratory system and skin
Sensitization	No information available
Carcinogenicity	The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Copper	7440-50-8	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects Mutagenic effects have occurred in microorganisms.

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system

STOT - repeated exposure Liver Kidney

Aspiration hazard No information available

Symptoms / effects, both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Copper	0.0426-0.0535 mg/L EC50 72 h 0.031-0.054 mg/L EC50 96 h	Onchorhynchys mykiss: LC50=0.15 mg/L 96h Cuprinus carpio: LC50=0.8 mg/L 96h	Not listed	EC50: = 0.03 mg/L, 48h Static (Daphnia magna)

Persistence and Degradability No information available

Bioaccumulation/ Accumulation No information available.

Mobility No information available.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No UN3089
 Proper Shipping Name METAL POWDERS, FLAMMABLE, N.O.S.
 Proper technical name (COPPER)
 Hazard Class 4.1
 Packing Group III

TDG

UN-No UN3089
 Proper Shipping Name METAL POWDERS, FLAMMABLE, N.O.S.
 Hazard Class 4.1
 Packing Group III

IATA

UN-No UN3089
 Proper Shipping Name METAL POWDERS, FLAMMABLE, N.O.S.
 Hazard Class 4.1
 Packing Group III

IMDG/IMO

UN-No UN3089
 Proper Shipping Name METAL POWDERS, FLAMMABLE, N.O.S.
 Hazard Class 4.1
 Packing Group III

15. Regulatory information

All of the components in the product are on the following Inventory lists: Australia China Canada Europe TSCA Korea Philippines

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Copper	X	X	-	231-159-6	-		X	-	X	X	X

Legend:

X - Listed

E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.

P - Indicates a commenced PMN substance

R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule

T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.

XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).

Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Copper	7440-50-8	100	1.0

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

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Copper	-	-	X	X

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA

Component	Hazardous Substances RQs	CERCLA EHS RQs
Copper	5000 lb	-

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

U.S. State Right-to-Know Regulations

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

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant Y

U.S. Department of Homeland Security

This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

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

Creation Date 28-Jul-2014
Revision Date 17-Jan-2018
Print Date 17-Jan-2018
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard

replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

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

End of SDS

SAFETY DATA SHEET

Version 4.11
Revision Date 10/12/2018
Print Date 10/19/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Lead

Product Number : 391352

Brand : Aldrich

CAS-No. : 7439-92-1

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

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

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Acute toxicity, Oral (Category 4), H302

Carcinogenicity (Category 2), H351

Reproductive toxicity (Category 2), H361

Specific target organ toxicity - repeated exposure (Category 2), H373

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

Warning

Hazard statement(s)

H302 Harmful if swallowed.

H351 Suspected of causing cancer.

H361 Suspected of damaging fertility or the unborn child.

H373 May cause damage to organs through prolonged or repeated exposure.

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/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
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	: Pb
Molecular weight	: 207.20 g/mol
CAS-No.	: 7439-92-1
EC-No.	: 231-100-4

Hazardous components

Component	Classification	Concentration
Lead		
	Acute Tox. 4; Carc. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H302, H351, H372, H410	90 - 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

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid 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.

Keep in a dry place.

Storage class (TRGS 510): 6.1D: 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	See 1910.1025		
Lead	7439-92-1	TWA	0.05 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
		Confirmed animal carcinogen with unknown relevance to humans		
		TWA	0.05 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Hematologic effects Peripheral Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		

		TWA	0.05 mg/m ³	USA. NIOSH Recommended Exposure Limits
		See Appendix C		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
	-	Lead	200 µg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
	Remarks	Not critical			

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: Dermatrill® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatrill® (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: powder |
| b) Odour | No data available |

c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 327.4 °C (621.3 °F) - lit.
f) Initial boiling point and boiling range	1,740 °C (3,164 °F) - lit.
g) Flash point	Not applicable
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 acids

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Lead oxides

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

Rat

Cytogenetic analysis

Carcinogenicity

Limited evidence of carcinogenicity in animal studies

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Lead)

NTP: RAHC - Reasonably anticipated to be a human carcinogenThe reference note has been added by TD based on the background information of the NTP. (Lead)

OSHA: OSHA specifically regulated carcinogen (Lead)

Reproductive toxicity

Reproductive toxicity - Rat - Inhalation

Effects on Newborn: Biochemical and metabolic.

Reproductive toxicity - Rat - Oral

Effects on Newborn: Behavioral.

Reproductive toxicity - Mouse - Oral

Effects on Fertility: Female fertility index (e.g., # females pregnant per females mated). Effects on Fertility: Pre-implantation mortality (e.g., reduction in numbe corpora lutea).

May damage fertility. May damage the unborn child.

Developmental Toxicity - Rat - Inhalation

Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Specific Developmental Abnormalities: Blood and lymphatic system (including spleen and marrow).

Developmental Toxicity - Rat - Oral

Specific Developmental Abnormalities: Blood and lymphatic system (including spleen and marrow). Effects on Newborn: Growth statistics (e.g., reduced weight gain).

Developmental Toxicity - Rat - Oral

Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Effects on Embryo or Fetus: Fetal death.

Developmental Toxicity - Mouse - Oral

Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Effects on Embryo or Fetus: Fetal death.

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard

No data available

Additional Information

RTECS: OF7525000

anemia

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	mortality LOEC - Oncorhynchus mykiss (rainbow trout) - 1.19 mg/l - 96.0 h LC50 - Micropterus dolomieu - 2.2 mg/l - 96.0 h mortality NOEC - Salvelinus fontinalis - 1.7 mg/l - 10.0 d
Toxicity to daphnia and other aquatic invertebrates	mortality LOEC - Daphnia (water flea) - 0.17 mg/l - 24 h mortality NOEC - Daphnia (water flea) - 0.099 mg/l - 24 h
Toxicity to algae	mortality EC50 - Skeletonema costatum - 7.94 mg/l - 10 d

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

Bioaccumulation	Oncorhynchus kisutch - 2 Weeks - 150 µg/l Bioconcentration factor (BCF): 12
-----------------	---

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: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Lead)
Reportable Quantity (RQ): 10 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. (Lead)
Marine pollutant: yes

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Lead)

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
Lead	7439-92-1	2015-11-23

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Lead	7439-92-1	2015-11-23

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Lead	7439-92-1	2015-11-23

	CAS-No.	Revision Date
Lead	7439-92-1	2015-11-23

New Jersey Right To Know Components

	CAS-No.	Revision Date
Lead	7439-92-1	2015-11-23

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

	CAS-No.	Revision Date
Lead	7439-92-1	2009-02-01

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

	CAS-No.	Revision Date
Lead	7439-92-1	2009-02-01

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
H302	Harmful if swallowed.
H351	Suspected of causing cancer.
H361	Suspected of damaging fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.
H373	May cause damage to organs through prolonged or repeated exposure.

Further information

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

Preparation Information

Sigma-Aldrich Corporation

Product Safety – Americas Region

1-800-521-8956

Version: 4.11

Revision Date: 10/12/2018

Print Date: 10/19/2018

SAFETY DATA SHEET

Creation Date 20-Aug-2014

Revision Date 17-Jan-2018

Revision Number 3

1. Identification

Product Name Mercury (Certified ACS)
Cat No. : M141-1LB; M141-6LB
Synonyms Colloidal mercury; Hydrargyrum; Metallic mercury
Recommended Use Laboratory chemicals.
Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company

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

Emergency Telephone Number

CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Corrosive to metals	Category 1
Acute Inhalation Toxicity - Vapors	Category 2
Reproductive Toxicity	Category 1B
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Central nervous system (CNS), Kidney.	

Label Elements

Signal Word

Danger

Hazard Statements

May be corrosive to metals
Fatal if inhaled
May damage the unborn child
Causes damage to organs through prolonged or repeated exposure

**Precautionary Statements****Prevention**

Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Do not get in eyes, on skin, or on clothing
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear respiratory protection

Response

IF exposed or concerned: Get medical attention/advice

Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Immediately call a POISON CENTER or doctor/physician

Skin

Immediately call a POISON CENTER or doctor/physician
IF ON SKIN: Gently wash with plenty of soap and water
Remove/Take off immediately all contaminated clothing
Wash contaminated clothing before reuse

Storage

Store locked up
Store in a well-ventilated place. Keep container tightly closed

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

Very toxic to aquatic life with long lasting effects

WARNING. Reproductive Harm - <https://www.p65warnings.ca.gov/>.

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Mercury	7439-97-6	100

4. First-aid measures

Eye Contact

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Immediate medical attention is required.

Skin Contact

Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Immediate medical attention is required.

Inhalation

Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required.

Ingestion

Do not induce vomiting. Call a physician or Poison Control Center immediately.

Most important symptoms and effects	No information available.
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.
Unsuitable Extinguishing Media	No information available
Flash Point	No information available
Method -	No information available
Autoignition Temperature	No information available
Explosion Limits	
Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Very toxic. Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products

Mercury oxide Highly toxic fumes

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
4	0	0	N/A

6. Accidental release measures

Personal Precautions	Wear self-contained breathing apparatus and protective suit. Evacuate personnel to safe areas. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing.
Environmental Precautions	Should not be released into the environment. See Section 12 for additional ecological information.
Methods for Containment and Clean Up	Wear self-contained breathing apparatus and protective suit. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling	Use only under a chemical fume hood. Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Do not breathe vapors or spray mist. Do not ingest.
Storage	Keep containers tightly closed in a dry, cool and well-ventilated place. Corrosives area.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Mercury	TWA: 0.025 mg/m ³ Skin	(Vacated) TWA: 0.05 mg/m ³ Ceiling: 0.1 mg/m ³ (Vacated) STEL: 0.03 mg/m ³ Skin (Vacated) Ceiling: 0.1 mg/m ³	IDLH: 10 mg/m ³ TWA: 0.05 mg/m ³ Ceiling: 0.1 mg/m ³	TWA: 0.05 mg/m ³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Use only under a chemical fume hood. Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

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

9. Physical and chemical properties

Physical State	Liquid
Appearance	Silver
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-38.87 °C / -38 °F
Boiling Point/Range	356.72 °C / 674.1 °F
Flash Point	No information available
Evaporation Rate	No information available
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	0.002 mmHg @ 25 °C
Vapor Density	7.0
Specific Gravity	13.59 (H2O=1)
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	Hg
Molecular Weight	200.59

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under normal conditions.
Conditions to Avoid	Incompatible products. Excess heat.
Incompatible Materials	Strong oxidizing agents, Ammonia, Metals, Halogens

Hazardous Decomposition Products Mercury oxide, Highly toxic fumes

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information No acute toxicity information is available for this product

Component Information

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Mercury	7439-97-6	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects May cause harm to the unborn child.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure Central nervous system (CNS) Kidney

Aspiration hazard No information available

Symptoms / effects, both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

This product contains the following substance(s) which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Mercury	Not listed	0.9 mg/L LC50 96h 0.18 mg/L LC50 96h 0.16 mg/L LC50 96h 0.5 mg/L LC50 96h	Not listed	EC50: = 5.0 µg/L, 96h (water flea)

Persistence and Degradability No information available

Bioaccumulation/ Accumulation No information available.

Mobility No information available.

13. Disposal considerations

Waste Disposal Methods

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Mercury - 7439-97-6	U151	-

14. Transport information

DOT

UN-No UN2809
 Proper Shipping Name MERCURY
 Hazard Class 8
 Subsidiary Hazard Class 6.1
 Packing Group III

TDG

UN-No UN2809
 Proper Shipping Name MERCURY
 Hazard Class 8
 Subsidiary Hazard Class 6.1
 Packing Group III

IATA

UN-No UN2809
 Proper Shipping Name MERCURY
 Hazard Class 8
 Subsidiary Hazard Class 6.1
 Packing Group III

IMDG/IMO

UN-No UN2809
 Proper Shipping Name MERCURY
 Hazard Class 8
 Subsidiary Hazard Class 6.1
 Packing Group III

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Mercury	X	X	-	231-106-7	-		X	-	X	X	X

Legend:

X - Listed

E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.

P - Indicates a commenced PMN substance

R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule

T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.

XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).

Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations**TSCA 12(b)**

Component	TSCA 12(b)
Mercury	Section 5

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Mercury	7439-97-6	100	1.0

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

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Mercury	-	-	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depleters	Class 2 Ozone Depleters
Mercury	X		-

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Mercury	1 lb	-

California Proposition 65 This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Mercury	7439-97-6	Developmental	-	Developmental

U.S. State Right-to-Know Regulations

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

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security

This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

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Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

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

End of SDS

HEALTH AND SAFETY WORK PLAN

APPENDIX D **Heat/Cold Stress Protocols**

HEAT STRESS

Heat Stress (Hyperthermia)

Heat stress is the body's inability to regulate the core temperature. A worker's susceptibility to heat stress can vary according to his/her physical fitness, degree of acclimation to heat, humidity, age and diet.

1. Prior to site activity, the field team leader may make arrangements for heat stress monitoring (i.e., monitoring heart rate, body temperature, and body water loss) during actual site work if conditions warrant. In addition, the FTL is to ensure that each team member has been acclimatized to the prevailing environmental conditions, that personnel are aware of the signs and symptoms of heat sickness, that they have been adequately trained in first aid procedures, and that there are enough personnel on-site to rotate work assignments and schedule work during hours of reduced temperatures. Personnel should not consume alcoholic or caffeinated beverages but rather drink moderate levels of an electrolyte solution and eat well prior to commencing site work.
2. Although there is no specific test given during a baseline physical that would identify a person's intolerance to heat, some indicators are tobacco or medication use, dietary habits, body weight, and chronic conditions such as high blood pressure or diabetes.
3. *Heat cramps*, caused by profuse perspiration with inadequate fluid intake and salt replacement, most often afflict people in good physical condition who work in high temperature and humidity. Heat cramps usually come on suddenly during vigorous activity. Untreated, heat cramps may progress rapidly to heat exhaustion or heat stroke. First aid treatment: remove victim to a cool place and replace lost fluids with water.
4. Thirst is not an adequate indicator of heat exposure. Drinking fluid by itself does not indicate sufficient water replacement during heat exposure. 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. For every half pound of water lost, 8 ounces of water should be ingested. 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.

5. *Heat exhaustion* results from salt and water loss along with peripheral pooling of blood. Like heat cramps, heat exhaustion tends to occur in persons in good physical health who are working in high temperatures and humidity. Heat exhaustion may come on suddenly as dizziness and collapse. Untreated, heat exhaustion may progress to heat stroke.
6. *Treatment for heat exhaustion:* Move the victim to a cool environment (e.g. air-conditioned room/car), lay victim down and fan him/her. If the air-conditioning is not available, remove the victim to a shaded area, remove shirt, and fan. If symptoms do not subside within an hour, notify 911 to transport to hospital.
7. *Heat stroke* results from the body's inability to dissipate excess heat. A true medical emergency that requires immediate care, it usually occurs when one ignores the signs of heat exhaustion and continues strenuous activities. Working when the relative humidity exceeds 60% is a particular problem. Workers in the early phase of heat stress may not be coherent of they will be confused, delirious or comatose. Changes in behavior, irritability and combativeness are useful early signs of heat stroke.
8. *Treatment of heat stroke:* Move the victim to a cool, air-conditioned environment. Place victim in a semi-reclined position with head elevated and strip to underclothing. Cool victim as rapidly as possible, applying ice packs to the arms and legs and massaging the neck and torso. Spray victim with tepid water and constantly fan to promote evaporation. Notify 911 to transport to hospital as soon as possible.

TABLE 1

SYMPTOMS OF HEAT STRESS

Heat cramps are caused by heavy sweating with inadequate fluid intake. Symptoms include;

- Muscle cramps
- Cramps in the hands, legs, feet and abdomen

Heat exhaustion occurs when body organs attempt to keep the body cool. Symptoms include;

- | | |
|----------------------------------|--------------------|
| • Pale, cool moist skin | • Rapid heart rate |
| • Core temperature elevated 1-2° | • Heavy sweating |
| • Thirst | • Dizziness |
| • Anxiety | • Nausea |

Heat stroke is the most serious form of heat stress. Immediate action must be taken to cool the body before serious injury and death occur. Symptoms are;

- Red, hot, dry skin
- Lack of perspiration
- Seizures
- Dizziness and confusion
- Strong, rapid pulse
- Core temperature of 104° or above
- Coma

TABLE 2

HEAT STRESS INDICATORS

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)	Shorten next work period by 33%
		100.6°F	Prohibit work in impermeable clothing
Body weight	1. Before workday begins (a.m.) 2. After workday ends (p.m.)		Increase fluid intake

COLD STRESS

Cold stress (Hypothermia)

In hypothermia the core body temperature drops below 95°F. Hypothermia can be attributed to a decrease in heat production, increased heat loss or both.

Prevention

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

1. Maintain body core temperature at 98.6°F or above by encouraging workers to drink warm liquids during breaks (preferably not coffee) and wear several layers of clothing that can keep the body warm even when the clothing 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 gloves. Tool handles should be covered with insulating material.
3. Adjust work schedules to provide adequate rest periods. When feasible, rotate personnel and perform work during the warmer hours of the day.
4. Provide heated shelter. Workers should remove their outer layer(s) of clothing while in the shelter to allow sweat to evaporate.
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 buildup of toxic or explosive gases or vapors. Care must be taken to keep a heat source away from flammable substances.
6. Using a wind chill chart such as the one in Table 3, 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.

Frostbite

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

Condition	Skin Surface	Tissue Under Skin	Skin Color
Frostnip	Soft	Soft	Initially red, then white
Frostbite	Hard	Soft	White and waxy
Freezing	Hard	Hard	Blotchy, white to yellow-gray to gray

1. *Frostnip* is the incipient stage of frostbite, brought about by direct contact with a cold object or exposure of a body part to cool/cold air. Wind chill or cold water also can be major factors. This condition is not serious. Tissue damage is minor and the response to care is good. The tip of the nose, tips of ears, upper cheeks and fingers (all areas generally exposed) are most susceptible to frostnip.
2. *Treatment of frostnip*: Care for frostnip by warming affected areas. Usually the worker can apply warmth from his/her bare hands, blow warm air on the site, or, if the fingers are involved, hold them in the armpits. During recovery, the worker may complain of tingling or burning sensation, which is normal. If the condition does not respond to this simple care, begin treatment for frostbite.
3. *Frostbite*: The skin and subcutaneous layers become involved. If frostnip goes untreated, it becomes superficial frostbite. This condition is serious. Tissue damage may be serious. The worker must be transported to a medical facility for evaluation. The tip of the nose, tips of ears, upper cheeks and fingers (all areas generally exposed) are most susceptible to frostbite. The affected area will feel frozen, but only on the surface. The tissue below the surface must still be soft and have normal response to touch. **DO NOT** squeeze or poke the tissue. The condition of the deeper tissues can be determined by gently palpating the affected area. The skin will turn mottled or blotchy. It may also be white and then turn grayish-yellow.
4. *Treatment of frostbite*: When practical, transport victim as soon as possible. Get the worker inside and keep him/her warm. Do not allow any smoking or alcohol consumption. Thaw frozen parts by immersion, re-warming in a 100°F to 106°F water bath. Water temperature will drop rapidly, requiring additional warm water throughout the process. Cover the thawed part with a dry sterile dressing. Do not puncture or drain any blisters.

NOTE: Never listen to myths and folk tales about the care of frostbite. *Never* rub a frostbitten or frozen area. *Never* rub snow on a frostbitten or frozen area. Rubbing the area may cause

serious damage to already injured tissues. Do not attempt to thaw a frozen area if there is any chance it will be re-frozen.

5. *General cooling/Hypothermia:* General cooling of the body is known as systemic hypothermia. This condition is not a common problem unless workers are exposed to cold for prolonged periods of time without any shelter.

Body Temperature	°C	Symptoms
99-96	37-35.5	Intense, uncontrollable shivering
95-91	35.5-32.7	Violent shivering persists. If victim is conscious, he has difficulty speaking.
90-86	32-30	Shivering decreases and is replaced by strong muscular rigidity. Muscle coordination is affected. Erratic or jerkey movements are produced. Thinking is less clear. General comprehension is dulled. There may be total amnesia. The worker is generally still able to maintain the appearance of psychological contact with his surroundings.
85-81	29.4-27.2	Victim becomes irrational, loses contact with his environment, and drifts into a stuporous state. Muscular rigidity continues. Pulse and respirations are slow and the worker may develop cardiac arrhythmias.
80-78	26.6-18.5	Victim becomes unconscious. He does not respond to the spoken word. Most reflexes cease to function. Heartbeat becomes erratic
Below 78	25.5	Cardiac and respiratory centers of the brain fail. Ventricular fibrillation occurs; probably edema and hemorrhage in the lungs; death.

6. *Treatment of hypothermia:* Keep worker dry. Remove any wet clothing and replace with dry clothes, or wrap person in dry blankets. Keep person at rest. Do not allow him/her to move around. Transport the victim to a medical facility as soon as possible.

TABLE 3⁽¹⁾
COOLING POWER OF WIND ON EXPOSED FLESH EXPRESSED
AS AN EQUIVALENT TEMPERATURE (UNDER CALM CONDITIONS)

Estimated wind Speed (in mph)	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	15	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	-146
(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 may freeze within 30 seconds.				Flesh
	Trench foot 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.

HEALTH AND SAFETY WORK PLAN

APPENDIX E **Field Accident Report**



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 claims through his/her Health and Welfare Fund.)

INDICATE STREET NAMES, DESCRIPTION OF VEHICLES, AND NORTH ARROW



APPENDIX B

COMMUNITY AIR MONITORING PLAN

Appendix 1A

New York State Department of Health Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical-specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.
4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (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 $150 \text{ mcg}/\text{m}^3$ above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than $150 \text{ mcg}/\text{m}^3$ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within $150 \text{ mcg}/\text{m}^3$ of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009