REMEDIAL INVESTIGATION WORK PLAN
ASTORIA STEEL SITE
BROWNFIELD CLEANUP PROGRAM
SITE #C241155
3-15 26TH AVENUE
ASTORIA, QUEENS COUNTY, NEW YORK

Prepared for:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
625 BROADWAY
ALBANY, NY 12233-7016

Prepared on Behalf of:

ASTORIA OWNERS LLC
43 WEST 47th STREET SUITE 203
NEW YORK, NY 10036

Prepared by:

STANTEC CONSULTING SERVICES INC.
61 COMMERCIAL STREET
ROCHESTER, NY 14614

JANUARY 2014

Stantec Consulting Services Inc.
61 Commercial Street
Rochester NY 14614
Tel: (585) 475-1440
Fax: (585) 272-1814

January 7, 2014
File: 190500789

Javier Pérez
Environmental Engineer
New York State Department of Environmental Conservation
Remediation Bureau B, 12th Floor
625 Broadway
Albany, NY 12233-7016

RE: Remedial Investigation Work Plan
Astoria Steel Site, BCP Site #C231080
3-15 26th Avenue
Astoria, Queens County, New York

Dear Mr. Pérez:

On behalf of Astoria Owners LLC, Stantec Consulting Services Inc., has prepared this revised Remedial Investigation Work Plan (RIWP) for 3-15 26th Avenue in Astoria, Queens County, New York (The "Site"). The RIWP was prepared pursuant to requirements of NYSDEC's DER Technical Guidance for Site Investigation and Remediation (DER-10) and was revised based on NYSDEC's December 13, 2013 Comment Letter. All of your comments have been incorporated into the document. Per our discussion on December 19, we have and will include comparison to Restricted Residential Soil Cleanup Objectives (SCOs) in the tables, in addition to the Unrestricted Use and Protection of Groundwater SCOs requested in your comment letter.

Should you have any questions or require further information, please do not hesitate to call.

Sincerely,

STANTEC CONSULTING SERVICES INC.

Michael P. Storonsky
Managing Principal
Tel: (585) 413-5266
Fax: (585) 272-1814
Mike.Storonsky@stantec.com

Stephanie Reynolds-Smith
Hydrogeologist
Tel: (585) 413-5272
Fax: (585) 272-1814
Stephanie.ReynoldsSmith@stantec.com

Peter Nielsen, P.E.
Senior Associate
Tel: (585) 413-5280
Fax: (585) 272-1814
Peter.Nielsen@stantec.com

Attachment: RIWP

ec w/enclosure: Mendy Chudaitov,
Boris Aronov
Linda Shaw

REMEDIAL INVESTIGATION WORK PLAN
Astoria Steel Site, BCP Site #C241155
3-15 26th Avenue, Astoria, Queens County, NY

CERTIFICATION

I, Peter Nielsen, certify that I am currently a NYS registered professional engineer and that this Remedial Investigation Work Plan was prepared in accordance with applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Signature

01/07/2014
Date

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1.0 Introduction

This Remedial Investigation (RI) Work Plan (Work Plan) for the property located at 3-15 26th Avenue in Astoria, Queens County, New York (the "Site") is being submitted to the New York State Department of Environmental Conservation (NYSDEC) concurrent with an application to enter the Site into NYSDEC's Brownfield Cleanup Program (BCP). A map showing the Site location is presented on Figure 1. As part of the BCP, Astoria Owners LLC (Volunteer) proposes to implement this RI Work Plan following acceptance of the Site into the BCP. This Work Plan identifies the remedial investigation tasks to be completed in accordance with the BCP and NYSDEC's DER-10 Technical Guidance for Site Investigation and Remediation (May 3, 2010; DER-10).

1.1 Purpose

The purposes of the RI are to determine surface and subsurface characteristics of the Site, assess the source(s) and determine the nature and extent of contamination on or migrating from the Site, and identify migration pathways and potential receptors. The information to be developed by the RI is needed to allow for the selection, as necessary, of remedial measures that will attain conditions at the Site, which are protective of restricted residential use of the Site and are protective of public health, the environment, and fish and wildlife resources.

1.2 Site Background

1.2.1 Location and Description

The subject property is an 3.1439-acre parcel located at 3-15 26th Avenue in Astoria, Queens County, New York (see Figure 1). The Site (Tax Map Block 911, Lot 1) is located on the north side of 26th Avenue and extends north to the East River bulkhead. The Site is improved by two buildings with a total approximate square footage of 53,000 and is occupied by multiple tenants.

The metal building closest to the East River (Building 1) is used for prop storage by three TV-Series production companies. Since the 1980's, the second tenant space has been used by JRC Lumber Corporation (later JPR Construction Co. Inc. and JRC Mill Works) and LeNoble Lumber Company Inc. (LeNoble). LeNoble currently stores various wood sheeting units at the Site.

Building 2 is located off of 26th Avenue and currently contains two tenants operating on the first floor. The first tenant is 24/7 Electric. 24/7 Electric stores forklifts and various equipment onsite although daily operations of the company are uncertain. The second tenant is a truck repair shop, Eagle One, which stores tires and petroleum drums inside and outside its tenant space.

Historical uses of the Site are described below in Section 1.2.5.

The intended future use of the Site following completion of the BCP remedial Investigation is that it will be developed with potentially two residential buildings. 'Restricted Residential' is the anticipated BCP use category.

1.2.2 Physical Setting

Topography: The Site is relatively level with minor elevation variations. According to a 1995 United States Geologic Survey (USGS) topographic map, Central Park, New York City Quadrangle, 7.5 minute series, the ground surface elevation averages approximately 20 feet above mean sea level (ft amsl). Surface water drainage is generally toward the East River.

The Site resides within FEMA flood zones, as displayed on Figure 2.

Site Geology and Hydrogeology: The general subsurface profile observed across the Site consists of the following deposits, in order of increasing depth: fill materials, native unconsolidated deposits, and bedrock. Not all layers were encountered in all explorations. The borings extended to depths ranging from 10 feet to 40 feet below ground surface (ft bgs).

Soil geology on-Site generally consists of a fill layer ranging from 0-15 feet bgs. The fill layer consists predominantly of gray/brown medium sands and medium gravels with some fines, rock fragments, coal ash, asphalt, concrete, brick, and black/dark gray sands intermittently throughout the site. Lenses of suspected foundry sands were also observed in the fill material in some areas of the central and northern portions of the Site and consisted of yellow/light brown sand. Native soils were identified starting at 5 to 10 ft bgs and contain gray medium sand and fine silty sand with medium gravel and some crushed rock. Bedrock, the Fordham Gneiss, was reached at depths ranging from 13 to 27 ft bgs.

Groundwater levels in monitoring wells installed for a 2006 Phase II ESA encountered groundwater at depths ranging from approximately 6 to 8 ft bgs near the East River and approximately 6 ft bgs inland. Groundwater flow direction is presumed to be north towards the East River. However, the exact flow direction is anticipated to be variable and dependent on tidal fluctuations in the River.

Natural Resource and Sensitive Receptors: Wetland resource mapping was reviewed including the NYSDEC Wetlands mapping and the US Fish and Wildlife Service National Wetland Inventory (NWI). The NYSDEC freshwater wetland mapping does not identify any wetland resources on, or in the near vicinity of, the Site. The NWI identifies the East River, which is located adjacent to the north end of the Site, as Estuarine subtidal, unconsolidated bottom, permanently flooded (see Figure 3). The shoreline of the Site that abuts the East River is lined with heavy stone riprap. There is no riparian wetland zone.

Other potential contaminant receptors include resident fish and wildlife resources within the East River to the north and west of the Site and residential housing to the south of the Site, described below. Possible contaminant pathways include sheet flow from the Site, storm drainage directed along 26th Avenue and any floor drains or surface inlets on the Site, which may connect to storm or sanitary sewers or the East River.

A baseball field is located approximately 400 ft west and cross-gradient to the Site abutting the East River. There are seven additional parks located within one-half mile of the Site. Three of the parks are located across, or on an island within, the East River. Two of the four parks located inland are cross-gradient from the Site while the other two parks are situated upgradient of the Site. There are three schools located within one-half mile of the Site, which are all upgradient (see Figure 3).

1.2.3 Current Site and Surrounding Land Uses

Land use at the site, and at immediately adjacent parcels to the east and west, is industrial/commercial (see Figure 3). The Site is currently occupied by multiple warehouse use type tenants. Building 1 is used for prop storage by three TV-Series production companies and lumber storage for LeNoble Lumber Company Inc. Building 2 is used for storage (forklifts and other equipment) by 24/7 Electric and a truck repair shop operated by Eagle One. The company also stores tires and petroleum drums both inside and outside of its tenant space.

There are two parcels currently abutting the western Site property line. The southerly parcel to the west of the Site is occupied by a large manufacturing building, which appeared to be vacant at the time of an August 2013 Phase I site visit. The northerly parcel to the west of the Site is occupied by a trucking storage yard. It currently has multiple trucks and storage containers on-site.

Two parcels adjoin the Site to the east including the Build It Green Company. Build It Green Co. provides recycling services for commercial companies. In addition to Build It Green, a school-bus parking depot is present.

Multi-tenant residential buildings are located off 26th Avenue south of the Site.

Zoning: The New York City Planning Commission Zoning Map (June 2011) provides zoning information for the Site and surrounding areas. The Site is located within a manufacturing district (M 1-1). The existing land uses and zoning in the surrounding area are primarily manufacturing (M 1-1) and residential (R6). However, the City has a waterfront revitalization plan, which includes this Site and a plan to redevelop the area into a new residential neighborhood with an esplanade along the front of the Site.

1.2.4 Water Supply in the Surrounding Area

According to the New York City Department of Environmental Protection (NYCDEP), potable water is supplied to businesses and residences by the New York City Water Supply System which is, or has been, sourced from three different supplies: the Catskill/Delaware supply, the Croton supply, and a groundwater supply in southeastern Queens. The southeastern Queens groundwater supply has reportedly not been used since 2007. Based on the

reported location of the southeastern Queens groundwater supply, it appears that no municipal water supply wells are located on, or adjacent to, the Site. According to the NYSDEC Water Well Program, no private water wells are located on, or adjacent to, the Site. This database contains information dating back to 2000 when the program began. In order to supplement this record, a Freedom of Information Law (FOIL) request was submitted to the NYC Department of Health concerning the presence of private water wells located within one-half mile of the Site. No response had been received at the time of this report. Any pertinent response will be forwarded.

1.2.5 Past Uses of the Site and Adjoining Properties

Site Property: Based on available information, it appears that the Site was established in the early 1900's. Multiple owners and manufacturing companies have occupied the parcel over the years. During the early 1900's, Site occupants included the Astoria Steel Facility, Brooklyn Foundry Co and the Weisberg-Baer Co. The Brooklyn Foundry Co. operated just east of Building 2 and occupied part of Building 1 space for approximately 30 years. Building 1 was occupied by a lumber yard operated by the Weisberg-Baer Co. Gas Purifying Materials Co. operated in Building 1 from the 1930's through 1970 although it is unclear when the company closed and Connelly GPM Inc., an iron aggregate supplier, took over the company. JPR Construction Corp Inc., a lumber company specializing in wood molding and lumber storage, and LeNoble Lumber Company, Inc. have since occupied the Site.

Adjacent Properties: The parcels to the east of the site had similar historical operations to the Site, starting as early as 1915. Occupants include the Brooklyn and Capital Foundries and lumber, machine shop and dry kiln operations.

The parcels to the west were unimproved or only occupied by a single house through at least 1950. Soil and/or materials storage appears to have occurred in the 1940s and 1950s. The Gas Purifying Materials Co. operated the property to the west in the early 1950s. By the mid-1960s, a large structure was constructed and was occupied by Coffee Instants Inc. This building remains to the present time with unidentified intervening occupants.

South of the site and 26th Avenue has been occupied by residential structures since at least 1898.

1.2.6 Previous Investigations and Activities

1.2.6.1 1997 Phase I ESA

A Phase I ESA was completed by Middleton, Kontokosta Associates in 1997. The following is a summary of findings and recommendations from the 1997 Phase I ESA:

- Building department records indicated (3) 3,000-gallon underground fuel oil storage tanks and a 550-gallon gasoline storage tank on the

Site. It was observed from Site reconnaissance that the fill ports for the fuel oil tanks were filled with concrete and appeared to have been sealed.

- Building department records also indicated the possible presence of a 1,500-gallon underground heating oil tank although its presence could not be confirmed.
- It was recommended that the observed oil storage containers, including 55-gallon drums and 5-gallon pails, be either removed from the Site or placed in a storage area with added secondary containment.
- It was also recommended that the observed Potential Asbestos Containing Materials (PACM) be removed and damaged, possibly lead-bearing paint be repaired.

1.2.6.2 2006 Phase II ESA

A Phase II ESA was completed by Leggette, Brashears, & Graham, Inc. in 2006. Tables 1 and 2 contain the 2006 data screened against current Soil Cleanup Objectives (SCOs) and groundwater standards. Figures 4 and 5 also display the exceedances.

The following is a summary of findings and recommendations from the prior Phase II ESA:

- Asbestos Containing Materials (ACM) were confirmed (>1 percent) in 14 different building materials and two other building materials were assumed to contain asbestos. It was noted that all ACM must be removed before any demolition or renovation activities occur on the Site.
- Soil boring data indicated that multiple areas on the Site are impacted by metals (arsenic, chromium, mercury, etc.), petroleum related VOCs, and SVOCs. TCLP metal analysis of soil samples did not reveal the presence of characteristic hazardous waste.
- Groundwater data suggested elevated concentrations of metals (arsenic, barium, chromium, lead, and mercury), SVOCs, and benzene. However, turbidities were not specified and sampling methodology suggests that high turbidity was probable. (No testing was performed for PCBs, pesticides, or other SVOCs in either soil or groundwater.)
- Further assessment of the soil and groundwater impacts was recommended.

1.2.6.3 2013 Phase I ESA

Stantec conducted a Phase I ESA in 2013 to further evaluate impacts to the Site from historical uses. The 2013 Phase I ESAs identified the following RECs:

- The presence of 55-gallon drums, 5-gallon pails, and adjacent ground staining on Site in three areas, one of which included an AST.
- Floor staining located inside LeNoble Tenant space next to a floor drain.
- Floor staining and liquid pooling in the 24/7 Electric tenant space.

In addition, the 2013 Phase I ESA revealed the following historical recognized environmental conditions (HRECs) in connection with the Site:

- Former drum storage area managed by former Site occupant, JRC Lumber Co.
- The floor trench of former tenant JRC Lumber Co. located in the current Eagle One tenant space in Building 2. The floor trench was used during wood molding construction. The floor trench took on water from wood molding production processes. The trench was a potential receptor to the environment as it was reported not to be connected to the municipal sewer.
- (3) 3,000-gallon fuel oil USTs, (1) 1,500-gallon heating oil UST, and (1) 550-gallon gasoline UST identified in the 1997 Phase I ESA including what appeared to be fill ports that had been apparently sealed with concrete. Supporting those observations, four fuel oil tanks were depicted onsite in Sanborn Maps between 1967 and 1986. A gasoline tank was also identified onsite in historic Sanborn mapping dated 1948 to 2006.
- Former steel, foundry and lumber yard operations beginning in the early 1900's and continuing through at least 1950; city directories indicate that lumber yard operations continue to occupy portions of the Site.
- A prior Phase II ESA conducted in 2006 identified the presence of metals, petroleum related volatile organic compounds (VOCs), and semi-volatile organic base metal compounds (SVOCs) in soil and/or groundwater at concentrations above applicable soil cleanup objectives and/or groundwater standards.

Detailed discussions of the RECs, database searches, historical documentation, and other findings can be found in the Phase I ESA report for the Site.

1.2.6.4 2013 Phase II ESA

Stantec conducted a Phase II ESA in 2013 to further evaluate impacts to the Site from historical uses. The Phase II ESA work scope included:

- Drilling of 8 soil test borings;
- Field screening of soil samples with a photoionization detector;
- Laboratory analysis of 8 soil samples. Samples were analyzed for Target Compound List (TCL)/Target Analyte List (TAL) parameters and a NYSDEC ASP Category B deliverable was produced. A data usability summary report (DUSR) was not generated, but it will be generated as part of the Remedial Investigation (see Section 2.2);
- Completion of a bench study for soil reductant demand analysis;
- Installation of 4 temporary groundwater monitoring wells in completed test borings; and
- Groundwater sampling and laboratory analysis of 4 samples.

A synopsis of the findings is presented below and data are summarized on Tables 3 and 4 and on Figures 4 and 5:

Soil results: Soil results were compared to the NYSDEC 6 NYCRR Part 375 SCOs for Track 1 Unrestricted Use SCOs, Track 2 Restricted Residential Use SCOs, and Protection of Groundwater (POGW) SCOs. In addition, the soil data were compared to the NYSDEC Commissioner Policy CP-51 SCOs for RR, POGW, and Tables 2 and 3, Soil Cleanup Levels for Gasoline Contaminated Soils and Fuel Oil Contaminated Soils.

One of the eight soil samples, B-105 (1-5), was reported with a VOC concentration above SCOs: acetone was reported at a concentration of150 µg/kg. Acetone is a common laboratory artifact, however, it was not reported in the associated method blank samples; therefore, the result is considered representative of the Site at this time.

The soil sample from B-101 was reported to contain five polycyclic aromatic hydrocarbons (PAHs) at concentrations above SCOs. These compounds are often found in association with fuel oil. Soil boring B-101 was installed adjacent to a reported former UST location, and the current AST and drum storage area, which exhibited staining.

PCB Aroclor 1260 was reported above the Track 1 SCO at 0.17mg/kg in sample B-105 (1-5). This is the same location reported to contain acetone, as discussed above, and an elevated lead level, discussed below.

No concentrations of pesticides or cyanide were reported above SCOs.

Metals exceedances were found across the site. This includes exceedances for aluminum, arsenic, barium, calcium, copper, trivalent chromium, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, and zinc. Perhaps the most noteworthy exceedance was for lead at B-105. It was detected at a concentration of 2,840 mg/kg at B-105, which exceeded the Track 1 Unrestricted Use, Track 2 Residential and POGW SCOs, and may exceed the hazardous waste threshold.

Groundwater results: Groundwater results were compared to the NYSDEC Technical and Operational Guidance Series (TOGS) groundwater standards and guidance values, 1.1.1 (Reissued June 1998 with errata in January 1999 and addenda in April 2000 and June 2004) for Class GA groundwater.

No VOC, PCBs or pesticides were detected above groundwater standards or guidance values.

The SVOCs naphthalene and nitrobenzene were reported at concentrations exceeding groundwater standards at MW-103 and/or MW-104 on the northern portion of the site.

Five metals were reported in groundwater at concentrations exceeding groundwater standards: iron, lead, magnesium, manganese, and sodium. The most noteworthy exceedance was for lead at MW-102

A soil reductant analysis was performed. Based on the elevated total chromium concentrations previously reported in the 2006 Phase II ESA, laboratory bench-scale testing was conducted to evaluate soil geochemical parameters in order to assess potential options for implementation of a remedial program to address hexavalent chromium impacts (Cr+6), if present. The Walkley-Black analytical method was used to determine the fraction of organic carbon (FOC) and total Cr+6 reducing capacity for the Site soils.

Four soil samples were shipped to Stantec's Treatability Laboratory in Sylvania, Ohio for the soil reductant analysis. Results indicate that Cr+6, if present, could be mitigated by chemical oxidation based on the observed soil conditions. However, based on the Phase II soil and groundwater data, hexavalent chromium is not present, therefore remediation for Cr+6 using chemical oxidation should not be necessary.

1.2.6.5 Discussion of 2006 and 2013 Phase II Analytical Results

Based on a review of the data from both Phase II investigations, there are several contaminant issues of concern. Tables 1 through 4 are data tables screened against SCOs and groundwater standards. Figures 4 and 5 contain summaries of the exceedances of standards, guidance and SCOs for both the 2006 and 2013 data. Contaminant issues of concern include:

- Petroleum based VOC and SVOC impacts:
    - In soils
        - At SB-1 under the northern portion of Building 2. SB-1 is in the vicinity of historic fuel oil tanks observed on historic Sanborn mapping. Groundwater sampling was not conducted at this location.
        - At B-101, SB-5, TW-5, and TW-4 as PAHs in the central and northern portion of the Site. Soil boring B-101 was installed adjacent to a reported former UST

location, and the current AST and drum storage area which exhibited staining. Locations SB-5 and TW-5 are in the northwest portion of the site where storage of miscellaneous materials occurred throughout the history of the site and near a geophysical anomaly.

- In groundwater
  - At TW-3 on the west central portion of the site.
  - At MW-103, TW-6 and MW-104 along the East River. MW-103 is downgradient from SB-5 and TW-5, which were both reported to contain elevated concentrations of SVOCs, suggesting a possible upgradient source.

- Metals:
  - In soils
    - During the 2013 Phase II at B-105, a noteworthy SCO exceedance was found in soil for lead. The lead concentration was an order of magnitude higher than any lead concentrations from the 2006 Phase II samples. A total of 27 samples were analyzed in 2006 for toxicity characteristic leachate procedure (TCLP) metals in order to determine if hazardous waste was present. While none of the analyzed 2006 samples were determined to be hazardous for metals, however, the concentration of lead at B-105 is high enough that it could potentially leach at a concentration above the hazardous waste threshold. Exceedances were also found at this location for one PCB Aroclor and the VOC acetone.
    - Metals were detected in fill materials across the site. The metal concentrations are suspected to have originated from the former steel facility and foundry operations and possibly the former lumber operations dating back to the early 1900's. The most noteworthy detections of metals in soils include:
      - Although total chromium does not have an SCO, when compared to the trivalent chromium SCO, which is the predominant form of chromium found onsite, the highest exceedances are at SB-3 near former foundry operations in Building 1 and at SB-4 in the north central portion of the site near the East River, with other lessor concentrations across the northern and central portions of the site.
      - Lead at B-105, as discussed above.
      - Arsenic, barium, copper, and mercury found at various locations across the site with exceedances of the Track 1 Unrestricted Use and Track 2 Residential SCOs.

- In groundwater
  - Elevated concentrations of metals were detected in groundwater at all locations where metals were sampled during the 2006 Phase II. However, the turbidities of the samples are unknown. During the 2013 sampling, turbidities were relatively low due to the low-flow methodology used to purge and sample the groundwater. The most noteworthy metal concentration in groundwater was a detection of lead above standard at MW-102. This location is in proximity to former foundry operations and a subsurface geophysical anomaly that was suspected to be a former tank.

- PCBs
  - In soils
    - PCB Aroclor 1260 was reported above the Track 1 SCO at 0.17mg/kg in sample B-105 (1-5). This is the same location reported to contain acetone and an elevated lead level, as discussed above.

1.2.6.6 Geotechnical Study

A Due Diligence Geotechnical Study was completed by Langan Engineering and Environmental Services in 2007. An environmental assessment was not conducted during the Geotechnical Study. The following is a summary of findings and recommendations:

- Test borings indicate that soil quality is predominantly fill in the top 5 feet followed by sand and gravel with some sand and cobbles.
- Groundwater was recorded between 5-7 feet below ground surface. A chemical odor was reported in Boring B-1 at a depth of 3 feet below ground surface. The 11" x 17" drawings in this report were copied in 8½" x 11" format, therefore, the location of B-1 could not be confirmed.
- General construction recommendations were developed including bulkhead restoration and building waterproofing due to the Site's proximity to the 100 year floodplain.

1.3 Objectives of the Remedial Investigation

The objectives of the Remedial Investigation (RI) proposed herein are to:

- build upon the data and findings of the previous environmental investigations performed to develop a more thorough characterization of the nature and extent of contamination of soil and groundwater at the Site, provide more thorough areal coverage and address data gaps and satisfy DER-10 requirements;
- identify, to the extent practicable, the sources of contamination, the migration pathways, and actual or potential receptors of contaminants on or through air,

soil, groundwater, and utilities;

- collect sufficient data to evaluate the impacts, if any, to public health and the environment, and evaluate current and future potential public health exposure pathways, as well as potential impacts to fish and wildlife in order to perform a Fish and Wildlife Resource Impact Analysis and a qualitative exposure assessment; and
- collect sufficient data to facilitate development of remedial alternative(s), if appropriate.

1.4 Additional Plans

Additional complementary plans, including a Quality Assurance Project Plan (QAPP), Health and Safety Plan (HASP), and Community Air Monitoring Plan (CAMP), have been prepared to supplement this RI Work Plan. The work to be performed for this investigation will be performed in accordance with this work plan and each of the following complementary plans:

- **QAPP:** Outlines the procedures to be used to assure that analytical results obtained from the investigation meet data quality objectives (Appendix A).
- **HASP:** Describes personal safety protection standards and procedures to be followed by Stantec personnel during the planned investigation activities at the Site (Appendix B). Material Safety Data Sheets (MSDS) for the chemicals suspected to be encountered at the Site are provided as an appendix to the HASP.
- **CAMP:** Describes procedures for monitoring and controlling air quality issues related to volatile organic compounds (VOCs) and particulates (dust) that may arise during intrusive drilling and sampling activities planned at the Site (Appendix C).

2.0 Planned Remedial Investigation Activities

2.1 Overview and Discussion of Investigation Areas

To accomplish the objectives of the RI described in Section 1.3 above, the RI will involve the following:

- Attempt to fully delineate the nature and extent of contamination identified during the 2006 and 2013 Phase II ESAs,
- Investigate the RECs and HRECs identified in the 2013 Phase I, which were not previously investigated, and
- Investigate areas of the Site not previously investigated for impacts associated with historic or current usage, including historic USTs, historic industrial Site usage, current Site usage, etc.

Descriptions of the methodologies for each planned activity are provided in the following sections of the work plan. Field work will be completed during daylight hours of weekdays. Proposed sampling activities are summarized in Table 5 and proposed sampling locations are depicted on Figure 6.

The sampling and field investigation activities described below will be performed in accordance with DER-10 and other applicable NYSDEC guidance and policies.

2.2 Data Usability Summary Report Preparation for 2013 Phase II Data

A Data Usability Summary Report will be prepared for all analytical data collected during the 2013 Phase II ESA. The data usability evaluation will be performed in accordance with the NYSDEC's "Guidance for the Development of Data Usability Summary Reports," revised 1997 and DER-10. Should any data or data qualifiers be updated as a result a result of the data usability review, RI sampling and investigation locations will be re-assessed as needed in consultation with NYSDEC.

2.3 Mobilization

This task includes preparation and pre-field work activities including notification to public utilities through DigSafelyNY of the planned subsurface investigation activities. Where there is an apparent need for it, the DigSafelyNY public utility clearance process will be supplemented by a private underground utility location effort to identify, where possible, other on-site underground utility lines. The HASP will be reviewed prior to the commencement of work including a mandatory tailgate meeting at the start of each day in the field.

2.4 General Sampling Considerations

Samples will be submitted to a laboratory accredited pursuant to the New York State Department of Health Environmental Laboratory Accreditation Program (ELAP).

Analyses of the following parameters will be performed during the RI.

- Target Compound List (TCL) volatile organic compounds (VOCs) plus NYSDEC Commissioner's Policy (CP) -51 VOCs plus up to 10 TICs by EPA Method 8260C;
- TCL semi-volatile organic compounds (SVOCs) plus up to 20 TICs by EPA Method 8270D;
- TCL Pesticides by EPA Method 8081B;
- Polychlorinated Biphenyls by EPA Method 8082A; and
- Target Analyte List (TAL) Metals plus cyanide by EPA Methods 6010C/7000-series/9012B.

Refer to Table 5 for the specific analyses planned for each sample medium at each sampling location. Table 5 also describes the field Quality Assurance/Quality Control (QA/QC) samples and analyses planned. Figure 6 displays proposed sampling locations.

2.5 Surface Soil Sampling

Up to three surface soil samples will be collected. Given that the majority of the site is covered with impervious surfaces, locations will be selected in the field in consultation with NYSDEC based on locations where surface soil is present. Surface soil samples will be collected from 0 to 2 inches below the vegetative cover.

The surface soil samples will be analyzed for the full suite of TCL/TAL parameters minus VOCs (see Table 5), unless PID readings or odors are noted during sampling. If staining or odors are observed or if field screening indicates contamination, additional parameters will be added, as appropriate.

2.6 Soil Pile Sampling

Two soil piles are present on site. One is in the northeast corner of the Site and the second is in the southwest portion of the Site (see Figure 6). The origin of both piles is unknown. In order to determine if any contaminants are present in these piles, samples will be collected from each pile. In order to determine if the soils are appropriate for re-use on- or off-site, sampling will be conducted in accordance with DER-10 Section 5.4(e), including Table 5.4(e)10. The soil pile in the northeast portion of the site is estimated to be 370 cubic yards. Therefore, based on DER-10 Table 5.4(e)10, four discrete TCL VOC samples will be analyzed and two composite samples will be analyzed for the remaining TCL/TAL parameters (see Table 5). The soil pile in the southwest portion of the site consists of two closely placed piles. Together, these are estimated to be 430 cubic yards. Therefore, based on DER-10 Table 5.4(e)10, four discrete TCL VOC samples will be analyzed and two composite samples will be analyzed for the remaining TCL/TAL parameters (see Table 5).

Samples will be obtained from the soil piles through use of a decontaminated shovel or soil probe or backhoe. The VOC portion of the sample will not be composited. Composite portions will be collected from 3 to 5 locations. Laboratory detection limits for each analysis for the soil pile samples will be below the values detailed in 6 NYCRR Part 375-6.8 for the Unrestricted Use Soil Cleanup Objectives, or as low as possible given analytical and matrix limitations.

2.7 Trench and Floor Drain Dye Testing

During the Phase I ESA, a trench drain was reported in the northwest corner of Building 2 and a floor drain was reported in the west central portion of Building 1.

The Trench in Building 2 was previously used during wood molding construction. During this process, sawdust was generated and water was used to contain the sawdust and push it towards the trench. The discharge location of the trench is not known. The trench is now covered and is reportedly filled with sawdust. The discharge location of the floor drain in Building 1 is also unknown.

Due to the potential for impacts to the environment from discharges to the trench or floor drain, separate dye tests will be performed to attempt to ascertain the discharge locations of the trench and floor drain. Prior to performing the dye test in the trench, to the extent possible, any sawdust present in the trench will be removed.

On separate occasions, a tracer dye such as FWT Red Liquid 50 will be placed in the trench and drain and a steady water supply will be applied. Nearby sanitary and storm catch basins and the East River will be observed for the appearance of the dye. Local authorities will be notified of the tests in advance, as needed.

2.8 Geophysical Survey

Historical tanks have been identified from various sources, often without reliable or consistent location information. An EM61 geophysical survey will be performed to assist in the location of potential underground storage tanks, however, the results from the geophysical survey may be limited by the presence of metallic rebar within concrete surfaces.

A reference grid will be installed over those portions of the Site that are accessible and for which metallic interference is not present. The grid will be installed to facilitate data acquisition and tied to existing site features.

The GEONICS EM61 High Sensitivity Metal Detector and solid-state data logger are recommended for surveying the shallow subsurface (0 to 11 feet) environment for the presence of metallic or metal-containing objects. The EM61 is a portable time-domain electromagnetic (EM) unit. The device detects both ferrous and nonferrous metals. The EM61 is sensitive enough to detect a single 55-gallon drum at a depth of over 10 feet, yet is relatively insensitive to nearby above-grade sources of interference such as fences, buildings and power lines. It is pulled around on a trailer with an odometer mounted on the axle to trigger the data logger.

The EM61 generates a primary EM field at a rate of 150 pulses per second. After each transmitted pulse, the transmitter turns off and the induced EM field is allowed to decay. The receivers are then turned on, measuring the strength of this decayed secondary EM field between each pulse. Because EM fields decay much more rapidly in normal soils than in metals, the EM61 instrument is relatively insensitive to terrain conductivities and is highly sensitive to metals.

The unit is typically configured to digitally collect a data point at 0.62-foot intervals along lines spaced 3 feet apart. Data are stored on a digital data logger and archived to a laptop computer.

Data are processed using GEOSOFT software and plotted as profile lines, gridded, filtered and color-contoured. Anomalous responses will be reported as a color-contoured map of the EM61 data showing any anomalies suggestive of buried USTs or metallic pipes.

In the event that geophysical anomalies suggestive of buried metallic objects are identified, a test pit program will be performed to confirm the presence of USTs or other potential sources of contamination (see Section 2.7). The geophysical survey data will also be reviewed to confirm the proposed boring locations (see Section 2.8) are placed in appropriate locations.

2.9 Test Pit Program

In the event that geophysical anomalies are identified during the geophysical survey (see Section 2.6), a test pit program will be conducted to investigate the presence of USTs or other potential sources of contamination.

Subsequent to implementation of the geophysical survey, Stantec will provide NYSDEC with the survey results of the geophysical survey and the proposed test pit locations based on the results. Sampling requirements and frequency will be in accordance with DER-10.

Where possible test pits will be advanced to native soil and/or the water table. Test pit dimensions, orientation, and a lithologic description will be recorded and photographs will be taken at each test pit location.

At least one subsurface soil sample will be collected from each test pit location if indications of contamination are present (i.e. elevated PID readings, staining, odors, etc.). If significant impacts are observed in the test pits in the field, a second soil sample may be collected per location to assist in delineating the vertical extent of impacts at those locations.

It is anticipated that soil samples from the test pits will be analyzed for TCL VOCs plus CP-51 VOCs + TICs by Method 8260B, TCL SVOCs + TICs by Method 8270C, and TAL Metals by Method 6010B/7000 series. If staining or odors are observed or if field screening indicates contamination, additional parameters will be added, as appropriate.

2.10 Test Boring and Monitoring Well Installation

A test boring program will be performed to investigate areas of the Site not previously investigated and to delineate impacts identified in prior investigations, including soils with exceedances of Unrestricted Use, Restricted Residential Use, and POGW SCOs and exceedances of groundwater standards and guidance values. Table 5 outlines the purpose of each boring and monitoring well and Figure 6 displays the locations. If access to some of the interior boring locations is not

possible, the borings locations will be shifted to the closest possible location. The borings will be installed with either a direct push rig and Macrocore® samplers or a rotary drill rig using either Macrocore® samplers or split spoon samplers.

At each test boring, overburden samples will generally be obtained continuously to a depth of 16 feet using standard direct-push methods. However, if necessary in order to characterize the depth of contaminants, soil borings will be extended deeper than 16 feet. Soils will be field-screened for the presence of VOCs and visually described and classified, and the results recorded on test boring logs.

Samples from each boring will be selected and submitted to the project laboratory for analysis. Sample selection will be performed in accordance with DER-10. The samples will be chosen based on field observations and screening results at each individual boring. Samples collected for VOC analysis will, where feasible, be collected using a method that is in accordance with USEPA Method 5035/5035A. Table 5 details the analyses proposed for each boring location, which include the full TCL/TAL lists. As outlined in Table 5, two samples will be collected at several of the proposed sampling locations to provide vertical delineation. If a need for additional vertical characterization or delineation samples is identified in the field based on significant PID readings, staining, odors, etc., additional samples will be collected.

Monitoring wells will be installed following completion of the test boring program. Monitoring wells will be installed with a rotary drill rig using 4¼-inch hollow stem augers. Wells will be constructed using 2-inch diameter, schedule-40 PVC with 10-ft. of 0.010-inch slot well screen. Where practical, the monitoring wells will be screened across the water table, which was found to range from 6-8 ft bgs near the East River to approximately 6 ft bgs further inland during previous investigation. Tidal fluctuations likely influence and cause variability in water levels. Unless deeper water table conditions are noted during the drilling activities, well screens will be placed in the interval from 6 to 16 ft bgs near the East River and from 4 to 14 ft bgs further inland. Sand packs will consist of fine sand extending approximately 12 inches above the well screens. The sand packs will be capped with an approximately 2-ft saltwater resistant bentonite seal and the remaining annulus will be filled to ground surface with concrete. A protective casing (stickup or flush-mounted depending on the location) will be installed and sealed and mounted in place with concrete at the surface. An inner cap will be installed on the well riser.

2.11 Monitoring Well Development

After installation, the monitoring wells will be developed in an effort to cleanse them of suspended sediments so that turbidities are reduced to the maximum extent practicable. The screen intervals will be surged and a minimum of three well volumes will be removed, unless the wells go dry and removal of three volumes is not feasible. Wells will be developed using a submersible pump, a Waterra pump or dedicated disposable bailers. Turbidity, pH, specific conductivity, and temperature will be monitored during well development. An attempt will be made to reduce turbidity below 50 NTUs and to stabilize pH, specific conductivity, and temperature over three readings; however, well development will be considered complete after 3 hours regardless of parameter levels.

2.12 Groundwater Elevation Measurement

Tidal fluctuations in the East River are likely to impact groundwater levels. In order to assess the extent of tidal influence on the fluctuation of groundwater levels, water level loggers will be placed in several wells and allowed to log water levels for a 24-hour period.

In addition, prior to ground water sampling events (see Section 2.11), the static water level will be measured in each well. Static water levels will be measured within a short timeframe on the same day in each well with electronic water level indicators to the nearest 0.01 ft.

The water level measurements will be used to develop groundwater table contour maps and assess groundwater flow directions. Water levels will be measured from surveyed PVC well risers. To allow for equilibration with intrinsic groundwater conditions prior to performing the first water level measurement event, the newly-installed wells will be allowed to equilibrate for at least two weeks following completion of development.

2.13 Groundwater Sampling

Two rounds of groundwater sampling will be performed. During the first round of sampling, groundwater sampling will occur a minimum of two weeks after the completion of well development to ensure that the groundwater conditions have stabilized sufficiently.

Groundwater samples will be obtained from all newly installed wells. The sampling will be completed using low-flow methodology provided there is sufficient water produced by each well. If there is not sufficient recharge in a well for low-flow sampling procedures, the well will be purged of at least three well volumes with monitoring and stabilization of pH, temperature and specific conductance, or until the well goes dry.

For low flow sampling, wells will be purged and sampled utilizing EPA Region 2 low stress/low flow methods and a flow through cell. General water quality field parameters (i.e., pH, temperature, specific conductance, oxidation reduction potential, dissolved oxygen and turbidity) will be monitored and stabilized during purging. Turbidity need not be stable, but a value of 50 NTU or less will be attempted prior to collection of metals samples. If the other parameters are stable and a value less than 50 NTUs cannot be achieved within one hour of starting the purge, total and filtered metals portions will be collected. Filtration will be accomplished with a 0.45 micron in-line filter. The unfiltered sample portion will be analyzed first. The filtered portion will only be analyzed if results from the unfiltered portion exceed standards.

Wells to be sampled and analysis parameters planned for the first sampling event are listed in Table 5. All wells will be sampled for TCL VOCs plus additional NYSDEC CP-51 VOCs + TICs by Method 8260C, TCL SVOCs by Method 8270D, TCL Pesticides by Method 8081B, PCBs by Method 8082A, and TAL inorgamics including cyanide by Methods 6010C/7000 series/9012B. During the second round of sampling, the same procedures will be employed; however, the results of the first

round of sampling will be used to determine whether selected wells and parameters can be eliminated for Round 2.

2.14 Hydraulic Conductivity Testing

Hydraulic conductivity tests (slug tests) will be performed on approximately four newly installed wells from locations across the Site. The tests will be performed no sooner than two weeks after the well development is complete. The tests will consist of the addition (falling head test) and/or removal (rising head test) of a slug in order to determine the hydraulic conductivity of the aquifer in the immediate vicinity of each well. The tests will be accomplished by recording water level changes with a pressure transducer (e.g., LevelTROLL 700) following first the insertion (falling head test) of a solid slug and monitoring water level recovery. Once static conditions are reestablished, the slug will be withdrawn for the rising head test. After field tests are completed, the slug test data will be analyzed with commercially available software (i.e. AQTESOLV) in order to determine approximate hydraulic conductivity values at each well.

2.15 Soil Vapor

The Soil Vapor Intrusion (SVI) Assessment will be conducted in accordance with applicable technical requirements specified in the "Guidance for Evaluating Soil Vapor Intrusion in the State of New York" (NYSDOH, October 2006, and updates).

The SVI Assessment will involve a pre-sampling building inspection and product inventory, installation of sub-slab vapor sampling points, and an event to collect sub-slab vapor, indoor air, and ambient outdoor air samples.

A pre-sampling building inspection and product inventory will be performed prior to sampling point installation and the sampling event. The pre-sampling inspection will include the identification and documentation of floor penetrations associated with sump and utility features and floor joints, cracks or seams, if any. Photoionization detector (PID) readings of VOCs in indoor air will be collected at locations where chemical or petroleum products are stored or used in the building. The NYSDOH "Indoor Air Quality Questionnaire and Building Inventory" form will be used to document the pre-sampling inspection and inventory.

The sampling event will involve collection of samples of paired sub-slab vapor and indoor air at five locations spread out between the two buildings. Exact sampling locations will be selected in the field in conjunction with NYSDEC based on logistical considerations (i.e. construction dates, HVAC systems, access and placement out of high traffic areas). Two sampling locations will be selected in Building 2. One will be placed in the front portion of the building, constructed prior to 1928. This sample will be placed near the former gasoline UST. The second will be placed in the back part of the building, which was constructed in approximately 1987. It will be placed near the location of the former fuel oil tank. Three sampling locations will be distributed across Building 1. Outdoor air sampling will be performed at one location on the upwind side of the buildings at the time of the sampling event to establish background conditions for ambient air. A duplicate sub-slab soil vapor and duplicate indoor air sample will be collected at one location.

Due to plans to demolish the buildings as part of the planned development of the site, temporary sub-slab vapor sampling points will be installed. Sub-slab sampling point installation will follow protocols outlined in Section 2.7.2 of the NYSDOH Guidance document. Floor penetrations will be completed with a rotary hammer drill. The points will be constructed of inert tubing of laboratory or food grade quality (e.g. high density polyethylene (HDPE), nylon, Teflon®, etc.). The tubing will not extend further than 2 inches into the sub-slab material and the use of a porous, inert backfill material (e.g. glass beads or sand) will be used to cover approximately one inch of the probe tip. The tubing will be capped and the floor penetration will be sealed with non-shrinking bentonite cement grout. The grout will be allowed to set for a minimum of 24 hours. Tracer testing of each sub-slab sample point will then be performed following protocols outlined in Section 2.7.5 of the NYSDOH Guidance document.

Sub-slab vapor, indoor air and outdoor air sampling will follow the protocols outlined in Sections 2.7.2, 2.7.3, and 2.7.4, respectively, of the NYSDOH Guidance document. Batch certification will be used by the project laboratory providing the sampling equipment to confirm that sample canisters and flow controllers are clean before sampling. Samples will be collected over an 8-hour period using 6-liter SUMMA® canisters. The canisters will be equipped with flow controllers and vacuum gauges. Airflow into the canisters will be controlled and monitored in accordance with NYSDOH's guidance criteria of 0.2 liters/minute for maximum flow rate. Vacuum levels will be recorded at regular intervals during the sampling event. Samples will be analyzed by EPA method TO-15 for the standard list of TO-15 VOC analytes for which it routinely maintains calibration. The laboratory will seek to attain detection limits of 1.0 micrograms per cubic meter ($\mu g/m^3$), which are comparable to those typically achieved for indoor air samples. However, depending upon contaminant levels, detection limits may be higher in sub-slab vapor samples. For indoor air samples, detection limits for all compounds except for TCE, vinyl chloride, and carbon tetrachloride will be 1.0 $\mu g/m^3$; the detection limits for TCE, vinyl chloride, and carbon tetrachloride will be 0.25 $\mu g/m^3$. Results will be evaluated in accordance with the NYSDOH guidance.

2.16 Decontamination

Sampling methods and equipment have been chosen to minimize the need for decontamination. All non-dedicated equipment will be decontaminated prior to and following each use. Decontamination of drilling equipment will be accomplished with a high pressure washer. Decontamination of smaller equipment (such as Macrocores, split spoons and hand-sampling tools) will consist of a wash with Alconox (or equivalent) solution and a potable water rinse. Following decontamination, direct contact between sampling equipment and the ground surface will not be permitted.

2.17 Investigation-Derived Waste

Investigation-derived waste (IDW) materials will be handled, containerized and disposed of in accordance with DER-10 guidance. Where permitted by DER-10, IDW from uncontaminated areas may be discharged or replaced on site. Well development and purge water may potentially be discharged to the municipal sanitary sewer in accordance with a temporary discharge permit issued by the appropriate

authority provided contaminant concentrations are demonstrated by appropriate lab analyses to be within required limits.

2.18 Sampling Location Survey

Locations of existing and newly-installed monitoring wells will be surveyed for horizontal and vertical coordinates by a licensed surveyor. Other sampling locations will be surveyed for horizontal coordinates using handheld GPS units, such as the Trimble GeoXT.

2.19 Field Quality Control Samples

Table 5 summarizes the field QA/QC samples to be collected during the field investigation. Field QA/QC samples to be collected include field duplicates, trip blanks, rinsate blanks, and matrix spike/matrix spike duplicate analyses. Field duplicates and matrix spike/matrix spike duplicates will be collected at a rate of one per 20 field samples. Trip blanks will be used for aqueous matrices only and will consist of deionized water. A trip blank will accompany each shipment of samples scheduled for analysis of VOCs. One rinsate blank will be collected for each piece of non-dedicated sampling equipment used. It will be collected by pouring deionized water over decontaminated equipment. The non-dedicated equipment planned for this project may include split spoon samplers and hand soil sampling equipment.

3.0 Analytical Program

Sampling and analytical activities will be conducted in accordance with standard environmental sampling and analytical guidelines and protocols contained in the Quality Assurance Project Plan (QAPP) as presented in Appendix A.

Laboratory analyses will be performed by a laboratory accredited pursuant to the New York State Department of Health Environmental Laboratory Accreditation Program (ELAP). Table 5 summarizes the proposed sampling and analysis for each medium. Analytical reports will be prepared in accordance with the NYSDEC Analytical Services Protocol (ASP) Category B requirements.

All analytical data collected during the RI and the 2013 Phase II ESA will undergo a data usability evaluation (DUSR). The data usability evaluation will be performed in accordance with the NYSDEC's "Guidance for the Development of Data Usability Summary Reports," revised 1997 and DER-10. Analytical summary tables will be prepared which summarize the data and compare them to New York State Standards, Objectives and Guidance. This will include, as applicable, NYSDEC 6 NYCRR Part 375 Track 1 Unrestricted Use (UU), Track 2 Restricted Residential (RR) Use and POGW SCOs, NYSDEC Commissioner Policy CP-51 SCOs for RR and POGW, and CP-51 Tables 2 and 3, Soil Cleanup Levels for Gasoline Contaminated Soils and Fuel Oil Contaminated Soils and NYSDEC Class GA Water Quality Standards and Guidance Values for groundwater.

All sampling data will be submitted to NYSDEC in the appropriate EQuIS Electronic Data Deliverable (EDD) format pursuant to DER-10.

4.0 Fish and Wildlife Resource Impact Analysis and Qualitative Exposure Assessment

4.1 Fish and Wildlife Resource Impact Analysis

A Fish and Wildlife Resource Impact Analysis (FWRIA) (Part 1) will be initiated as part of the Remedial Investigation Workplan. A Part 1 FWRIA is required if there are Contaminant Migration Pathways between the Site and a Fish and Wildlife Resource. Due to the proximity of the East River which is immediately adjacent to the north end of the Site, a Site investigation will be conducted to determine if there are Contaminant Migration Pathways between the Site and the Fish and Wildlife Resource (East River), i.e. drainage ditches, lagoons, outfalls, seeps. Some off-site investigation may be required to support this assessment.

The NYSDEC Natural Heritage Program will also be contacted to request records of observed Threatened or Endangered species having occurred in the Site vicinity. Habitat information will also be requested from the Natural Heritage Program for the section of the East River near the Site.

If it is determined that there are existing Contaminant Migration Pathways between the Site and the East River, the Part 1 FWRIA will need to be completed and submitted to the NYSDEC for review as part of the Remedial Investigation. Requirements for the Part 1 FWRIA include:

- General cover type map within 0.5 miles of the Site;
- Typical fish and wildlife species present in the Site vicinity (including any threatened/endangered species);
- Identify any Contaminant Migration Pathways and depict any identified pathways on a Site map; and
- Identify contaminants of ecological concern that have been identified as having been discharged or disposed of on the Site and that have been determined to exist at concentrations that are known to bio-accumulate in the food chain, result in toxic effects to biota and/or potentially contribute to the need for a consumption health advisory.

Based upon the fish and wildlife resources and contaminant migration pathways that are identified and the toxicity of the contaminants of ecological concern, the FWRIA will draw conclusions regarding the actual or potential impacts to fish and wildlife resources. Based upon information provided in a potential FWRIA Part 1 submission, the DEC will identify if there is a need to conduct a FWRIA Part 2 Ecological Impact Assessment.

4.2 Qualitative Exposure Assessment

A qualitative exposure assessment addressing potential impacts to human health and fish and wildlife resources will be performed in accordance with DER-10 as part of the RI. The qualitative exposure assessment for both human health and/or fish and wildlife resources will completed to qualitatively determine the route, intensity, frequency and duration of actual or potential exposures to contaminants. This assessment will:

- Describe the nature and size of the population currently exposed or which

may reasonably be expected to be exposed to the contaminants that are present at or migrating from a site;

- Include a determination of the reasonably anticipated future land use of the site and affected off-site areas;
- Identify the reasonably anticipated future groundwater use;
- Characterize the exposure setting, identifying current and reasonably foreseeable exposure pathways; and
- Evaluate contaminant fate and transport.

5.0 Documentation and Reporting

Detailed documentation of Site activities will be maintained during the field work. Reporting will include submission of a final written report to NYSDEC. The written report will be provided to the NYSDEC in both hard copy and electronically on compact disk.

5.1 Field Documentation

Documentation of the field activities and environmental sampling will include the following:

Field Notebook **-** Field personnel will maintain a bound field notebook which will document dates, times and duration of pertinent field occurrences. Notebook entries will be made on consecutive pages.

Project Photographs - Photographs will be taken of field activities.

Calibration Records - Calibration records for field instrumentation will be maintained in the field notebook.

Geologic Logs - Observations pertaining to site geology and hydrogeology made during subsurface drilling will be recorded in the field notebook or on field data sheets. Construction logs of monitoring well installations will also be recorded.

Safety Forms **-** Sign-in forms, air monitoring results, and other safety related documentation will be maintained.

Chain-of-Custody Forms **-** Sample handling will be recorded on chain-of-custody forms with associated labels and custody seals.

5.2 Remedial Investigation Report

Upon receipt and review of the full set of analytical data generated by the RI, a Final Remedial Investigation Report (RIR) will be prepared, which summarizes the methods, field findings (including field documentation, such as documentation of disposal of IDW, well development data including volumes purged and field parameter readings, groundwater sampling logs, soil boring and monitoring well construction logs, etc.), lab results, interpretations, conclusions and recommendations. The RIR will be prepared in accordance with the requirements of DER-10.

Depending on the results of the remedial investigation, the Volunteer may elect to submit to NYSDEC for approval of an Interim Remedial Measure (IRM) work plan.

5.3 Remedial Action Work Plan and Alternatives Analysis Report

Upon review of and comment on the RI report by NYSDEC, an Alternatives Analysis Report (AAR) and a Remedial Action Work Plan (RAWP) and will be prepared in accordance with DER-10.

6.0 Project Organization

A multi-disciplined team is proposed to perform the activities described in this document. The project team will include experienced Stantec staff and qualified subcontractors that are appropriately trained for their assigned duties and are acceptable to the NYSDEC.

6.1 Project Personnel

The principal Stantec personnel selected to perform the activities included in this document are presented below along with a brief description of their duties. Qualifications of principal personnel who will participate in the RI are presented in Appendix D.

Michael Storonsky - Project Manager

- Provides overall project management;
- Provides managerial guidance to technical group;
- Serves as liaison between technical group and client;
- Serves as liaison with NYSDEC; and
- Prepares and reviews reports

Peter Nielsen, P.E. – Professional Engineer

- Provides managerial guidance to technical group; and
- Prepares remediation plans.

Stephanie Reynolds-Smith - Project Geologist

- Provide management of technical aspects of project;
- Provide technical guidance;
- Serve as liaison with NYSDEC; and
- Prepare and review reports.

Field Team Leaders– Hydrogeologist/Geologist

- Investigation task leaders;
- Site Safety Officers;
- Review and interpret hydrogeological data and contaminant plume geometry;
- Provide the geological and hydrogeological description of the site;
- Provide immediate supervision of on-site activities, including site preparation, borehole and monitoring well installations, sample collection, aquifer testing and health and safety;
- Ensure that samples are properly collected, stored and subjected to the appropriate chain-of-custody protocols;
- Maintain field equipment;
- Prepare field logs;
- Provide technical representation at meetings; and
- Prepare reports.

Judy Harry (Data Validation Services) - Third Party Data Validator

- Project QA director;
- Assists in review of data;
- Prepares DUSR report;

Katie Premo – Environmental Scientist

- Health and Safety Coordinator;
- Coordinates project Health and Safety; and
- Coordinates the Community Air Monitoring Plan.

Field Technician – Environmental Engineer, Geologist or Scientist

- Performs community air monitoring; and
- Provides field and office support as needed.

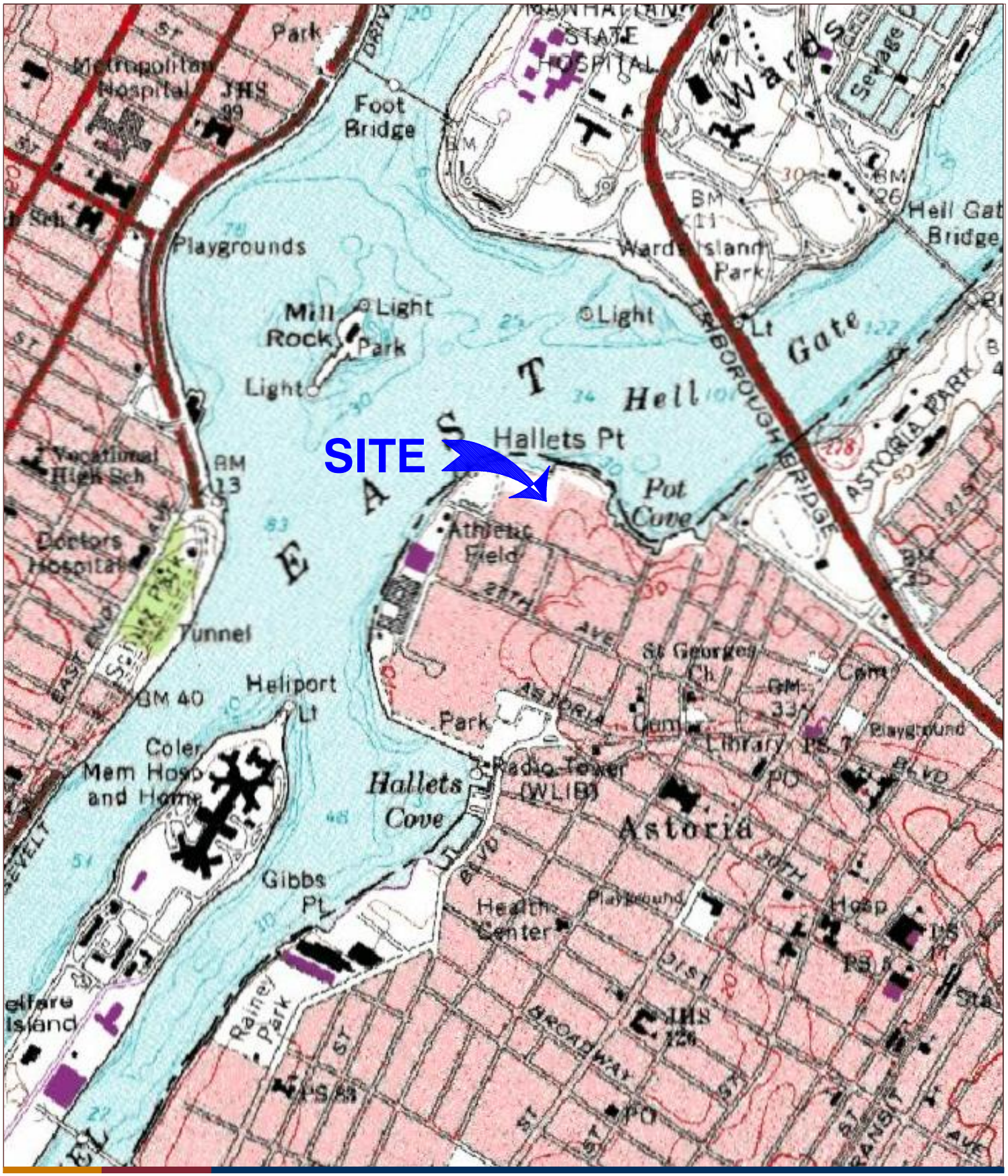
6.2 Subcontractors

Qualified, experienced, and licensed or certified subcontractors will be retained to perform monitoring well installations and sample analyses. All subcontractors are subject to the approval of the NYSDEC.

7.0 Project Schedule

The investigation activities proposed in this Work Plan will be initiated upon NYSDEC's approval to proceed. A proposed task summary and associated schedule is presented in Table 6.

FIGURES



Stantec Consulting Services Inc.
61 Commercial Street – Suite 100
Rochester, NY
14614
PH: 585.475.1440
FAX:585.272.1814

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USGS TOPOGRAPHIC QUADRANGLE
CENTRAL PARK, NY 1966

0 1000 2000

APPROXIMATE SCALE IN FEET

Client/Project
RIWP
ASTORIA STEEL SITE,
BCP SITE # C241155
3-15 26TH AVE.
ASTORIA, QUEENS, NY

Figure No. 1

Title SITE LOCATION MAP

FLOOD HAZARD NOTE

THE PARCEL SURVEYED IS COMPRISED OF AREAS DESIGNATED AS
ZONE AE(EL 11), X SHADED AND X,
FEDERAL EMERGENCY MANAGEMENT AGENCY,
NATIONAL FLOOD INSURANCE PROGRAM FLOOD INSURANCE RATE MAP
CITY OF NEW YORK BRONX, RICHMOND, NEW YORK QUEENS, AND KINGS COUNTIES–
MAP NUMBER 3604970093 PANEL 93 OF 457
COMMUNITY PANEL NUMBER 380497 PANEL 0093 SUFFIX F
MAP REVISED EFFECTIVE DATE SEPTEMBER 5, 2007

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD.

THE 1 % ANNUAL FLOOD (100–YEAR FLOOD), ALSO KNOWN AS THE BASE FLOOD THAT HAS A 1% CHANCE OF BEING EQUALED OR EXCEEDED IN ANY GIVEN YEAR. THE SPECIAL FLOOD HAZARD AREA IS THE AREA SUBJECT TO FLOODING BY THE 1% ANNUAL CHANCE FLOOD. AREAS OF SPECIAL FLOOD HAZARD INCLUDE ZONES A,AE,AH,AO,AR,A99,V,AND VE. THE BASE FLOOD ELEVATION IS THE WATER–SURFACE ELEVATION OF THE 1% ANNUAL CHANCE FLOOD.

ZONE A NO BASE FLOOD ELEVATIONS DETERMINED

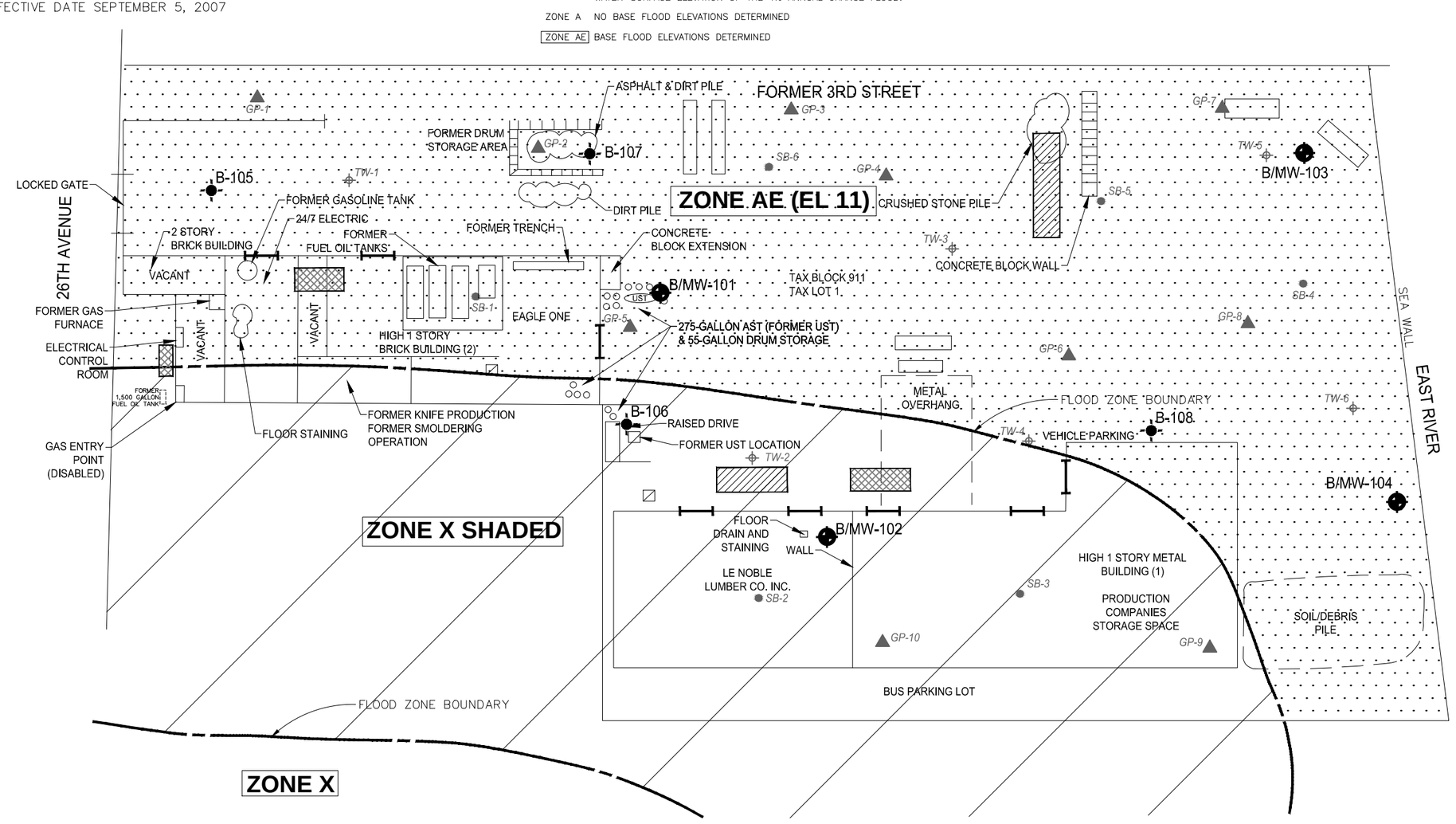
ZONE AE BASE FLOOD ELEVATIONS DETERMINED

OTHER FLOOD AREAS

ZONE X SHADED — AREAS OF 0.2% ANNUAL CHANCE FLOOD; AREAS OF 1% ANNUAL CHANCE FLOOD WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR WITH DRAINAGE AREAS LESS THAN 1 SQUARE MILE; AND AREAS PROTECTED BY LEVEES FROM 1% ANNUAL CHANCE FLOOD.

OTHER AREAS

ZONE X — AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN



NOTE:

1. MAPPING DOES NOT INCLUDE PRELIMINARY POST HURRICANE SANDY UPDATED DATA.

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APPROXIMATE SCALE IN FEET

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ORIGINAL SHEET – ANSI A

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Rochester, NY
14614
PH: 585.475.1440
FAX:585.272.1814

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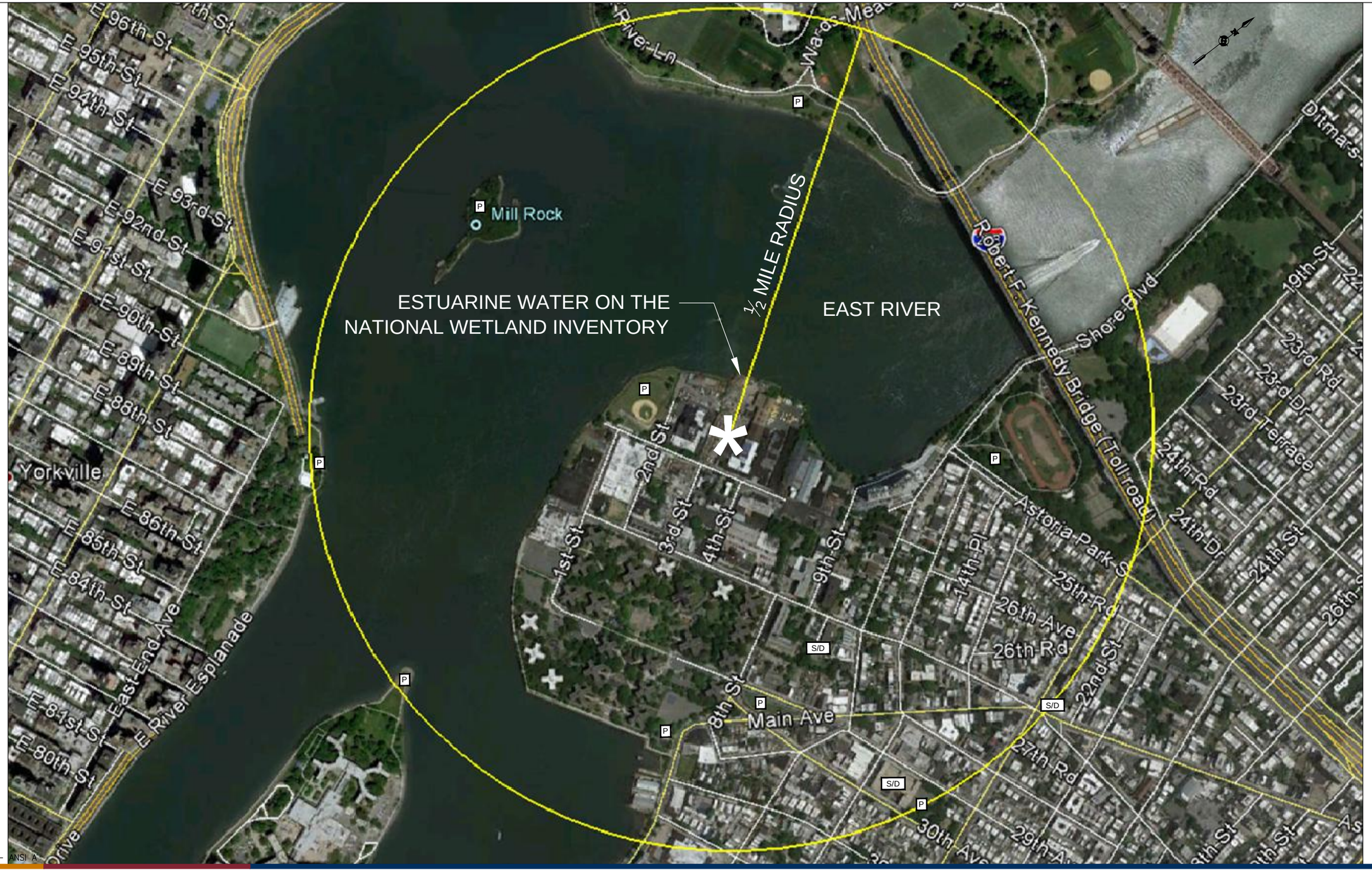
LEGEND

- SB-1 — 2006 PHASE II GEOPROE SOIL BORING LOCATION
- TW-2 — 2006 PHASE II GEOPROE SOIL BORING / TEMPORARY MONITORING WELL LOCATION
- GP-10 — 2006 PHASE II ADDITIONAL GEOPROBE SOIL BORING LOCATION
- SUSPECTED ANOMALY BASED ON 2006 GEOPHYSICAL SURVEY
- SUSPECTED UST LOCATION BASED ON 2006 PHASE II
- B/MW-102 — 2013 PHASE II BORING / TEMPORARY MONITORING WELL
- B-106 — 2013 PHASE II BORING
- FLOOD ZONE BOUNDARY
- DOOR
- LOCKED TENNANT STORAGE
- FORMER ELECTRICAL JUNCTION (UNDERGROUND)

Client/Project
RIWP
ASTORIA STEEL SITE,
BCP SITE # C241155
3-15 26TH AVE.
ASTORIA, QUEENS, NY

Figure No.
2

Title
FLOOD INSURANCE RATE MAP (FIRM) BOUNDARIES



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ORIGINAL SHEET – ANSI A

Stantec Consulting Services Inc.
61 Commercial Street – Suite 100
Rochester, NY
14614
PH: 585.475.1440
FAX:585.272.1814

NOTES

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LEGEND

NOTE:

1. IMAGE REFERENCES THE MOST CURRENT AERIAL IMAGE AVAILABLE.

P – PARKS/PUBLIC SPACE

S/D1 – SCHOOL AND/OR DAYCARE

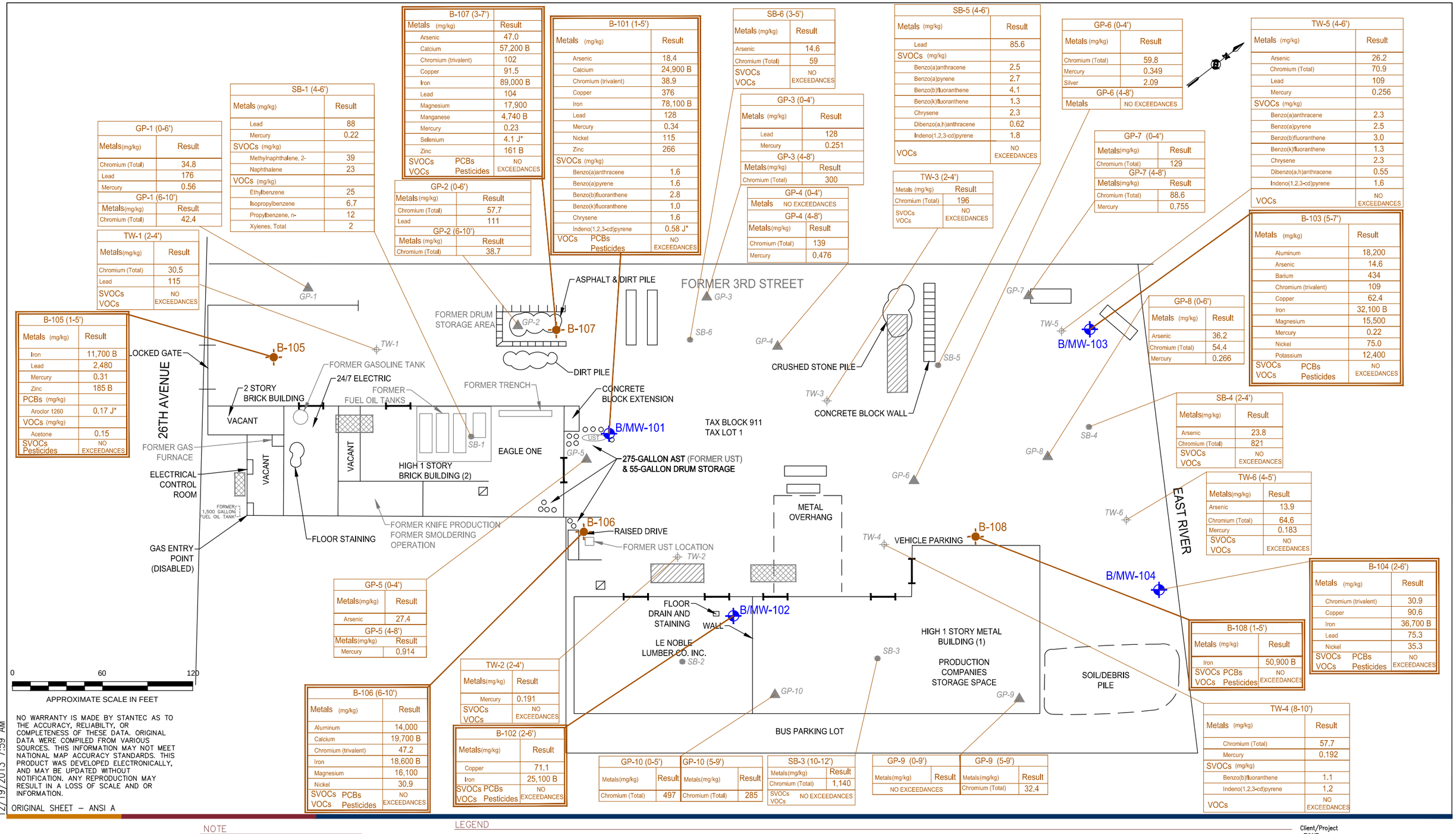
0 600 1200

APPROXIMATE SCALE IN FEET

Client/Project
RIWP
ASTORIA STEEL SITE,
BCP SITE # C241155
3-15 26TH AVE.
ASTORIA, QUEENS, NY

Figure No.
3

Title
LAND USE AND LOCATION OF
WATER COURSES AND WETLANDS



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ORIGINAL SHEET – ANSI A

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Stantec Consulting Services Inc.
61 Commercial Street – Suite 100
Rochester, NY
14614
PH: 585.475.1440
FAX:585.272.1814

NOTE

1.) * SOIL CLEANUP OBJECTIVES INCLUDE NYSDEC PART 375 UNRESTICTED USE, AND PROTECTION OF GROUNDWATER (POGW) AND NYSDEC CP–51 POGW, AND SOIL CLEANUP LEVELS FOR GASOLINE AND FUEL OIL CONTAMINATED SOILS.

2.) TRIVALENT CHROMIUM SCOS HAVE BEEN UTILIZED FOR DETERMINING EXCEEDANCES FOR 2006 TOTAL CHROMIUM DATA BECAUSE 2013 PHASE II RESULTS DEMONSTRATED THAT TRIVALENT CHROMIUM COMPRISED THE MAJORITY OF THE TOTAL CHROMIUM CONCENTRATIONS AT THE SITE.

LEGEND

- SB-1 — 2006 PHASE II GEOPROE SOIL BORING LOCATION
- TW-2 — 2006 PHASE II GEOPROE SOIL BORING / TEMPORARY MONITORING WELL LOCATION
- GP-10 — 2006 PHASE II ADDITIONAL GEOPROE SOIL BORING LOCATION
- SUSPECTED ANOMALY BASED ON 2006 GEOPHYSICAL SURVEY
- SUSPECTED UST LOCATION BASED ON 2006 PHASE II
- B/MW-102 — 2013 PHASE II BORING / TEMPORARY MONITORING WELL
- B-106 — 2013 PHASE II BORING
- mg/kg — MILLIGRAMS PER KILOGRAM
- VOCs — VOLATILE ORGANIC COMPOUNDS
- SVOCs — SEMI–VOLATILE ORGANIC COMPOUNDS
- DOOR
- LOCKED TENNANT STORAGE
- FORMER ELECTRICAL JUNCTION (UNDERGROUND)
- J* — RESULT IS LESS THAN THE RL BUT GREATER THAN OR EQUAL TO THE MDL AND THE CONCENTRATION IS AN APPROXIMATE VALUE
- B — COMPOUND WAS FOUND IN THE METHOD BLANK

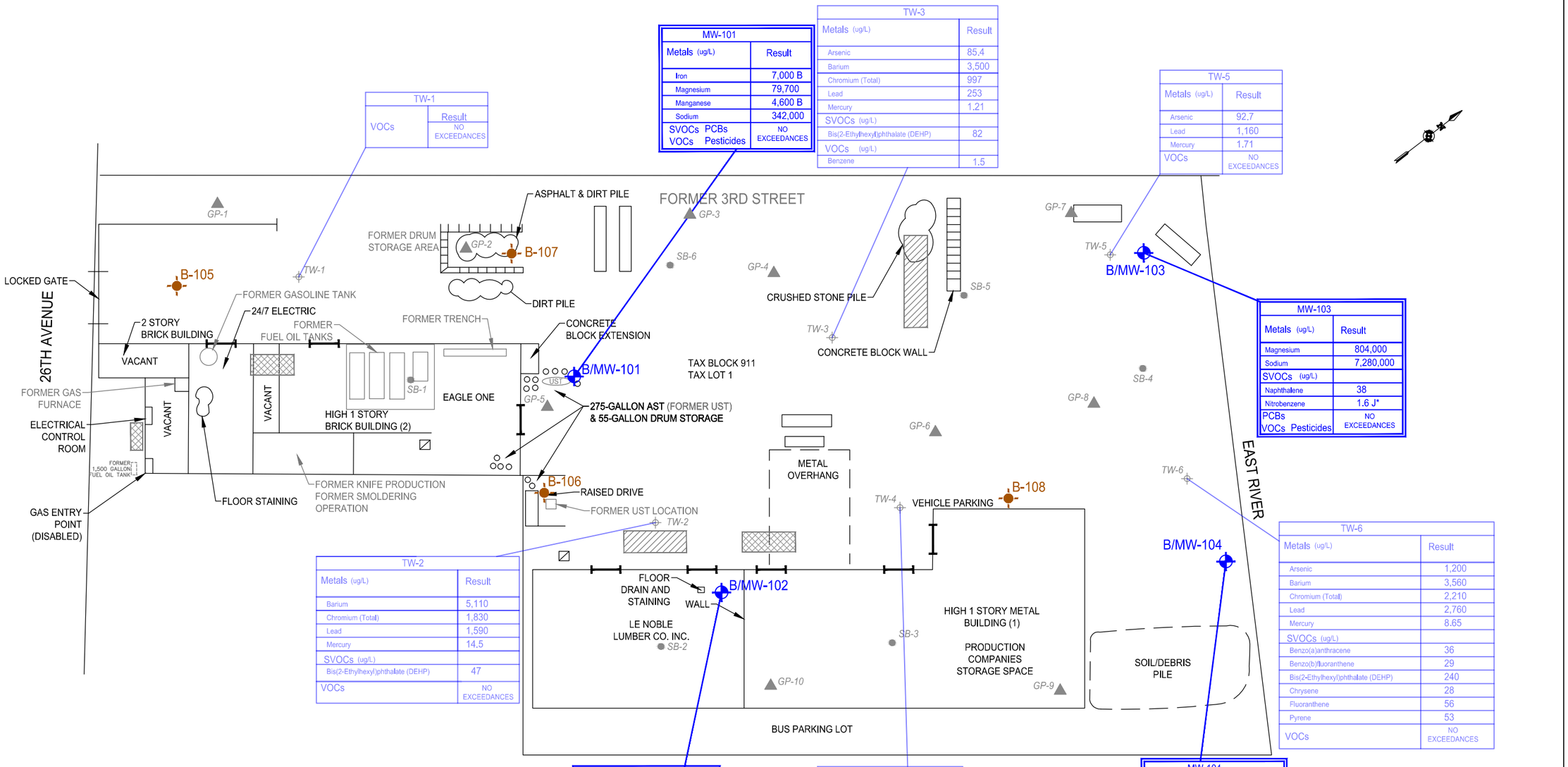
SB-3 (10-12')
Metals(mg/kg) Result
Chromium (Total) 1,140
SVOCs VOC NO EXCEEDANCES
2006 SOIL EXCEEDANCE INFORMATION

B-102 (2-6')
Metals Result
SVOCs PCBs VOCs Pesticides NO EXCEEDANCES
2013 SOIL EXCEEDANCE INFORMATION

Client/Project
RIWP
ASTORIA STEEL SITE, BCP SITE # C241155
3-15 26TH AVE.
ASTORIA, QUEENS, NY

Figure No.
4

Title
Exceedances of NYSDEC Soil Cleanup Objectives in 2006 and 2013 Phase IIs



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ORIGINAL SHEET – ANSI A

Stantec Consulting Services Inc.
61 Commercial Street – Suite 100
Rochester, NY
14614
PH: 585.475.1440
FAX:585.272.1814

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LEGEND

SB-1	2006 PHASE II GEOPROE SOIL BORING LOCATION	B/MW-102	2013 PHASE II BORING/TEMPORARY MONITORING WELL
TW-2	2006 PHASE II GEOPROE SOIL BORING / TEMPORARY MONITORING WELL LOCATION	B-106	2013 PHASE II BORING
GP-10	2006 PHASE II ADDITIONAL GEOPROE SOIL BORING LOCATION	ug/L	MICROGRAMS PER LITER
	SUSPECTED ANOMALY BASED ON 2006 GEOPHYSICAL SURVEY	VOCs	VOLATILE ORGANIC COMPOUNDS
	SUSPECTED UST LOCATION BASED ON 2006 PHASE II	SVOCs	SEMI–VOLATILE ORGANIC COMPOUNDS
		PCBs	POLYCHLORINATED BIPHENYLS

	DOOR
	LOCKED TENNANT STORAGE
	FORMER ELECTRICAL JUNCTION (UNDERGROUND)
J*	RESULT IS LESS THAN THE RL BUT GREATER THAN OR EQUAL TO THE MDL AND THE CONCENTRATION IS AN APPROXIMATE VALUE
B	COMPOUND WAS FOUND IN THE METHOD BLANK

TW-4

Metals	Result
	NO RELIABLE EXCEEDANCES
SVOCs VOCs	NO EXCEEDANCES

MW-102

Metals (mg/L)	Result
Lead	0.080
SVOCs PCBs VOCs Pesticides	NO EXCEEDANCES

2006 GROUNDWATER EXCEEDANCE INFORMATION

2013 GROUNDWATER EXCEEDANCE INFORMATION

Client/Project
RIWP
ASTORIA STEEL SITE, BCP SITE # C241155
3-15 26TH AVE.
ASTORIA, QUEENS, NY

Figure No.
5

Title
Exceedances of NYSDEC Groundwater Standards and Guidance in 2006 and 2013 Phase IIs

B-107 (3-7')	
Metals (mg/kg)	Result
Arsenic	47.0
Chromium (trivalent)	102
Copper	91.5
Lead	104
Mercury	0.23
Selenium	4.1 J*
Zinc	161 B
SVOCs PCBs VOCs Pesticides	NO EXCEEDANCES

GP-2 (0-6')	
Metals (mg/kg)	Result
Chromium (Total)	57.7
Lead	111
GP-2 (6-10')	
Metals (mg/kg)	Result
Chromium (Total)	38.7

GP-1 (0-6')	
Metals (mg/kg)	Result
Chromium (Total)	34.8
Lead	176
Mercury	0.56
GP-1 (6-10')	
Metals (mg/kg)	Result
Chromium (Total)	42.4

TW-1 (2-4')	
Metals (mg/kg)	Result
Chromium (Total)	30.5
Lead	115
SVOCs VOCs	NO EXCEEDANCES

TW-1	
	Result
VOCs	NO EXCEEDANCES

B-105 (1-5')	
Metals (mg/kg)	Result
Lead	2,480
Mercury	0.31
Zinc	185 B
PCBs (mg/kg)	
Aroclor 1260	0.17 J*
VOCs (mg/kg)	
Acetone	0.15
SVOCs Pesticides	NO EXCEEDANCES

SB-1 (4-6')	
Metals (mg/kg)	Result
Lead	88
Mercury	0.22
SVOCs (mg/kg)	
Methylnaphthalene, 2-	39
Naphthalene	23
VOCs (mg/kg)	
Ethylbenzene	25
Isopropylbenzene	6.7
Propylbenzene, n-	12
Xylenes, Total	2

GP-5 (0-4')	
Metals (mg/kg)	Result
Arsenic	27.4
GP-5 (4-8')	
Metals (mg/kg)	Result
Mercury	0.914

B-106 (6-10')	
Metals (mg/kg)	Result
Chromium (trivalent)	47.2
Nickel	30.9
SVOCs PCBs VOCs Pesticides	NO EXCEEDANCES

TW-2 (2-4')	
Metals (mg/kg)	Result
Mercury	0.191
SVOCs VOCs	NO EXCEEDANCES

TW-2	
	Result
Metals	NO RELIABLE EXCEEDANCES
VOCs SVOCs	NO EXCEEDANCES

B-101 (1-5')	
Metals (mg/kg)	Result
Arsenic	18.4
Chromium (trivalent)	38.9
Copper	376
Lead	128
Mercury	0.34
Nickel	115
Zinc	266
SVOCs (mg/kg)	
Benzo(a)anthracene	1.6
Benzo(a)pyrene	1.6
Benzo(b)fluoranthene	2.8
Benzo(k)fluoranthene	1.0
Chrysene	1.6
Indeno(1,2,3-cd)pyrene	0.58 J*
VOCs PCBs Pesticides	NO EXCEEDANCES

MW-101	
	Result
Metals SVOCs PCBs VOCs Pesticides	NO EXCEEDANCES

SB-6 (3-5')	
Metals (mg/kg)	Result
Arsenic	14.6
Chromium (Total)	59
SVOCs VOCs	NO EXCEEDANCES

GP-3 (0-4')	
Metals (mg/kg)	Result
Lead	128
Mercury	0.251
GP-3 (4-8')	
Metals (mg/kg)	Result
Chromium (Total)	300

GP-4 (0-4')	
Metals	NO EXCEEDANCES
GP-4 (4-8')	
Metals (mg/kg)	Result
Chromium (Total)	139
Mercury	0.476

TW-3 (2-4')	
Metals (mg/kg)	Result
Chromium (Total)	196
SVOCs VOCs	NO EXCEEDANCES

TW-3	
VOCs (ug/L)	Result
Benzene	1.5
Metals	NO RELIABLE EXCEEDANCES
SVOCs	NO EXCEEDANCES

SB-5 (4-6')	
Metals (mg/kg)	Result
Lead	85.6
SVOCs (mg/kg)	
Benzo(a)anthracene	2.5
Benzo(a)pyrene	2.7
Benzo(b)fluoranthene	4.1
Benzo(k)fluoranthene	1.3
Chrysene	2.3
Dibenzo(a,h)anthracene	0.62
Indeno(1,2,3-cd)pyrene	1.8
VOCs	NO EXCEEDANCES

GP-6 (0-4')	
Metals (mg/kg)	Result
Chromium (Total)	59.8
Mercury	0.349
Silver	2.09
GP-6 (4-8')	
Metals	NO EXCEEDANCES

GP-7 (0-4')	
Metals (mg/kg)	Result
Chromium (Total)	129
GP-7 (4-8')	
Metals (mg/kg)	Result
Chromium (Total)	88.6
Mercury	0.755

TW-5 (4-6')	
Metals (mg/kg)	Result
Arsenic	26.2
Chromium (Total)	70.9
Lead	109
Mercury	0.256
SVOCs (mg/kg)	
Benzo(a)anthracene	2.3
Benzo(a)pyrene	2.5
Benzo(b)fluoranthene	3.0
Benzo(k)fluoranthene	1.3
Chrysene	2.3
Dibenzo(a,h)anthracene	0.55
Indeno(1,2,3-cd)pyrene	1.6
VOCs	NO EXCEEDANCES

TW-5	
	Result
Metals	NO RELIABLE EXCEEDANCES
VOCs	NO EXCEEDANCES

B-103 (5-7')	
Metals (mg/kg)	Result
Arsenic	14.6
Barium	434
Chromium (trivalent)	109
Copper	62.4
Mercury	0.22
Nickel	75.0
Potassium	12,400
SVOCs PCBs VOCs Pesticides	NO EXCEEDANCES

MW-103	
	Result
SVOCs (ug/L)	
Naphthalene	38
Nitrobenzene	1.6 J*
PCBs Metals VOCs Pesticides	NO EXCEEDANCES

SB-4 (2-4')	
Metals (mg/kg)	Result
Arsenic	23.8
Chromium (Total)	821
SVOCs VOCs	NO EXCEEDANCES

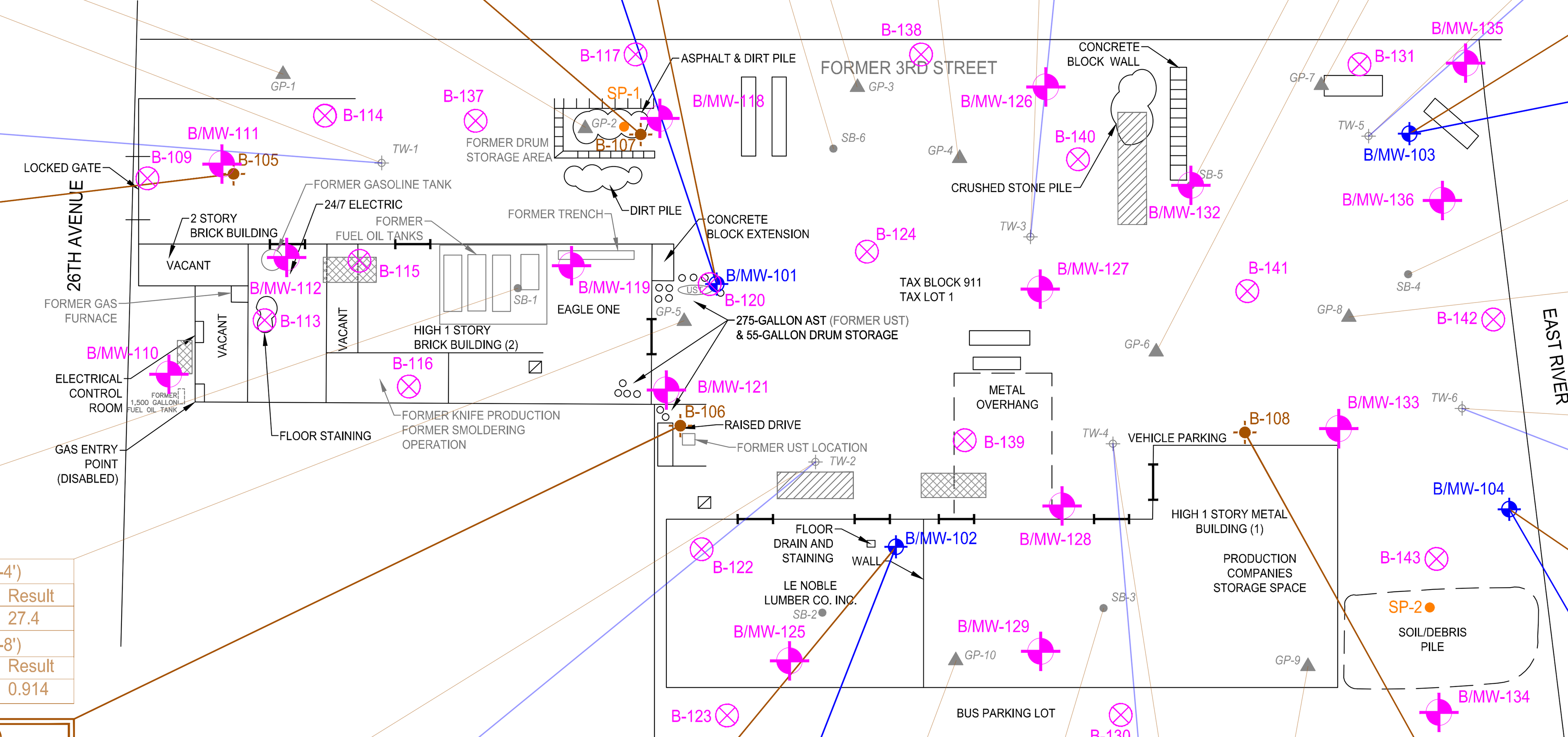
GP-8 (0-6')	
Metals (mg/kg)	Result
Arsenic	36.2
Chromium (Total)	54.4
Mercury	0.266

TW-6 (4-5')	
Metals (mg/kg)	Result
Arsenic	13.9
Chromium (Total)	64.6
Mercury	0.183
SVOCs VOCs	NO EXCEEDANCES

TW-6	
	Result
SVOCs (ug/L)	
Benzo(a)anthracene	36
Benzo(b)fluoranthene	29
Chrysene	28
Fluoranthene	56
Pyrene	53
VOCs	NO EXCEEDANCES
Metals	NO RELIABLE EXCEEDANCES

B-104 (2-6')	
Metals (mg/kg)	Result
Chromium (trivalent)	30.9
Copper	90.6
Lead	75.3
Nickel	35.3
SVOCs PCBs VOCs Pesticides	NO EXCEEDANCES

MW-104	
	Result
SVOCs (ug/L)	
Nitrobenzene	1.2 J*
PCBs Metals VOCs Pesticides	NO EXCEEDANCES



B-102 (2-6')	
Metals (mg/kg)	Result
Copper	71.1
SVOCs PCBs VOCs Pesticides	NO EXCEEDANCES

MW-102	
Metals (ug/L)	Result
Lead	80
SVOCs PCBs VOCs Pesticides	NO EXCEEDANCES

GP-10 (0-5')	
Metals (mg/kg)	Result
Chromium (Total)	497

GP-10 (5-9')	
Metals (mg/kg)	Result
Chromium (Total)	285

SB-3 (10-12')	
Metals (mg/kg)	Result
Chromium (Total)	1,140
SVOCs VOC s	NO EXCEEDANCES

TW-4	
	Result
Metals	NO RELIABLE EXCEEDANCES
SVOCs VOCs	NO EXCEEDANCES

TW-4 (8-10')	
Metals (mg/kg)	Result
Chromium (Total)	57.7
Mercury	0.192
SVOCs (mg/kg)	
Benzo(b)fluoranthene	1.1
Indeno(1,2,3-cd)pyrene	1.2
VOCs	NO EXCEEDANCES

B-108 (1-5')	
	Result
Metals SVOCs PCBs VOCs Pesticides	NO EXCEEDANCES

GP-9 (0-9')	
Metals (mg/kg)	Result
NO EXCEEDANCES	

GP-9 (5-9')	
Metals (mg/kg)	Result
Chromium (Total)	32.4

0 60 120
APPROXIMATE SCALE IN FEET

LEGEND

- SB-1 — 2006 PHASE II GEOPROBE SOIL BORING LOCATION
- TW-2 — 2006 PHASE II GEOPROBE SOIL BORING / TEMPORARY MONITORING WELL LOCATION
- GP-10 — 2006 PHASE II ADDITIONAL GEOPROBE SOIL BORING LOCATION
- VOCs — VOLATILE ORGANIC COMPOUNDS
- SVOCs — SEMI-VOLATILE ORGANIC COMPOUNDS
- mg/kg — MILLIGRAMS PER KILOGRAM
- ug/L — MICROGRAMS PER LITER
- PCBs — POLYCHLORINATED BIPHENYLS
- B/MW-102 — 2013 PHASE II BORING / TEMPORARY MONITORING WELL
- B-106 — 2013 PHASE II BORING
- B/MW-119 — PROPOSED BORING / MONITORING WELL
- B-124 — PROPOSED BORING
- SP-2 — PROPOSED SOIL PILE SAMPLE LOCATION
- DOOR
- LOCKED TENNANT STORAGE
- FORMER ELECTRICAL JUNCTION (UNDERGROUND)
- J* — RESULT IS LESS THAN THE RL BUT GREATER THAN OR EQUAL TO THE MDL AND THE CONCENTRATION IS AN APPROXIMATE VALUE
- B — COMPOUND WAS FOUND IN THE METHOD BLANK
- SUSPECTED ANOMALY BASED ON 2006 GEOPHYSICAL SURVEY
- SUSPECTED UST LOCATION BASED ON 2006 PHASE II
- 2006 SOIL EXCEEDANCE INFORMATION
- 2006 GROUNDWATER EXCEEDANCE INFORMATION
- 2013 SOIL EXCEEDANCE INFORMATION
- 2013 GROUNDWATER EXCEEDANCE INFORMATION

Stantec

Consultants

Legend

Notes

1. SOIL CLEANUP OBJECTIVES (SCOs) INCLUDE NYSDEC PART 375 UNRESTRICTED USE AND PROTECTION OF GROUNDWATER (POGW) SCOs AND NYSDEC CP–51 POGW SCOs AND SOIL CLEANUP LEVELS FOR GASOLINE AND FUEL OIL CONTAMINATED SOILS.
2. SOIL RESULTS EXCEEDING SCOs FOR ALUMINUM, CALCIUM, IRON, MAGNESIUM, MANGANESE, AND SODIUM NOT INCLUDED.
3. TRIVALENT CHROMIUM SCOS HAVE BEEN UTILIZED FOR DETERMINING EXCEEDANCES FOR 2006 TOTAL CHROMIUM DATA BECAUSE 2013 PHASE II RESULTS DEMONSTRATED THAT TRIVALENT CHROMIUM COMPRISED THE MAJORITY OF THE TOTAL CHROMIUM CONCENTRATIONS AT THE SITE.
4. GROUNDWATER EXCEEDANCES FOR 2006 METALS NOT INCLUDED AS THE TURBIDITIES OF THE SAMPLES ARE UNKNOWN.
5. 2006 BIS(2–ETHYLHEXYL)PHTHALATE (DEHP) GROUNDWATER DATA NOT INCLUDED AS THESE DATA ARE LIKELY A RESULT OF SAMPLING PROCEDURES. PLANNED RI SOIL SAMPLING WILL CONFIRM THIS.
6. 2013 GROUNDWATER EXCEEDANCES FOR IRON, MAGNESIUM, MANGANESE AND SODIUM NOT INCLUDED

Issued | By | Appd. | YY.MM.DD

Permit-Seal

Project/ Client

RIWP
BCP SITE # C241155

ASTORIA STEEL SITE
3-15 26TH AVE.
Astoria, Queens New York

Title

Proposed Sampling Locations and Exceedances of NYSDEC Soil Cleanup Objectives and Groundwater Standards in 2006 and 2013 Phase IIs

Project No. 190500789 | Scale

Drawing No. 6 | Sheet of | Revision

ORIGINAL SHEET – 22 X 34

TABLES

Table 1
Summary of 2006 Phase II Soil Analytical Results
Remedial Investigation Work Plan
Astoria Steel Site
3-15 26th Avenue, Astoria, Queens County, NY

Sample Location			SB-1	SB-3	SB-4	SB-5	SB-6	TW-1	TW-2	TW-3	TW-4	TW-5	TW-6	GP-1		GP-2		GP-3	
Sample Date			13-Oct-05	13-Oct-05	13-Oct-05	13-Oct-05	13-Oct-05	13-Oct-05	13-Oct-05	13-Oct-05	13-Oct-05	13-Oct-05	13-Oct-05	7-Dec-05	7-Dec-05	7-Dec-05	7-Dec-05	7-Dec-05	7-Dec-05
Sample ID			SB-1	SB-3	SB-4	SB-5	SB-6	TW-1	TW-2	TW-3	TW-4	TW-5	TW-6	GP-1	GP-1	GP-2	GP-2	GP-3	GP-3
Sample Depth			4 - 6 ft bgs	10 - 12 ft bgs	2 - 4 ft bgs	4 - 6 ft bgs	3 - 5 ft bgs	2 - 4 ft bgs	2 - 4 ft bgs	2 - 4 ft bgs	8 - 10 ft bgs	4 - 6 ft bgs	4 - 5 ft bgs	0 - 6 ft bgs	6 - 10 ft bgs	0 - 6 ft bgs	6 - 10 ft bgs	0 - 4 ft bgs	4 - 8 ft bgs
Sampling Company			LBG	LBG	LBG	LBG	LBG	LBG	LBG	LBG	LBG	LBG	LBG	LBG	LBG	LBG	LBG	LBG	LBG
Laboratory Work Order	Units	NYSDEC[1,2,3]	SO2006	SO2006	SO2006	SO2006	SO2006	SO2006	SO2006	SO2006	SO2006	SO2006	SO2006	SO2006-2	SO2006-2	SO2006	SO2006	SO2006	SO2006
Metals																			
Arsenic	mg/kg	13_n^A 16_g^{BC}	7.76 U	7.16 U	**23.8**[ABC]	7.9	**14.6**[A]	12.7	7.21 U	8.56	8.54	**26.2**[ABC]	**13.9**[A]	11.5	6.71 U	6.9 U	9.54 U	7.81 U	9.82 U
Barium	mg/kg	350_n^A 400^B 820^C	75	40.3	310	66.3	86.7	72.6	81.3	212	92.3	69.3	99.3	119	78.2	79.6	108	105	129
Cadmium	mg/kg	2.5_n^A 4.3^B 7.5^C	0.776 U	0.716 U	1.24 U	0.646 U	0.98 U	1.03 U	0.721 U	0.720 U	0.695 U	0.674 U	1.02 U	0.734 U	0.671 U	0.69 U	0.954 U	0.781 U	0.982 U
Chromium (Total)	mg/kg	$30_{n,i}^A$ 180^B n/v,i[C]	26.1	**1140**[AB]	**821**[AB]	24.9	**59**[A]	**30.5**[A]	30	**196**[AB]	**57.7**[A]	**70.9**[A]	**64.6**[A]	**34.8**[A]	**42.4**[A]	**57.7**[A]	**38.7**[A]	24	**300**[AB]
Cyanide	mg/kg	27_r^{AB} 40^C	1.3 U	1.1 U	1.9 U	1.1 U	1.5 U	1.5 U	1.2 U	1.2 U	1.2 U	1.2 U	2.0 U	-	-	-	-	-	-
Lead	mg/kg	63_n^A 400^B 450^C	**88**[A]	3.58 U	19.1	**85.6**[A]	21.7	**115**[A]	45.7	8.65	30.4	**109**[A]	41.7	**176**[A]	25	**111**[A]	9.59	**128**[A]	20.5
Mercury	mg/kg	0.18_n^A 0.81_s^B 0.73^C	**0.22**[A]	0.0559 U	0.13	0.108	0.0912	0.13	**0.191**[A]	0.0571 U	**0.192**[A]	**0.256**[A]	**0.183**[A]	**0.56**[A]	0.137	0.156	0.0747 U	**0.251**[A]	0.129
Selenium	mg/kg	3.9_n^A 180^B 4_g^C	1.6 U	1.4 U	2.0 U	1.1 U	2.0 U	2.1 U	1.4 U	1.4 U	1.4 U	***5.4 U***	2.0 U	***17.6 U***	***16.1 U***	***16.6 U***	***22.9 U***	***18.8 U***	***23.6 U***
Silver	mg/kg	2^A 180^B 8.3^C	***2.17 U***	***2.01 U***	***3.48 U***	1.81 U	***2.74 U***	***2.87 U***	***2.02 U***	***2.02 U***	1.95 U	1.89 U	***2.87 U***	***2.05 U***	1.88 U	2	***2.67 U***	***2.19 U***	***2.75 U***
Semi - Volatile Organic Compounds																			
Acenaphthene	mg/kg	20^{AG} 100_b^B 98^C	0.32 U	0.29 U	0.49 U	0.27 U	0.41 U	0.41 U	0.29 U	0.29 U	0.29 U	0.28 U	0.43 U	-	-	-	-	-	-
Acenaphthylene	mg/kg	100_a^{AG} 100_b^B 107^C	0.32 U	0.29 U	0.49 U	0.63	0.41 U	0.41 U	0.29 U	0.29 U	0.29 U	0.28 U	0.43 U	-	-	-	-	-	-
Anthracene	mg/kg	100_a^{AG} 100_b^B 1000_d^C	0.32 U	0.29 U	0.49 U	0.79	0.41 U	0.41 U	0.29 U	0.29 U	0.29 U	0.41	0.43 U	-	-	-	-	-	-
Benzo(a)anthracene	mg/kg	1_n^{AG} 1_g^{BC}	0.32 U	0.6	0.49 U	**2.5**[ABCG]	0.41 U	0.41 U	0.29 U	0.29 U	0.38	**2.3**[ABCG]	0.43 U	-	-	-	-	-	-
Benzo(a)pyrene	mg/kg	1_n^{AG} 1_g^B 22^C	0.32 U	0.29 U	0.49 U	**2.7**[ABG]	0.41 U	0.41 U	0.29 U	0.29 U	0.74	**2.5**[ABG]	0.43 U	-	-	-	-	-	-
Benzo(b)fluoranthene	mg/kg	1_n^{AG} 1_g^B 1.7^C	0.32 U	0.29 U	0.49 U	**4.1**[ABCG]	0.41 U	0.41 U	0.29 U	0.29 U	**1.1**[ABG]	**3**[ABCG]	0.43 U	-	-	-	-	-	-
Benzo(g,h,i)perylene	mg/kg	100^{AG} 100_b^B 1000_d^C	0.32 U	0.29 U	0.49 U	2.2	0.41 U	0.41 U	0.29 U	0.29 U	1.6	2	0.43 U	-	-	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.8_n^{AG} 3.9^B 1.7^C	0.32 U	0.29 U	0.49 U	**1.3**[AG]	0.41 U	0.41 U	0.29 U	0.29 U	0.44	**1.3**[AG]	0.43 U	-	-	-	-	-	-
Bis(2-Ethylhexyl)phthalate (DEHP)	mg/kg	100_a^A 100_b^B 1000_d^C 435^E	0.32 U	0.29 U	0.49 U	0.27 U	0.41 U	0.41 U	0.29 U	0.65	0.29 U	0.28 U	0.43 U	-	-	-	-	-	-
Chrysene	mg/kg	1_n^{AG} 3.9^B 1_g^C	0.32 U	0.57	0.61	**2.3**[ACG]	0.41 U	0.41 U	0.29 U	0.29 U	0.4	**2.3**[ACG]	0.43 U	-	-	-	-	-	-
Dibenzo(a,h)anthracene	mg/kg	0.33_m^{AG} 0.33_t^B 1000_d^C	0.32 U	0.29 U	***0.49 U***	**0.62**[ABG]	***0.41 U***	***0.41 U***	0.29 U	0.29 U	0.29 U	**0.55**[ABG]	***0.43 U***	-	-	-	-	-	-
Fluoranthene	mg/kg	100_a^{AG} 100_b^B 1000_d^C	0.32 U	0.37	0.49 U	3.4	0.41 U	0.41 U	0.29 U	0.29 U	0.57	2.9	0.43 U	-	-	-	-	-	-
Fluorene	mg/kg	30^{AG} 100_b^B 386^C	0.32 U	0.29 U	0.49 U	0.27 U	0.41 U	0.41 U	0.29 U	0.29 U	0.29 U	0.28 U	0.43 U	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.5_n^{AG} 0.5_g^B 8.2^C	0.32 U	0.29 U	0.49 U	**1.8**[ABG]	0.41 U	0.41 U	0.29 U	0.29 U	**1.2**[ABG]	**1.6**[ABG]	0.43 U	-	-	-	-	-	-
Methylnaphthalene, 2-	mg/kg	100_a^A 100_b^B 1000_d^C 36.4^E	**39**[E]	0.29 U	1	0.27 U	0.41 U	0.41 U	0.29 U	0.29 U	0.29 U	0.28 U	0.43 U	-	-	-	-	-	-
Naphthalene	mg/kg	12^{ACFG} 100_b^B	**23**[ACFG]	0.29 U	0.53	0.27 U	0.41 U	0.41 U	0.29 U	0.29 U	0.29 U	0.28 U	0.43 U	-	-	-	-	-	-
Phenanthrene	mg/kg	100^{AG} 100_b^B 1000_d^C	0.32 U	0.29 U	0.49 U	0.87	0.41 U	0.41 U	0.29 U	0.29 U	0.29 U	2.1	0.43 U	-	-	-	-	-	-
Pyrene	mg/kg	100^{AG} 100_b^B 1000_d^C	0.32 U	0.79	0.49 U	3.4	0.41 U	0.41 U	0.29 U	0.29 U	0.55	3.5	0.43 U	-	-	-	-	-	-
Volatile Organic Compounds																			
Benzene	mg/kg	0.06^{ACFG} 4.8^B	***0.33 U***	0.026 U	0.054 U	0.023 U	0.047 U	0.045 U	0.029 U	0.027 U	0.028 U	0.024 U	0.046 U	-	-	-	-	-	-
Butylbenzene, n-	mg/kg	12^{ACFG} 100_b^B	6.6	0.026 U	0.054 U	0.023 U	0.047 U	0.045 U	0.029 U	0.027 U	0.028 U	0.024 U	0.046 U	-	-	-	-	-	-
Butylbenzene, sec- (2-Phenylbutane)	mg/kg	11^{ACFG} 100_b^B	2.6	0.047	0.054 U	0.023 U	0.047 U	0.049	0.029 U	0.027 U	0.028 U	0.024 U	0.046 U	-	-	-	-	-	-
Butylbenzene, tert-	mg/kg	5.9^{ACFG} 100_b^B	0.33 U	0.028	0.054 U	0.023 U	0.047 U	0.045 U	0.029 U	0.027 U	0.028 U	0.024 U	0.046 U	-	-	-	-	-	-
Ethylbenzene	mg/kg	1^{ACFG} 41^B	**25**[ACFG]	0.026 U	0.054 U	0.023 U	0.047 U	0.045 U	0.029 U	0.027 U	0.028 U	0.024 U	0.046 U	-	-	-	-	-	-
Isopropylbenzene	mg/kg	100_a^A 100_b^B 1000_d^C 2.3^{EFG}	**6.7**[EFG]	0.026 U	0.054 U	0.023 U	0.047 U	0.081	0.029 U	0.027 U	0.028 U	0.024 U	0.046 U	-	-	-	-	-	-
Isopropyltoluene, p- (Cymene)	mg/kg	100_a^A 100_b^B 1000_d^C 10^{EFG}	3.2	0.026 U	0.054 U	0.023 U	0.047 U	0.045 U	0.029 U	0.027 U	0.028 U	0.024 U	0.046 U	-	-	-	-	-	-
Methyl tert-butyl ether (MTBE)	mg/kg	0.93^{ACF} 100_b^B	0.33 U	0.026 U	0.054 U	0.023 U	0.047 U	0.045 U	0.029 U	0.027 U	0.028 U	0.024 U	0.046 U	-	-	-	-	-	-
Naphthalene	mg/kg	12^{ACFG} 100_b^B	12	0.052 U	0.11 U	0.046 U	0.094 U	0.11	0.058 U	0.054 U	0.056 U	0.049	0.092 U	-	-	-	-	-	-
Propylbenzene, n-	mg/kg	3.9^{ACFG} 100_b^B	**12**[ACFG]	0.026 U	0.054 U	0.023 U	0.047 U	0.1	0.029 U	0.027 U	0.028 U	0.024 U	0.046 U	-	-	-	-	-	-
Toluene	mg/kg	0.7^{ACFG} 100_b^B	0.33 U	0.026 U	0.054 U	0.023 U	0.047 U	0.045 U	0.029 U	0.027 U	0.028 U	0.024 U	0.046 U	-	-	-	-	-	-
Trimethylbenzene, 1,2,4-	mg/kg	3.6^{ACFG} 52^B	0.33 U	0.026 U	0.054 U	0.023 U	0.047 U	0.53	0.029 U	0.027 U	0.028 U	0.024 U	0.046 U	-	-	-	-	-	-
Trimethylbenzene, 1,3,5-	mg/kg	8.4^{ACFG} 52^B	0.73	0.026 U	0.054 U	0.023 U	0.047 U	0.16	0.029 U	0.027 U	0.028 U	0.024 U	0.046 U	-	-	-	-	-	-
Xylenes, Total	mg/kg	0.26^{AFG} 100_b^B 1.6^C	**2**[ACFG]	0.026 U	0.054 U	0.023 U	0.047 U	0.118	0.029 U	0.027 U	0.028 U	0.024 U	0.046 U	-	-	-	-	-	-
Metals - TCLP																			
Arsenic	mg/L	n/v	0.25 U	0.25 U	0.25 U	-	-	-	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Barium	mg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	2.0 U	2.0 U	2.0 U	5.4	2.0 U	2.0 U
Cadmium	mg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Chromium (Total)	mg/L	n/v	0.10 U	0.10 U	0.10 U	-	-	-	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Lead	mg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Mercury	mg/L	n/v	0.0010 U	0.0010 U	0.0010 U	-	-	-	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Selenium	mg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U
Silver	mg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	0.07 U	0.07 U	0.07 U	0.07 U	0.07 U	0.07 U

See notes on last page

Table 1
Summary of 2006 Phase II Soil Analytical Results
Remedial Investigation Work Plan
Astoria Steel Site
3-15 26th Avenue, Astoria, Queens County, NY

Sample Location			GP-4		GP-5		GP-6		GP-7		GP-8	GP-9		GP-10	
Sample Date			7-Dec-05	7-Dec-05	7-Dec-05	7-Dec-05	7-Dec-05	7-Dec-05	7-Dec-05	7-Dec-05	7-Dec-05	7-Dec-05	7-Dec-05	7-Dec-05	7-Dec-05
Sample ID			GP-4	GP-4	GP-5	GP-5	GP-6	GP-6	GP-7	GP-7	GP-8	GP-9	GP-9	GP-10	GP-10
Sample Depth			0 - 4 ft bgs	4 - 8 ft bgs	0 - 4 ft bgs	4 - 8 ft bgs	0 - 4 ft bgs	4 - 8 ft bgs	0 - 4 ft bgs	4 - 8 ft bgs	0 - 6 ft bgs	0 - 5 ft bgs	5 - 9 ft bgs	0 - 5 ft bgs	5 - 9 ft bgs
Sampling Company			LBG	LBG	LBG	LBG	LBG	LBG	LBG	LBG	LBG	LBG	LBG	LBG	LBG
Laboratory Work Order	Units	NYSDEC[1,2,3]	SO2006	SO2006	SO2006	SO2006	SO2006	SO2006	SO2006	SO2006	SO2006	SO2006	SO2006	SO2006	SO2006
Metals															
Arsenic	mg/kg	13_n^A 16_g^{BC}	6.82 U	9.34	**27.4**[ABC]	7.67 U	6.67 U	7.21 U	6.59 U	8.48	**36.2**[ABC]	11.2	7.33 U	6.41 U	6.13 U
Barium	mg/kg	350_n^A 400^B 820^C	74.4	218	113	51.6	61.7	53.5	83.8	200	104	61.6	104	112	103
Cadmium	mg/kg	2.5_n^A 4.3^B 7.5^C	0.712	0.647 U	0.716 U	0.767 U	0.667 U	0.721 U	0.829	0.687 U	0.688 U	0.695 U	0.733 U	0.641 U	0.613 U
Chromium (Total)	mg/kg	$30_{n,i}^A$ 180^B n/v,i[C]	25	**139**[A]	14.6	25.1	**59.8**[A]	14.1	**129**[A]	**88.6**[A]	**54.4**[A]	17.8	**32.4**[A]	**497**[AB]	**285**[AB]
Cyanide	mg/kg	27_i^{AB} 40_i^C	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	mg/kg	63_n^A 400^B 450^C	58.9	9.52	16.2	39.2	51.2	9.21	50.5	55.1	15.2	27.5	20	24.5	26.1
Mercury	mg/kg	0.18_n^A 0.81_s^B 0.73^C	0.105	**0.476**[A]	0.106	**0.914**[ABC]	**0.349**[A]	0.0583 U	0.142	**0.755**[AC]	**0.266**[A]	0.0799	0.0612	0.0533 U	0.0492 U
Selenium	mg/kg	3.9_n^A 180^B 4_g^C	***16.4 U***	***15.5 U***	***17.2 U***	***18.4 U***	***16.0 U***	***17.3 U***	***15.8 U***	***16.5 U***	***16.5 U***	***16.7 U***	***17.6 U***	***15.4 U***	***14.7 U***
Silver	mg/kg	2^A 180^B 8.3^C	1.91 U	1.81 U	2.0 U	***2.15 U***	**2.09**[A]	***2.02 U***	1.84 U	1.92 U	1.93 U	1.95 U	***2.05 U***	1.8 U	1.72 U
Semi - Volatile Organic Compounds															
Acenaphthene	mg/kg	20^{AG} 100_b^B 98^C	-	-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthylene	mg/kg	100_a^{AG} 100_b^B 107^C	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthracene	mg/kg	100_a^{AG} 100_b^B 1000_d^C	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(a)anthracene	mg/kg	1_n^{AG} 1_g^{BC}	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene	mg/kg	1_n^{AG} 1_g^B 22^C	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(b)fluoranthene	mg/kg	1_n^{AG} 1_g^B 1.7^C	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	mg/kg	100^{AG} 100_b^B 1000_d^C	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.8_n^{AG} 3.9^B 1.7^C	-	-	-	-	-	-	-	-	-	-	-	-	-
Bis(2-Ethylhexyl)phthalate (DEHP)	mg/kg	100_a^A 100_b^B 1000_d^C 435^E	-	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene	mg/kg	1_n^{AG} 3.9^B 1_g^C	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibenzo(a,h)anthracene	mg/kg	0.33_m^{AG} 0.33_t^B 1000_d^C	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluoranthene	mg/kg	100_a^{AG} 100_b^B 1000_d^C	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluorene	mg/kg	30^{AG} 100_b^B 386^C	-	-	-	-	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.5_n^{AG} 0.5_g^B 8.2^C	-	-	-	-	-	-	-	-	-	-	-	-	-
Methylnaphthalene, 2-	mg/kg	100_a^A 100_b^B 1000_d^C 36.4^E	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	mg/kg	12^{ACFG} 100_b^B	-	-	-	-	-	-	-	-	-	-	-	-	-
Phenanthrene	mg/kg	100^{AG} 100_b^B 1000_d^C	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyrene	mg/kg	100^{AG} 100_b^B 1000_d^C	-	-	-	-	-	-	-	-	-	-	-	-	-
Volatile Organic Compounds															
Benzene	mg/kg	0.06^{ACFG} 4.8^B	-	-	-	-	-	-	-	-	-	-	-	-	-
Butylbenzene, n-	mg/kg	12^{ACFG} 100_b^B	-	-	-	-	-	-	-	-	-	-	-	-	-
Butylbenzene, sec- (2-Phenylbutane)	mg/kg	11^{ACFG} 100_b^B	-	-	-	-	-	-	-	-	-	-	-	-	-
Butylbenzene, tert-	mg/kg	5.9^{ACFG} 100_b^B	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene	mg/kg	1^{ACFG} 41^B	-	-	-	-	-	-	-	-	-	-	-	-	-
Isopropylbenzene	mg/kg	100_a^A 100_b^B 1000_d^C 2.3^{EFG}	-	-	-	-	-	-	-	-	-	-	-	-	-
Isopropyltoluene, p- (Cymene)	mg/kg	100_a^A 100_b^B 1000_d^C 10^{EFG}	-	-	-	-	-	-	-	-	-	-	-	-	-
Methyl tert-butyl ether (MTBE)	mg/kg	0.93^{ACF} 100_b^B	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	mg/kg	12^{ACFG} 100_b^B	-	-	-	-	-	-	-	-	-	-	-	-	-
Propylbenzene, n-	mg/kg	3.9^{ACFG} 100_b^B	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	mg/kg	0.7^{ACFG} 100_b^B	-	-	-	-	-	-	-	-	-	-	-	-	-
Trimethylbenzene, 1,2,4-	mg/kg	3.6^{ACFG} 52^B	-	-	-	-	-	-	-	-	-	-	-	-	-
Trimethylbenzene, 1,3,5-	mg/kg	8.4^{ACFG} 52^B	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylenes, Total	mg/kg	0.26^{AFG} 100_b^B 1.6^C	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals - TCLP															
Arsenic	mg/L	n/v	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Barium	mg/L	n/v	2.0 U	4.8	2.0 U	2.1	2.0 U	2.4	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Cadmium	mg/L	n/v	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Chromium (Total)	mg/L	n/v	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Lead	mg/L	n/v	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Mercury	mg/L	n/v	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Selenium	mg/L	n/v	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U
Silver	mg/L	n/v	0.07 U	0.07 U	0.07 U	0.07 U	0.07 U	0.07 U	0.07 U	0.07 U	0.07 U	0.07 U	0.07 U	0.07 U	0.07 U

See notes on last page

Table 1
Summary of 2006 Phase II Soil Analytical Results
Remedial Investigation Work Plan
Astoria Steel Site
3-15 26th Avenue, Astoria, Queens County, NY

Notes:

NYSDEC[1]	NYSDEC 6 NYCRR Part 375 Soil Clean-up Objectives (SCOs)
A	NYSDEC 6 NYCRR Part 375 - Unrestricted Use Soil Cleanup Objectives
B	NYSDEC 6 NYCRR Part 375 - Restricted Use SCO - Protection of Human Health - Restricted Residential
C	NYSDEC 6 NYCRR Part 375 - Restricted Use SCO - Protection of Groundwater
NYSDEC[2]	New York State Department of Environmental Conservation, DEC Policy CP-51, October 21, 2010
D	Table 1 Supplemental Soil Cleanup Objectives - Restricted Residential
E	Table 1 Supplemental Soil Cleanup Objectives - Protection of Groundwater
F	Table 2 Soil Cleanup Levels for Gasoline Contaminated Soils
G	Table 3 Soil Cleanup Levels for Fuel Oil Contaminated Soil
3	Trivalent chromium SCOs have been listed for total chromium as 2013 Phase II results demonstrated that trivalent chromium comprised the majority of the total chromium concentration at the site.
6.5[A]	Concentration exceeds the indicated standard.
15.2	Concentration was detected but did not exceed applicable standards.
0.50 U	Laboratory reportable detection limit exceeded standard.
0.03 U	The analyte was not detected above the laboratory reportable detection limit.
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
NS,q[ABC]	No SCO has been established for this compound. No SCO has been established for total chromium; however, see standards for trivalent and hexavalent chromium.
b	The SCOs for residential, restricted-residential and ecological resources use were capped at a maximum value of 100 mg/kg. See 6 NYCRR Part 375 TSD Section 9.3.
d	The SCOs for industrial use and the protection of groundwater were capped at a maximum value of 1000 mg/kg (Organics) and 10000 mg/kg (Inorganics). See 6 NYCRR Part 375 TSD Section 9.3.
f	For constituents where the calculated SCO was lower than the CRQL, the CRQL is used as the SCO value.
g[BC]	For constituents where the calculated SCO was lower than the rural soil background concentration as determined by the DEC/DOH rural soil survey, the rural soil background concentration is used as the Track 2 SCO value for this use of the site.
i[ABC]	The SCO for this specific compound (or family of compounds) is considered to be met if the analysis for the total species of this contaminant is below the specific SCO.
m	For constituents where the calculated SCO was lower than the Contract Required Quantitation Limit (CRQL), the CRQL is used as the Track 1 SCO value.
n	For constituents where the calculated SCO was lower than the rural soil background concentration as determined by the DEC/DOH rural soil survey, the rural soil background concentration is used as the Track 1 SCO value for this use of the site.

Table 2
Summary of 2006 Phase II Groundwater Analytical Results
Remedial Investigation Work Plan
Astoria Steel Site
3-15 26th Avenue, Astoria, Queens County, NY

Sample Location			TW-1	TW-2	TW-3	TW-4	TW-5	TW-6
Sample Date			13-Oct-05	13-Oct-05	13-Oct-05	13-Oct-05	13-Oct-05	13-Oct-05
Sample ID			TW-1	TW-2	TW-3	TW-4	TW-5	TW-6
Sampling Company			LBG	LBG	LBG	LBG	LBG	LBG
Laboratory Work Order	Units	TOGS	WG2006	WG2006	WG2006	WG2006	WG2006	WG2006
Metals								
Arsenic	µg/L	25[A]	-	***500 U***	**85.4[A]**	**141[A]**	**92.7[A]**	**1200[A]**
Barium	µg/L	1000[A]	-	**5110[A]**	**3500[A]**	**1380[A]**	200 U	**3560[A]**
Cadmium	µg/L	5[A]	-	***50 U***	5 U	5 U	5 U	***50 U***
Chromium (Total)	µg/L	50[A]	-	**1830[A]**	**997[A]**	**614[A]**	38.9	**2210[A]**
Lead	µg/L	25[A]	-	**1590[A]**	**253[A]**	**2910[A]**	**1160[A]**	**2760[A]**
Mercury	µg/L	0.7[A]	-	**14.5[A]**	**1.21[A]**	**3.08[A]**	**1.71[A]**	**8.65[A]**
Selenium	µg/L	10[A]	-	***20 U***	***20 U***	5.5	***20 U***	***20 U***
Silver	µg/L	50[A]	-	***70 U***	7 U	7 U	7 U	***70 U***
Semi - Volatile Organic Compounds								
Acenaphthene	µg/L	20[A]	-	10 U	10 U	10 U	-	10 U
Anthracene	µg/L	50[B]	-	10 U	10 U	10 U	-	10 U
Benzo(a)anthracene	µg/L	0.002[B]	-	***10 U***	***10 U***	***10 U***	-	**36[B]**
Benzo(a)pyrene	µg/L	n/v	-	10 U	10 U	10 U	-	28
Benzo(b)fluoranthene	µg/L	0.002[B]	-	***10 U***	***10 U***	***10 U***	-	**29[B]**
Benzo(g,h,i)perylene	µg/L	n/v	-	10 U	10 U	10 U	-	10 U
Benzo(k)fluoranthene	µg/L	0.002[B]	-	***10 U***	***10 U***	***10 U***	-	***10 U***
Bis(2-Ethylhexyl)phthalate (DEHP)	µg/L	5[A]	-	**47[A]**	**82[A]**	***10 U***	-	**240[A]**
Chrysene	µg/L	0.002[B]	-	***10 U***	***10 U***	***10 U***	-	**28[B]**
Dibenzo(a,h)anthracene	µg/L	n/v	-	10 U	10 U	10 U	-	10 U
Diethyl Phthalate	µg/L	50[B]	-	10 U	13	10 U	-	10 U
Fluoranthene	µg/L	50[B]	-	10 U	10 U	10 U	-	**56[B]**
Indeno(1,2,3-cd)pyrene	µg/L	0.002[B]	-	***10 U***	***10 U***	***10 U***	-	***10 U***
Naphthalene	µg/L	10[A]	-	10 U	10 U	10 U	-	10 U
Phenanthrene	µg/L	50[B]	-	10 U	10 U	10 U	-	10 U
Pyrene	µg/L	50[B]	-	10 U	10 U	10 U	-	**53[B]**
Volatile Organic Compounds								
Acetone	µg/L	50[B]	10 U	10 U	10 U	10 U	11	13
Benzene	µg/L	1[A]	1.0 U	1.0 U	**1.5[A]**	1.0 U	1.0 U	1.0 U
Butylbenzene, n-	µg/L	5**[A]	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Butylbenzene, sec- (2-Phenylbutane)	µg/L	5**[A]	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Butylbenzene, tert-	µg/L	5**[A]	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Ethylbenzene	µg/L	5**[A]	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Isopropylbenzene	µg/L	5**[A]	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Isopropyltoluene, p- (Cymene)	µg/L	5**[A]	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Methyl tert-butyl ether (MTBE)	µg/L	10[B]	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Naphthalene	µg/L	10[A]	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Propylbenzene, n-	µg/L	5**[A]	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Toluene	µg/L	5**[A]	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Trimethylbenzene, 1,2,4-	µg/L	5**[A]	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Trimethylbenzene, 1,3,5-	µg/L	5**[A]	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Xylenes, Total	µg/L	5**[A]	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U

See notes on last page

Table 2
Summary of 2006 Phase II Groundwater Analytical Results
Remedial Investigation Work Plan
Astoria Steel Site
3-15 26th Avenue, Astoria, Queens County, NY

Notes:

TOGS	NYSDEC TOGS 1.1.1 (Reissued June 1998 with errata in January 1999 and addenda in April 2000 and June 2004)
A	TOGS 1.1.1 - Table 1 - Ambient Water Quality Standards and Guidance Values, Division of Water, Technical and Operational Guidance Series (TOGS 1.1.1); Standards
B	TOGS 1.1.1 - Table 1 - Ambient Water Quality Standards and Guidance Values, Division of Water, Technical and Operational Guidance Series (TOGS 1.1.1); Guidance
6.5[A]	Concentration exceeds the indicated standard.
15.2	Concentration was detected but did not exceed applicable standards.
0.50 U	Laboratory reportable detection limit exceeded standard.
0.03 U	The analyte was not detected above the laboratory reportable detection limit.
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
**	The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in the TOGS table) applies to this substance.

Table 3
Summary of 2013 Phase II Soil Analytical Results
Remedial Investigation Work Plan
Astoria Steel Site
3-15 26th Avenue, Astoria, Queens County, NY

Sample Location			B-101		B-102	B-103	B-104
Sample Date			5-Aug-13	5-Aug-13	5-Aug-13	5-Aug-13	5-Aug-13
Sample ID			B-101 (1-5)	DUP080513	B-102 (2-6)	B-103 (5-7)	B-104 (2-6)
Sample Depth			1 - 5 ft	1 - 5 ft	2 - 6 ft	5 - 7 ft	2 - 6 ft
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			TALBU	TALBU	TALBU	TALBU	TALBU
Laboratory Work Order			43221	43221	43221	43221	43221
Laboratory Sample ID			480-43221-12	480-43221-17	480-43221-11	480-43221-9	480-43221-10
Sample Type	Units	NYSDEC[1,2]		Field Duplicate			
Metals							
Aluminum	mg/kg	$_{NS}^{AB}$ 10000$_{d}^{C}$ 10000$_{a}^{E}$	8210	5460	6580	**18200^{CE}**	9760
Antimony	mg/kg	$_{NS}^{AB}$ 10000$_{d}^{C}$ 10000$_{a}^{E}$	0.81 J*	14.9 U	15.6 U	18.5 U	15.2 U
Arsenic	mg/kg	13$_{n}^{A}$ 16$_{g}^{BC}$	**18.4^{ABC}**	**16.9^{ABC}**	4.9	**14.6^{A}**	7.7
Barium	mg/kg	350$_{n}^{A}$ 400^{B} 820^{C}	84.7	100	52.7	**434^{AB}**	92.5
Beryllium	mg/kg	7.2^{A} 72^{B} 47^{C}	0.36	0.34	0.22	0.081 J*	0.23
Cadmium	mg/kg	2.5$_{n}^{A}$ 4.3^{B} 7.5^{C}	0.36	0.93	0.19 J*	0.052 J*	0.16 J*
Calcium	mg/kg	$_{NS}^{AB}$ 10000$_{d}^{C}$ 10000$_{a}^{E}$	5320 BS	**24900 BS^{CE}**	5580 BS	2310 BS	6840 BS
Chromium (Hexavalent)	mg/kg	1$_{m,i}^{A}$ 110$_{i}^{B}$ 19$_{i}^{C}$	0.69 J*	0.85 U	0.84 U	0.90 U	0.85 U
Chromium (Total)	mg/kg	$_{NS,q}^{ABC}$	30.7	38.9	19.3	109	30.9
Chromium (Trivalent)	mg/kg	30$_{n,i}^{A}$ 180$_{i}^{B}$ n/v,I^{C}	30.0	**38.9^{A}**	19.3	**109^{A}**	**30.9^{A}**
Cobalt	mg/kg	$_{NS}^{AB}$ 10000$_{d}^{C}$ 10000$_{a}^{E}$	10.8	21.6	6.7	20.1	12.0
Copper	mg/kg	50^{A} 270^{B} 1720^{C}	**133^{A}**	**376^{AB}**	**71.1^{A}**	**62.4^{A}**	**90.6^{A}**
Iron	mg/kg	$_{NS}^{AB}$ 10000$_{d}^{C}$ 10000$_{a}^{E}$	**49600 B*^{CE}**	**78100 B*^{CE}**	**25100 B*^{CE}**	**32100 B*^{CE}**	**36700 B*^{CE}**
Lead	mg/kg	63$_{n}^{A}$ 400^{B} 450^{C}	**128^{A}**	**113^{A}**	39.7	33.9	**75.3^{A}**
Magnesium	mg/kg	$_{NS}^{AB}$ 10000$_{d}^{C}$	3010	2690	6010	**15500^{C}**	5530
Manganese	mg/kg	1600$_{n}^{A}$ 2000$_{g}^{BC}$	645 BS	1600 BS	787 BS	918 BS	863 BS
Mercury	mg/kg	0.18$_{n}^{A}$ 0.81$_{k}^{B}$ 0.73^{C}	0.18	**0.34^{A}**	0.030	**0.22^{A}**	0.058
Nickel	mg/kg	30^{A} 310^{B} 130^{C}	**37.0^{A}**	**115^{A}**	16.5	**75.0^{A}**	**35.3^{A}**
Potassium	mg/kg	$_{NS}^{AB}$ 10000$_{d}^{C}$	1450	1110	1700	**12400^{C}**	3890
Selenium	mg/kg	3.9$_{n}^{A}$ 180^{B} 4$_{g}^{C}$	1.7 J*	1.4 J*	0.55 J*	1.0 J*	***4.1 U***
Silver	mg/kg	2^{A} 180^{B} 8.3^{C}	0.51 U	0.50 U	0.52 U	0.62 U	0.51 U
Sodium	mg/kg	$_{NS}^{AB}$ 10000$_{d}^{C}$	279 BS	400 BS	520 BS	1930 BS	450 BS
Thallium	mg/kg	$_{NS}^{AB}$ 10000$_{d}^{C}$ 10000$_{a}^{E}$	6.1 U	5.9 U	6.2 U	7.4 U	6.1 U
Vanadium	mg/kg	$_{NS}^{AB}$ 10000$_{d}^{C}$ 10000$_{a}^{E}$	41.6 BS	41.7 BS	33.5 BS	83.9 BS	41.8 BS
Zinc	mg/kg	109$_{n}^{A}$ 10000$_{e}^{B}$ 2480^{C}	**144 BS^{A}**	**266 BS^{A}**	74.7 BS	108 BS	84.7 BS
General Chemistry							
Cyanide	mg/kg	27$_{i}^{AB}$ 40$_{i}^{C}$	1.0 U	1.1 U	1.0 U	1.1 U	0.99 U
Total Organic Carbon	mg/kg	n/v	32000	65000	11700	34900	8230
Polychlorinated Biphenyls							
Aroclor 1016	mg/kg	0.1$_{o}^{AB}$ 3.2$_{o}^{C}$	***0.24 U***	***0.22 U***	***0.23 U***	***0.23 U***	***0.23 U***
Aroclor 1221	mg/kg	0.1$_{o}^{AB}$ 3.2$_{o}^{C}$	***0.24 U***	***0.22 U***	***0.23 U***	***0.23 U***	***0.23 U***
Aroclor 1232	mg/kg	0.1$_{o}^{AB}$ 3.2$_{o}^{C}$	***0.24 U***	***0.22 U***	***0.23 U***	***0.23 U***	***0.23 U***
Aroclor 1242	mg/kg	0.1$_{o}^{AB}$ 3.2$_{o}^{C}$	***0.24 U***	***0.22 U***	***0.23 U***	***0.23 U***	***0.23 U***
Aroclor 1248	mg/kg	0.1$_{o}^{AB}$ 3.2$_{o}^{C}$	***0.24 U***	***0.22 U***	***0.23 U***	***0.23 U***	***0.23 U***
Aroclor 1254	mg/kg	0.1$_{o}^{AB}$ 3.2$_{o}^{C}$	***0.24 U***	***0.22 U***	***0.23 U***	***0.23 U***	***0.23 U***
Aroclor 1260	mg/kg	0.1$_{o}^{AB}$ 3.2$_{o}^{C}$	***0.24 U***	***0.22 U***	***0.23 U***	***0.23 U***	***0.23 U***
Aroclor 1262	mg/kg	0.1$_{o}^{AB}$ 3.2$_{o}^{C}$	***0.24 U***	***0.22 U***	***0.23 U***	***0.23 U***	***0.23 U***
Aroclor 1268	mg/kg	0.1$_{o}^{AB}$ 3.2$_{o}^{C}$	***0.24 U***	***0.22 U***	***0.23 U***	***0.23 U***	***0.23 U***
Semi - Volatile Organic Compounds							
Acenaphthene	mg/kg	20^{AG} 100$_{b}^{B}$ 98^{C}	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Acenaphthylene	mg/kg	100$_{a}^{AG}$ 100$_{b}^{B}$ 107^{C}	3.7 U	0.14 J*	0.18 U	0.014 J*	0.0086 J*
Acetophenone	mg/kg	n/v	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Anthracene	mg/kg	100$_{a}^{AG}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	3.7 U	0.14 J*	0.18 U	0.19 U	0.021 J*
Atrazine	mg/kg	n/v	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Benzaldehyde	mg/kg	n/v	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Benzo(a)anthracene	mg/kg	1$_{n}^{AG}$ 1$_{g}^{BC}$	***3.7 U***	**1.6^{ABCG}**	0.055 J*	0.068 J*	0.13 J*
Benzo(a)pyrene	mg/kg	1$_{n}^{AG}$ 1$_{g}^{B}$ 22^{C}	0.2 J*	**1.6^{ABG}**	0.091 J*	0.086 J*	0.12 J*
Benzo(b)fluoranthene	mg/kg	1$_{n}^{AG}$ 1$_{g}^{B}$ 1.7^{C}	0.33 J*	**2.8^{ABCG}**	0.16 J*	0.12 J*	0.18
Benzo(g,h,i)perylene	mg/kg	100^{AG} 100$_{b}^{B}$ 1000$_{d}^{C}$	0.13 J*	0.56 J*	0.055 J*	0.043 J*	0.046 J*
Benzo(k)fluoranthene	mg/kg	0.8$_{n}^{AG}$ 3.9^{B} 1.7^{C}	0.16 J*	**1^{AG}**	0.18 U	0.038 J*	0.068 J*
Biphenyl, 1,1'- (Biphenyl)	mg/kg	n/v	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Bis(2-Chloroethoxy)methane	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Bis(2-Chloroethyl)ether	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Bis(2-Chloroisopropyl)ether (2,2-oxybis(1-Chloropropane))	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Bis(2-Ethylhexyl)phthalate (DEHP)	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 435^{E}	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Bromophenyl Phenyl Ether, 4-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Butyl Benzyl Phthalate	mg/kg	$_{NS}^{AB}$ 1000$_{d}^{C}$ 122^{E}	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Caprolactam	mg/kg	n/v	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Carbazole	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	3.7 U	0.1 J*	0.18 U	0.19 U	0.18 U
Chloro-3-methyl phenol, 4-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Chloroaniline, 4-	mg/kg	$_{NS}^{AB}$ 1000$_{d}^{C}$ 0.22^{E}	***3.7 U***	***0.90 U***	0.18 U	0.19 U	0.18 U
Chloronaphthalene, 2-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Chlorophenol, 2- (ortho-Chlorophenol)	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Chlorophenyl Phenyl Ether, 4-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Chrysene	mg/kg	1$_{n}^{AG}$ 3.9^{B} 1$_{g}^{C}$	0.33 J*	**1.6^{ACG}**	0.076 J*	0.069 J*	0.12 J*
Cresol, o- (Methylphenol, 2-)	mg/kg	0.33$_{m}^{A}$ 100$_{b}^{B}$ 0.33$_{f}^{C}$	***3.7 U***	***0.90 U***	0.18 U	0.19 U	0.18 U
Cresol, p- (Methylphenol, 4-)	mg/kg	0.33$_{m}^{A}$ 100$_{b}^{B}$ 0.33$_{f}^{C}$	***7.1 U***	***1.7 U***	***0.34 U***	***0.37 U***	***0.35 U***
Dibenzo(a,h)anthracene	mg/kg	0.33$_{m}^{AG}$ 0.33$_{f}^{B}$ 1000$_{d}^{C}$	***3.7 U***	0.21 J*	0.18 U	0.19 U	0.018 J*
Dibenzofuran	mg/kg	7^{A} 59^{B} 210^{C} 6.2^{E}	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Dibutyl Phthalate (DBP)	mg/kg	$_{NS}^{AB}$ 1000$_{d}^{C}$ 8.1^{E}	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Dichlorobenzidine, 3,3'-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Dichlorophenol, 2,4-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 0.4^{E}	***3.7 U***	***0.90 U***	0.18 U	0.19 U	0.18 U
Diethyl Phthalate	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 7.1^{E}	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Dimethyl Phthalate	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 27^{E}	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Dimethylphenol, 2,4-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Dinitro-o-cresol, 4,6-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	7.1 U	1.7 U	0.34 U	0.37 U	0.35 U
Dinitrophenol, 2,4-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 0.2^{E}	***7.1 U***	***1.7 U***	***0.34 U***	***0.37 U***	***0.35 U***
Dinitrotoluene, 2,4-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Dinitrotoluene, 2,6-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 1/0.17$_{b,s1}^{E}$	***3.7 U***	0.90 U	0.18 U	0.19 U	0.18 U
Di-n-Octyl phthalate	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 120^{E}	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Fluoranthene	mg/kg	100$_{a}^{AG}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	0.29 J*	2.4	0.07 J*	0.096 J*	0.21
Fluorene	mg/kg	30^{AG} 100$_{b}^{B}$ 386^{C}	3.7 U	0.90 U	0.18 U	0.016 J*	0.18 U
Hexachlorobenzene	mg/kg	0.33$_{m}^{A}$ 1.2^{B} 3.2^{C} 1.4^{E}	***3.7 U***	***0.90 U***	0.18 U	0.19 U	0.18 U
Hexachlorobutadiene (Heachloro-1,3-butadiene)	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Hexachlorocyclopentadiene	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Hexachloroethane	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.5$_{n}^{AG}$ 0.5$_{g}^{B}$ 8.2^{C}	0.15 J*	**0.58 J*^{ABG}**	0.043 J*	0.028 J*	0.038 J*
Isophorone	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 4.4^{E}	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Methylnaphthalene, 2-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 36.4^{E}	3.7 U	0.02 J*	0.036 J*	0.038 J*	0.011 J*
Naphthalene	mg/kg	12^{ACFG} 100$_{b}^{B}$	3.7 U	0.90 U	0.024 J*	0.19 U	0.0097 J*
Nitroaniline, 2-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 0.4^{E}	***7.1 U***	***1.7 U***	0.34 U	0.37 U	0.35 U
Nitroaniline, 3-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 0.5^{E}	***7.1 U***	***1.7 U***	0.34 U	0.37 U	0.35 U
Nitroaniline, 4-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	7.1 U	1.7 U	0.34 U	0.37 U	0.35 U
Nitrobenzene	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 15^{D} 0.17$_{b}^{E}$	***3.7 U***	***0.90 U***	***0.18 U***	***0.19 U***	***0.18 U***
Nitrophenol, 2-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 0.3^{E}	***3.7 U***	***0.90 U***	0.18 U	0.19 U	0.18 U

See notes on last page

Table 3
Summary of 2013 Phase II Soil Analytical Results
Remedial Investigation Work Plan
Astoria Steel Site
3-15 26th Avenue, Astoria, Queens County, NY

Sample Location			B-101		B-102	B-103	B-104
Sample Date			5-Aug-13	5-Aug-13	5-Aug-13	5-Aug-13	5-Aug-13
Sample ID			B-101 (1-5)	DUP080513	B-102 (2-6)	B-103 (5-7)	B-104 (2-6)
Sample Depth			1 - 5 ft	1 - 5 ft	2 - 6 ft	5 - 7 ft	2 - 6 ft
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			TALBU	TALBU	TALBU	TALBU	TALBU
Laboratory Work Order			43221	43221	43221	43221	43221
Laboratory Sample ID			480-43221-12	480-43221-17	480-43221-11	480-43221-9	480-43221-10
Sample Type	Units	NYSDEC[1,2]		Field Duplicate			
Semi - Volatile Organic Compounds (continued)							
Nitrophenol, 4-	mg/kg	100_a^A 100_b^B 1000_d^C 0.1^E	***7.1 U***	***1.7 U***	***0.34 U***	***0.37 U***	***0.35 U***
N-Nitrosodi-n-Propylamine	mg/kg	100_a^A 100_b^B 1000_d^C	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
n-Nitrosodiphenylamine	mg/kg	100_a^A 100_b^B 1000_d^C	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Pentachlorophenol	mg/kg	0.8_m^A 6.7^B 0.8_f^C	***7.1 U***	***1.7 U***	0.34 U	0.37 U	0.35 U
Phenanthrene	mg/kg	100^{AG} 100_b^B 1000_d^C	0.16 J* BS	0.41 J* BS	0.081 J* BS	0.065 J* BS	0.1 J* BS
Phenol	mg/kg	0.33_m^A 100_b^B 0.33_f^C	***3.7 U***	***0.90 U***	0.18 U	0.19 U	0.18 U
Pyrene	mg/kg	100^{AG} 100_b^B 1000_d^C	0.24 J*	1.7	0.052 J*	0.089 J*	0.15 J*
Trichlorophenol, 2,4,5-	mg/kg	100_a^A 100_b^B 1000_d^C 0.1^E	***3.7 U***	***0.90 U***	***0.18 U***	***0.19 U***	***0.18 U***
Trichlorophenol, 2,4,6-	mg/kg	100_a^A 100_b^B 1000_d^C	3.7 U	0.90 U	0.18 U	0.19 U	0.18 U
Total SVOC TICs	mg/kg	n/v	ND	ND	ND	ND	ND
Volatile Organic Compounds							
Acetone	mg/kg	0.05^{AC} 100_b^B	0.011 J*	0.02 J*	0.026 U	0.021 U	0.028 U
Benzene	mg/kg	0.06^{ACFG} 4.8^B	0.023	0.027	0.0051 U	0.0042 U	0.0056 U
Bromodichloromethane	mg/kg	100_a^A 100_b^B 1000_d^C	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Bromoform (Tribromomethane)	mg/kg	100_a^A 100_b^B 1000_d^C	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Bromomethane (Methyl bromide)	mg/kg	100_a^A 100_b^B 1000_d^C	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Carbon Disulfide	mg/kg	100_a^A 100_b^B 1000_d^C 2.7^E	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Carbon Tetrachloride (Tetrachloromethane)	mg/kg	0.76^{AC} 2.4^B	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Chlorobenzene (Monochlorobenzene)	mg/kg	1.1^{AC} 100_b^B	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Chloroethane (Ethyl Chloride)	mg/kg	100_a^A 100_b^B 1000_d^C 1.9^E	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Chloroform (Trichloromethane)	mg/kg	0.37^{AC} 49^B	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Chloromethane	mg/kg	100_a^A 100_b^B 1000_d^C	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Cyclohexane	mg/kg	n/v	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Dibromo-3-Chloropropane, 1,2- (DBCP)	mg/kg	n/v	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Dibromochloromethane	mg/kg	100_a^A 100_b^B 1000_d^C	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Dichlorobenzene, 1,2-	mg/kg	1.1^{AC} 100_b^B	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Dichlorobenzene, 1,3-	mg/kg	2.4^{AC} 49^B	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Dichlorobenzene, 1,4-	mg/kg	1.8^{AC} 13^B	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Dichlorodifluoromethane (Freon 12)	mg/kg	n/v	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Dichloroethane, 1,1-	mg/kg	0.27^{AC} 26^B	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Dichloroethane, 1,2-	mg/kg	0.02_m^A 3.1^B 0.02_g^C	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Dichloroethene, 1,1-	mg/kg	0.33^{AC} 100_b^B	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Dichloroethylene, cis-1,2-	mg/kg	0.25^{AC} 100_b^B	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Dichloroethylene, trans-1,2-	mg/kg	0.19^{AC} 100_b^B	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Dichloropropane, 1,2-	mg/kg	100_a^A 100_b^B 1000_d^C	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Dichloropropene, cis-1,3-	mg/kg	100_a^A 100_b^B 1000_d^C	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Dichloropropene, trans-1,3-	mg/kg	100_a^A 100_b^B 1000_d^C	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Ethylbenzene	mg/kg	1^{ACFG} 41^B	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Ethylene Dibromide (Dibromoethane, 1,2-)	mg/kg	n/v	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Hexanone, 2- (Methyl Butyl Ketone)	mg/kg	100_a^A 100_b^B 1000_d^C	0.027 U	0.028 U	0.026 U	0.021 U	0.028 U
Isopropylbenzene	mg/kg	100_a^A 100_b^B 1000_d^C 2.3^{EFG}	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Methyl Acetate	mg/kg	n/v	0.0054 U LQ	0.0055 U LQ	0.0051 U LQ	0.0042 U LQ	0.0056 U LQ
Methyl Ethyl Ketone (MEK)	mg/kg	0.12^{AC} 100_b^B 0.3^E	0.027 U	0.0030 J*	0.026 U	0.021 U	0.028 U
Methyl Isobutyl Ketone (MIBK)	mg/kg	100_a^A 100_b^B 1000_d^C 1^E	0.027 U	0.028 U	0.026 U	0.021 U	0.028 U
Methyl tert-butyl ether (MTBE)	mg/kg	0.93^{ACF} 100_b^B	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Methylcyclohexane	mg/kg	n/v	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Methylene Chloride (Dichloromethane)	mg/kg	0.05^{AC} 100_b^B	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Styrene	mg/kg	100_a^A 100_b^B 1000_d^C	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Tetrachloroethane, 1,1,2,2-	mg/kg	100_a^A 100_b^B 1000_d^C 0.6^E	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Tetrachloroethylene (PCE)	mg/kg	1.3^{AC} 19^B	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Toluene	mg/kg	0.7^{ACFG} 100_b^B	0.0036 J*	0.0044 J*	0.0051 U	0.0042 U	0.0056 U
Trichlorobenzene, 1,2,4-	mg/kg	100_a^A 100_b^B 1000_d^C 3.4^E	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Trichloroethane, 1,1,1-	mg/kg	0.68^{AC} 100_b^B	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Trichloroethane, 1,1,2-	mg/kg	100_a^A 100_b^B 1000_d^C	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Trichloroethylene (TCE)	mg/kg	0.47^{AC} 21^B	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Trichlorofluoromethane (Freon 11)	mg/kg	n/v	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Trichlorotrifluoroethane (Freon 113)	mg/kg	100_a^A 100_b^B 1000_d^C 6^E	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Vinyl chloride	mg/kg	0.02^{AC} 0.9^B	0.0054 U	0.0055 U	0.0051 U	0.0042 U	0.0056 U
Xylenes, Total	mg/kg	0.26^{AFG} 100_b^B 1.6^C	0.011 U	0.011 U	0.010 U	0.0084 U	0.011 U
Total VOC TICs	mg/kg	n/v	ND	0.0069 T* J M*	ND	ND	ND
Total VOC	mg/kg	n/v	0.0376	0.0544	ND	ND	ND
Pesticides							
Aldrin	mg/kg	0.005_n^A 0.097^B 0.19^C	***0.090 U***	***0.035 U***	***0.034 U***	***0.037 U***	***0.018 U***
BHC, alpha-	mg/kg	0.02^{AC} 0.48^B	***0.090 U***	***0.035 U***	***0.034 U***	***0.037 U***	0.018 U
BHC, beta-	mg/kg	0.036^A 0.36^B 0.09^C	***0.090 U***	0.035 U	0.034 U	***0.037 U***	0.018 U
BHC, delta-	mg/kg	0.04_n^A 100_b^B 0.25^C	***0.090 U***	0.035 U	0.034 U	0.037 U	0.018 U
Camphechlor (Toxaphene)	mg/kg	100_a^A 100_b^B 1000_d^C	0.90 U	0.35 U	0.34 U	0.37 U	0.18 U
Chlordane, alpha-	mg/kg	0.094^A 4.2^B 2.9^C	0.090 U	0.035 U	0.034 U	0.037 U	0.018 U
Chlordane, trans-	mg/kg	n/v	0.090 U	0.035 U	0.034 U	0.037 U	0.018 U
DDD (p,p'-DDD)	mg/kg	0.0033_m^A 13^B 14^C	***0.090 U***	***0.035 U***	***0.034 U***	***0.037 U***	***0.018 U***
DDE (p,p'-DDE)	mg/kg	0.0033_m^A 8.9^B 17^C	***0.090 U***	***0.035 U***	***0.034 U***	***0.037 U***	***0.018 U***
DDT (p,p'-DDT)	mg/kg	0.0033_m^A 7.9^B 136^C	***0.090 U***	***0.035 U***	***0.034 U***	***0.037 U***	***0.018 U***
Dieldrin	mg/kg	0.005_n^A 0.2^B 0.1^C	***0.090 U***	***0.035 U***	***0.034 U***	***0.037 U***	***0.018 U***
Endosulfan I	mg/kg	2.4_j^A 24_j^B 102^C	0.090 U	0.035 U	0.034 U	0.037 U	0.018 U
Endosulfan II	mg/kg	2.4_j^A 24_j^B 102^C	0.090 U	0.035 U	0.034 U	0.037 U	0.018 U
Endosulfan Sulfate	mg/kg	2.4_j^A 24_j^B 1000_d^C	0.090 U	0.035 U	0.034 U	0.037 U	0.018 U
Endrin	mg/kg	0.014^A 11^B 0.06^C	***0.090 U***	***0.035 U***	***0.034 U***	***0.037 U***	***0.018 U***
Endrin Aldehyde	mg/kg	100_a^A 100_b^B 1000_d^C	0.090 U	0.035 U	0.034 U	0.037 U	0.018 U
Endrin Ketone	mg/kg	100_a^A 100_b^B 1000_d^C	0.090 U	0.035 U	0.034 U	0.037 U	0.018 U
Heptachlor	mg/kg	0.042^A 2.1^B 0.38^C	***0.090 U***	0.035 U	0.034 U	0.037 U	0.018 U
Heptachlor Epoxide	mg/kg	100_a^A 100_b^B 1000_d^C 0.02^E	***0.090 U***	***0.035 U***	***0.034 U***	***0.037 U***	0.018 U
Lindane (Hexachlorocyclohexane, gamma)	mg/kg	0.1^{AC} 1.3^B	0.090 U	0.035 U	0.034 U	0.037 U	0.018 U
Methoxychlor (4,4'-Methoxychlor)	mg/kg	100_a^A 100_b^B 1000_d^C 900^E	0.090 U	0.035 U	0.034 U	0.037 U	0.018 U

See notes on last page

Table 3
Summary of 2013 Phase II Soil Analytical Results
Remedial Investigation Work Plan
Astoria Steel Site
3-15 26th Avenue, Astoria, Queens County, NY

Sample Location			B-105	B-106	B-107	B-108
Sample Date			5-Aug-13	5-Aug-13	5-Aug-13	5-Aug-13
Sample ID			B-105 (1-5)	B-106 (6-10)	B-107 (3-7)	B-108 (1-5)
Sample Depth			1 - 5 ft	6 - 10 ft	3 - 7 ft	1 - 5 ft
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			TALBU	TALBU	TALBU	TALBU
Laboratory Work Order			43221	43221	43221	43221
Laboratory Sample ID			480-43221-16	480-43221-14	480-43221-15	480-43221-13
Sample Type	Units	NYSDEC[1,2]				
Metals						
Aluminum	mg/kg	$_{NS}^{AB}$ 10000$_{d}^{C}$ 10000$_{a}^{E}$	7260	**14000^{CE}**	6330	4510
Antimony	mg/kg	$_{NS}^{AB}$ 10000$_{d}^{C}$ 10000$_{a}^{E}$	17.0 U	17.5 U	18.0 U	16.3 U
Arsenic	mg/kg	13$_{n}^{A}$ 16$_{g}^{BC}$	3.3	1.9 J*	**47.0^{ABC}**	5.9
Barium	mg/kg	350$_{n}^{A}$ 400^{B} 820^{C}	106	124	140	38.1
Beryllium	mg/kg	7.2^{A} 72^{B} 47^{C}	0.32	0.16 J*	1.1	0.25
Cadmium	mg/kg	2.5$_{n}^{A}$ 4.3^{B} 7.5^{C}	0.13 J*	0.082 J*	0.51	0.22 U
Calcium	mg/kg	$_{NS}^{AB}$ 10000$_{d}^{C}$ 10000$_{a}^{E}$	4970 BS	**19700 BS^{CE}**	**57200 BS^{CE}**	3120 BS
Chromium (Hexavalent)	mg/kg	1$_{m,i}^{A}$ 110$_{i}^{B}$ 19$_{i}^{C}$	0.89 U	0.87 U	0.90 U	0.87 U
Chromium (Total)	mg/kg	$_{NS,q}^{ABC}$	15.3	47.2	102	10.0
Chromium (Trivalent)	mg/kg	30$_{n,i}^{A}$ 180$_{i}^{B}$ n/v,l^{C}	15.3	**47.2^{A}**	**102^{A}**	10.0
Cobalt	mg/kg	$_{NS}^{AB}$ 10000$_{d}^{C}$ 10000$_{a}^{E}$	4.9	10.5	10.3	6.2
Copper	mg/kg	50^{A} 270^{B} 1720^{C}	28.2	12.1	**91.5^{A}**	28.1
Iron	mg/kg	$_{NS}^{AB}$ 10000$_{d}^{C}$ 10000$_{a}^{E}$	**11700 B*^{CE}**	**18600 B*^{CE}**	**89000 B*^{CE}**	**50900 B*^{CE}**
Lead	mg/kg	63$_{n}^{A}$ 400^{B} 450^{C}	**2480^{ABC}**	7.7	**104^{A}**	11.4
Magnesium	mg/kg	$_{NS}^{AB}$ 10000$_{d}^{C}$	3730	**16100^{C}**	**17900^{C}**	1600
Manganese	mg/kg	1600$_{n}^{A}$ 2000$_{g}^{BC}$	103 BS	208 BS	**4740 BS^{ABC}**	659 BS
Mercury	mg/kg	0.18$_{n}^{A}$ 0.81$_{k}^{B}$ 0.73^{C}	**0.31^{A}**	0.012 J*	**0.23^{A}**	0.028
Nickel	mg/kg	30^{A} 310^{B} 130^{C}	12.0	**30.9^{A}**	27.9	14.6
Potassium	mg/kg	$_{NS}^{AB}$ 10000$_{d}^{C}$	1110	4620	531	520
Selenium	mg/kg	3.9$_{n}^{A}$ 180^{B} 4$_{g}^{C}$	1.3 J*	0.63 J*	**4.1 J*^{AC}**	1.1 J*
Silver	mg/kg	2^{A} 180^{B} 8.3^{C}	0.57 U	0.58 U	1.2 U	0.54 U
Sodium	mg/kg	$_{NS}^{AB}$ 10000$_{d}^{C}$	399 BS	325 BS	639 BS	375 BS
Thallium	mg/kg	$_{NS}^{AB}$ 10000$_{d}^{C}$ 10000$_{a}^{E}$	6.8 U	7.0 U	4.9 J*	6.5 U
Vanadium	mg/kg	$_{NS}^{AB}$ 10000$_{d}^{C}$ 10000$_{a}^{E}$	17.5 BS	40.3 BS	576 BS	18.5 BS
Zinc	mg/kg	109$_{n}^{A}$ 10000$_{e}^{B}$ 2480^{C}	**185 BS^{A}**	38.1 BS	**161 BS^{A}**	28.3 BS
General Chemistry						
Cyanide	mg/kg	27$_{i}^{AB}$ 40$_{i}^{C}$	1.0 U	1.1 U	1.0 U	1.1 U
Total Organic Carbon	mg/kg	n/v	9130	152000	22700	16800
Polychlorinated Biphenyls						
Aroclor 1016	mg/kg	0.1$_{o}^{AB}$ 3.2$_{o}^{C}$	***0.24 U***	***0.20 U***	***0.24 U***	***0.25 U***
Aroclor 1221	mg/kg	0.1$_{o}^{AB}$ 3.2$_{o}^{C}$	***0.24 U***	***0.20 U***	***0.24 U***	***0.25 U***
Aroclor 1232	mg/kg	0.1$_{o}^{AB}$ 3.2$_{o}^{C}$	***0.24 U***	***0.20 U***	***0.24 U***	***0.25 U***
Aroclor 1242	mg/kg	0.1$_{o}^{AB}$ 3.2$_{o}^{C}$	***0.24 U***	***0.20 U***	***0.24 U***	***0.25 U***
Aroclor 1248	mg/kg	0.1$_{o}^{AB}$ 3.2$_{o}^{C}$	***0.24 U***	***0.20 U***	***0.24 U***	***0.25 U***
Aroclor 1254	mg/kg	0.1$_{o}^{AB}$ 3.2$_{o}^{C}$	***0.24 U***	***0.20 U***	***0.24 U***	***0.25 U***
Aroclor 1260	mg/kg	0.1$_{o}^{AB}$ 3.2$_{o}^{C}$	**0.17 J*^{A}**	***0.20 U***	***0.24 U***	***0.25 U***
Aroclor 1262	mg/kg	0.1$_{o}^{AB}$ 3.2$_{o}^{C}$	***0.24 U***	***0.20 U***	***0.24 U***	***0.25 U***
Aroclor 1268	mg/kg	0.1$_{o}^{AB}$ 3.2$_{o}^{C}$	***0.24 U***	***0.20 U***	***0.24 U***	***0.25 U***
Semi - Volatile Organic Compounds						
Acenaphthene	mg/kg	20^{AG} 100$_{b}^{B}$ 98^{C}	0.0031 J*	0.18 U	0.024 J*	0.18 U
Acenaphthylene	mg/kg	100$_{a}^{AG}$ 100$_{b}^{B}$ 107^{C}	0.18 U	0.18 U	0.03 J*	0.016 J*
Acetophenone	mg/kg	n/v	0.18 U	0.18 U	0.93 U	0.18 U
Anthracene	mg/kg	100$_{a}^{AG}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	0.022 J*	0.18 U	0.083 J*	0.26
Atrazine	mg/kg	n/v	0.18 U	0.18 U	0.93 U	0.18 U
Benzaldehyde	mg/kg	n/v	0.18 U	0.18 U	0.93 U	0.18 U
Benzo(a)anthracene	mg/kg	1$_{n}^{AG}$ 1$_{g}^{BC}$	0.12 J*	0.18 U	0.29 J*	0.54
Benzo(a)pyrene	mg/kg	1$_{n}^{AG}$ 1$_{g}^{B}$ 22^{C}	0.13 J*	0.18 U	0.29 J*	0.46
Benzo(b)fluoranthene	mg/kg	1$_{n}^{AG}$ 1$_{g}^{B}$ 1.7^{C}	0.16 J*	0.18 U	0.47 J*	0.58
Benzo(g,h,i)perylene	mg/kg	100^{AG} 100$_{b}^{B}$ 1000$_{d}^{C}$	0.13 J*	0.0081 J*	0.16 J*	0.12 J*
Benzo(k)fluoranthene	mg/kg	0.8$_{n}^{AG}$ 3.9^{B} 1.7^{C}	0.069 J*	0.18 U	0.19 J*	0.28
Biphenyl, 1,1'- (Biphenyl)	mg/kg	n/v	0.18 U	0.18 U	0.93 U	0.18 U
Bis(2-Chloroethoxy)methane	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	0.18 U	0.18 U	0.93 U	0.18 U
Bis(2-Chloroethyl)ether	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	0.18 U	0.18 U	0.93 U	0.18 U
Bis(2-Chloroisopropyl)ether (2,2-oxybis(1-Chloropropane))	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	0.18 U	0.18 U	0.93 U	0.18 U
Bis(2-Ethylhexyl)phthalate (DEHP)	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 435^{E}	0.18 U	0.18 U	0.93 U	0.18 U
Bromophenyl Phenyl Ether, 4-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	0.18 U	0.18 U	0.93 U	0.18 U
Butyl Benzyl Phthalate	mg/kg	$_{NS}^{AB}$ 1000$_{d}^{C}$ 122^{E}	0.18 U	0.18 U	0.93 U	0.18 U
Caprolactam	mg/kg	n/v	0.18 U	0.18 U	0.93 U	0.18 U
Carbazole	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	0.18 U	0.18 U	0.93 U	0.18 U
Chloro-3-methyl phenol, 4-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	0.18 U	0.18 U	0.93 U	0.18 U
Chloroaniline, 4-	mg/kg	$_{NS}^{AB}$ 1000$_{d}^{C}$ 0.22^{E}	0.18 U	0.18 U	***0.93 U***	0.18 U
Chloronaphthalene, 2-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	0.18 U	0.18 U	0.93 U	0.18 U
Chlorophenol, 2- (ortho-Chlorophenol)	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	0.18 U	0.18 U	0.93 U	0.18 U
Chlorophenyl Phenyl Ether, 4-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	0.18 U	0.18 U	0.93 U	0.18 U
Chrysene	mg/kg	1$_{n}^{AG}$ 3.9^{B} 1$_{g}^{C}$	0.15 J*	0.18 U	0.41 J*	0.48
Cresol, o- (Methylphenol, 2-)	mg/kg	0.33$_{m}^{A}$ 100$_{b}^{B}$ 0.33$_{f}^{C}$	0.18 U	0.18 U	***0.93 U***	0.18 U
Cresol, p- (Methylphenol, 4-)	mg/kg	0.33$_{m}^{A}$ 100$_{b}^{B}$ 0.33$_{f}^{C}$	***0.36 U***	***0.35 U***	***1.8 U***	***0.35 U***
Dibenzo(a,h)anthracene	mg/kg	0.33$_{m}^{AG}$ 0.33$_{f}^{B}$ 1000$_{d}^{C}$	0.026 J*	0.18 U	0.041 J*	0.033 J*
Dibenzofuran	mg/kg	7^{A} 59^{B} 210^{C} 6.2^{E}	0.18 U	0.18 U	0.064 J*	0.01 J*
Dibutyl Phthalate (DBP)	mg/kg	$_{NS}^{AB}$ 1000$_{d}^{C}$ 8.1^{E}	0.18 U	0.18 U	0.93 U	0.18 U
Dichlorobenzidine, 3,3'-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	0.18 U	0.18 U	0.93 U	0.18 U
Dichlorophenol, 2,4-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 0.4^{E}	0.18 U	0.18 U	***0.93 U***	0.18 U
Diethyl Phthalate	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 7.1^{E}	0.18 U	0.18 U	0.93 U	0.18 U
Dimethyl Phthalate	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 27^{E}	0.18 U	0.18 U	0.93 U	0.18 U
Dimethylphenol, 2,4-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	0.18 U	0.18 U	0.93 U	0.18 U
Dinitro-o-cresol, 4,6-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	0.36 U	0.35 U	1.8 U	0.35 U
Dinitrophenol, 2,4-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 0.2^{E}	***0.36 U***	***0.35 U***	***1.8 U***	***0.35 U***
Dinitrotoluene, 2,4-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	0.18 U	0.18 U	0.93 U	0.18 U
Dinitrotoluene, 2,6-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 1/0.17$_{b,s1}^{E}$	0.18 U	0.18 U	0.93 U	0.18 U
Di-n-Octyl phthalate	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 120^{E}	0.18 U	0.18 U	0.93 U	0.18 U
Fluoranthene	mg/kg	100$_{a}^{AG}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	0.18	0.026 J*	0.51 J*	1
Fluorene	mg/kg	30^{AG} 100$_{b}^{B}$ 386^{C}	0.18 U	0.22	0.055 J*	0.029 J*
Hexachlorobenzene	mg/kg	0.33$_{m}^{A}$ 1.2^{B} 3.2^{C} 1.4^{E}	0.18 U	0.18 U	***0.93 U***	0.18 U
Hexachlorobutadiene (Heachloro-1,3-butadiene)	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	0.18 U	0.18 U	0.93 U	0.18 U
Hexachlorocyclopentadiene	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	0.18 U	0.18 U	0.93 U	0.18 U
Hexachloroethane	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	0.18 U	0.18 U	0.93 U	0.18 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.5$_{n}^{AG}$ 0.5$_{g}^{B}$ 8.2^{C}	0.076 J*	0.0050 J*	0.11 J*	0.13 J*
Isophorone	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 4.4^{E}	0.18 U	0.18 U	0.93 U	0.18 U
Methylnaphthalene, 2-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 36.4^{E}	0.0054 J*	0.18 U	0.098 J*	0.015 J*
Naphthalene	mg/kg	12^{ACFG} 100$_{b}^{B}$	0.0083 J*	0.18 U	0.11 J*	0.016 J*
Nitroaniline, 2-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 0.4^{E}	0.36 U	0.35 U	***1.8 U***	0.35 U
Nitroaniline, 3-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 0.5^{E}	0.36 U	0.35 U	***1.8 U***	0.35 U
Nitroaniline, 4-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$	0.36 U	0.35 U	1.8 U	0.35 U
Nitrobenzene	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 15^{D} 0.17$_{b}^{E}$	***0.18 U***	***0.18 U***	***0.93 U***	***0.18 U***
Nitrophenol, 2-	mg/kg	100$_{a}^{A}$ 100$_{b}^{B}$ 1000$_{d}^{C}$ 0.3^{E}	0.18 U	0.18 U	***0.93 U***	0.18 U

See notes on last page

Table 3
Summary of 2013 Phase II Soil Analytical Results
Remedial Investigation Work Plan
Astoria Steel Site
3-15 26th Avenue, Astoria, Queens County, NY

Sample Location			B-105	B-106	B-107	B-108
Sample Date			5-Aug-13	5-Aug-13	5-Aug-13	5-Aug-13
Sample ID			B-105 (1-5)	B-106 (6-10)	B-107 (3-7)	B-108 (1-5)
Sample Depth			1 - 5 ft	6 - 10 ft	3 - 7 ft	1 - 5 ft
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			TALBU	TALBU	TALBU	TALBU
Laboratory Work Order			43221	43221	43221	43221
Laboratory Sample ID			480-43221-16	480-43221-14	480-43221-15	480-43221-13
Sample Type	Units	NYSDEC[1,2]				
Semi - Volatile Organic Compounds (continued)						
Nitrophenol, 4-	mg/kg	100_a^A 100_b^B 1000_d^C 0.1^E	***0.36 U***	***0.35 U***	***1.8 U***	***0.35 U***
N-Nitrosodi-n-Propylamine	mg/kg	100_a^A 100_b^B 1000_d^C	0.18 U	0.18 U	0.93 U	0.18 U
n-Nitrosodiphenylamine	mg/kg	100_a^A 100_b^B 1000_d^C	0.18 U	0.18 U	0.93 U	0.18 U
Pentachlorophenol	mg/kg	0.8_m^A 6.7^B 0.8_f^C	0.36 U	0.35 U	***1.8 U***	0.35 U
Phenanthrene	mg/kg	100^{AG} 100_b^B 1000_d^C	0.1 J* BS	0.06 J* BS	0.39 J* BS	0.5 BS
Phenol	mg/kg	0.33_m^A 100_b^B 0.33_f^C	0.18 U	0.18 U	***0.93 U***	0.18 U
Pyrene	mg/kg	100^{AG} 100_b^B 1000_d^C	0.18	0.023 J*	0.39 J*	0.70
Trichlorophenol, 2,4,5-	mg/kg	100_a^A 100_b^B 1000_d^C 0.1^E	***0.18 U***	***0.18 U***	***0.93 U***	***0.18 U***
Trichlorophenol, 2,4,6-	mg/kg	100_a^A 100_b^B 1000_d^C	0.18 U	0.18 U	0.93 U	0.18 U
Total SVOC TICs	mg/kg	n/v	6.57 T* J	ND	ND	ND
Volatile Organic Compounds						
Acetone	mg/kg	0.05^{AC} 100_b^B	**0.15[AC]**	***0.22 U***	0.022 J*	0.0071 J*
Benzene	mg/kg	0.06^{ACFG} 4.8^B	0.0052 U	0.044 U	0.0056 U	0.0047 U
Bromodichloromethane	mg/kg	100_a^A 100_b^B 1000_d^C	0.0052 U	0.044 U	0.0056 U	0.0047 U
Bromoform (Tribromomethane)	mg/kg	100_a^A 100_b^B 1000_d^C	0.0052 U	0.044 U	0.0056 U	0.0047 U
Bromomethane (Methyl bromide)	mg/kg	100_a^A 100_b^B 1000_d^C	0.0052 U	0.044 U	0.0056 U	0.0047 U
Carbon Disulfide	mg/kg	100_a^A 100_b^B 1000_d^C 2.7^E	0.0052 U	0.044 U	0.0056 U	0.0047 U
Carbon Tetrachloride (Tetrachloromethane)	mg/kg	0.76^{AC} 2.4^B	0.0052 U	0.044 U	0.0056 U	0.0047 U
Chlorobenzene (Monochlorobenzene)	mg/kg	1.1^{AC} 100_b^B	0.0052 U	0.044 U	0.0056 U	0.0047 U
Chloroethane (Ethyl Chloride)	mg/kg	100_a^A 100_b^B 1000_d^C 1.9^E	0.0052 U	0.044 U	0.0056 U	0.0047 U
Chloroform (Trichloromethane)	mg/kg	0.37^{AC} 49^B	0.0052 U	0.044 U	0.0056 U	0.0047 U
Chloromethane	mg/kg	100_a^A 100_b^B 1000_d^C	0.0052 U	0.044 U	0.0056 U	0.0047 U
Cyclohexane	mg/kg	n/v	0.0052 U	0.044 U	0.0056 U	0.0047 U
Dibromo-3-Chloropropane, 1,2- (DBCP)	mg/kg	n/v	0.0052 U	0.044 U	0.0056 U	0.0047 U
Dibromochloromethane	mg/kg	100_a^A 100_b^B 1000_d^C	0.0052 U	0.044 U	0.0056 U	0.0047 U
Dichlorobenzene, 1,2-	mg/kg	1.1^{AC} 100_b^B	0.0052 U	0.044 U	0.0056 U	0.0047 U
Dichlorobenzene, 1,3-	mg/kg	2.4^{AC} 49^B	0.0052 U	0.044 U	0.0056 U	0.0047 U
Dichlorobenzene, 1,4-	mg/kg	1.8^{AC} 13^B	0.0052 U	0.044 U	0.0056 U	0.0047 U
Dichlorodifluoromethane (Freon 12)	mg/kg	n/v	0.0052 U	0.044 U	0.0056 U	0.0047 U
Dichloroethane, 1,1-	mg/kg	0.27^{AC} 26^B	0.0052 U	0.044 U	0.0056 U	0.0047 U
Dichloroethane, 1,2-	mg/kg	0.02_m^A 3.1^B 0.02_g^C	0.0052 U	***0.044 U***	0.0056 U	0.0047 U
Dichloroethene, 1,1-	mg/kg	0.33^{AC} 100_b^B	0.0052 U	0.044 U	0.0056 U	0.0047 U
Dichloroethylene, cis-1,2-	mg/kg	0.25^{AC} 100_b^B	0.0052 U	0.044 U	0.0098	0.0047 U
Dichloroethylene, trans-1,2-	mg/kg	0.19^{AC} 100_b^B	0.0052 U	0.044 U	0.00084 J*	0.0047 U
Dichloropropane, 1,2-	mg/kg	100_a^A 100_b^B 1000_d^C	0.0052 U	0.044 U	0.0056 U	0.0047 U
Dichloropropene, cis-1,3-	mg/kg	100_a^A 100_b^B 1000_d^C	0.0052 U	0.044 U	0.0056 U	0.0047 U
Dichloropropene, trans-1,3-	mg/kg	100_a^A 100_b^B 1000_d^C	0.0052 U	0.044 U	0.0056 U	0.0047 U
Ethylbenzene	mg/kg	1^{ACFG} 41^B	0.00047 J*	0.044 U	0.0056 U	0.0047 U
Ethylene Dibromide (Dibromoethane, 1,2-)	mg/kg	n/v	0.0052 U	0.044 U	0.0056 U	0.0047 U
Hexanone, 2- (Methyl Butyl Ketone)	mg/kg	100_a^A 100_b^B 1000_d^C	0.026 U	0.22 U	0.028 U	0.024 U
Isopropylbenzene	mg/kg	100_a^A 100_b^B 1000_d^C 2.3^{EFG}	0.0052 U	0.044 U	0.0056 U	0.0047 U
Methyl Acetate	mg/kg	n/v	0.0052 U LQ	0.044 U	0.0056 U LQ	0.0047 U LQ
Methyl Ethyl Ketone (MEK)	mg/kg	0.12^{AC} 100_b^B 0.3^E	0.046	***0.22 U***	0.028 U	0.024 U
Methyl Isobutyl Ketone (MIBK)	mg/kg	100_a^A 100_b^B 1000_d^C 1^E	0.026 U	0.22 U	0.028 U	0.024 U
Methyl tert-butyl ether (MTBE)	mg/kg	0.93^{ACF} 100_b^B	0.0052 U	0.044 U	0.0056 U	0.0047 U
Methylcyclohexane	mg/kg	n/v	0.0052 U	0.038 J*	0.0056 U	0.0047 U
Methylene Chloride (Dichloromethane)	mg/kg	0.05^{AC} 100_b^B	0.0052 U	0.044 U	0.0056 U	0.0047 U
Styrene	mg/kg	100_a^A 100_b^B 1000_d^C	0.0052 U	0.044 U	0.0056 U	0.0047 U
Tetrachloroethane, 1,1,2,2-	mg/kg	100_a^A 100_b^B 1000_d^C 0.6^E	0.0052 U	0.044 U	0.0056 U	0.0047 U
Tetrachloroethylene (PCE)	mg/kg	1.3^{AC} 19^B	0.0052 U	0.044 U	0.0056 U	0.0047 U
Toluene	mg/kg	0.7^{ACFG} 100_b^B	0.0052 U	0.044 U	0.0056 U	0.0047 U
Trichlorobenzene, 1,2,4-	mg/kg	100_a^A 100_b^B 1000_d^C 3.4^E	0.0052 U	0.044 U	0.0056 U	0.0047 U
Trichloroethane, 1,1,1-	mg/kg	0.68^{AC} 100_b^B	0.0052 U	0.044 U	0.0056 U	0.0047 U
Trichloroethane, 1,1,2-	mg/kg	100_a^A 100_b^B 1000_d^C	0.0052 U	0.044 U	0.0056 U	0.0047 U
Trichloroethylene (TCE)	mg/kg	0.47^{AC} 21^B	0.0052 U	0.044 U	0.0027 J*	0.0047 U
Trichlorofluoromethane (Freon 11)	mg/kg	n/v	0.0052 U	0.044 U	0.0056 U	0.0047 U
Trichlorotrifluoroethane (Freon 113)	mg/kg	100_a^A 100_b^B 1000_d^C 6^E	0.0052 U	0.044 U	0.0056 U	0.0047 U
Vinyl chloride	mg/kg	0.02^{AC} 0.9^B	0.0052 U	***0.044 U***	0.0050 J*	0.0047 U
Xylenes, Total	mg/kg	0.26^{AFG} 100_b^B 1.6^C	0.0011 J*	0.088 U	0.011 U	0.0095 U
Total VOC TICs	mg/kg	n/v	0.169 T* J M*	54.2 T* J M*	0.1343 T* J M*	ND
Total VOC	mg/kg	n/v	0.19757	0.038	0.04034	0.0071
Pesticides						
Aldrin	mg/kg	0.005_n^A 0.097^B 0.19^C	***0.090 U***	0.0018 U	***0.037 U***	0.0018 U
BHC, alpha-	mg/kg	0.02^{AC} 0.48^B	***0.090 U***	0.0018 U	***0.037 U***	0.0018 U
BHC, beta-	mg/kg	0.036^A 0.36^B 0.09^C	***0.090 U***	0.0018 U	***0.037 U***	0.0018 U
BHC, delta-	mg/kg	0.04_n^A 100_b^B 0.25^C	***0.090 U***	0.0018 U	0.037 U	0.0018 U
Camphechlor (Toxaphene)	mg/kg	100_a^A 100_b^B 1000_d^C	0.90 U	0.018 U	0.37 U	0.018 U
Chlordane, alpha-	mg/kg	0.094^A 4.2^B 2.9^C	0.090 U	0.0018 U	0.037 U	0.0018 U
Chlordane, trans-	mg/kg	n/v	0.090 U	0.0018 U	0.037 U	0.0018 U
DDD (p,p'-DDD)	mg/kg	0.0033_m^A 13^B 14^C	***0.090 U***	0.0018 U	***0.037 U***	0.0018 U
DDE (p,p'-DDE)	mg/kg	0.0033_m^A 8.9^B 17^C	***0.090 U***	0.0018 U	***0.037 U***	0.0018 U
DDT (p,p'-DDT)	mg/kg	0.0033_m^A 7.9^B 136^C	***0.090 U***	0.0018 U	***0.037 U***	0.0018 U
Dieldrin	mg/kg	0.005_n^A 0.2^B 0.1^C	***0.090 U***	0.0018 U	***0.037 U***	0.0018 U
Endosulfan I	mg/kg	2.4_j^A 24_j^B 102^C	0.090 U	0.0018 U	0.037 U	0.0018 U
Endosulfan II	mg/kg	2.4_j^A 24_j^B 102^C	0.090 U	0.0018 U	0.037 U	0.0018 U
Endosulfan Sulfate	mg/kg	2.4_j^A 24_j^B 1000_d^C	0.090 U	0.0018 U	0.037 U	0.0018 U
Endrin	mg/kg	0.014^A 11^B 0.06^C	***0.090 U***	0.0018 U	***0.037 U***	0.0018 U
Endrin Aldehyde	mg/kg	100_a^A 100_b^B 1000_d^C	0.090 U	0.0018 U	0.037 U	0.00071 J*
Endrin Ketone	mg/kg	100_a^A 100_b^B 1000_d^C	0.090 U	0.00057 J*	0.037 U	0.0018 U
Heptachlor	mg/kg	0.042^A 2.1^B 0.38^C	***0.090 U***	0.0018 U	0.037 U	0.0018 U
Heptachlor Epoxide	mg/kg	100_a^A 100_b^B 1000_d^C 0.02^E	***0.090 U***	0.0018 U	***0.037 U***	0.0018 U
Lindane (Hexachlorocyclohexane, gamma)	mg/kg	0.1^{AC} 1.3^B	0.090 U	0.0018 U	0.037 U	0.0018 U
Methoxychlor (4,4'-Methoxychlor)	mg/kg	100_a^A 100_b^B 1000_d^C 900^E	0.090 U	0.0018 U	0.037 U	0.00055 J*

See notes on last page

Table 3
Summary of 2013 Phase II Soil Analytical Results
Remedial Investigation Work Plan
Astoria Steel Site
3-15 26th Avenue, Astoria, Queens County, NY

Notes:

NYSDEC[1]	NYSDEC 6 NYCRR Part 375 Soil Clean-up Objectives (SCOs)
[A]	NYSDEC 6 NYCRR Part 375 - Unrestricted Use Soil Cleanup Objectives
[B]	NYSDEC 6 NYCRR Part 375 - Restricted Use SCO - Protection of Human Health - Restricted Residential
[C]	NYSDEC 6 NYCRR Part 375 - Restricted Use SCO - Protection of Groundwater
NYSDEC[2]	New York State Department of Environmental Conservation, DEC Policy CP-51, October 21, 2010
[D]	Table 1 Supplemental Soil Cleanup Objectives - Restricted Residential
[E]	Table 1 Supplemental Soil Cleanup Objectives - Protection of Groundwater
[F]	Table 2 Soil Cleanup Levels for Gasoline Contaminated Soils
[G]	Table 3 Soil Cleanup Levels for Fuel Oil Contaminated Soil
6.5[A]	Concentration exceeds the indicated standard.
15.2	Concentration was detected but did not exceed applicable standards.
0.50 U	Laboratory reportable detection limit exceeded standard.
0.03 U	The analyte was not detected above the laboratory reportable detection limit.
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
NS[AB]	No SCO has been established for this compound.
NS,q[ABC]	No SCO has been established for this compound. No SCO has been established for total chromium; however, see standards for trivalent and hexavalent chromium.
a[A]	The SCOs for unrestricted use were capped at a maximum value of 100 mg/kg. See 6 NYCRR Part 375 TSD Section 9.3
b[E]	Based on rural background study
b[B]	The SCOs for residential, restricted-residential and ecological resources use were capped at a maximum value of 100 mg/kg. See 6 NYCRR Part 375 TSD Section 9.3.
b,s1	Based on rural background study. The value of 1.0 refers to SVOC analses while the 0.17b refers to VOC analyses.
d	The SCOs for industrial use and the protection of groundwater were capped at a maximum value of 1000 mg/kg (Organics) and 10000 mg/kg (Inorganics). See 6 NYCRR Part 375 TSD Section 9.3.
e	The SCOS for metals were capped at a maximum value of 10,000 mg/kg. See 6 NYCRR Part 375 TSD Section 9.3.
f[BC]	For constituents where the calculated SCO was lower than the CRQL, the CRQL is used as the SCO value.
g[BC]	For constituents where the calculated SCO was lower than the rural soil background concentration as determined by the DEC/DOH rural soil survey, the rural soil background concentration is used as the Track 2 SCO value for this use of the site.
i[ABC]	The SCO for this specific compound (or family of compounds) is considered to be met if the analysis for the total species of this contaminant is below the specific SCO.
k	This SCO is the lower of the values for mercury (elemental) or mercury (inorganic salts). See 6 NYCRR Part 375 TSD Table 5.6-1.
m	For constituents where the calculated SCO was lower than the Contract Required Quantitation Limit (CRQL), the CRQL is used as the Track 1 SCO value.
m,i	For constituents where the calculated SCO was lower than the Contract Required Quantitation Limit (CRQL), the CRQL is used as the Track 1 SCO value. The SCO for this specific compound (or family of compounds) is considered to be met if the analysis for the total species of this contaminant is below the specific SCO.
n	For constituents where the calculated SCO was lower than the rural soil background concentration as determined by the DEC/DOH rural soil survey, the rural soil background concentration is used as the Track 1 SCO value for this use of the site.
n,i	For constituents where the calculated SCO was lower than the rural soil background concentration as determined by the DEC/DOH rural soil survey, the rural soil background concentration is used as the Track 1 SCO value for this use of the site. The SCO for this specific compound (or family of compounds) is considered to be met if the analysis for the total species of this contaminant is below the specific SCO.
n/v,l	No value. Protection of ecological resources SCOs were not developed for contaminants identified in 6 NYCRR Part 375-6.8(b) with "NS". Where such contaminants appear in 6 NYCRR Part 375-6.8(a), the applicant may be required by the Department to calculate a protection of ecological resources SCO according to the TSD.
o[ABC]	The criterion is applicable to total PCBs, and the individual Aroclors should be added for comparison.
B*	Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the blank.
BS	Compound was found in the blank and sample
J	Indicates estimated value.
J*	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value
LQ	LCS or LCSD exceeds the control limits
M*	Presumptive evidence of material.
T*	Result is a tentatively identified compound (TIC) and an estimated value.

Table 4
Summary of 2013 Phase II Groundwater Analytical Results
Remedial Investigation Work Plan
Astoria Steel Site
3-15 26th Avenue, Astoria, Queens County, NY

Sample Location	Units	TOGS	MW-101	MW-102	MW-103	MW-104	
Sample Date			5-Aug-13	5-Aug-13	5-Aug-13	5-Aug-13	5-Aug-13
Sample ID			MW-101	MW-102	MW-103	MW-104	DUP080513
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			TALBU	TALBU	TALBU	TALBU	TALBU
Laboratory Work Order			43221	43221	43221	43221	43221
Laboratory Sample ID			480-43316-2	480-43316-1	480-43221-2	480-43221-1	480-43221-3
Sample Type							Field Duplicate
Metals							
Aluminum	µg/L	n/v	3900	700	67 J*	3000	3100
Antimony	µg/L	3[A]	***20 U***	***20 U***	***20 U***	***20 U***	***20 U***
Arsenic	µg/L	25[A]	10 U	17	10 U	8.1 J*	8.2 J*
Barium	µg/L	1000[A]	550	110	31	49	51
Beryllium	µg/L	3[B]	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Cadmium	µg/L	5[A]	1.0 U	2.1	0.81 J*	0.94 J*	0.88 J*
Calcium	µg/L	n/v	264000	185000	256000	264000	271000
Chromium (Hexavalent)	µg/L	50[A]	10 U H	10 U H	10 U	10 U	10 U
Chromium (Total)	µg/L	50[A]	15	12	2.1 J*	7.9	7.9
Chromium (Trivalent)	µg/L	n/v	15	12	10 U	7.9 J*	7.9 J*
Cobalt	µg/L	n/v	9.0	0.95 J*	4.0 U	4.5	4.7
Copper	µg/L	200[A]	18	34	5.0 J*	14	15
Iron	µg/L	300.[A]	**7000 BS[A]**	**1100 BS[A]**	150 BS	**4700 BS[A]**	**4800 BS[A]**
Lead	µg/L	25[A]	4.2 J*	**80[A]**	5.0 U	6.6	6.4
Magnesium	µg/L	35000[B]	**79700[B]**	**123000[B]**	**804000[B]**	**711000[B]**	**739000[B]**
Manganese	µg/L	300.[A]	**4600 BS[A]**	290 BS	8.5 BS	**390 BS[A]**	**410 BS[A]**
Mercury	µg/L	0.7[A]	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	µg/L	100[A]	21	14	4.8 J*	12	12
Potassium	µg/L	n/v	69400	38500	297000	276000	285000
Selenium	µg/L	10[A]	***15 U***	***15 U***	***15 U***	***15 U***	***15 U***
Silver	µg/L	50[A]	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U
Sodium	µg/L	20000[A]	**342000[A]**	**753000[A]**	**7280000[A]**	**6310000[A]**	**6730000[A]**
Thallium	µg/L	0.5[B]	***20 U***	***20 U***	***20 U***	***20 U***	***20 U***
Vanadium	µg/L	n/v	11	14	5.0 U	10	10
Zinc	µg/L	2000[B]	24	150	15	19	17
General Chemistry							
Total Organic Carbon	µg/L	n/v	2200	8600	740 J*	890 J*	860 J*
Polychlorinated Biphenyls							
Aroclor 1016	µg/L	0.09[A]	***0.47 U***	***0.47 U***	***0.47 U***	***0.47 U***	***0.48 U***
Aroclor 1221	µg/L	0.09[A]	***0.47 U***	***0.47 U***	***0.47 U***	***0.47 U***	***0.48 U***
Aroclor 1232	µg/L	0.09[A]	***0.47 U***	***0.47 U***	***0.47 U***	***0.47 U***	***0.48 U***
Aroclor 1242	µg/L	0.09[A]	***0.47 U***	***0.47 U***	***0.47 U***	***0.47 U***	***0.48 U***
Aroclor 1248	µg/L	0.09[A]	***0.47 U***	***0.47 U***	***0.47 U***	***0.47 U***	***0.48 U***
Aroclor 1254	µg/L	0.09[A]	***0.47 U***	***0.47 U***	***0.47 U***	***0.47 U***	***0.48 U***
Aroclor 1260	µg/L	0.09[A]	***0.47 U***	***0.47 U***	***0.47 U***	***0.47 U***	***0.48 U***
Aroclor 1262	µg/L	0.09[A]	***0.47 U***	***0.47 U***	***0.47 U***	***0.47 U***	***0.48 U***
Aroclor 1268	µg/L	0.09[A]	***0.47 U***	***0.47 U***	***0.47 U***	***0.47 U***	***0.48 U***
Semi - Volatile Organic Compounds							
Acenaphthene	µg/L	20[A]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Acenaphthylene	µg/L	n/v	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Acetophenone	µg/L	n/v	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Anthracene	µg/L	50[B]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Atrazine	µg/L	7.5[A]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Benzaldehyde	µg/L	n/v	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Benzo(a)anthracene	µg/L	0.002[B]	***4.7 U***	***4.8 U***	***4.7 U***	***4.9 U***	***4.7 U***
Benzo(a)pyrene	µg/L	n/v	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Benzo(b)fluoranthene	µg/L	0.002[B]	***4.7 U***	***4.8 U***	***4.7 U***	***4.9 U***	***4.7 U***
Benzo(g,h,i)perylene	µg/L	n/v	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Benzo(k)fluoranthene	µg/L	0.002[B]	***4.7 U***	***4.8 U***	***4.7 U***	***4.9 U***	***4.7 U***
Biphenyl, 1,1'- (Biphenyl)	µg/L	5.**[A]	4.7 U	4.8 U	0.96 J*	4.9 U	4.7 U
Bis(2-Chloroethoxy)methane	µg/L	5.**[A]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Bis(2-Chloroethyl)ether	µg/L	1[A]	***4.7 U***	***4.8 U***	***4.7 U***	***4.9 U***	***4.7 U***
Bis(2-Chloroisopropyl)ether (2,2-oxybis(1-Chloropropane))	µg/L	5.**[A]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Bis(2-Ethylhexyl)phthalate (DEHP)	µg/L	5[A]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Bromophenyl Phenyl Ether, 4-	µg/L	n/v	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Butyl Benzyl Phthalate	µg/L	50[B]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Caprolactam	µg/L	n/v	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Carbazole	µg/L	n/v	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Chloro-3-methyl phenol, 4-	µg/L	n/v	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Chloroaniline, 4-	µg/L	5.**[A]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Chloronaphthalene, 2-	µg/L	10[A]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Chlorophenol, 2- (ortho-Chlorophenol)	µg/L	n/v	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Chlorophenyl Phenyl Ether, 4-	µg/L	n/v	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Chrysene	µg/L	0.002[B]	***4.7 U***	***4.8 U***	***4.7 U***	***4.9 U***	***4.7 U***
Cresol, o- (Methylphenol, 2-)	µg/L	n/v	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Cresol, p- (Methylphenol, 4-)	µg/L	n/v	9.5 U	9.5 U	9.3 U	9.8 U	9.4 U
Dibenzo(a,h)anthracene	µg/L	n/v	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Dibenzofuran	µg/L	n/v	9.5 U	9.5 U	0.64 J*	9.8 U	9.4 U
Dibutyl Phthalate (DBP)	µg/L	50[A]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Dichlorobenzidine, 3,3'-	µg/L	5.**[A]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Dichlorophenol, 2,4-	µg/L	5.**[A]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Diethyl Phthalate	µg/L	50[B]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Dimethyl Phthalate	µg/L	50[B]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Dimethylphenol, 2,4-	µg/L	50[B]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Dinitro-o-cresol, 4,6-	µg/L	n/v	9.5 U	9.5 U	9.3 U	9.8 U	9.4 U
Dinitrophenol, 2,4-	µg/L	10[B]	9.5 U	9.5 U	9.3 U	9.8 U	9.4 U
Dinitrotoluene, 2,4-	µg/L	5.**[A]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Dinitrotoluene, 2,6-	µg/L	5.**[A]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Di-n-Octyl phthalate	µg/L	50[B]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Fluoranthene	µg/L	50[B]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Fluorene	µg/L	50[B]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Hexachlorobenzene	µg/L	0.04[A]	***4.7 U***	***4.8 U***	***4.7 U***	***4.9 U***	***4.7 U***
Hexachlorobutadiene (Heachloro-1,3-butadiene)	µg/L	0.5[A]	***4.7 U***	***4.8 U***	***4.7 U***	***4.9 U***	***4.7 U***
Hexachlorocyclopentadiene	µg/L	5.**[A]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Hexachloroethane	µg/L	5.**[A]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Indeno(1,2,3-cd)pyrene	µg/L	0.002[B]	***4.7 U***	***4.8 U***	***4.7 U***	***4.9 U***	***4.7 U***
Isophorone	µg/L	50[B]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Methylnaphthalene, 2-	µg/L	n/v	4.7 U	4.8 U	6.1	4.9 U	4.7 U
Naphthalene	µg/L	10[A]	4.7 U	4.8 U	**38[A]**	4.9 U	4.7 U

See notes on last page

Table 4
Summary of 2013 Phase II Groundwater Analytical Results
Remedial Investigation Work Plan
Astoria Steel Site
3-15 26th Avenue, Astoria, Queens County, NY

Sample Location			MW-101	MW-102	MW-103	MW-104	
Sample Date			5-Aug-13	5-Aug-13	5-Aug-13	5-Aug-13	5-Aug-13
Sample ID			MW-101	MW-102	MW-103	MW-104	DUP080513
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			TALBU	TALBU	TALBU	TALBU	TALBU
Laboratory Work Order			43221	43221	43221	43221	43221
Laboratory Sample ID			480-43316-2	480-43316-1	480-43221-2	480-43221-1	480-43221-3
Sample Type	Units	TOGS					Field Duplicate
Semi - Volatile Organic Compounds (continued)							
Nitroaniline, 2-	µg/L	5** [A]	***9.5 U***	***9.5 U***	***9.3 U***	***9.8 U***	***9.4 U***
Nitroaniline, 3-	µg/L	5** [A]	***9.5 U***	***9.5 U***	***9.3 U***	***9.8 U***	***9.4 U***
Nitroaniline, 4-	µg/L	5** [A]	***9.5 U***	***9.5 U***	***9.3 U***	***9.8 U***	***9.4 U***
Nitrobenzene	µg/L	0.4 [A]	***4.7 U***	***4.8 U***	**1.6 J*** [A]	***4.9 U***	**1.2 J*** [A]
Nitrophenol, 2-	µg/L	n/v	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Nitrophenol, 4-	µg/L	n/v	9.5 U	9.5 U	9.3 U	9.8 U	9.4 U
N-Nitrosodi-n-Propylamine	µg/L	n/v	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
n-Nitrosodiphenylamine	µg/L	50 [B]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Pentachlorophenol	µg/L	1.0 [A]	***9.5 U***	***9.5 U***	***9.3 U***	***9.8 U***	***9.4 U***
Phenanthrene	µg/L	50 [B]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Phenol	µg/L	1.0 [A]	***4.7 U***	***4.8 U***	***4.7 U***	***4.9 U***	***4.7 U***
Pyrene	µg/L	50 [B]	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Trichlorophenol, 2,4,5-	µg/L	n/v	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Trichlorophenol, 2,4,6-	µg/L	n/v	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U
Total SVOC TICs	µg/L	n/v	ND	ND	ND	ND	ND
Volatile Organic Compounds							
Acetone	µg/L	50 [B]	10 U	3.6 J*	10 U	10 U	10 U
Benzene	µg/L	1 [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	µg/L	50 [B]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform (Tribromomethane)	µg/L	50 [B]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane (Methyl bromide)	µg/L	5** [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon Disulfide	µg/L	60 [B]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon Tetrachloride (Tetrachloromethane)	µg/L	5 [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene (Monochlorobenzene)	µg/L	5** [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane (Ethyl Chloride)	µg/L	5** [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform (Trichloromethane)	µg/L	7 [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane	µg/L	5** [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cyclohexane	µg/L	n/v	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromo-3-Chloropropane, 1,2- (DBCP)	µg/L	0.04 [A]	***1.0 U***	***1.0 U***	***1.0 U***	***1.0 U***	***1.0 U***
Dibromochloromethane	µg/L	50 [B]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorobenzene, 1,2-	µg/L	3 [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorobenzene, 1,3-	µg/L	3 [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorobenzene, 1,4-	µg/L	3 [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane (Freon 12)	µg/L	5** [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichloroethane, 1,1-	µg/L	5** [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichloroethane, 1,2-	µg/L	0.6 [A]	***1.0 U***	***1.0 U***	***1.0 U***	***1.0 U***	***1.0 U***
Dichloroethene, 1,1-	µg/L	5** [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichloroethylene, cis-1,2-	µg/L	5** [A]	1.3	1.0 U	1.0 U	1.0 U	1.0 U
Dichloroethylene, trans-1,2-	µg/L	5** [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichloropropane, 1,2-	µg/L	1 [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichloropropene, cis-1,3-	µg/L	0.4p [A]	***1.0 U***	***1.0 U***	***1.0 U***	***1.0 U***	***1.0 U***
Dichloropropene, trans-1,3-	µg/L	0.4p [A]	***1.0 U***	***1.0 U***	***1.0 U***	***1.0 U***	***1.0 U***
Ethylbenzene	µg/L	5** [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylene Dibromide (Dibromoethane, 1,2-)	µg/L	0.0006 [A]	***1.0 U***	***1.0 U***	***1.0 U***	***1.0 U***	***1.0 U***
Hexanone, 2- (Methyl Butyl Ketone)	µg/L	50 [B]	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Isopropylbenzene	µg/L	5** [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl Acetate	µg/L	n/v	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl Ethyl Ketone (MEK)	µg/L	50 [B]	10 U	10 U	10 U	10 U	10 U
Methyl Isobutyl Ketone (MIBK)	µg/L	n/v	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methyl tert-butyl ether (MTBE)	µg/L	10 [B]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylcyclohexane	µg/L	n/v	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene Chloride (Dichloromethane)	µg/L	5** [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	µg/L	5** [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethane, 1,1,2,2-	µg/L	5** [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethylene (PCE)	µg/L	5** [A]	1.0 U	1.0 U	1.0 U	1.0 U	0.45 J*
Toluene	µg/L	5** [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichlorobenzene, 1,2,4-	µg/L	5** [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethane, 1,1,1-	µg/L	5** [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethane, 1,1,2-	µg/L	1 [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethylene (TCE)	µg/L	5** [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichlorofluoromethane (Freon 11)	µg/L	5** [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichlorotrifluoroethane (Freon 113)	µg/L	5** [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	µg/L	2 [A]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylenes, Total	µg/L	5** [A]	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Total VOC TICs	µg/L	n/v	0.41 T*	ND	ND	ND	ND
Total VOC	µg/L	n/v	1.3	3.6	ND	ND	0.45
Pesticides							
Aldrin	µg/L	n/v	0.047 U	0.47 U	0.047 U	0.047 U	0.048 U
BHC, alpha-	µg/L	0.01 [A]	***0.047 U***	***0.47 U***	***0.047 U***	***0.047 U***	***0.048 U***
BHC, beta-	µg/L	0.04 [A]	***0.047 U***	***0.47 U***	***0.047 U***	***0.047 U***	***0.048 U***
BHC, delta-	µg/L	0.04 [A]	***0.047 U***	***0.47 U***	***0.047 U***	***0.047 U***	***0.048 U***
Camphechlor (Toxaphene)	µg/L	0.06 [A]	***0.47 U***	***4.7 U***	***0.47 U***	***0.47 U***	***0.48 U***
Chlordane, alpha-	µg/L	n/v	0.047 U	0.47 U	0.047 U	0.047 U	0.048 U
Chlordane, trans-	µg/L	n/v	0.047 U	0.47 U	0.047 U	0.047 U	0.048 U
DDD (p,p'-DDD)	µg/L	0.3 [A]	0.047 U	***0.47 U***	0.047 U	0.047 U	0.048 U
DDE (p,p'-DDE)	µg/L	0.2 [A]	0.047 U	***0.47 U***	0.047 U	0.047 U	0.048 U
DDT (p,p'-DDT)	µg/L	0.2 [A]	0.047 U	***0.47 U***	0.047 U	0.047 U	0.048 U
Dieldrin	µg/L	0.004 [A]	***0.047 U***	***0.47 U***	***0.047 U***	***0.047 U***	***0.048 U***
Endosulfan I	µg/L	n/v	0.047 U	0.47 U	0.047 U	0.047 U	0.048 U
Endosulfan II	µg/L	n/v	0.047 U	0.47 U	0.047 U	0.047 U	0.048 U
Endosulfan Sulfate	µg/L	n/v	0.047 U	0.47 U	0.047 U	0.047 U	0.048 U
Endrin	µg/L	n/v	0.047 U	0.47 U	0.047 U	0.047 U	0.048 U
Endrin Aldehyde	µg/L	5** [A]	0.047 U	0.47 U	0.047 U	0.047 U	0.048 U
Endrin Ketone	µg/L	5** [A]	0.047 U	0.47 U	0.047 U	0.047 U	0.048 U
Heptachlor	µg/L	0.04 [AB]	***0.047 U***	***0.47 U***	***0.047 U***	***0.047 U***	***0.048 U***
Heptachlor Epoxide	µg/L	0.03 [A]	***0.047 U***	***0.47 U***	***0.047 U***	***0.047 U***	***0.048 U***
Lindane (Hexachlorocyclohexane, gamma)	µg/L	0.05 [A]	0.047 U	***0.47 U***	0.047 U	0.047 U	0.048 U
Methoxychlor (4,4'-Methoxychlor)	µg/L	35 [A]	0.047 U	0.47 U	0.056	0.055	0.057

See notes on last page

Table 4
Summary of 2013 Phase II Groundwater Analytical Results
Remedial Investigation Work Plan
Astoria Steel Site
3-15 26th Avenue, Astoria, Queens County, NY

Notes:

TOGS	NYSDEC TOGS 1.1.1 (Reissued June 1998 with errata in January 1999 and addenda in April 2000 and June 2004)
A	TOGS 1.1.1 - Table 1 - Ambient Water Quality Standards and Guidance Values, Division of Water, Technical and Operational Guidance Series (TOGS 1.1.1); Standards
B	TOGS 1.1.1 - Table 1 - Ambient Water Quality Standards and Guidance Values, Division of Water, Technical and Operational Guidance Series (TOGS 1.1.1); Guidance
6.5[A]	Concentration exceeds the indicated standard.
15.2	Concentration was detected but did not exceed applicable standards.
0.50 U	Laboratory reportable detection limit exceeded standard.
0.03 U	The analyte was not detected above the laboratory reportable detection limit.
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
*	The standard for Iron and Manganese is 500 ug/L, which applies to the sum of these substances. As individual standards, the standard is 300 ug/L.
**	The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in the TOGS table) applies to this substance.
p	Applies to the sum of cis- and trans-1,3-dichloropropene.
BS	Compound was found in the blank and sample
H	Sample was prepped or analyzed beyond the specified holding time.
J*	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

Table 5
Summary of Proposed Sampling Activities
Remedial Investigation Work Plan
Astoria Steel Site
3-15 26th Avenue, Astoria, Queens County, NY

Location ID	Location Type	Location Rationale	Sample Medium, Number of Samples and Analyses[1]										
			Soil Samples					1st Round Groundwater Samples [2]					Air Samples[3]
			TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	TO-15 VOCs
SS-1	SS	Investigate surface soil		1	1	1	1						
SS-2	SS	Investigate surface soil		1	1	1	1						
SS-3	SS	Investigate surface soil		1	1	1	1						
SV-1	SV	Investigate potential soil vapor intrusion											1
SV-2	SV	Investigate potential soil vapor intrusion											1
SV-3	SV	Investigate potential soil vapor intrusion											1
SV-4	SV	Investigate potential soil vapor intrusion											1
SV-5	SV	Investigate potential soil vapor intrusion											1
SP-1	SP	Assess soil piles with 4 discrete VOC samples and 2 composite samples for other parameters	4	2	2	2	2						
SP-2	SP	Assess soil pile with 4 discrete VOC samples and 2 composite samples for other parameters	4	2	2	2	2						
TP-1 thru TP-X	TP	Test pit locations to be determined based on anomalies found in the geophysical survey	TBD	TBD	TBD	TBD	TBD						
B-109	B	Horizontal delineation of lead, other metals, PCBs and acetone in soil reported at B-105	1	1	1	1	1						
B/MW-110	B/MW	Investigate former 1,500 gallon fuel oil tank by delineating horizontally and vertically, general site coverage for metals	2	2	1	1	1	1	1	1	1	1	
B/MW-111	B/MW	Confirm acetone detection in soil reported at B-105 (horizontally and vertically), vertical delineation of PCBs, determine if lead, PCBs or acetone in soil are impacting groundwater	2	1	1	1	2	1	1	1	1	1	
B/MW-112	B/MW	Investigate soil and groundwater horizontally and vertically near location of former gasoline tank, horizontal delineation of lead, other metals, PCBs and acetone reported at B-105	2	1	1	1	1	1	1	1	1	1	
B-113	B	Investigate floor staining observed during Phase I	1	1	1	1	1						
B-114	B	Horizontal delineation of metals at GP-1 and TW-1, and lead, other metals, PCBs, and acetone in soil reported at B-105	1	1	1	1	1						
B-115	B	Investigate suspected UST (per 2006 Phase II), horizontal delineation of petroleum impacts reported at SB-1, horizontal delineation of metals impacts reported at TW-1 and SB-1	1	1	1	1	1						
B-116	B	Horizontal delineation of petroleum and metals impacts reported at SB-1, site coverage	1	1	1	1	1						
B-117	B	Horizontal delineation of metals reported in soils at B-107 and GP-2	1	1	1	1	1						
B/MW-118	B/MW	Investigate potential impacts to groundwater from drum storage area, horizontal delineation of metals impacts reported at various locations, general site coverage	1	1	1	1	1	1	1	1	1	1	
B/MW-119	B/MW	Investigate potential groundwater impacts related to petroleum impacts observed in soils at SB-1, investigate former trench, horizontal and vertical delineation of VOCs and SVOCs in soil, horizontal delineation of metals in soil	2	2	1	1	1	1	1	1	1	1	
B-120	B	Horizontal and vertical delineation of SVOCs and metals in B-101 and other nearby locations	1	2	1	1	2						
B/MW-121	B/MW	Investigate potential impacts to groundwater due to drum storage or UST, horizontal delineation of metals impacts reported at GP-5, B-101, and B-106	1	1	1	1	1	1	1	1	1	1	
B-122	B	Investigate former foundry area and lumber area, delineation of metals impacts reported at TW-2 and B-106, general site coverage	1	1	1	1	1						
B-123	B	Investigate former foundry area, general site coverage	1	1	1	1	1						
B-124	B	Horizontal delineation of metals reported at various locations and SVOCs reported at B-101	1	1	1	1	1						
B/MW-125	B/MW	Investigate foundry operations, horizontal delineation of chromium impacts to soil reported at GP-10, horizontal delineation of copper impacts to soil and lead impacts to groundwater reported at B/MW-102	1	1	1	1	1	1	1	1	1	1	
B/MW-126	B/MW	Horizontal delineation of benzene in groundwater reported at TW-3, horizontal delineation of metals in soils reported at GP-3, GP-4, and SB-5	1	1	1	1	1	1	1	1	1	1	
B/MW-127	B/MW	Horizontal delineation of benzene in groundwater reported at TW-3, horizontal delineation of SVOCs reported in soils at various locations, horizontal delineation of metals in soil and groundwater at various locations	1	1	1	1	1	1	1	1	1	1	
B/MW-128	B/MW	Horizontal delineation of lead in groundwater reported at MW-102, horizontal delineation of chromium impacts reported in soil at GP-10 and SB-3, horizontal delineation of metals impacts reported in soil at B-102 and TW-4, horizontal and vertical delineation of SVOC impacts reported in soil at TW-4, investigate historic truck bodies storage observed on Sanborn maps	1	2	1	1	1	1	1	1	1	1	
B/MW-129	B/MW	Horizontal delineation of metals reported in soils at GP-10 and SB-3, investigate potential impacts to groundwater from chromium reported in soil at SB-3, site coverage	1	1	1	1	2	1	1	1	1	1	
B-130	B	Horizontal delineation of chromium impacts to soil reported at SB-3, investigate bus parking area	1	1	1	1	1						
B-131	B	Horizontal delineation of SVOC impacts and horizontal and vertical delineation of metals impacts to soil reported at GP-7, B-103, SB-5, TW-5, etc.	1	1	1	1	2						
B/MW-132	B/MW	Horizontal delineation of benzene in groundwater reported at TW-3, horizontal delineation of metals in soils reported at various locations, horizontal delineation of SVOCs reported in groundwater at various locations, horizontal and vertical delineation of SVOCs reported in soil at various locations	1	2	1	1	1	1	1	1	1	1	
B/MW-133	B/MW	Horizontal delineation of SVOC impacts reported in groundwater at TW-4, MW-104, etc., horizontal delineation of metals impacts to soils reported at GP-8, SB-3, TW-6, B-104, site groundwater coverage	1	1	1	1	1	1	1	1	1	1	

Location ID	Location Type	Location Rationale	Sample Medium, Number of Samples and Analyses[1]										
			Soil Samples					1st Round Groundwater Samples [2]					Air Samples[3]
			TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	TO-15 VOCs
B/MW-134	B/MW	Horizontal delineation of SVOCs reported in groundwater at TW-4 and MW-104, horizontal delineation of metals impacts reported at GP-9 and B-104, investigate bus parking, site coverage	1	1	1	1	1	1	1	1	1	1	
B/MW-135	B/MW	Horizontal delineation of SVOC impacts to groundwater reported at various locations, horizontal delineation of metals in soils reported at various locations, provide a downgradient well location	1	1	1	1	1	1	1	1	1	1	
B/MW-136	B/MW	Horizontal delineation of SVOC impacts and horizontal and vertical delineation of metals impacts to soil reported at various locations, investigate metals impacts to groundwater, horizontal delineation of SVOC impacts to groundwater reported at TW-6 and MW-103	1	1	1	1	2	1	1	1	1	1	
B-137	B	Horizontal delineation of metals impacts to soil reported at TW-1 and GP-2	1	1	1	1	1						
B-138	B	Horizontal delineation of metals impacts to soil reported at GP-3, SB-6 and GP-4	1	1	1	1	1						
B-139	B	Horizontal delineation of metals impacts to soil reported at TW-2, B/MW-102, and TW-4	1	1	1	1	1						
B-140	B	Horizontal delineation of metals impacts to soil reported at GP-4, TW-3, and SB-5	1	1	1	1	1						
B-141	B	Horizontal delineation of metals impacts reported at various locations, including GP-8 and SB-4	1	1	1	1	1						
B-142	B	Horizontal delineation of metals impacts to soil reported at SB-4, GP-8, and TW-6	1	1	1	1	1						
B-143	B	Horizontal delineation of metals impacts to soil reported at B/MW-104	1	1	1	1	1						
		Anticipated totals [3]:	47	44	39	39	44	16	16	16	16	16	5

Key:

B = Boring
GW = Groundwater
MW = Monitoring well
PCBs = Polychlorinated biphenyls
QA/QC = Quality Assurance / Quality Control
SP = Soil Pile
SS = Surface Soil
SV = Soil Vapor/Indoor Air
SVOCs = TCL Semivolatile organic compounds plus up to 20 TICs.
TAL = USEPA's Target Analyte List, including cyanide.
TBD = To be determined based on geophysical survey
TCL = USEPA's Target Compound List.
TCLP = Toxicity Characteristic leachate Procedure
TICs = Tentatively identified compounds
TP = Test Pit
VOCs = TCL Volatile organic compounds plus additional NYSDEC
CP-51 VOCs plus up to 10 TICs for soil and water; TO-15 VOCs for air.
X = Number of sampling locations TBD based on geophysical survey
Text in red represents revisions to the proposed sampling based on NYSDEC's 12/13/13 comments on the draft RIWP.

Notes: 1. QA/QC sample analysis will be performed at the following required sampling frequencies:
- Field duplicates - 1 per 20 samples for each sample medium
- Matrix Spike/Matrix Spike Duplicates - 1 each per 20 samples for soil and water
- Rinsate blanks - 1 per mobilization for each sampling method using non-dedicated sampling equipment
- Trip blanks (VOCs only) - 1 for each sample cooler containing aqueous samples to be analyzed for VOCs

2. The need for and scope of a second groundwater sampling event will be determined in a consultation with NYSDEC following evaluation of the data from the first event and comparison of that data to data from the previous investigation (s)

3. The number of air samples listed represent the number of air sampling locations. At each location an indoor air and sub-slab sample will be collected. In addition, an outdoor air sample will be collected.

4. This table represents an estimate of the number of samples to be collected and analyses performed. Actual numbers will be determined on the basis of conditions encountered in the field and in accordance with the NYSDEC Div. of Env. Remediation's Technical Guidance for Site Investigation and Remediation, May 2010 (DER-10).

Table 6
Esimated Project Schedule
Remedial Investigation Work Plan
Astoria Steel Site
3-15 26th Avenue, Astoria, Queens County, New York

Task	2013			2014												2015											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
RI Work Plan Preparation, Review and Approval																											
BCP Application and Draft RI Work Plan Submitted	X																										
BCP Application Review by NYSDEC																											
Submit Revisions to BCP Application		X																									
BCP Application Review by NYSDEC																											
NYSDEC determines BCP Application is complete		X																									
Application and Draft RI Work Plan placed in document repository, notice published in ENB and local newspaper, notice and RI Work Plan Fact Sheet mailed to site contact		X																									
Public Comment Period																											
NYSDEC comments on Draft RI Work Plan																											
Response to NYSDEC comments submitted																											
Final RI Work Plan Approval				X																							
Remedial Investigation Field Activities																											
Geophysical Survey																											
Surface Soil Sampling																											
Soil Pile Sampling																											
Soil Vapor Intrusion Sampling																											
Dye Testing																											
Evaluate Geophysical Survey, consult with NYSDEC																											
Test Pit Program																											
Test Boring and Monitoring Well Installation																											
Monitoring Well Development																											
Well location/elevation survey																											
Groundwater Level Measurement Events																											
Groundwater Sampling & Lab Analysis																											
Aquifer Testing																											
Investigation Derived Waste (IDW) Disposal																											
Draft RI Report, IRM Work Plan, Interim SMP Preparation																											
Laboratory Data Validation																											
Draft RI Report Preparation																											
NYSDEC Review of Draft RI Report																											
Respond to Comments, Prepare Revised RI Report																											
Draft Interim Remedial Measures (IRM) Work Plan Preparation																											
Draft Interim Site Management Plan (SMP) Preparation																											
Submit 2nd groundwater sampling event report to NYSDEC																											
NYSDEC Review of IRM Work Plan and SMP																											
Respond to Comments, Prepare Revised Submittals																											
IRM Work Plan Approval											X																
Interim SMP Approval											X																
Implementation of IRM Work Plan																											
Preparation of IRM Specifications																											
Contractor Bidding, Bid Evaluation, Contractor Selection																											
Break Ground												X															
IRM Implementation																											
IRM Construction Completion Report (CCR) Preparation																											
Final RI Report, Alternatives Analysis (AA),																											
Remedial Action Work Plan (RAWP),																											
Environmental Easement (EE), Site Mgmt. Plan (SMP)																											
and Final Engineering Report (FER)																											
Draft Documents Preparation																											
Draft AA and RAWP submission																	X										
Draft EE submission																	X										
Draft Site Management Plan (SMP) submission																		X									
Draft FER submission																			X								
Finall EE submission																				X							
SMP Approval by NYSDEC																					X						
Record Environmental Easement																								X			
Final FER submission																									X		
Public Comment Period																											
COC issued																										X	
Site Redevelopment (TBD)																											

APPENDICES

APPENDIX A

QUALITY ASSURANCE PROJECT PLAN
REMEDIAL INVESTIGATION

ASTORIA STEEL SITE
BCP SITE #C241155
3-15 26TH AVENUE
ASTORIA, QUEENS COUNTY, NEW YORK

January 2014

Prepared for:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF ENVIRONMENTAL REMEDIATION
REMEDIAL BUREAU B, 12TH FLOOR
625 BROADWAY, ALBANY, NEW YORK 12233-7016

Prepared on Behalf of:

ASTORIA OWNERS LLC
43 WEST 47th STREET SUITE 203
NEW YORK, NY 10036

Prepared by:

STANTEC CONSULTING SERVICES INC.
61 COMMERCIAL STREET
ROCHESTER, NEW YORK 14614

Stantec

QUALITY ASSURANCE PROJECT PLAN
FOR
REMEDIAL INVESTIGATION WORK PLAN
ASTORIA STEEL SITE
BCP #C241155
3-15 26th AVENUE
ASTORIA, QUEENS COUNTY, NEW YORK

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Quality Assurance Project Plan
RI Work Plan
Astoria Steel Site
BCP #C241155
3-15 26th Avenue, Astoria, New York

1.0 Introduction

This Quality Assurance Project Plan (QAPP) is to be used in conjunction with the Remedial Investigation (RI) Work Plan (Work Plan) for 3-15 26th Avenue in Astoria, Queens County, New York (the "Site"; see Figure 1). This QAPP presents the policies, organization, objectives, functional activities, and specific quality assurance and quality control activities to ensure the validity of data generated in the completion of the investigation. The purpose of this QAPP program is to ensure that technical data generated are accurate and representative.

Quality assurance (QA) is a management system for ensuring that information, data, and decisions resulting from investigation and environmental monitoring programs are technically sound, and properly documented. Quality control (QC) is the functional mechanism through which quality assurance achieves its goals. Quality control programs, for example, define the frequency and methods of checks, audits, and reviews necessary to identify problems and dictate corrective actions to resolve these problems, thus ensuring high quality data. As such, a quality assurance and quality control program pertains to data collection, evaluation, and review activities which are part of the investigation.

QA/QC procedures will be in accordance with applicable professional technical standards, government regulations and guidelines, and specific project goals and requirements. This QAPP has been prepared in accordance with New York State Department of Environmental Conservation (NYSDEC) and United States Environmental Protection Agency (EPA) Region II guidance documents.

The QAPP incorporates the following activities:

- Sample collection, control, chain-of-custody, and analysis;
- Document control;
- Laboratory instrumentation, analysis, and control; and
- Review of project reports.

Laboratory analysis of project samples will be performed by an independent laboratory with the experience and certifications appropriate to the analyses to be performed. Analyses will be performed by laboratories accredited pursuant to the NYSDOH Environmental Laboratory Accreditation Program (ELAP) for the category of parameters to be analyzed by the laboratory. The specific environmental laboratory or laboratories to be used will be determined at the time the monitoring activities are scheduled.

Duplicates, replicates, and spiked samples will be used to identify the quality of the analytical data. Field audits may be conducted to verify that proper sampling techniques and chain-of-custody procedures are followed. Field data compilation, tabulation, and analysis will be checked for accuracy. Calculations and other post-field tasks will be reviewed by senior project personnel. Equipment used to take field measurements will be maintained and calibrated in accordance with established procedures. Records of calibration and maintenance will be kept by assigned personnel. Field testing and data acquisition will be performed following guidelines as described herein.

Document control procedures will be used to coordinate the distribution, coding, storage, retrieval, and review of data collected during sampling tasks.

A Data Usability Summary Report (DUSR) will be prepared for analytical results from each monitoring activity, with the exception of sampling data utilized for screening and survey purposes only. These screening and survey samples will be specified in the RI Work Plan. The DUSR will be prepared by an independent consultant with the required experience, in accordance with NYSDEC's "Guidance for the Development of Data Usability Summary Reports," revised 1997 and NYSDEC's DER-10 "Technical Guidance for Site Investigation and Remediation," May 2010 (DER-10).

2.0 Project Description

This QAPP pertains to the completion of field activities and subsequent laboratory and data analysis associated with the Remedial Investigation at 3-15 26th Avenue in Astoria, New York. A description of the site and the Remedial Investigation activities planned for the site is presented in the RI Work plan to which this QAPP is attached as an appendix. The RI Work Plan also describes the previous environmental investigations performed at the Site and the investigation program elements planned for the RI.

3.0 Project Organization and Responsibility

This QAPP provides for designated qualified personnel to review products and provide guidance on QA matters. This QAPP also outlines the approach to be followed to ensure that products of sufficient quality are obtained. This structure will provide for direct and constant operational responsibility, clear lines of authority, and the integration of QA activities. The QA-related functions of the project positions are as follows:

Project Manager

The project manager will have overall responsibility for ensuring that the project meets the objectives and quality standards as presented in the RI Work Plan and this QAPP. He/She will be responsible for implementing the project and will have the authority to commit the resources necessary to meet project objectives and requirements. The project manager's primary function is to ensure that technical, financial, and scheduling objectives are achieved successfully. The project manager will provide the major point of contact and control for matters concerning the project. In addition, he/she will be responsible for technical quality control and project oversight.

Team Leaders

The project manager will be supported by a team leader or leaders who will be responsible for leading and coordinating the day-to-day activities of the various resource specialists under their supervision. The team leader is a highly experienced environmental professional who will report directly to the project manager.

Technical Staff

The technical staff (team members) for this project will be drawn from corporate resources and appropriately qualified subcontractors. The technical team staff will be used to gather and analyze data, and to prepare various task reports and support materials. The designated technical team members will be experienced professionals who possess the degree of

specialization and technical competence required to effectively and efficiently perform the required work.

Project QA Director
The Project QA Director will be responsible for maintaining QA for the project.

Laboratory Director
The laboratory director will be responsible for analytical work and works in conjunction with the QA unit. He/She maintains liaison with the QA officer regarding QA and custody requirements.

Laboratory Manager
The laboratory manager will maintain liaison with the laboratory director regarding QA elements of specific sample analyses tasks. He/She will report to the laboratory director and work in conjunction with the laboratory QA unit.

Laboratory QA Coordinator
The Laboratory QA officer will be responsible for overseeing the QA program within the laboratory and for maintaining QC documentation. He/She reports directly to the laboratory director.

Laboratory Staff
Each member of the laboratory staff will perform an assigned QA or analytical function that is pertinent to and within the scope of his or her knowledge, experience, training, and aptitude. An individual will be assigned the responsibility for checking, reviewing, or otherwise verifying that a sample analysis activity has been correctly performed.

Laboratory Facilities
Laboratory work will be performed in accordance with guidelines established by NYSDEC, United States Environmental Protection Agency (USEPA), the Water Pollution Control Federation, and/or the American Society for Testing and Materials (ASTM). In case of conflict, these guidelines and protocols will be considered in the order shown (i.e., NYSDEC criteria is of primary precedence). In addition, QA and QC programs will be maintained for the instruments and the analytical procedures used. A NYSDOH ELAP certified laboratory capable of providing (NYSDEC Analytical Services Protocol (ASP) Category B deliverables will be identified to provide laboratory services for this project. With the exception of data collected solely for screening and survey purposes, data will be reported with a NYSDEC ASP Category B deliverable. The laboratory's preventative maintenance procedures will be provided and outlined in their Laboratory Quality Assurance Manual.

4.0 QA Objectives for Data Measurement

Measurements will be made to ensure that analytical results are representative of the media and conditions measured. Unless otherwise specified, data will be calculated and reported in units consistent with other organizations who report similar data to allow comparability of databases among organizations.

The key considerations for the QA assessment of generated data are accuracy, precision, completeness, representativeness, and comparability. These characteristics are defined below:

Accuracy: Accuracy is the degree of agreement of a measurement or average of measurements with an accepted reference or "true" value and is a measure of bias in the system.

Precision: Precision is the degree of mutual agreement among individual measurements of a given parameter.

Completeness: Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount expected to be obtained under correct normal conditions.

Representativeness: Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.

Comparability: Comparability expresses the confidence with which one data set can be compared to another.

4.1 Goals

The QA/QC goal will focus on controlling measurement error within the limits established and will ultimately provide a database for estimating the actual uncertainty in the measurement data.

Target values for detection limit, percent spike recovery and percent "true" value of known check standards, and RPD of duplicates/replicates are provided in the referenced analytical procedures. It should be noted that target values are not always attainable. Instances may arise where high sample concentrations, non-homogeneity of samples, or matrix interferences preclude achievement of target detection limits or other quality control criteria. In such instances, the laboratory will report reasons for deviations from these detection limits or noncompliance with quality control criteria.

5.0 Sampling Procedures

The sampling of various environmental media will be completed as part of the Remedial Investigation activities. The RI Work Plan presents the location, type, and analytical requirements of samples to be collected as part of the Remedial Investigation Activities.

5.1 Sampling Program

The sampling and field procedures for the following activities are described in the RI Work Plan:

- Test borings with soil sampling;
- Geophysical survey;
- Soil pile sampling;
- Surface soil sampling;
- Dye testing;

- Test pit program;
- Monitoring well installations and well development;
- Groundwater level measurement;
- Groundwater sampling from monitoring wells; and
- Monitoring well and sampling point location and elevation survey.

The sample containers, preservation, and holding time that will be used are identified in Table 1. The sample containers will be labeled in accordance with Section 6.2. Sample handling, packaging and shipping procedures are presented in Section 6.3.

5.2 Field Quality Control Samples

Field quality control samples will consist of trip blanks, field blanks, field duplicates, matrix spikes and matrix spike duplicates, as shown on Table 2.

5.2.1 Field Duplicates

Field quality control samples will be collected to verify reproducibility of the sampling and analytical methods. Field duplicates will be obtained at a rate of one per 20 original field samples, as shown in Table 2.

5.2.2 Trip Blanks

Trip blanks will be used to assess whether groundwater, has been exposed to volatile constituents during sample storage and transport. The trip blanks for water samples will consist of a container filled by the laboratory with analyte-free water. The trip blanks will remain unopened throughout the sampling event and will only be analyzed for volatile organics. The trip blanks will be collected as shown in Table 2.

5.2.3 Matrix Spike/Matrix Spike Duplicates

Matrix Spike/Matrix Spike Duplicates (MS/MSD) will be obtained to determine if the matrix is interfering with the sample analysis. MS/MSDs will be collected at a rate of one per 20 original field samples, as shown on Table 2.

5.2.4 Rinsate Blanks

Rinsate blanks will be used to assess decontamination procedures for non-dedicated equipment. Rinse blanks will be collected as shown in Table 2.

5.2.5 Laboratory Quality Control Checks

Internal laboratory quality control checks will be used to monitor data integrity. These checks include method (equipment) blanks, spike blanks, internal standards, surrogate samples, calibration standards, and reference standards.

5.3 Sample Containers

The volumes and containers required for the sampling activities are included in Table 1. Pre-washed sample containers will be provided by the laboratory. All bottles are to be prepared in accordance with EPA bottle washing procedures.

5.4 Decontamination

Dedicated and/or disposable sampling equipment will be used to the extent possible to minimize decontamination requirements and the possibility of cross-contamination.

Split spoon samplers, hand augers, and sediment samplers are examples of sampling equipment that could be used at more than one location. The water level indicator will be decontaminated between locations by using the following decontamination procedures:

- Initial cleaning of any foreign matter with paper towels, if needed;
- Low-phosphate detergent wash;
- De-ionized water rinse; and
- Air dry.

The samplers used for drilling and soil sampling in test borings will be decontaminated with a bucket wash consisting of a low-phosphate detergent wash followed by water rinse. During monitoring well installation, the drill rig, augers, rods, and other related downhole equipment will be decontaminated using high-pressure steam prior to initiating the soil boring program. Steam cleaning will be performed in a designated on-site decontamination area. Throughout and after the cleaning processes, direct contact between the equipment and the ground surface will not be permitted. Decontamination waste water will be containerized. The drill rig and associated equipment will also be cleaned upon completion of the investigation prior to departure from the site using the following methods:

- Initial cleaning of foreign matter; and
- Wash down with high pressure, high-temperature spray to remove and/or volatilize organic contamination.

5.5 Levels of Protection/Site Safety

Sampling will be conducted under a written Health and Safety Plan. On the basis of air monitoring, the level of protection may be downgraded or upgraded at the discretion of the site safety officer. Crew members will stand upwind of open boreholes or wellheads during the collection of samples, when possible.

Work will initially be conducted in Level D (refer to Site Specific Health and Safety Plan). Air purifying respirators (APRs) will be available if monitoring indicates an upgrade to Level C is appropriate.

6.0 Sample Custody

This section describes standard operating procedures for sample identification and chain-of-custody to be used for field activities. The purpose of these procedures is to ensure that the quality of the samples is maintained during collection, transportation, storage, and analysis. Chain-of-custody requirements comply with standard operating procedures indicated in USEPA and NYSDEC sample-handling protocol.

Sample identification documents must be carefully prepared so that sample identification and chain-of-custody can be maintained and sample disposition controlled. Sample identification documents include:

- Field records,
- Sample label,
- Custody seals, and
- Chain-of-custody records.

6.1 Chain-Of-Custody

The primary objective of the chain-of-custody procedures is to provide an accurate written or computerized record that can be used to trace the possession and handling of a sample from collection to completion of required analyses.

6.1.1 Sample Labels

Sample labels attached to, or affixed around, the sample container must be used to properly identify samples collected in the field. To the extent possible, the sample labels are to be placed on the bottles so as not to obscure any QA/QC lot numbers on the bottles. Sample information must be printed in a legible manner using waterproof ink. Field identification must be sufficient to enable cross-reference with the field sampling records or sample logbook. For chain-of-custody purposes, QC samples are subject to exactly the same custodial procedures and documentation as "real" samples.

6.1.2 Custody Seals

Custody seals are preprinted adhesive-backed seals often with security slots which are designed to break if the seals are disturbed. Sample shipping containers (coolers, cardboard boxes, etc., as appropriate) are sealed in as many places as necessary to ensure security. Seals must be signed and dated before use. On receipt at the laboratory, the custodian must check (and certify, by completing logbook entries) that seals on shipping containers are intact. Strapping tape should be placed over the seals to ensure that seals on shipping containers are not accidentally broken during shipment.

6.1.3 Chain-Of-Custody Record

The chain-of-custody record must be fully completed at least in duplicate by the field technician who has been designated by the project manager as being responsible for sample shipment to the appropriate laboratory for analysis. In

addition, if samples are known to require rapid turnaround in the laboratory because of project time constraints or analytical concerns (e.g., extraction time or sample retention period limitations, etc.), the person completing the chain-of-custody record should note these constraints in the "Remarks" section of the custody record.

6.1.4 Field Custody Procedures

- As few persons as possible should handle samples.
- Sample bottles will be obtained pre-cleaned by the laboratory and shipped to the sampling personnel in charge of the field activities. Coolers or boxes containing cleaned bottles should be sealed with a custody tape seal during transport to the field or while in storage prior to use.
- The sample collector is personally responsible for the care and custody of samples collected until they are transferred to another person or dispatched properly under chain-of-custody rules.
- The sample collector will record sample data in a controlled field notebook and/or on appropriate field sampling records.
- The site team leader will determine whether proper custody procedures were followed during the fieldwork and decide if additional samples are required.

6.2 Documentation

6.2.1 Sample Identification

Containers of samples collected from the project will be identified using the following format on a label or tag fixed to the sample container:

AS-*XX*-*Y*

- "AS" - This shorthand indicates the project located at 3-15 26th Avenue in Astoria, NY.
- *"XX"* - These characters (letters and numbers) will identify the sample. Actual sample locations will be recorded on the sampling record. Field duplicates, field blanks and rinsate blanks will be assigned unique sample numbers.
- *"Y"* - This initial will identify the sample matrix in accordance with the following abbreviations:
  - W: Water Sample
  - S: Soil Sample

Each sample will be labeled, chemically preserved, if required, and sealed immediately after collection. To minimize handling of sample containers, labels will be filled out prior to sample collection to the extent possible. The sample label will be filled out using waterproof ink and will be firmly affixed to the sample containers. The sample label will give the following information:

- Name or initials of sampler;
- Date (and time, if possible) of collection;
- Sample number;
- Intended analysis; and
- Preservation performed.

6.2.2 Daily Logs

Daily logs and data forms are necessary to provide sufficient data and observations to enable participants to reconstruct events that occurred during the project. Daily logs will be kept in a notebook and consecutively numbered. Entries will be made in waterproof ink, dated, and signed. Sampling data will be recorded in the sampling records. Information will be completed in waterproof ink. Corrections will be made according to the procedures given at the end of this section.

6.3 Sample Handling, Packaging, and Shipping

The transportation and handling of samples must be accomplished in a manner that not only protects the integrity of the sample, but also prevents any detrimental effects due to the possible hazardous nature of samples. Regulations for packaging, marking, labeling, and shipping hazardous materials are promulgated by the United States Department of Transportation (DOT) in the Code of Federal Regulations, 49 CFR 171 through 177.

All chain-of-custody requirements must comply with standard operating procedures in the NYSDEC and USEPA sample handling protocol. Field personnel will make arrangements for transportation of samples to the laboratory. When custody is relinquished to a shipper, field personnel will ensure that the laboratory custodian or project manager is aware of the expected time of arrival of the sample shipment and of any time constraints on sample analysis(es). Samples will be delivered to the laboratory in a timely manner to help ensure that holding times are followed.

7.0 Calibration Procedures and Frequency

Instruments and equipment used during sampling and analysis will be operated, calibrated, and maintained according to the manufacturer's guidelines and recommendations as well as criteria set forth in the applicable analytical methodology references.

7.1 Field Instruments

A calibration program will be implemented to ensure that routine calibration is performed on field instruments. Calibration will typically be performed on a daily basis unless manufacturer's instructions indicate differently. More frequent calibrations may be performed as necessary to maintain analytical integrity. Field team members familiar with the field calibration and operations of the equipment will maintain proficiency and perform the prescribed calibration procedures outlined in the Operation and Field Manuals accompanying the respective instruments. Calibration records for each field instrument used on the project will be maintained on-site during the respective field activities and a copy will be kept in the project files.

7.2 Laboratory Instruments

Laboratory calibration procedures are addressed in detail in the laboratory Quality Assurance Manual (QAM), which can be provided upon selection of a laboratory. Calibration procedures will be consistent with the method used for analysis.

8.0 Analytical Procedures

8.1 Field

On-site procedures for analysis of total organic vapor and other field parameters are addressed in the Remedial Investigation Work Plan, if applicable.

8.2 Laboratory

Specific analytical methods for constituents of interest in soil and groundwater are listed in Table 1. The laboratory will maintain and have available for the appropriate operators standard operating procedures relating to sample preparation and analysis according to the methods stipulated in Table 1.

9.0 Data Reduction and Reporting

QA/QC requirements will be strictly adhered to during sampling and analytical work. Data generated will be reviewed by comparing and interpreting results from chromatograms (responses, stability of retention times), accuracy (mean percent recovery of spiked samples), and precision (reproducibility of results). Refer to Section 10 for a discussion of QA/QC protocol.

Data storage and documentation will be maintained using logbooks and data sheets that will be kept on file. Analytical QC will be documented and included in the analytical testing report. A central file will be maintained for the sampling and analytical effort after the final laboratory report is issued.

Calculations and data manipulations are included in the appropriate methodology references. Control charts and calibration curves will be used to review the data and identify outlying results. Prior to the submission of the report to the client, data will be evaluated for precision, accuracy,

and completeness. Sections 4.0, 8.0, and 13.0 of this document include some of the QC criteria to be used in the data evaluation process.

Laboratory reports will be reviewed by the laboratory supervisor, the QA officer, laboratory manager and/or director, and the project manager. Analytical reports will contain a data tabulation including results and supporting QC information will be provided. Raw data will be available for later inspection, if required, and maintained in the control job file. With the exception of data collected solely for screening and survey purposes, data will be reported with a NYSDEC ASP Category B deliverable.

Data will be reported to NYSDEC in electronic format in accordance with DER-10 and the NYSDEC's Environmental Data Submission requirements.

10.0 Internal Quality Control Checks

QC data are necessary to determine precision and accuracy and to demonstrate the absence of interferences and/or contamination of glassware and reagents. The procedures to be followed for internal quality control checks are consistent with NYSDEC ASP protocols.

11.0 Performance and System Audits

11.1 Field Audits

The Project QA Director may conduct episodic audits of the operations at the site to ensure that work is being performed in accordance with the work plan and associated standard operating practice. The audit will cover, but not necessarily be limited to, such areas as:

- Conformance to standard operating procedures
- Completeness and accuracy of documentation
- Chain of custody procedures
- Construction specifications

11.2 Laboratory Audits

In addition to any audits required by the NYSDEC, the Project QA Director may choose to audit the laboratory. These additional audits may take the form of performance evaluation samples or on-site inspections of the laboratory. Performance evaluation samples may be either blind samples or samples of known origin to the laboratory. Reasonable notice will be provided if the audit is to include an on-site inspection of the laboratory.

12.0 Preventive Maintenance

12.1 Field

Field personnel assigned to complete the work will be responsible for preventative maintenance of field instruments. The field sampling personnel will protect the photoionization detectors, water quality meter, etc. by placing them in portable boxes and/or protective cases.

Field equipment will be subject to a routine maintenance program, prior to and after each use. The routine maintenance program for each piece of equipment will be in accordance with the manufacturer's operations and maintenance manual. Equipment will be cleaned and checked for integrity after each use. Necessary repairs will be performed immediately after any defects are observed, and before the item of equipment is used again. Equipment parts with a limited life (such as batteries, membranes and some electronic components) will be periodically checked and replaced or recharged as necessary according to the manufacturer's specifications.

12.2 Laboratory

The laboratory's preventative maintenance procedures can be provided as outlined in their Laboratory Quality Assurance Manual.

13.0 Data Assessment Procedures

Performance of the following calculations will be completed to evaluate the accuracy, precision and completeness of collected measurement data.

13.1 Precision

Precision of a particular analysis is measured by assessing its performance with duplicate or replicate samples. Duplicate samples are pairs of samples taken in the field and transported to the laboratory as distinct samples. Their identity as duplicates is sometimes not known to the laboratory and usually not known to bench analysts, so their usefulness for monitoring analytical precision at bench level is limited. For most purposes, precision is determined by the analysis of replicate pairs (i.e., two samples prepared at the laboratory from one original sample). Often in replicate analysis the sample chosen for replication does not contain target analytes so that quantification of precision is impossible. Replicate pairs of spiked samples, known as matrix spike/matrix spike duplicate samples, are used for precision studies. This has the advantage that two real positive values for a target analyte can be compared.

Precision is calculated in terms of Relative Percent Difference (RPD), which is expressed as follows:

$$RPD = \frac{(X_1 - X_2) \quad x\ 100}{(X1 + X2)/2}$$

where X_1 and X_2 represent the individual values found for the target analyte in the two replicate analyses or in the matrix spike/matrix spike duplicate analyses.

RPDs must be compared to the method RPD for the analysis. The analyst or his supervisor must investigate the cause of RPDs outside stated acceptance limits. This may include a visual inspection of the sample for non-homogeneity, analysis of check samples, etc. Follow-up action may include sample re-analysis or flagging of the data as suspect if problems cannot be resolved.

13.2 Accuracy

Accuracy of a particular analysis is measured by assessing its performance with "known" samples. These "knowns" can take the form of EPA or NBS traceable standards (usually spiked into a pure water matrix), or laboratory prepared solutions of target analytes into a pure water or sample matrix; or (in the case of GC or GC/MS analyses) solutions of surrogate compounds which can be spiked into every sample and are designed to mimic the behavior of target analytes without interfering with their determination. In each case the recovery of the analyte is measured as a percentage, corrected for analytes known to be present in the original sample if necessary, as in the case of a matrix spike analysis. For EPA or NBS supplied known solutions, this recovery is compared to the published data that accompany the solution. For prepared solutions, the recovery is compared to EPA-developed data or historical data as available. For surrogate compounds, recoveries are compared to USEPA CLP acceptable recovery tables. If recoveries do not meet required criteria, then the analytical data for the batch (or, in the case of surrogate compounds, for the individual sample) are considered potentially inaccurate.

For highly contaminated samples, recovery of matrix spike may depend on sample homogeneity. As a rule, analyses are not corrected for recovery of matrix spike or surrogate compounds.

13.3 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the total amount expected to be obtained under normal conditions. Completeness for each parameter is calculated as:

$$\text{Completeness} = \frac{\text{Number of successful analyses} \times 100}{\text{Number of requested analyses}}$$

Target value for completeness for parameters is 100%. A completeness value of 95% will be considered acceptable. Incomplete results will be reported to the client project officer.

13.4 Representativeness

The characteristic of representativeness is not quantifiable. Subjective factors to be taken into account are as follows:

- The degree of homogeneity of a site;
- The degree of homogeneity of a sample taken from one point in a site; and
- The available information on which a sampling plan is based.

To maximize representativeness of results, sampling techniques and sample locations will be carefully chosen so that they provide laboratory samples representative of the site and the specific area.

14.0 Corrective Action

Corrective actions can be initiated as a result of performance and system audits, laboratory and interfield comparison studies, data validation, and/or a QA program audit. They may also be required as a result of a request from project representatives. Corrective action necessary to resolve analytical problems will be taken. Success or failure of corrective actions will be reported with an estimate of effect on data quality, if any.

Corrective actions may include altering procedures in the field, conducting subsequent audits, or modifying project protocol. Time and type of corrective action, if needed, will depend on the severity of the problem and relative overall project importance. The project manager is responsible for initiating corrective action and the team leader is responsible for its implementation in the correction of field non-conformance corrective actions.

15.0 Quality Assurance Reports

Upon completion of a project sampling effort, with the exception of sampling efforts conducted solely for screening and survey purposes, analytical and QC data will be included in a Data Usability Summary Report (DUSR) that summarizes the work and provides a data evaluation. A discussion of the usability of the results in the context of QA/QC procedures will be made, as well as a summation of the QA/QC activity. The DUSR will be performed in accordance with the DEC's "Guidance for the Development of Data Usability Summary Reports," revised 1997 and DER-10.

Serious analytical problems will be reported. Time and type of corrective action, if needed, will depend on the severity of the problem and relative overall project importance. Corrective actions may include altering procedures in the field, conducting an audit, or modifying laboratory protocol. Corrective action will be implemented after notification of the project representatives.

TABLES

Table 1 - Required Sample Container Types and Volumes and Sample Preservation and Holding Times

Remedial Investigation Work Plan
Quality Assurance Project Plan
Astoria Steel Site, 3-15 26th Avenue, Astoria, Queens County, NY

Media	Type of Analysis	Method	Required Container	Preferred Sample Volume	Preservation	Maximum Holding Time
Soil	TCL VOCs plus CP-51 VOCs + TICs	EPA 8260C, 3035	(2) Pre-tared 40 ml glass vials with water, (1) Pre-tared 40 ml glass vial with methanol, (1) 2 oz. cwm	5 grams per container	Cool 4°C	Within 48 hours of collection, or frozen within 48 hours of collection and analyzed within 14 days
	TCL SVOCs + TICs	EPA 8270D	4 oz. cwm	4 oz.	Cool 4°C	VTSR + 5 days
	TCL Pesticides	EPA 8081B	4 oz. cwm	4 oz.	Cool 4°C	VTSR + 5 days
	PCBs	EPA 8082A	4 oz. cwm	4 oz.	Cool 4°C	VTSR + 5 days
	TAL Metals	EPA 6010C/7000 Series	4 oz. cwm	4 oz.	Cool 4°C	VTSR + 6 Months; 28 days for mercury
	Cyanide	EPA 9012B	4 oz. cwm	4 oz.	Cool 4°C	VTSR + 12 Days
Groundwater	TCL VOCs plus CP-51 VOCs + TICs	EPA 8260C, 3035A	(3) 40 ml glass vials	80 ml	pH<2, HCl, Cool 4°C	VTSR + 10 days if acidified with HCl
	TCL SVOCs + TICs	EPA 8270D	100 ml amber glass vial, 250 ml amber glass jar, or 1000 ml amber glass jar (lab dependent)	200 to 1000 ml (lab dependent)	Cool 4°C	VTSR + 7 day/40 day**
	TCL Pesticides	EPA 8081B			Cool 4°C	VTSR + 7 day/40 day**
	PCBs	EPA 8082A			Cool 4°C	VTSR + 7 day/40 day**
	TAL Metals	EPA 6010C/7000 Series	500 ml plastic or glass jar	500 ml	pH<2, HNO3	VTSR + 6 Months; 28 days for mercury
	Cyanide	EPA 9012B	250ml plastic	250 ml	NaOH	VTSR + 12 Days

Notes:

*Samples have to be received by the lab within 48 hours of the first sample being taken.

**Holding time is 7 days from collection to extraction and 40 days from extraction to analysis.

Key:

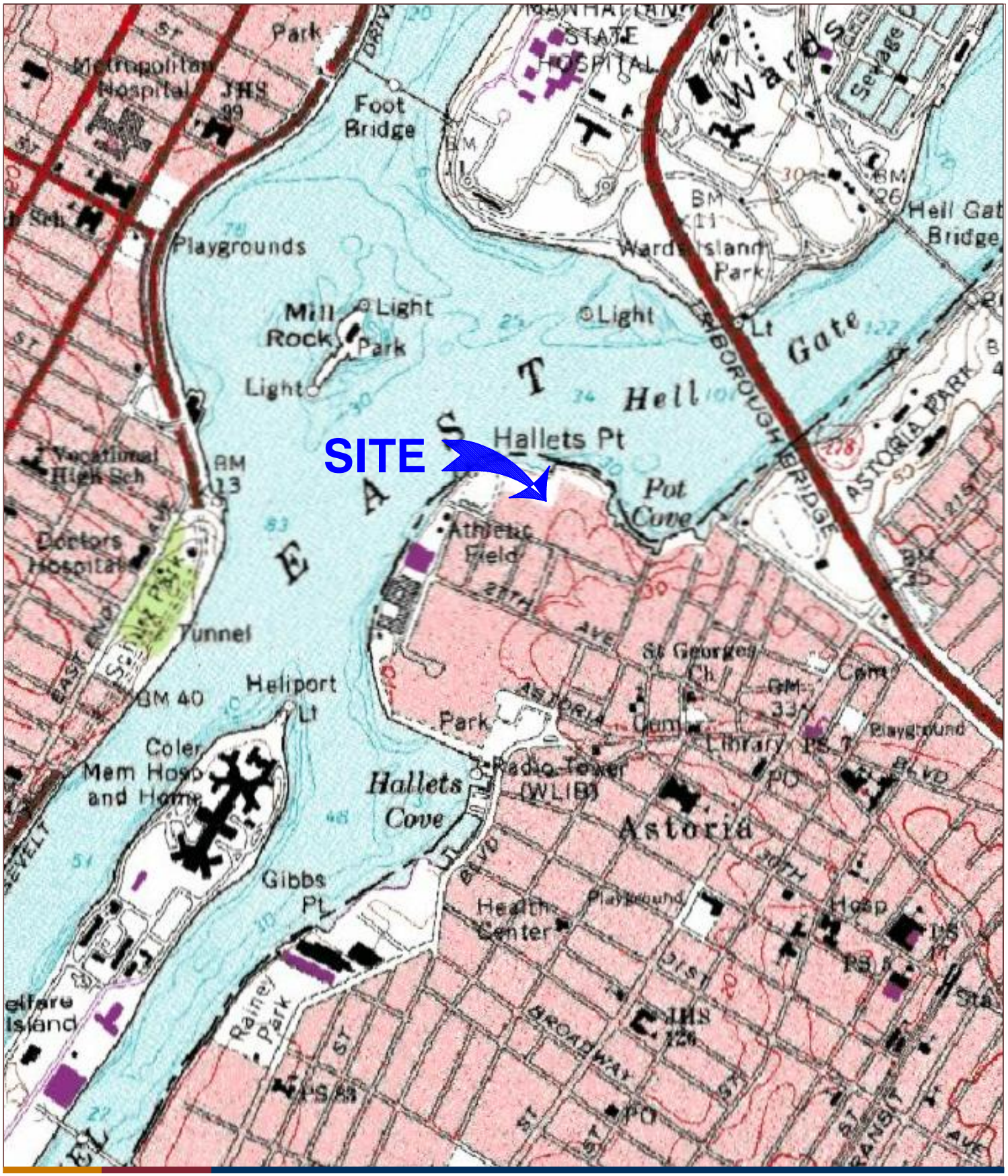
cwm = clear wide mouth jar.
EPA = U.S. Environmental Protection Agency.
HCl = Hydrochloric acid.
ml = milliliter.
HNO3 = Nitric acid.
PCBs = Polychlorinated biphenyls.
SVOCs = Semivolatile organic compounds.
TAL = Target analyte list.
TCL = Target compound list.
VOCs = Volatile organic compounds.
VTSR = Verified Time of Sample Receipt at laboratory.

Table 2 - Summary of Field Quality Control Checks

Remedial Investigation Work Plan
Quality Assurance Project Plan
Astoria Steel Site, 3-15 26th Avenue, Astoria, Queens County, NY

Type of QC	Frequency	Minimum Number	Remarks
Field Duplicates	1 per 20 field samples per media	1	(2) Pre-tared 40 ml glass vials with water, (1) Pre-tared 40 ml glass vial with methanol, (1) 2 oz. cwm
Trip Blanks	1 per shipment for each cooler in which aqueous samples for VOC analysis are shipped	1	4 oz. cwm
Matrix Spike/Matrix Spike Duplicate	1 per 20 field samples per media	1	
Rinsate Blanks	1 per non-dedicated equipment set	1	4 oz. cwm

FIGURE



Stantec Consulting Services Inc.
61 Commercial Street – Suite 100
Rochester, NY
14614
PH: 585.475.1440
FAX:585.272.1814

NOTES

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USGS TOPOGRAPHIC QUADRANGLE
CENTRAL PARK, NY 1966

0 1000 2000

APPROXIMATE SCALE IN FEET

Client/Project
RIWP
3-15 26TH AVE.
ASTORIA, QUEENS, NY

Figure No. 1

Title SITE LOCATION MAP

APPENDIX B

HEALTH AND SAFETY PLAN
REMEDIAL INVESTIGATION

ASTORIA STEEL SITE
BCP SITE #C241155
3-15 26TH AVENUE
ASTORIA, QUEENS COUNTY, NEW YORK

January 2014

Prepared for:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF ENVIRONMENTAL REMEDIATION
REMEDIAL BUREAU B, 12TH FLOOR
625 BROADWAY, ALBANY, NEW YORK 12233-7016

Prepared on Behalf of:

ASTORIA OWNERS LLC
43 WEST 47th STREET SUITE 203
NEW YORK, NY 10036

Prepared by:

STANTEC CONSULTING SERVICES INC.
61 COMMERCIAL STREET
ROCHESTER, NEW YORK 14614

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1.0 INTRODUCTION

The following Health and Safety Plan (HASP) describes personal safety protection standards and procedures to be followed by Stantec staff during planned Remedial Investigation activities at 3-15 26th Avenue in Astoria, New York (see location, Figure 1). This work will include a geophysical survey, soil pile sampling, trench and drain dye testing, a test pit program, drilling activities and monitoring well sampling.

This HASP establishes mandatory safety procedures and personal protection standards pursuant to the Occupational Safety and Health Administration (OSHA) regulations 29 Code of Federal Regulations (CFR) 1910.120. The HASP applies to all Stantec personnel conducting any site work, as defined in 29 CFR 1910.120(a). All personnel involved in the mentioned activities must familiarize themselves with this HASP, comply with its requirements and have completed the required health and safety training and medical surveillance program participation pursuant to 29 CFR 1910.120 prior to beginning any work on site.

THIS HASP IS FOR THE EXPRESS USE OF STANTEC EMPLOYEES. ALL OTHER CONTRACTORS TO BE WORKING IN THE EXCLUSION AREAS ARE REQUIRED BY LAW TO DEVELOP THEIR OWN HASP, AS WELL TO MEET ALL PERTINENT ASPECTS OF OSHA REGULATIONS. STANTEC RESERVES THE RIGHT TO STOP ANY SITE WORK WHICH IS DEEMED TO POSE A HEALTH AND SAFETY THREAT TO ITS STAFF.

1.1 Background

This Remedial Investigation (RI) Work Plan (Work Plan) is being is being submitted to the New York State Department of Environmental Conservation (NYSDEC) concurrent with an application to enter the Site into NYSDEC's Brownfield Cleanup Program (BCP). The objectives of the proposed project include the following:

- build upon the data and findings of the previous environmental investigations performed to develop a more thorough characterization of the nature and extent of contamination of soil and groundwater at the Site, provide more thorough areal coverage and address data gaps and satisfy DER-10 requirements;
- identify, to the extent practicable, the sources of contamination, the migration pathways, and actual or potential receptors of contaminants on or through air, soil, groundwater or utilities;
- collect sufficient data to evaluate the impacts, if any, to public health and the environment, and evaluate current and future potential public health exposure pathways, as well as potential impacts to fish and wildlife; and
- collect sufficient data to facilitate development of remedial alternative(s), if appropriate.

The Site consists of one parcel that encompasses a total of approximately 3 acres in Astoria, Queens County, New York. Access is granted by way of a concrete driveway and electric-powered fenced gate, approximately 10 feet north from 26th Avenue. The Site is located in an industrial and commercial zone, located north of 26th Avenue abutting the East River.

Historical activities on the Site have included foundry and lumber yard operations beginning in the early 1900's..

Historical environmental Site documentation includes a 1997 Phase I ESA prepared by Middleton, Kontosta Associates, a 2006 Phase II ESA prepared by Leggette, Brashears & Gram, Inc. (LBG), and a 2007 Geotechnical Due Diligence Study prepared by Langan Engineering and Environmental Services, P.C.

A Phase II ESA performed by Stantec in September 2013 at the Site detected contaminant compounds in soil and groundwater at levels in excess of NYSDEC soil cleanup objectives and groundwater standards and guidance values.

1.2 Site-Specific Chemicals of Concern

Volatile Organic Compounds (VOCs)

The primary VOCs of concern that are documented to be present in the soil and groundwater at the Site are listed in Table 1. Material Safety Data Sheets (MSDSs) for these compounds are presented in HASP Appendix A. The air monitoring action levels will be based on one-half of the current Threshold Limit Valve (TLV) or Permissible Exposure Limit (PEL) for benzene with a margin of safety built into the action levels to account for the non-specificity of the field monitoring instruments. Exposure limits for less hazardous compounds will be satisfied by meeting the more stringent exposure limits for benzene. Table 1 summarizes health and safety data for the volatile compounds of primary concern.

Semivolatile Organic Compounds (VOCs)

Several petroleum-related SVOCs were detected in soil and groundwater. MSDS sheets for the primary SVOCs of concern are listed in Table 1 along with health and safety data for these SVOCs. MSDSs for these compounds are presented in HASP Appendix A.

Metals

Several metals have been detected in soil and groundwater samples at the site. The primary metals of concern include arsenic, barium, chromium, copper, lead, and mercury. MSDS sheets for the primary metals of concern are included in HASP Appendix A. Table 1 summarizes health and safety data for the metals of primary concern.

Table 1

Health and Safety Data for Contaminants of Concern

Compound	PEL/ TWA	Physical Description	Odor Threshold in Air	Route of Exposure	Symptoms	Target Organs
Acetone	250 ppm	Colorless liquid with a fragrant, mint-like odor.	4.58 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis	Eyes, skin, respiratory system, central nervous system
Benzene	10 ppm	Colorless liquid with a characteristic sweet aromatic odor	5 ppm (8.65 ppm)	Inhalation, Skin Absorption, Ingestion, Skin/Eye Contact	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression	Carcinogen; Eyes, Skin, Respiratory System, Blood, Central Nervous System, Bone Marrow
Ethylbenzene	100 ppm	Colorless liquid with an aromatic odor.	2.3 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma	Eyes, skin, respiratory system, central nervous system
Isopropylbenzene	50 ppm	Colorless liquid with a sharp, penetrating, aromatic odor.	0.024 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, mucous membrane; dermatitis; headache, narcosis, coma	Eyes, skin, respiratory system, central nervous system
Propylbenzene, n-		Colorless liquid.	NA	Inhalation, Ingestion, Skin/Eye Contact	Irritate or burn skin and eyes; respiratory tract irritation, suffocation, aspiration hazard if swallowed	Lungs, Eyes, Kidney
Xylenes	100 ppm	Colorless flammable liquid, sweet aromatic odor.	0.08 ppm (0.851 ppm, 0.324 ppm, and 0.49 ppm)	Inhalation, Skin Absorption, Ingestion, Skin/Eye Contact	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis	Eyes, Skin, Respiratory System, Central Nervous System, Gastrointestinal Tract, Blood, Liver, kidneys

Compound	PEL/ TWA	Physical Description	Odor Threshold in Air	Route of Exposure	Symptoms	Target Organs
Benzo (a) anthracene*	0.2 mg/m^3	Colorless crystals with violet fluoresence when pure; yellow with green fluorescence when impure; faint aromatic odor	0.2 mg/m^3	Inhalation, Ingestion, Skin/Eye Contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory System, Skin, Bladder, Kidneys
Benzo (a) pyrene*	0.2 mg/m^3	Yellow to brown powder with faint aromatic odor	0.2 mg/m^3	Inhalation, Ingestion, Skin/Eye Contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory System, Skin, Bladder, Kidneys
Benzo (b) fluoranthene*	0.2 mg/m^3	Solid; colorless crystals	0.2 mg/m^3	Inhalation, Ingestion, Skin/Eye Contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory System, Skin, Bladder, Kidneys
Benzo (k) fluoranthene*	0.2 mg/m^3	Crystalline.	0.2 mg/m^3	Inhalation, Ingestion, Skin/Eye Contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory System, Skin, Bladder, Kidneys
Bis (2-Ethylhexyl) phthalate	5 mg/m^3	Colorless to light yellow oily liquid with a slight odor	NA	Inhalation, Ingestion, Skin/Eye Contact	Irritation eyes, mucous membrane; liver damage; teratogenic effects; [potential occupational carcinogen]	Eyes, respiratory system, central nervous system, liver, reproductive system, gastrointestinal tract
Chrysene*	0.2 mg/m^3	Light beige solid	0.2 mg/m^3	Inhalation, Ingestion, Skin/Eye Contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory System, Skin, Bladder, Kidneys
Dibenzo (a,h) anthracene*	0.2 mg/m^3	White to yellow crystalline solid	0.2 mg/m^3	Inhalation, Ingestion, Skin/Eye Contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory System, Skin, Bladder, Kidneys
Fluoranthene*	0.2 mg/m^3	Solid; colorless crystals	0.2 mg/m^3	Inhalation, Ingestion, Skin/Eye Contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory System, Skin, Bladder, Kidneys
Indeno (1,2,3-cd)	0.2	Solid; yellow	0.2 mg/m^3	Inhalation, Ingestion,	Dermatitis, bronchitis, [potential	Respiratory System,

Compound	PEL/ TWA	Physical Description	Odor Threshold in Air	Route of Exposure	Symptoms	Target Organs
pyrene*	mg/m^3	crystals		Skin/Eye Contact	occupational carcinogen]	Skin, Bladder, Kidneys
Methylnaphthalene, 2-	0.5 ppm	Solid.	NA	Inhalation, Ingestion, Skin/Eye Contact	Irritate skin, eyes, respiratory tract; harmful if swallowed	Respiratory system
Naphthalene	10 ppm (50 mg/m^3	Colorless to brown solid with an odor of mothballs	0.015 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage	Eyes, skin, blood, liver, kidneys, central nervous system
Nitrobenzene	1 ppm (5 mg/m^3)	Yellow, oily liquid with a pungent odor like paste shoe polish. [Note: A solid below 42°F.]	0.044 mg/m^3	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; anoxia; dermatitis; anemia; methemoglobinemia; in animals: liver, kidney damage; testicular effects	Eyes, skin, blood, liver, kidneys, cardiovascular system, reproductive system
Pyrene*	0.2 mg/m^3	Colorless or yellow crystalline or powdered solid	0.2 mg/m^3	Inhalation, Ingestion, Skin/Eye Contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory System, Skin, Bladder, Kidneys
Arsenic	0.010 mg/m^3	Silver-gray or tin-white, brittle odorless, lustrous solid.	NA	Inhalation, Skin Absorption, Ingestion, Skin/Eye Contact	Dermatitis; ulceration of nasal septum; gastrointestinal and/or respiratory irritation; peripheral neuropathy	Carcinogen, CNS, kidneys, lungs, liver, skin, mucous membranes
Barium	0.500 mg/m^3	Soft, silvery, odorless, lustrous metal.	NA	Inhalation, Ingestion, Skin/Eye Contact	Eye/skin irritation, inflammation, or rash; burns; nausea, vomiting, headache; fever; irregular breathing	CNS, kidneys
Chromium	1 mg/m^3	Blue-white to steel-gray, lustrous, brittle, hard, odorless solid.	NA	Inhalation, Ingestion, Skin/Eye Contact	Irritation eyes, skin; lung fibrosis (histologic)	Eyes, skin, respiratory system

Compound	PEL/ TWA	Physical Description	Odor Threshold in Air	Route of Exposure	Symptoms	Target Organs
Copper	1 mg/m^3	Reddish, lustrous, malleable, odorless solid.	NA	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis; in animals: lung, liver, kidney damage; anemia	Eyes, skin, respiratory system, liver, kidneys (increased risk with Wilson's disease)
Lead	0.050 mg/m^3	A heavy, ductile, soft, gray solid.	NA	Inhalation, Ingestion, Skin/Eye Contact	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypotension	Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue
Mercury	0.025 mg/m^3	Silver-white odorless heavy liquid.	NA	Inhalation, Skin Absorption, Ingestion, Skin/Eye Contact	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria	Eyes, skin, respiratory system, central nervous system, kidneys

Notes:

NA - not available
PEL - permissible exposure limits
TWA - time weighted average, 8-hour workday
mg/m^3 - milligrams per cubic meter.
ppm - parts per million, in air
* - indicates a constituent of coal tar pitch volatiles; the given PEL/TWA, odor threshold, symptoms, and target organs apply to coal tar pitch volatile constituents; although physical descriptions for individual compounds are listed, coal tar pitch occurs as black or dark brown amorphous residue

2.0 STANTEC PERSONNEL ORGANIZATION

The following Stantec personnel will be involved in health and safety operations at the 3-15 2th Avenue, Astoria, NY Site:

2.1 Project Manager

The Project Manager is responsible for ensuring that all Stantec procedures and methods are carried out, and that all Stantec personnel abide by the provisions of this Health and Safety Plan.

2.2 Site Safety Officer/Field Team Leader

The Field team leader (FTL) and Site Safety Officer (SSO)will report directly to the Project Manager and will be responsible for the implementation of this HASP as well as daily calibration of Stantec's safety monitoring instruments. The FTL/SSO will keep a log book of all calibration data and instrument readings for the Site.

2.3 Health and Safety Coordinator

The Health and Safety Coordinator will be responsible for overall coordination of Health and Safety issues on the project.

2.4 Daily Meetings

All Stantec personnel and contractors working within the exclusion zone will be required to read this document and sign off on the daily safety meeting form presented in HASP Appendix B.

3.0 MEDICAL SURVEILLANCE REQUIREMENTS

3.1 Introduction

A. Hazardous waste site workers can often experience high levels of physical and chemical stress. Their daily tasks may expose them to toxic chemicals, physical hazards, biologic hazards, or radiation. They may develop heat stress while wearing protective equipment or working under temperature extremes, or face life-threatening emergencies such as explosions and fires. Therefore, a medical program is essential to: assess and monitor worker's health and fitness both prior to employment and during the course of the work; provide emergency and other treatment as needed; and keep accurate records for future reference. In addition, OSHA requires a medical evaluation for employees that may be required to work on hazardous waste sites and/or wear a respirator (29 CFR Part 1910.120 and 1910.134), and certain OSHA standards include specific medical surveillance requirements (e.g., 29 CFR Part 1926.62, Part 1910.95 and Parts 1910.1001 through 1910.1045).

3.2 Medical Examinations

A. All Stantec personnel working in areas of the site where site-related contaminants may be present shall have been examined by a licensed physician as prescribed in 29 CFR Part 1910.120, and determined to be medically fit to perform their duties for

work conditions which require respirators. Employees will be provided with medical examinations as outlined below:

- Pre-job physical examination
- Annually thereafter if contract duration exceeds 1 year;
- Termination of employment;
- Upon reassignment in accordance with CFR 29 Part 1910.120(e)(3)(i)(C);
- If the employee develops signs or symptoms of illness related to workplace exposures;
- If the physician determines examinations need to be conducted more often than once a year; and
- When an employee develops a lost time injury or illness during the Contract period.

B. Examinations will be performed by, or under the supervision of a licensed physician, preferably one knowledgeable in occupational medicine, and will be provided without cost to the employee, without loss of pay and at a reasonable time and place. Medical surveillance protocols and examination and test results shall be reviewed by the Occupational Physician.

4.0 ON-SITE HAZARDS

4.1 Chemical Hazards

The primary potential chemical hazards on-site are expected to be exposure to the VOCs, SVOCs and metals detailed in Table 1. Material safety data sheets for the anticipated chemicals are presented in Appendix A.

The soil and groundwater contaminants are volatiles, semi-volatiles, and metals, therefore, any activity at the site which causes physical disturbance of the soil can potentially allow the release of contaminants into the air. For volatiles and semi-volatiles, this can include release of organic vapors into the air and for metals this can include mobilization of soil particles to which the metals are adhered. Such an occurrence may be recognized by noticeable chemical odors. Field personnel should be aware of the odor threshold for these chemicals and their relation to the action levels and Permissible Exposure Limits.

Symptoms of overexposure to primary compounds of concern are detailed in Table 1. To prevent exposure to these chemicals, dermal contact will be minimized by using disposable surgical gloves with work gloves (as appropriate) when handling soil, groundwater equipment or samples. Real time, breathing zone levels of total VOCs will be monitored using a portable photoionization detector (PID). If ambient levels exceed action levels, all site activities will be performed using level C personal protection until ambient concentrations dissipate. Where levels exceed 50 ppm, work will cease and the project manager will be notified immediately. Intrusive work may also be halted where required by action levels detailed in the Community Air Monitoring Plan (CAMP), Appendix D of the RI Work Plan.

In addition, depending on seasonal conditions, disturbance of the site soils may cause the particulate contaminants to become airborne as dust. Therefore, particulates will be monitored as discussed in Section 6.1 and dust-suppression methods used where appropriate as discussed in Section 6.2, or in the CAMP.

Finally, aeration of the groundwater may cause volatilization of chemicals into the air, particularly VOCs. Table 2 below summarizes first aid instructions for exposure pathways for the compounds of concern.

Table 2
Exposure Pathways and First Aid Response for Contaminants of Concern

Substance	Exposure Pathways	First-Aid Instructions
VOCs and SVOCs listed in Table 1	Eye	Irrigate immediately
	Dermal	Soap wash promptly for VOCs; soap wash immediately for SVOCs (and acetone); water flush promptly for ethylbenzene and isopropylbenzene
	Inhalation	Respiratory support
	Ingestion	Medical attention immediately
Metals listed in Table 1	Eye	Irrigate immediately
	Dermal	Soap wash immediately for arsenic, soap wash promptly for mercury and copper, soap wash for Chromium; Soap flush immediately for Barium, soap wash promptly for Lead)
	Inhalation	Respiratory support
	Ingestion	Medical attention immediately

4.2 Physical Hazards

Hazards typically encountered at construction sites with drilling and excavation activities will be a concern at this site. These hazards include slippery ground surfaces, holes, and operation of heavy machinery and equipment. Field team members will wear the basic safety apparel such as steel-toed shoes, hard hat and safety glasses during all appropriate activities.

Under no circumstances will Stantec personnel approach the borehole during active drilling operation. All field personnel working around the rig will be shown the location and operation of kill switches, which are to be tested daily.

Multi-purpose fire extinguishers, functional and within annual inspection period, will be staged and readily accessible for use.

The use of electrical equipment in any established exclusion zones will be limited to areas verified as containing non-explosive atmospheres (<10% LEL) prior to operation, unless the equipment has been previously demonstrated or designed to be FM or UL rated as intrinsically safe. Care will be taken to avoid an ignition source while working in the presence of vapors.

The driller shall make all necessary contacts with utilities and/or underground utility locator hotlines prior to drilling, and shall meet OSHA requirements for distances between the drilling rig and overhead utilities. No drilling work will be carried out where the drill rig chassis has not been stabilized and the rig is not to be moved between locations with its boom in a vertical position.

4.2.1 Noise

The use of heavy machinery/equipment and operation may result in noise exposures, which require hearing protection. Exposure to noise can result in temporary hearing losses, interference with speech communication, interference with complicated tasks or permanent hearing loss due to repeated exposure to noise.

During the investigative activities, all Stantec field team members will use hearing protection when sound levels are in excess of 90 dB TWA.

4.2.2 Heat and Cold Stress Exposure

Heat is a potential threat to the health and safety of site personnel. The Site Safety Officer under the direction of the Project Manager will determine the schedule of work and rest. These schedules will be employed as necessary so that personnel do not suffer adverse effects from heat. Table 3 summarizes exposure symptoms and first aid instructions for heat stress. Non-caffeinated, thirst replenishment liquids will be available on-site.

Cold stress is also a potential threat to the health and safety of site personnel. Symptoms of cold stress include, shivering, blanching of the extremities, numbness or burning sensations, blue, purple or gray discoloration of hands and feet, frostbite, hypothermia, and loss of consciousness. Cold stress can be prevented by acclimatizing one's self to the cold, increasing fluid intake, avoiding caffeine and alcohol, maintaining proper salt and electrolyte intake, eating a well-balanced diet, wearing proper clothing, building heated enclosures to work in, and taking regular breaks to warm up. If any of the above symptoms are encountered the person should be removed from the cold area. Depending on the severity of the cold stress, 911 should be contacted and first aid administered. No fluids should be given to an unconscious person.

Table 3
Exposure Symptoms and First Aid for Heat Exposure

Hazard	Exposure Symptoms	First-Aid Instructions
Heat Stress	Fatigue, sweating, irritability	rest; take fluids
	Dizziness, disorientation, perspiration ceases, loss of consciousness	remove from hot area, activate 911, administer first aid, no fluids to be administered to unconscious victim.

4.2.3 Roadway Hazards

Field activities may take place near active roadways. Where such work zones are established, personnel shall assure that protective measures including signage, cones, and shielding through use of vehicles parked at workmen perimeter, are in place. All contractors shall be responsible for meeting signage requirements of DOT. Fluorescent safety vests shall be worn by all personnel during activities in or adjacent to roadways and driveways.

4.2.4 Electrical Work

Site work involving electrical installation or energized equipment must be performed by a qualified electrician. All electrical work will be performed in accordance with the OSHA electrical safety requirements found in 29 CFR 1926.400 through 1926.449. Workers are not permitted to work near electrical power circuits unless the worker is protected against electric shock by de-energizing and grounding the circuit or by guarding or barricading the circuit and providing proper personal protective equipment. All electrical installations must comply with NEC regulations. All electrical wiring and equipment used must be listed by a nationally recognized testing laboratory.

All electrical circuits and equipment must be grounded in accordance with the NEC regulations. The path to ground from circuits, equipment, and enclosures will be permanent and continuous. Ground fault circuit interrupters (GFCIs) are required on all 120-volt, single phase, 15- and 20-amp outlets in work areas that are not part of the permanent wiring of the building or structure. A GFCI is required when using an extension cord. GFCIs must be tested regularly with a GFCI tester.

Heavy-duty extension cords will be used; flat-type extension cords are not allowed. All extension cords must be the three-wire type, and designed for hard/extra hard usage. Electrical wire or cords passing through work areas must be protected from water and damage. Worn, frayed, or damaged cords and cables will not be used. Walkways and work spaces will be kept clear of cords and cables to prevent a tripping hazard. Extension cords and cables may not be secured with staples, hung from nails, or otherwise temporarily secured. Cords or cables passing through holes in covers, outlet boxes, etc., will be protected by bushings or fittings.

All lamps used in temporary lighting will be protected from accidental contact and breakage. Metal shell and paper-lined lamp holders are not permitted. Fixtures, lamp holders, lamps, receptacles, etc. are not permitted to have live parts. Workers must not have wet hands while plugging/unplugging energized equipment. Plugs and receptacles will be kept out of water (unless they are approved for submersion).

4.2.5 Lock-Out/Tag-Out

Before a worker sets up, services, or repairs a system where unexpected energizing (or release of stored energy) could occur and cause injury or electrocution, the circuits energizing the parts must be locked-out and tagged. Only authorized personnel will perform lock-out/tag-out procedures. All workers affected by the lock-out/tag-out will be notified prior to, and upon completion of, the lock-out/tag-out procedure.

Lock-out/tag-out devices must be capable of withstanding the environment to which they are exposed. Locks will be attached in such a way as to prevent other personnel from operating the equipment, circuit, or control, or from removing the lock unless they resort to excessive force. Tags will identify the worker who attached the device, and contain information, which warns against the hazardous condition that will result from the system's unauthorized start-up. Tags must be legible and understood by all affected workers and incidental personnel. The procedures for attaching and removing lock-out/tag-out devices include the steps outlined in the following table.

If maintenance work is required, the electrical supply to the equipment must be disconnected. Turning off the MAIN breaker using the disconnect switch will disconnect all power to the system. Once the disconnect switch has been turned off, the switch will be locked-out using the steps outlined below.

STEP	LOCK-OUT/TAG-OUT PROCEDURES
1	Disconnect the circuits and/or equipment to be worked on from all electrical energy sources.
2	Ensure that the system is completely isolated so that it cannot be operated at that shut-off point or at any other location.
3	Release stored electrical energy.
4	Block or relieve stored non-electrical energy.
5	Place a lock on each shut-off or disconnect point necessary to isolate all potential energy sources. Place the lock in such a manner that it will maintain the shut-off/disconnect in the off position.
6	Place a tag on each shut-off or disconnect point. The tag must contain a statement prohibiting the unauthorized re-start or re-connect of the energy source and the removal of the tag, and the identity of the individual performing the tag and lock-out.
7	Workers who will be working on the system must place their own lock and tag on each lock-out point.
8	A qualified person must verify the system cannot be re-started or re-connected, and de-energization of the system has been accomplished.

Once the service or repairs have been made on the system:	
1	A qualified person will conduct an inspection of the work area, to verify that all tools, jumpers, shorts, grounds, etc., have been removed so that the system can then be safely re-energized.
2	All workers stand clear of the system.
3	Each lock and tag will be removed by the worker who attached it. If the worker has left the site, then the lock and tag may be removed by a qualified person under the following circumstances:
	a. The qualified person ensures the worker who placed the lock and tag has left the site; and
	b. The qualified person ensures the worker is aware the lock and tag has been removed before the worker resumes work on-site.

4.2.6 Ladders

One-third of worker deaths in construction result from falls. Many falls occur because ladders are not placed or used safely. Ladder use will comply with OSHA 1926.1053 through 1926.1060, including the following safety requirements.

STEP	PROPER LADDER USE PROCEDURE
1	Choose the right ladder for the task--the proper type and size, with a sufficient rating for the task.
2	Check the condition of the ladder before climbing. • Do not use a ladder with broken, loose, or cracked rails or rungs. • Do not use a ladder with oil, grease, or dirt on its rungs. • The ladder should have safety feet.
3	Place the ladder on firm footing, with a four-to-one pitch.
4	Support the ladder by: • Tying it off; • Using ladder outrigger stabilizers; or • Have another worker hold the ladder at the bottom. If another worker holds the ladder, they must: • Wear a hard hat; • Hold the ladder with both hands; • Brace the ladder with their feet; and • Not look up.
5	Keep the areas around the top and bottom of the ladder clear.
6	Extend the top of the ladder at least 36 inches (3 feet) above the landing.
7	Climb the ladder carefully - facing it - and use both hands. • Use a tool belt and hand-line to carry material to the top or bottom of the ladder. • Wear shoes in good repair with clean soles.
8	Inspect the ladder every day, prior to use, for the following problems: • Rail or rung damage • Broken feet • Rope or pulley damage • Rung lock defects or damage • Excessive dirt, oil, or grease If the ladder fails inspection, it must be removed from service and tagged with a "Do Not Use" sign.

Ladders with non-conductive side rails must be used when working near electrical conductors, equipment, or other sources. Ladders will not be used horizontally for platforms, runways, or scaffolds.

4.2.7 Hand and Power Tools

All hand and power tools will be maintained in a safe condition and in good repair. Hand and power tools will be used in accordance with 29 CFR 1926, Subpart I (1926.300 through 1926.307). Neither Stantec nor its subcontractors will issue

unsafe tools, and workers are not permitted to bring unsafe tools on-site. All tools will be used, inspected, and maintained in accordance with the manufacturer's instructions. Throwing tools or dropping tools to lower levels is prohibited. Hand and power tools will be inspected, tested, and determined to be in safe operating condition prior to each use. Periodic safety inspections of all tools will be conducted to assure that the tools are in good condition, all guards are in place, and the tools are being properly maintained. Any tool that fails an inspection will be immediately removed from service and tagged with a "Do Not Use" sign.

Workers using hand and power tools, who are exposed to falling, flying, abrasive, or splashing hazards will be required to wear personal protective equipment (PPE). Eye protection must always be worn when working on-site. Additional eye and face protection, such as safety goggles or face shields, may also be required when working with specific hand and power tools. Workers, when on-site, will wear hard hats. Additional hearing protection may be required when working with certain power tools. Workers using tools, which may subject their hands to an injury, such as cuts, abrasions, punctures, or burns, will wear protective gloves. Loose or frayed clothing, dangling jewelry, or loose long hair will not be worn when working with power tools.

Electric power-operated tools will be double insulated or grounded, and equipped with an on/off switch. Guards must be provided to protect the operator and other nearby workers from hazards such as in-going nip points, rotating parts, flying chips, and sparks. All reciprocating, rotating and moving parts of tools will be guarded if contact is possible. Removing machine guards is prohibited.

Abrasive wheels will only be used on equipment provided with safety guards. Safety guards must be strong enough to withstand the effect of a bursting wheel. Abrasive wheels will not be operated in excess of their rated speed. Work or tool rests will not be adjusted while the wheel is in motion. All abrasive wheels will be closely inspected and ring tested before each use, and any cracked or damaged wheels will be removed immediately and destroyed.

Circular saws must be equipped with guards that completely enclose the cutting edges and have anti-kickback devices. All planer and joiner blades must be fully guarded. The use of cracked, bent, or otherwise defective parts is prohibited. Chain saws must have an automatic chain brake or kickback device. The worker operating the chain saw will hold it with both hands during cutting operations. A chain saw must never be used to cut above the operator's shoulder height. Chain saws will not be re-fueled while running or hot. Power saws will not be left unattended.

Only qualified workers will operate pneumatic tools, powder-actuated tools, and abrasive blasting tools.

4.2.8 Manual Lifting

Back injuries are among the leading occupational injuries reported by industrial workers. Back injuries such as pulls and disc impairments can be reduced by using proper manual lifting techniques. Leg muscles are stronger than back muscles, so workers should lift with their legs and not with their back. Proper manual lifting techniques include the following steps:

STEP	PROPER MANUAL LIFTING PROCEDURE
1	Plan the lift before lifting the load. Take into consideration the weight, size, and shape of the load.
2	Preview the intended path of travel and the destination to ensure there are no tripping hazards along the path.
3	Wear heavy-duty work gloves to protect hands and fingers from rough edges, sharp corners, and metal straps. Also, keep hands away from potential pinch points between the load and other objects.
4	Get the load close to your ankles, and spread your feet apart. Keep your back straight and do not bend your back too far; instead bend at your knees.
5	Feel the weight; test it.
6	Lift the load smoothly, and let your legs do the lifting. If you must pivot, do not swing just the load; instead, move your feet and body with the load.

If the load is too heavy, then do not lift it alone. Lifting is always easier when performed with another person. Assistance should always be used when it is available.

4.2.9 Weather-Related Hazards

Weather-related hazards include the potential for heat or cold stress, electrical storms, treacherous weather-related working conditions, or limited visibility. These hazards correlate with the season in which site activities occur. Outside work will be suspended during electrical storms. In the event of other adverse weather conditions, the Site Safety Officer will determine if work can continue without endangering the health and safety of site personnel.

5.0 SITE WORK ZONES

The following work zones will be physically delineated by Stantec during the investigation activities.

5.1 Control Zones

Control boundaries will be established within the areas of site activities. Examples of boundary zones include the exclusion and decontamination zone. All boundaries will be dynamic, and will be determined by the planned activities for the day. The Field Team Leader will record the names of any visitors to the site.

5.2 Exclusion Zone

The controlled portion of the site will be delineated to identify the exclusion zone, wherein a higher level of personal protective equipment may be required for entry during intrusive activities. The limits of the exclusion zone will be designated at each work location appropriately. A decontamination zone will be located immediately outside the entrance to the exclusion zone. All personnel leaving the exclusion zone will be required to adhere to proper decontamination procedures.

A "super exclusion" zone will be established around the borehole which will not be entered by Stantec personnel at any time during any active drilling, slambar, cathead, silica sand dumping, or other related activities. The drilling contractor will be directed to stop such activity when Stantec site team members have a need to enter this zone.

5.3 Decontamination Zone

The decontamination zone will be located immediately outside the entrance to the exclusion zone on its apparent upwind side, if feasible, and will be delineated with caution tape and traffic cones as needed. This zone will contain the necessary decontamination materials for personnel decontamination. Decontamination procedures are outlined in Section 8.0 of this plan.

6.0 SITE MONITORING/ACTION LEVELS

6.1 Site Monitoring

Field activities associated with drilling, excavation, and sampling may create potentially hazardous conditions due to the migration of contaminants into the breathing zone. These substances may be in the form of mists, vapors, dusts, or fumes that can enter the body through ingestion, inhalation, absorption, and direct dermal contact. Monitoring for VOCs and particulates will be performed as needed to ensure appropriate personal protective measures are employed during site activities.

A separate Community Air Monitoring Plan (CAMP) has also been developed (Appendix C of the Work Plan) to protect the surrounding neighborhood. It is assumed that continuous downwind particulate and VOC monitoring will not be required during drilling and that air monitoring will not be required during the groundwater monitoring events.

The following describes the conditions that will be monitored for during the investigation activities. All background and site readings will be logged, and all instrument calibrations, etc., will be logged.

Organic Vapor Concentrations – During drilling, organic vapors will be monitored continuously in the breathing zone in the work area with a portable photoionization detector (PID), such as a miniRAE Model 3000 with a 10.2 eV lamp. The instrument will be calibrated daily or as per the manufacturer's recommendations. PID readings will be used as the criteria for upgrading or downgrading protective equipment and for implementing additional precautions or procedures.

Split spoons or other soil sampling devices will be monitored using the PID at the time they are opened, with appropriate PPE to be used where soils exhibit measurable volatile organic compound levels.

Particulates - Should subsurface conditions be observed to be dry, Stantec will perform particulate monitoring with a aerosol monitor (such as the TSI 8530 DustTrak II) within the outdoor work area to monitor personal exposures to particulates and to compare work area readings with downwind and upwind readings. The first readings of the day will be obtained prior to the commencement of work to obtain a daily background reading, and the instrument will be zeroed daily and calibrated to manufacturer's specifications. Readings will be manually recorded approximately every 30 minutes thereafter. If the work area particulate levels exceed the background levels by more than 0.15 mg/m^3, the Contractor will be instructed to implement dust suppression measures.

6.2 Action Levels

During the course of any activity, as long as PID readings in the breathing zone are less than 5 ppm above background, Level D protection will be considered adequate. Level C protection will be required when VOC concentrations in ambient air in the work zone exceed 5 ppm total VOCs above background but remain below 50 ppm total VOCs.

If concentrations in the work zone exceed 50 ppm for a period of 5 minutes or longer, work will immediately be terminated by the Site Safety Officer. Options to allow continued drilling would then be discussed amongst all parties. Supplied-air respiratory protection is generally required for drilling to resume under these conditions. If Level B protection is not used, work may resume in Level C once monitoring concentrations have decreased below 50 ppm and conditions outlined in the CAMP are met.

If the monitoring of fugitive particulate levels within the work area exceeds 0.15 mg/m^3 above background, then the drilling Contractor will be directed to implement fugitive dust control measures which may include use of engineering controls such as water spray at the borehole.

7.0 PERSONAL PROTECTIVE EQUIPMENT

Based on an evaluation of the hazards at the site, personal protective equipment (PPE) will be required for all personnel and visitors entering the drilling exclusion zone(s). It is anticipated that all Stantec oversight work will be performed in Level D. All contractors will be responsible for selection and implementation of PPE for their personnel.

7.1 Protective Clothing/Respiratory Protection:

Protective equipment for each level of protection is as follows:

If PID readings are above 50 ppm, requiring an upgrade to Level B, site work will be halted pending review of conditions and options by Stantec and other involved parties.

When PID readings range between 5 and 50 ppm, upgrade to Level C:

Level C

- Full face, air purifying respirator with organic/HEPA cartridge;
- Disposable chemical resistant one-piece suit (Tyvek or Saranex, as appropriate);
- Inner and outer chemical resistant gloves;
- Hard hat;
- Steel-toed boots; and
- Disposable booties.

When PID readings range between background and 5 ppm use Level D:

Level D

- Safety glasses;
- Steel-toed boots;
- Protective cotton, latex or leather gloves depending on site duties;
- Hard hat; and
- Tyvek coverall (optional).

8.0 DECONTAMINATION

8.1 Personnel Decontamination

For complete decontamination, all personnel will observe the following procedures upon leaving the exclusion zone:

1. Remove disposable outer boots and outer gloves and place in disposal drum.

2. If using a respirator, remove respirator, dispose of cartridges if necessary, and set aside for later cleaning.

3. Remove disposable chemical resistant suits and dispose of articles in drum.

4. Remove and dispose of inner gloves.

Decontamination solutions shall be supplied at the decontamination zone. The wash solution will consist of water and detergent such as Alconox or trisodium phosphate (TSP), and the rinse solution will consist of clean water.

Contaminated wash solutions shall be collected in drums for disposal. All other disposable health and safety equipment will be decontaminated and disposed of as non-hazardous waste.

8.2 Equipment Decontamination

If equipment is used during field activities, it will be properly washed or steam-cleaned prior to exiting the decontamination zone. Pre- or post-use rinsing using solvents will be done wearing appropriate PPE.

When feasible, monitoring instruments will be either wrapped in plastic or carried by personnel not involved in handling contaminated materials, to reduce the need for decontamination. All instruments will be wet-wiped prior to removal from the work zone.

9.0 EMERGENCY PROCEDURES

The Site Safety Officer will coordinate emergency procedures and will be responsible for initiating emergency response activities. Emergency communications at the site will be conducted verbally and by means of an air or vehicle horn. All personnel will be informed of the location of the cellular telephone and horn. Three blasts on the air or vehicle horn will be used to signal distress.

9.1 List of Emergency Contacts

Ambulance: 911
Hospital: **Mount Sinai Queens: (718) 267-4285**
Fire Department: 911
Police: 911
Poison Control Center: 1-800-222-1222
Utility Emergency: 911

9.2 Directions to Hospital

A map presenting directions to the hospital is included in the back of the document (Figure 2). The route shall be reviewed at the initial site safety meeting on site.

9.3 Accident Investigation and Reporting

A. All accidents requiring first aid, which occur incidental to activities onsite, will be investigated. The investigation format will be as follows:

- interviews with witnesses,
- pictures, if applicable, and
- necessary actions to alleviate the problem.

B. In the event that an accident or some other incident such as an explosion or exposure to toxic chemicals occurs during the course of the project, the Project Health and Safety Officer will be telephoned as soon as possible and receive a written notification within 24 hours. The report will include the following items:

- Name of injured;
- Name and title of person(s) reporting;
- Date and time of accident/incident;
- Location of accident/incident, building number, facility name;
- Brief summary of accident/incident giving pertinent details including type of operation ongoing at the time of the accident/incident;
- Cause of accident/incident;
- Casualties (fatalities, disabling injuries), hospitalizations;
- Details of any existing chemical hazard or contamination;
- Estimated property damage, if applicable;
- Nature of damage; effect on contract schedule;
- Action taken to insure safety and security; and
- Other damage or injuries sustained (public or private).

Where reportable injuries, hospitalizations or fatalities occur amongst Stantec personnel, the necessary document required by OSHA will be submitted within timeframes allowed by law.

The accident report form is illustrated in Table 4.

TABLE 4
ACCIDENT REPORT

Project Astoria Steel Site, 3-15 26th Avenue, Astoria, NY Date of Occurrence_____

Location __3-15 26th Avenue, Astoria, NY_____
_____

Type of Occurrence: (check all that Apply)

☐Disabling Injury	☐Other Injury
☐Property Damage	☐Equip. Failure
☐Chemical Exposure	☐Fire
☐Explosion	☐Vehicle Accident

☐Other (explain)_____
_____

Witnesses to Accident/Injury:

_____ _____
_____ _____
_____ _____

Injuries:
Name of Injured _____

What was being done at the time of the accident/injury?

_____
_____

What corrective actions will be taken to prevent recurrence? _____
_____
_____

SIGNATURES

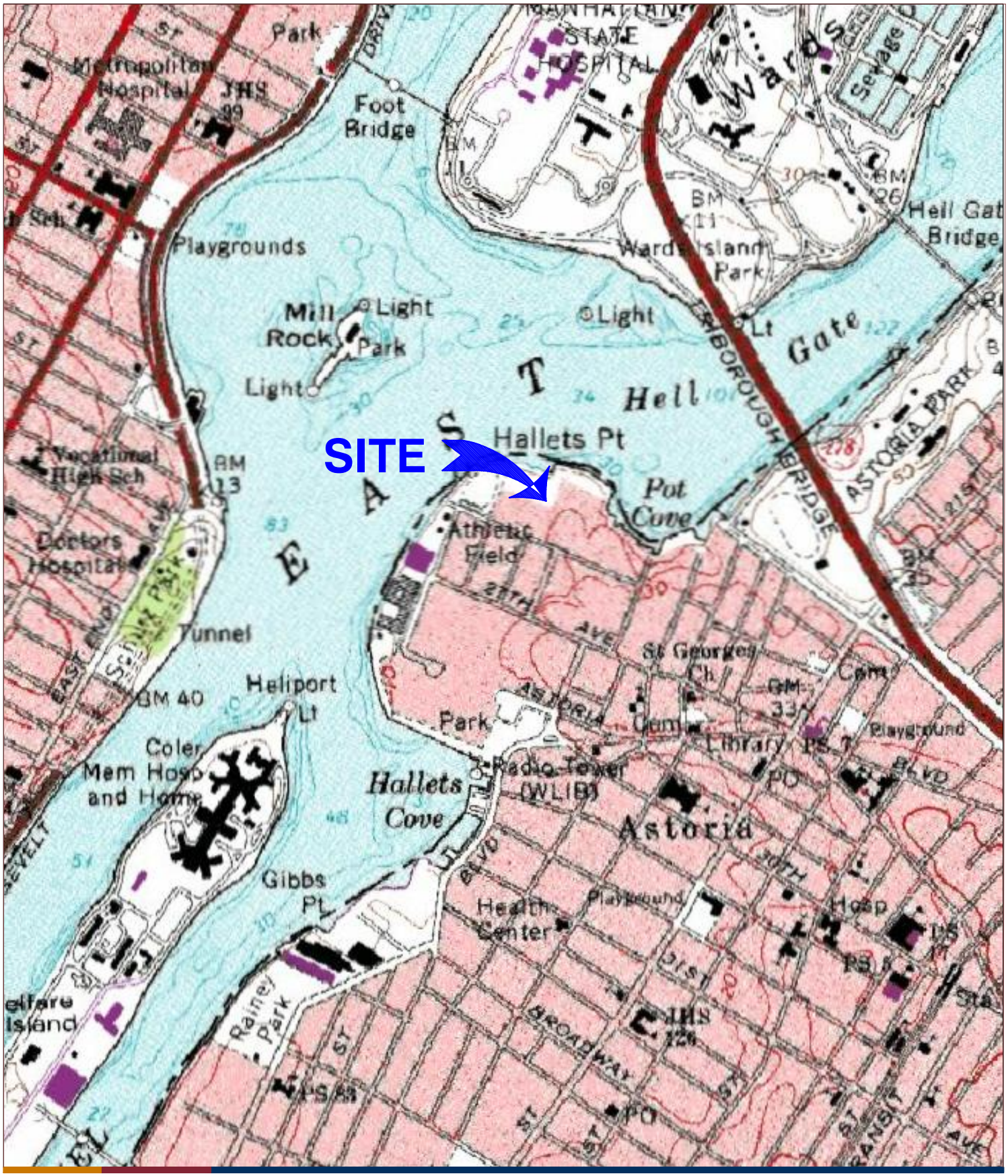
Health and Safety Officer _____ Date _____

Project Manager _____ Date _____

Reviewer _____ Date _____

Comments by reviewer _____
_____
_____

FIGURES



Stantec Consulting Services Inc.
61 Commercial Street – Suite 100
Rochester, NY
14614
PH: 585.475.1440
FAX:585.272.1814

NOTES

NO WARRANTY IS MADE BY STANTEC AS TO THE ACCURACY, RELIABILTY, OR COMPLETENESS OF THESE DATA. ORIGINAL DATA WERE COMPILED FROM VARIOUS SOURCES. THIS INFORMATION MAY NOT MEET NATIONAL MAP ACCURACY STANDARDS. THIS PRODUCT WAS DEVELOPED ELECTRONICALLY, AND MAY BE UPDATED WITHOUT NOTIFICATION. ANY REPRODUCTION MAY RESULT IN A LOSS OF SCALE AND OR INFORMATION.

USGS TOPOGRAPHIC QUADRANGLE
CENTRAL PARK, NY 1966

0 1000 2000

APPROXIMATE SCALE IN FEET

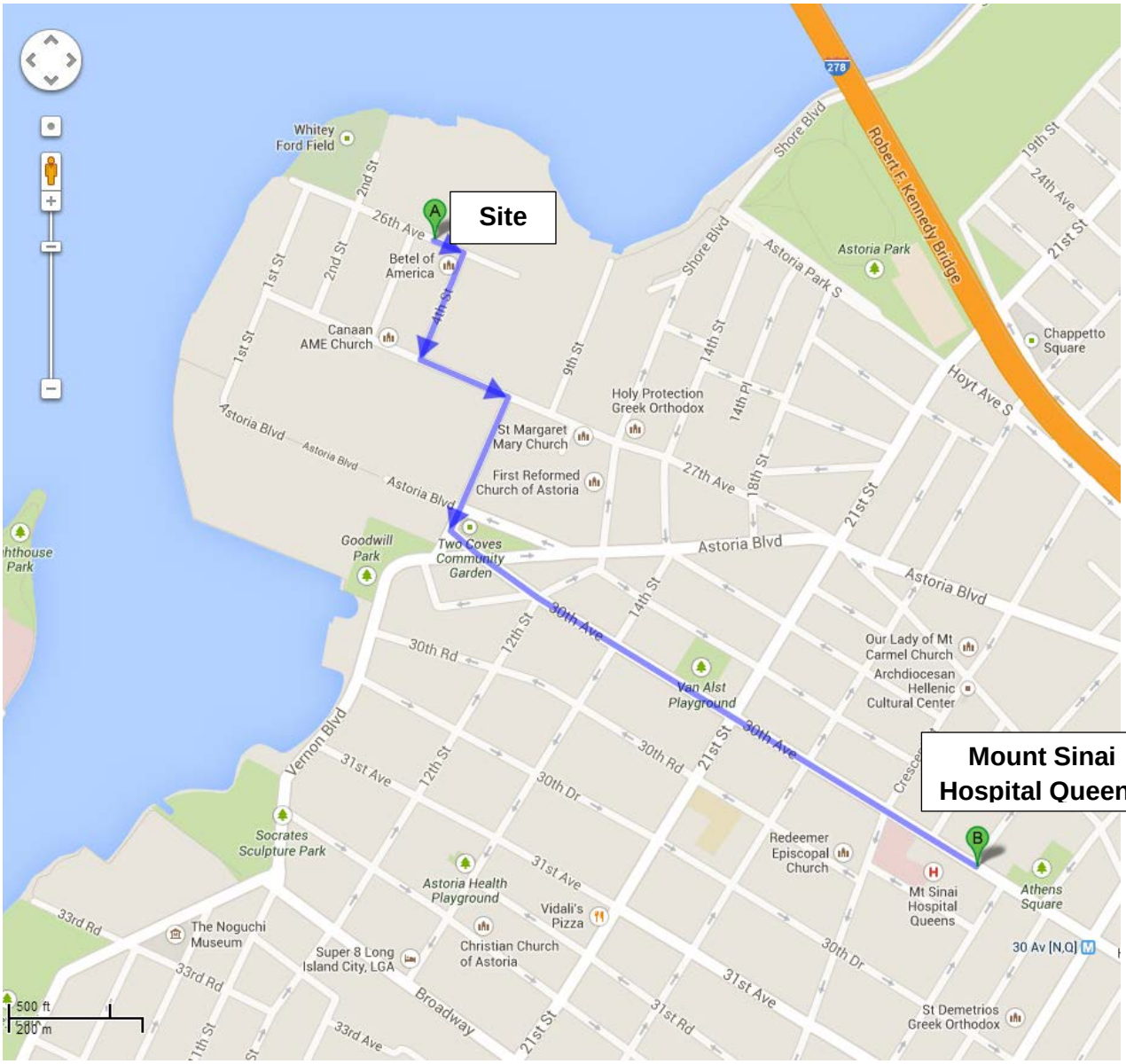
Client/Project
RIWP
3-15 26TH AVE.
ASTORIA, QUEENS, NY

Figure No. 1

Title SITE LOCATION MAP

Figure 2

Driving Directions from Site to Mount Sinai Hospital of Queens



A 3-15 26th Ave, Astoria, NY 11102

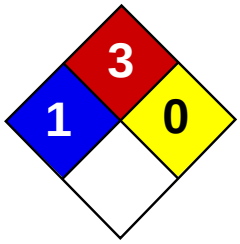
1.	Head **southeast** on **26th Ave** toward **4th St**	go 157 ft total 157 ft
2.	Take the 1st right onto **4th St**	go 0.1 mi total 0.1 mi
3.	Turn left onto **27th Ave**	go 469 ft total 0.2 mi
4.	Take the 1st right onto **8th St** About 54 secs	go 0.1 mi total 0.4 mi
5.	Turn left onto **30th Ave** Destination will be on the left About 2 mins	go 0.6 mi total 0.9 mi

B 25-10 30th Ave, Queens, NY 11102

HEALTH & SAFETY PLAN

APPENDIX A

MATERIAL SAFETY DATA SHEETS



Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Acetone MSDS

Section 1: Chemical Product and Company Identification

Product Name: Acetone

Catalog Codes: SLA3502, SLA1645, SLA3151, SLA3808

CAS#: 67-64-1

RTECS: AL3150000

TSCA: TSCA 8(b) inventory: Acetone

CI#: Not applicable.

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

Chemical Name: Acetone

Chemical Formula: C3-H6-O

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

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

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

Section 3: Hazards Identification

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

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

Section 4: First Aid Measures

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

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

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

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

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

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

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

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

Flammable Limits: LOWER: 2.6% UPPER: 12.8%

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

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

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

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

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

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

Section 6: Accidental Release Measures

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

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

Section 7: Handling and Storage

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

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

Section 8: Exposure Controls/Personal Protection

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

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

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

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

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Fruity. Mint-like. Fragrant. Ethereal

Taste: Pungent, Sweetish

Molecular Weight: 58.08 g/mole

Color: Colorless. Clear

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

Boiling Point: 56.2°C (133.2°F)

Melting Point: -95.35 (-139.6°F)

Critical Temperature: 235°C (455°F)

Specific Gravity: 0.79 (Water = 1)

Vapor Pressure: 24 kPa (@ 20°C)

Vapor Density: 2 (Air = 1)

Volatility: Not available.

Odor Threshold: 62 ppm

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

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

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

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

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

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

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

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

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

Special Remarks on Toxicity to Animals: Not available.

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

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

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

Section 12: Ecological Information

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

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Acetone UNNA: 1090 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

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

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

Other Classifications:

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

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

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 1

Flammability: 3

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

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

Other Special Considerations: Not available.

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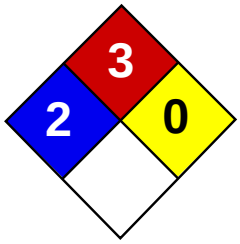
Last Updated: 05/21/2013 12:00 PM



Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Benzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Benzene

Catalog Codes: SLB1564, SLB3055, SLB2881

CAS#: 71-43-2

RTECS: CY1400000

TSCA: TSCA 8(b) inventory: Benzene

CI#: Not available.

Synonym: Benzol; Benzine

Chemical Name: Benzene

Chemical Formula: C6-H6

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Benzene	71-43-2	100

Toxicological Data on Ingredients: Benzene: ORAL (LD50): Acute: 930 mg/kg [Rat]. 4700 mg/kg [Mouse]. DERMAL (LD50): Acute: >9400 mg/kg [Rabbit]. VAPOR (LC50): Acute: 10000 ppm 7 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of eye contact (irritant), of inhalation. Hazardous in case of skin contact (irritant, permeator), of ingestion. Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. MUTAGENIC EFFECTS: Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female [POSSIBLE]. The substance is toxic to blood, bone marrow, central nervous system (CNS). The substance may be toxic to liver, Urinary System. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

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

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

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

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

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 497.78°C (928°F)

Flash Points: CLOSED CUP: -11.1°C (12°F). (Setaflash)

Flammable Limits: LOWER: 1.2% UPPER: 7.8%

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

Fire Hazards in Presence of Various Substances:
Highly flammable in presence of open flames and sparks, of heat. Slightly flammable to flammable in presence of oxidizing materials. Non-flammable in presence of shocks.

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

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

Special Remarks on Fire Hazards:
Extremely flammable liquid and vapor. Vapor may cause flash fire. Reacts on contact with iodine heptafluoride gas. Dioxygenyl tetrafluoroborate is as very powferful oxidant. The addition of a small particle to small samples of benzene, at ambient temperature, causes ignition. Contact with sodium peroxide with benzene causes ignition. Benzene ignites in contact with powdered chromic anhydride. Virgorous or incandescent reaction with hydrogen + Raney nickel (above 210 C) and bromine trifluoride.

Special Remarks on Explosion Hazards:
Benzene vapors + chlorine and light causes explosion. Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate. Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion. Interaction

of nitryl perchlorate with benzene gave a slight explosion and flash. The solution of permanganic acid (or its explosive anhydride, dimaganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene. Peroxodisulfuric acid is a very powferful oxidant. Uncontrolled contact with benzene may cause explosion. Mixtures of peroxomonsulfuric acid with benzene explodes.

Section 6: Accidental Release Measures

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

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

Section 7: Handling and Storage

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

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

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
TWA: 0.5 STEL: 2.5 (ppm) from ACGIH (TLV) [United States] TWA: 1.6 STEL: 8 (mg/m3) from ACGIH (TLV) [United States] TWA: 0.1 STEL: 1 from NIOSH TWA: 1 STEL: 5 (ppm) from OSHA (PEL) [United States] TWA: 10 (ppm) from OSHA (PEL) [United States] TWA: 3 (ppm) [United Kingdom (UK)] TWA: 1.6 (mg/m3) [United Kingdom (UK)] TWA: 1 (ppm) [Canada] TWA: 3.2 (mg/m3) [Canada] TWA: 0.5 (ppm) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor:
Aromatic. Gasoline-like, rather pleasant. (Strong.)

Taste: Not available.

Molecular Weight: 78.11 g/mole

Color: Clear Colorless. Colorless to light yellow.

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

Boiling Point: 80.1 (176.2°F)

Melting Point: 5.5°C (41.9°F)

Critical Temperature: 288.9°C (552°F)

Specific Gravity: 0.8787 @ 15 C (Water = 1)

Vapor Pressure: 10 kPa (@ 20°C)

Vapor Density: 2.8 (Air = 1)

Volatility: Not available.

Odor Threshold: 4.68 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 2.1

Ionicity (in Water): Not available.

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

Solubility:
Miscible in alcohol, chloroform, carbon disulfide oils, carbon tetrachloride, glacial acetic acid, diethyl ether, acetone. Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources, incompatibles.

Incompatibility with various substances: Highly reactive with oxidizing agents, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Benzene vapors + chlorine and light causes explosion. Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate. Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion. Interaction of nitryl perchlorate with benzene gave a slight explosion and flash. The solution of permanganic acid (or its explosive anhydride, dimaganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene. Peroxodisulfuric acid is a very powferful oxidant. Uncontrolled contact with benzene may cause explosion. Mixtures of peroxomonsulfuric acid with benzene explodes.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

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

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 930 mg/kg [Rat]. Acute dermal toxicity (LD50): >9400 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 10000 7 hours [Rat].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. MUTAGENIC EFFECTS: Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female [POSSIBLE]. Causes damage to the following organs: blood, bone marrow, central nervous system (CNS). May cause damage to the following organs: liver, Urinary System.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (female fertility, Embryotoxic and/or foetotoxic in animal) and birth defects. May affect genetic material (mutagenic). May cause cancer (tumorigenic, leukemia)) Human: passes the placental barrier, detected in maternal milk.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes skin irritation. It can be absorbed through intact skin and affect the liver, blood, metabolism,and urinary system. Eyes: Causes eye irritation. Inhalation: Causes respiratory tract and mucous membrane irritation. Can be absorbed through the lungs. May affect behavior/Central and Peripheral nervous systems (somnolence, muscle weakness, general anesthetic, and other symptoms similar to ingestion), gastrointestinal tract (nausea), blood metabolism, urinary system. Ingestion: May be harmful if swallowed. May cause gastrointestinal tract irritation including vomiting. May affect behavior/Central and Peripheral nervous systems (convulsions, seizures, tremor, irritability, initial CNS stimulation followed by depression, loss of coordination, dizziness, headache, weakness, pallor, flushing), respiration (breathlessness and chest constriction), cardiovascular system, (shallow/rapid pulse), and blood.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Benzene UNNA: 1114 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Benzene California prop. 65 (no significant risk level): Benzene: 0.007 mg/day (value) California prop. 65: This product contains the following ingredients

for which the State of California has found to cause cancer which would require a warning under the statute: Benzene Connecticut carcinogen reporting list.: Benzene Connecticut hazardous material survey.: Benzene Illinois toxic substances disclosure to employee act: Benzene Illinois chemical safety act: Benzene New York release reporting list: Benzene Rhode Island RTK hazardous substances: Benzene Pennsylvania RTK: Benzene Minnesota: Benzene Michigan critical material: Benzene Massachusetts RTK: Benzene Massachusetts spill list: Benzene New Jersey: Benzene New Jersey spill list: Benzene Louisiana spill reporting: Benzene California Director's list of Hazardous Substances: Benzene TSCA 8(b) inventory: Benzene SARA 313 toxic chemical notification and release reporting: Benzene CERCLA: Hazardous substances.: Benzene: 10 lbs. (4.536 kg)

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

Other Classifications:

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

DSCL (EEC):
R11- Highly flammable. R22- Harmful if swallowed. R38- Irritating to skin. R41- Risk of serious damage to eyes. R45- May cause cancer. R62- Possible risk of impaired fertility. S2- Keep out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S39- Wear eye/face protection. S46- If swallowed, seek medical advice immediately and show this container or label. S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:35 PM

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

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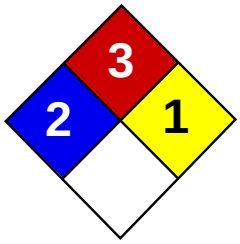

Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Cumene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Cumene

Catalog Codes: SLC3052

CAS#: 98-82-8

RTECS: GR8575000

TSCA: TSCA 8(b) inventory: Cumene

CI#: Not available.

Synonym: Isopropyl benzene; Cumol; 2-Phenyl propane; (1-Methylethyl)benzene

Chemical Name: Isopropylbenzene

Chemical Formula: C6H5CH(CH3)2

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Cumene	98-82-8	100

Toxicological Data on Ingredients: Cumene: ORAL (LD50): Acute: 1400 mg/kg [Rat]. 12750 mg/kg [Mouse]. DERMAL (LD50): Acute: 12300 mg/kg [Rabbit].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
Very hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, the nervous system, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

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

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

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

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

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 424°C (795.2°F)

Flash Points: CLOSED CUP: 36°C (96.8°F). OPEN CUP: 44°C (111.2°F).

Flammable Limits: LOWER: 0.9% UPPER: 6.5%

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

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks.

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

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

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

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

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

Section 7: Handling and Storage

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

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

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
TWA: 50 CEIL: 75 (ppm) TWA: 245 CEIL: 365 (mg/m3) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 120.2 g/mole

Color: Clear Colorless.

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

Boiling Point: 152.4°C (306.3°F)

Melting Point: -96°C (-140.8°F)

Critical Temperature: Not available.

Specific Gravity: 0.862 (Water = 1)

Vapor Pressure: 8 mm of Hg (@ 20°C)

Vapor Density: 4.14 (Air = 1)

Volatility: Not available.

Odor Threshold: 1.2 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 3.7

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 1400 mg/kg [Rat]. Acute dermal toxicity (LD50): 12300 mg/kg [Rabbit].

Chronic Effects on Humans: The substance is toxic to lungs, the nervous system, mucous membranes.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

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

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : Isopropylbenzene : UN1918 PG: III

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

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

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

Other Classifications:

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

DSCL (EEC):
R10- Flammable. R22- Harmful if swallowed. R38- Irritating to skin. R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 3

Reactivity: 1

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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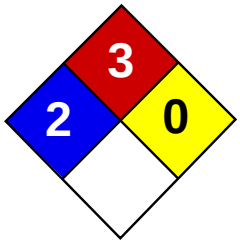

Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Ethylbenzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Ethylbenzene

Catalog Codes: SLE2044

CAS#: 100-41-4

RTECS: DA0700000

TSCA: TSCA 8(b) inventory: Ethylbenzene

CI#: Not available.

Synonym: Ethyl Benzene; Ethylbenzol; Phenylethane

Chemical Name: Ethylbenzene

Chemical Formula: C8H10

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Ethylbenzene	100-41-4	100

Toxicological Data on Ingredients: Ethylbenzene: ORAL (LD50): Acute: 3500 mg/kg [Rat].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (irritant, sensitizer). CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention.

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

Serious Skin Contact: Not available.

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

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 432°C (809.6°F)

Flash Points:
CLOSED CUP: 15°C (59°F). (Tagliabue.) OPEN CUP: 26.667°C (80°F) (Cleveland) (CHRIS, 2001) CLOSED CUP: 12.8 C (55 F) (Bingham et al, 2001; NIOSH, 2001) CLOSED CUP: 21 C (70 F) (NFPA)

Flammable Limits: LOWER: 0.8% - 1.6%UPPER: 6.7% - 7%

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

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

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

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

Special Remarks on Fire Hazards:
Vapor may travel considerable distance to source of ignition and flash back. Vapors may form explosive mixtures with air. When heated to decomposition it emits acrid smoke and irritating fumes.

Special Remarks on Explosion Hazards: Vapors may form explosive mixtures in air.

Section 6: Accidental Release Measures

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

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

Section 7: Handling and Storage

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

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Sensitive to light. Store in light-resistant containers.

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
TWA: 100 STEL: 125 (ppm) from OSHA (PEL) [United States] TWA: 435 STEL: 545 from OSHA (PEL) [United States] TWA: 435 STEL: 545 (mg/m3) from NIOSH [United States] TWA: 100 STEL: 125 (ppm) from NIOSH [United States] TWA: 100 STEL: 125 (ppm) from ACGIH (TLV) [United States] TWA: 100 STEL: 125 (ppm) [United Kingdom (UK)] TWA: 100 STEL: 125 (ppm) [Belgium] TWA: 100 STEL: 125 (ppm) [Finland] TWA: 50 (ppm) [Norway] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Sweetish. Gasoline-like. Aromatic.

Taste: Not available.

Molecular Weight: 106.16 g/mole

Color: Colorless.

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

Boiling Point: 136°C (276.8°F)

Melting Point: -94.9 (-138.8°F)

Critical Temperature: 617.15°C (1142.9°F)

Specific Gravity: 0.867 (Water = 1)

Vapor Pressure: 0.9 kPa (@ 20°C)

Vapor Density: 3.66 (Air = 1)

Volatility: 100% (v/v).

Odor Threshold: 140 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 3.1

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility:
Easily soluble in diethyl ether. Very slightly soluble in cold water or practically insoluble in water. Soluble in all proportions in Ethyl alcohol. Soluble in Carbon tetrachloride, Benzene. Insoluble in Ammonia. Slightly soluble in Chloroform. Solubility in Water: 169 mg/l @ 25 deg. C.; 0.014 g/100 ml @ 15 deg. C.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ingnition sources (flames, sparks, static), incompatible materials, light

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity:
Can react vigorously with oxidizing materials. Sensitive to light.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Inhalation.

Toxicity to Animals: Acute oral toxicity (LD50): 3500 mg/kg [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. May cause damage to the following organs: central nervous system (CNS).

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

Special Remarks on Toxicity to Animals:
Lethal Dose/Conc 50% Kill: LD50 [Rabbit] - Route: Skin; Dose: 17800 ul/kg Lowest Published Lethal Dose/Conc: LDL[Rat] - Route: Inhalation (vapor); Dose: 4000 ppm/4 H

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects and birth defects (teratogenic) based on animal test data. May cause cancer based on animals data. IARC evidence for carcinogenicity in animals is sufficient. IARC evidence of carcinogenicity in humans inadequate. May affect genetic material (mutagenic).

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Can cause mild skin irritation. It can be absorbed through intact skin. Eyes: Contact with vapor or liquid can cause severe eye irritation depending on concentration. It may also cause conjunctivitis. At a vapor exposure level of 85 - 200 ppm , it is mildly and transiently irritating to the eyes; 1000 ppm causes further irritation and tearing; 2000 ppm results in immediate and severe irritation and tearing; 5,000 ppm is intolerable (ACGIH, 1991; Clayton and Clayton, 1994). Standard draize test for eye irritation using 500 mg resulted in severe irritation (RTECS) Inhalation: Exposure to high concentrations can cause nasal, mucous membrane and respiratory tract irritation and can also result in chest constriction and, trouble breathing, respiratory failure, and even death. It can also affect behavior/Central Nervous System. The effective dose for CNS depression in experimental animals was 10,000 ppm (ACGIH, 1991). Symptoms of CNS depression include

headache, nausea, weakness, dizziness, vertigo, irritability, fatigue, lightheadedness, sleepiness, tremor, loss of coordination, judgement and conciousness, coma, and death. It can also cause pulmonary edema. Inhalation of 85 ppm can produce fatigue, insomnia, headache, and mild irritation of the respiratory tract (Haley & Berndt, 1987). Ingestion: Do not drink, pipet or siphon by mouth. May cause gastroinestinal/digestive tract irritation with Abdominal pain, nausea, vomiting. Ethylbenzene is a pulmonary aspiration hazard. Pulmonary aspiration of even small amounts of the liquid may cause fatal pneumonitis. It may also affect behavior/central nervous system with

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 14 mg/l 96 hours [Fish (Trout)] (static). 12.1 mg/l 96 hours [Fish (Fathead Minnow)] (flow-through)]. 150 mg/l 96 hours [Fish (Blue Gill/Sunfish)] (static). 275 mg/l 96 hours [Fish (Sheepshead Minnow)]. 42.3 mg/l 96 hours [Fish (Fathead Minnow)](soft water). 87.6mg/l 96 hours [Shrimp].

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Ethylbenzene UNNA: 1175 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Ethylbenzene Illinois toxic substances disclosure to employee act: Ethylbenzene Illinois chemical safety act: Ethylbenzene New York release reporting list: Ethylbenzene Rhode Island RTK hazardous substances: Ethylbenzene Pennsylvania RTK: Ethylbenzene Minnesota: Ethylbenzene Massachusetts RTK: Ethylbenzene Massachusetts spill list: Ethylbenzene New Jersey: Ethylbenzene New Jersey spill list: Ethylbenzene Louisiana spill reporting: Ethylbenzene California Director's List of Hazardous Substances: Ethylbenzene TSCA 8(b) inventory: Ethylbenzene TSCA 4(a) proposed test rules: Ethylbenzene TSCA 8(d) H and S data reporting: Ethylbenzene: Effective Date: 6/19/87; Sunset Date: 6/19/97 SARA 313 toxic chemical notification and release reporting: Ethylbenzene

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

Other Classifications:

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

DSCL (EEC):
R11- Highly flammable. R20- Harmful by inhalation. S16- Keep away from sources of ignition - No smoking. S24/25- Avoid contact with skin and eyes. S29- Do not empty into drains.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References:
-Manufacturer's Material Safety Data Sheet. -Fire Protection Guide to Hazardous Materials, 13th ed., National Fire Protection Association (NFPA) -Registry of Toxic Effects of Chemical Substances (RTECS) -Chemical Hazard Response Information System (CHRIS) -Hazardous Substance Data Bank (HSDB) -New Jersey Hazardous Substance Fact Sheet -Ariel Global View -Reprotext System

Other Special Considerations: Not available.

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Material Safety Data Sheet

Version 4.2
Revision Date 02/22/2013
Print Date 09/24/2013

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Propylbenzene
Product Number	:	P52407
Brand	:	Aldrich
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Combustible Liquid, Irritant

Target Organs

Lungs, Eyes, Kidney

GHS Classification
Flammable liquids (Category 3)
Specific target organ toxicity - single exposure (Category 3)
Aspiration hazard (Category 1)
Acute aquatic toxicity (Category 2)

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H226	Flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H335	May cause respiratory irritation.
H401	Toxic to aquatic life.

Precautionary statement(s)

P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P331	Do NOT induce vomiting.

HMIS Classification

Health hazard:	2
Flammability:	2
Physical hazards:	0

NFPA Rating

Health hazard: 2
Fire: 2
Reactivity Hazard: 0

Potential Health Effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.
Ingestion	May be harmful if swallowed. Aspiration hazard if swallowed - can enter lungs and cause damage.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 1-Phenylpropane

Formula : C_9H_{12}
Molecular Weight : 120.19 g/mol

Component		Concentration
Propylbenzene		
CAS-No.	103-65-1	-
EC-No.	203-132-9	
Index-No.	601-024-00-X	

4. 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
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIREFIGHTING MEASURES

Conditions of flammability
Flammable in the presence of a source of ignition when the temperature is above the flash point. Keep away from heat/sparks/open flame/hot surface. No smoking.

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

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

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.

Methods and materials for containment and cleaning up
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).

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) 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).

Hand 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: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 30 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, 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.

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

Skin and body protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid, clear
Colour	colourless

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: -99 °C (-146 °F) - lit.
Boiling point	159 °C (318 °F) - lit.
Flash point	42.0 °C (107.6 °F) - closed cup
Ignition temperature	450 °C (842 °F)
Auto-ignition temperature	450.0 °C (842.0 °F)
Lower explosion limit	0.8 %(V)
Upper explosion limit	6 %(V)
Vapour pressure	no data available
Density	0.862 g/cm3 at 25 °C (77 °F)
Water solubility	slightly soluble
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evapouration rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
Heat, flames and sparks.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
LD50 Oral - rat - 6,040 mg/kg

Remarks: Behavioral:Somnolence (general depressed activity).

Inhalation LC50
LC50 Inhalation - rat - 2 h - 65000 ppm

Dermal LD50
no data available

Other information on acute toxicity
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

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

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
May cause respiratory irritation.

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
May be fatal if swallowed and enters airways.

Potential health effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Ingestion	May be harmful if swallowed. Aspiration hazard if swallowed - can enter lungs and cause damage.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.

Signs and Symptoms of Exposure
Damage to the lungs., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information
RTECS: DA8750000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 1.55 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 2 mg/l - 24 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Toxic to aquatic life.

Avoid release to the environment.

13. DISPOSAL CONSIDERATIONS

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: 2364 Class: 3 Packing group: III
Proper shipping name: n-Propyl benzene
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 2364 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: n-PROPYLBENZENE
Marine pollutant: No

IATA
UN number: 2364 Class: 3 Packing group: III
Proper shipping name: n-Propylbenzene

15. REGULATORY INFORMATION

OSHA Hazards
Combustible Liquid, Irritant

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

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

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Propylbenzene	103-65-1	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Propylbenzene	103-65-1	2007-03-01

New Jersey Right To Know Components

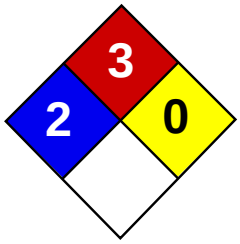
	CAS-No.	Revision Date
Propylbenzene	103-65-1	2007-03-01

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

Further information

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



Material Safety Data Sheet
Xylenes MSDS

Section 1: Chemical Product and Company Identification

Product Name: Xylenes

Catalog Codes: SLX1075, SLX1129, SLX1042, SLX1096

CAS#: 1330-20-7

RTECS: ZE2100000

TSCA: TSCA 8(b) inventory: Xylenes

CI#: Not available.

Synonym: Xylenes; Dimethylbenzene; xylol; methyltoluene

Chemical Name: Xylenes (o-, m-, p- isomers)

Chemical Formula: C6H4(CH3)2

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Xylenes	1330-20-7	100

Toxicological Data on Ingredients: Xylenes: ORAL (LD50): Acute: 4300 mg/kg [Rat]. 2119 mg/kg [Mouse]. DERMAL (LD50): Acute: >1700 mg/kg [Rabbit].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, liver, mucous membranes, bone marrow, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

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

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

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

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

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

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 464°C (867.2°F)

Flash Points: CLOSED CUP: 24°C (75.2°F). (Tagliabue.) OPEN CUP: 37.8°C (100°F).

Flammable Limits: LOWER: 1% UPPER: 7%

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

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

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

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

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

Special Remarks on Explosion Hazards:
Vapors may form explosive mixtures with air. Containers may explode when heated. May polymerize explosively when heated. An attempt to chlorinate xylene with 1,3-Dichloro-5,5-dimethyl-2,4-imidazolidindione (dichlorohydrantoin) caused a violent explosion

Section 6: Accidental Release Measures

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

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined

areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

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

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

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
TWA: 100 (ppm) [Canada] TWA: 435 (mg/m3) [Canada] TWA: 434 STEL: 651 (mg/m3) from ACGIH (TLV) [United States] TWA: 100 STEL: 150 (ppm) from ACGIH (TLV) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Sweetish.

Taste: Not available.

Molecular Weight: 106.17 g/mole

Color: Colorless. Clear

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

Boiling Point: 138.5°C (281.3°F)

Melting Point: -47.4°C (-53.3°F)

Critical Temperature: Not available.

Specific Gravity: 0.864 (Water = 1)

Vapor Pressure: 0.9 kPa (@ 20°C)

Vapor Density: 3.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 1 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 3.1

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Insoluble in cold water, hot water. Miscible with absolute alcohol, ether, and many other organic liquids.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources, incompatibles

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

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Store away from acetic acid, nitric acid, chlorine, bromine, and fluorine.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

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

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2119 mg/kg [Mouse]. Acute dermal toxicity (LD50): >1700 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 5000 4 hours [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, liver, mucous membranes, bone marrow, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals:
Lowest Lethal Dose: LDL [Human] - Route: Oral; Dose: 50 mg/kg LCL [Man] - Route: Oral; Dose: 10000 ppm/6H

Special Remarks on Chronic Effects on Humans:
Detected in maternal milk in human. Passes through the placental barrier in animal. Embryotoxic and/or foetotoxic in animal. May cause adverse reproductive effects (male and femael fertility (spontaneous abortion and fetotoxicity)) and birth defects based animal data.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes skin irritation. Can be absorbed through skin. Eyes: Causes eye irritation. Inhalation: Vapor causes respiratory tract and mucous membrane irritation. May affect central nervous system and behavior (General anesthetic/CNS depressant with effects including headache, weakness, memory loss, irritability, dizziness, giddiness, loss of coordination and judgement, respiratory depression/arrest or difficulty breathing, loss of appetite, nausea, vomiting, shivering, and possible coma and death). May also affects blood, sense organs, liver, and peripheral nerves. Ingestion: May cause gastrointestinal irritation including abdominal pain, vomiting, and nausea. May also affect liver and urinary system/ kidneys. May cause effects similar to those of acute inhalation. Chronic Potential Health Effects: Chronic inhalation may affect the urinary system (kidneys) blood (anemia), bone marrow (hyperplasia of bone marrow) brain/behavior/Central Nervous system. Chronic inhalation may alsocause mucosal bleeding. Chronic ingestion may affect the liver and metabolism (loss of appetite) and may affect urinary system (kidney damage)

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Xylenes UNNA: 1307 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Xylenes Illinois chemical safety act: Xylenes New York acutely hazardous substances: Xylenes Rhode Island RTK hazardous substances: Xylenes Pennsylvania RTK: Xylenes Minnesota: Xylenes Michigan critical material: Xylenes Massachusetts RTK: Xylenes Massachusetts spill list: Xylenes New Jersey: Xylenes New Jersey spill list: Xylenes Louisiana spill reporting: Xylenes California Director's List of Hazardous Substances: Xylenes TSCA 8(b) inventory: Xylenes SARA 302/304/311/312 hazardous chemicals: Xylenes SARA 313 toxic chemical notification and release reporting: Xylenes CERCLA: Hazardous substances.: Xylenes: 100 lbs. (45.36 kg)

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

Other Classifications:

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

DSCL (EEC):
R10- Flammable. R21- Harmful in contact with skin. R36/38- Irritating to eyes and skin. S2- Keep out of the reach of children. S36/37- Wear suitable protective clothing and gloves. S46- If swallowed, seek medical advice immediately and show this container or label.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/11/2005 12:54 PM

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

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Material Safety Data Sheet

Version 5.1
Revision Date 01/02/2013
Print Date 08/14/2013

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Benz[*a*]anthracene
Product Number	:	48563
Brand	:	Supelco
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Carcinogen

GHS Classification
Carcinogenicity (Category 1B)
Acute aquatic toxicity (Category 1)

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H350	May cause cancer.
H400	Very toxic to aquatic life.

Precautionary statement(s)

P201	Obtain special instructions before use.
P273	Avoid release to the environment.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.

HMIS Classification

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

NFPA Rating

Health hazard:	2
Fire:	0
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 1,2-Benzanthracene
Tetraphene

Formula : $C_{18}H_{12}$

Molecular Weight : 228.29 g/mol

Component		Concentration
Benz[a]anthracene		
CAS-No.	56-55-3	-
EC-No.	200-280-6	
Index-No.	601-033-00-9	

4. 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.

5. FIREFIGHTING MEASURES

Conditions of flammability
Not flammable or combustible.

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

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

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.

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.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

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).

Hand 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.

Eye 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 and body protection
Impervious clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid
Colour	no data available

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: 157 - 159 °C (315 - 318 °F)
Boiling point	437.6 °C (819.7 °F)
Flash point	no data available
Ignition temperature	no data available
Auto-ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	no data available
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available

Relative vapor density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
Inhalation LC50
no data available

Dermal LD50
no data available

Other information on acute toxicity
LD50 Intravenous - rat - > 200 mg/kg

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Benz[a]anthracene)
NTP:	Reasonably anticipated to be human carcinogens. (Benz[a]anthracene)
	Reasonably anticipated to be a human carcinogen (Benz[a]anthracene)

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

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information
RTECS: Not available

12. ECOLOGICAL INFORMATION

Toxicity

no data available

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

Very toxic to aquatic life.

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

13. DISPOSAL CONSIDERATIONS

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

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Benz[a]anthracene)
Marine Pollutant: Marine pollutant

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benz[a]anthracene)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

OSHA Hazards
Carcinogen

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

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	2007-03-01

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	2007-03-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Benz[a]anthracene	56-55-3	1990-01-01

16. OTHER INFORMATION

Further information

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

Material Safety Data Sheet

Version 5.0
Revision Date 10/11/2012
Print Date 08/14/2013

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Benzo[*a*]pyrene
Product Number	:	B1760
Brand	:	Sigma
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards

Carcinogen, Skin sensitiser, Teratogen, Reproductive hazard, Mutagen

Target Organs

Lungs, Skin

GHS Classification

Skin irritation (Category 3)
Respiratory sensitization (Category 1)
Germ cell mutagenicity (Category 1B)
Carcinogenicity (Category 1B)
Reproductive toxicity (Category 1B)
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 1)

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H316	Causes mild skin irritation.
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H340	May cause genetic defects.
H350	May cause cancer.
H360	May damage fertility or the unborn child.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P273	Avoid release to the environment.

P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P501	Dispose of contents/ container to an approved waste disposal plant.

HMIS Classification

Health hazard:	3
Chronic Health Hazard:	*
Flammability:	0
Physical hazards:	0

NFPA Rating

Health hazard:	3
Fire:	0
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 3,4-Benzpyrene
3,4-Benzopyrene
Benzo[def]chrysene

Formula : $C_{20}H_{12}$

Molecular Weight : 252.31 g/mol

Component		Concentration
Benzo[a]pyrene		
CAS-No.	50-32-8	-
EC-No.	200-028-5	
Index-No.	601-032-00-3	

4. 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.

5. FIREFIGHTING MEASURES

Conditions of flammability
Not flammable or combustible.

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

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

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.

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.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
Remarks	Cancer Substances for which there is a Biological Exposure Index or Indices (see BEI® section), see BEI® for Polycyclic Aromatic Hydrocarbons (PAHs) Exposure by all routes should be carefully controlled to levels as low as possible. Suspected human carcinogen			
Benzo[a]pyrene	50-32-8	TWA	0.2 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.2 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	0.2 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	0.2 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants

Personal protective equipment

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).

Hand 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.

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

Skin and 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.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid
Colour	no data available

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: 177 - 180 °C (351 - 356 °F) - lit.
Boiling point	495 °C (923 °F) - lit.
Flash point	no data available
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	1.35 g/cm3
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 5.97
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
no data available

Inhalation LC50
no data available

Dermal LD50
no data available

Other information on acute toxicity
LD50 Subcutaneous - rat - 50 mg/kg

Skin corrosion/irritation
Skin - mouse - Mild skin irritation

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
Chronic exposure may cause dermatitis.

May cause allergic skin reaction.

Germ cell mutagenicity
May alter genetic material.
In vivo tests showed mutagenic effects

Carcinogenicity

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC:	1 - Group 1: Carcinogenic to humans (Benzo[a]pyrene)
NTP:	Reasonably anticipated to be human carcinogens. (Benzo[a]pyrene)
	Reasonably anticipated to be a human carcinogen (Benzo[a]pyrene)

Reproductive toxicity

May cause reproductive disorders.

Teratogenicity

May cause congenital malformation in the fetus.

Presumed human reproductive toxicant

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting

Synergistic effects
no data available

Additional Information
RTECS: DJ3675000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 0.25 mg/l - 48 h
Toxicity to algae	EC50 - Pseudokirchneriella subcapitata (green algae) - 0.02 mg/l - 72 h

Persistence and degradability
no data available

Bioaccumulative potential

Bioaccumulation	Lepomis macrochirus (Bluegill) - 48 h Bioconcentration factor (BCF): 3,208

Mobility in soil
no data available

PBT and vPvB assessment
no data available

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

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

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Benzo[a]pyrene)
Reportable Quantity (RQ): 1 lbs
Marine pollutant:
Poison Inhalation Hazard: No

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Benzo[a]pyrene)
Marine pollutant: No

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benzo[a]pyrene)

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

OSHA Hazards
Carcinogen, Skin sensitiser, Teratogen, Reproductive hazard, Mutagen

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

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Benzo[a]pyrene	50-32-8	2007-03-01

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benzo[a]pyrene	50-32-8	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benzo[a]pyrene	50-32-8	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Benzo[a]pyrene	50-32-8	2007-03-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Benzo[a]pyrene	50-32-8	1990-01-01

16. OTHER INFORMATION

Further information

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

Material Safety Data Sheet

Version 5.1
Revision Date 07/03/2013
Print Date 08/14/2013

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Benzo[*b*]fluoranthene
Product Number	:	275336
Brand	:	Aldrich
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Carcinogen

GHS Classification
Carcinogenicity (Category 1B)
Acute aquatic toxicity (Category 1)

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H350	May cause cancer.
H400	Very toxic to aquatic life.

Precautionary statement(s)

P201	Obtain special instructions before use.
P273	Avoid release to the environment.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.

HMIS Classification

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	0
Physical hazards:	0

NFPA Rating

Health hazard:	2
Fire:	0
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 3,4-Benzofluoranthene
Benz[e]acephenanthrylene
2,3-Benzfluoranthene
3,4-Benz[e]acephenanthrylene
3,4-Benzfluoranthene
Benzo[b]fluoranthene
Benzo[e]fluoranthene
NSC 89265

Formula : C20H12
Molecular Weight : 252.31 g/mol

Component		Concentration
Benz[e]acephenanthrylene		
CAS-No.	205-99-2	<=100%
EC-No.	205-911-9	
Index-No.	601-034-00-4	

4. 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.

5. FIREFIGHTING MEASURES

Conditions of flammability
Not flammable or combustible.

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

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

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.

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.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

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).

Hand 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.

Eye 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 and body protection
impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid
Colour	no data available

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: 163 - 165 °C (325 - 329 °F) - lit.
Boiling point	no data available
Flash point	no data available
Ignition temperature	no data available
Auto-ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	no data available
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evapouration rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
TDLo Oral - mouse - 7.57 mg/kg
Remarks: Liver:Changes in liver weight. Endocrine:Changes in thymus weight.

Inhalation LC50
no data available

Dermal LD50
no data available

Other information on acute toxicity
no data available

Skin corrosion/irritation

no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitisation
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Benz[e]acephenanthrylene)
NTP:	Reasonably anticipated to be a human carcinogen (Benz[e]acephenanthrylene)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information

RTECS: Not available

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - > 1.024 mg/l - 24 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

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

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Benz[e]acephenanthrylene)
Marine pollutant: Marine pollutant

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benz[e]acephenanthrylene)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

OSHA Hazards
Carcinogen

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

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Benz[e]acephenanthrylene	205-99-2	2007-09-28

16. OTHER INFORMATION

Further information

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

Material Safety Data Sheet

Version 3.5
Revision Date 01/25/2013
Print Date 09/24/2013

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Benzo[*k*]fluoranthene
Product Number	:	392251
Brand	:	Aldrich
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Carcinogen, Irritant

GHS Classification
Skin irritation (Category 2)
Eye irritation (Category 2A)
Carcinogenicity (Category 1B)
Acute aquatic toxicity (Category 1)

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H315	Causes skin irritation.
H319	Causes serious eye irritation.
H350	May cause cancer.
H400	Very toxic to aquatic life.

Precautionary statement(s)

P201	Obtain special instructions before use.
P273	Avoid release to the environment.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.

HMIS Classification

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

NFPA Rating

Health hazard:	2
Fire:	0
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : $C_{20}H_{12}$

Molecular Weight : 252.31 g/mol

Component		Concentration
Benzo[k]fluoranthene		
CAS-No.	207-08-9	-
EC-No.	205-916-6	
Index-No.	601-036-00-5	

4. FIRST AID MEASURES

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

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

5. FIREFIGHTING MEASURES

Conditions of flammability
Not flammable or combustible.

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

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

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.

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.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

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).

Hand 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.

Eye 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 and body protection
Impervious clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	crystalline
Colour	no data available

Safety data

pH	no data available

Melting point/freezing point	Melting point/range: 215 - 217 °C (419 - 423 °F) - lit.
Boiling point	no data available
Flash point	no data available
Ignition temperature	no data available
Auto-ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	no data available
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapor density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
no data available

Inhalation LC50
Dermal LD50
no data available

Other information on acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

Carcinogenicity - rat - Implant
Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Lungs, Thorax, or Respiration:Tumors.
Tumorigenic:Tumors at site or application.

Carcinogenicity - mouse - Skin
Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Skin and Appendages: Other: Tumors.
Tumorigenic:Tumors at site or application.

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Benzo[k]fluoranthene)
	2B - Group 2B: Possibly carcinogenic to humans (Benzo[k]fluoranthene)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	Reasonably anticipated to be human carcinogens. (Benzo[k]fluoranthene)
	Reasonably anticipated to be a human carcinogen (Benzo[k]fluoranthene)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information
RTECS: DF6350000

12. ECOLOGICAL INFORMATION

Toxicity

no data available

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

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

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Benzo[k]fluoranthene)
Reportable Quantity (RQ): 5000 lbs
Marine Pollutant:
Poison Inhalation Hazard: No

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Benzo[k]fluoranthene)
Marine Pollutant: No

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benzo[k]fluoranthene)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

OSHA Hazards
Carcinogen, Irritant

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

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Benzo[k]fluoranthene	207-08-9	2007-03-01

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benzo[k]fluoranthene	207-08-9	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benzo[k]fluoranthene	207-08-9	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Benzo[k]fluoranthene	207-08-9	2007-03-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Benzo[k]fluoranthene	207-08-9	2007-09-28

16. OTHER INFORMATION

Further information

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

Material Safety Data Sheet

Version 5.5
Revision Date 06/24/2013
Print Date 08/14/2013

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Bis(2-ethylhexyl) phthalate
Product Number	:	67261
Brand	:	Fluka
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards

Carcinogen, Teratogen, Reproductive hazard

Target Organs

Liver, Gastrointestinal tract, Kidney

GHS Classification

Skin irritation (Category 3)
Eye irritation (Category 2B)
Reproductive toxicity (Category 1B)

GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)

H316	Causes mild skin irritation.
H320	Causes eye irritation.
H360	May damage fertility or the unborn child.

Precautionary statement(s)

P201	Obtain special instructions before use.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.

HMIS Classification

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	1
Physical hazards:	0

NFPA Rating

Health hazard: 0
Fire: 1
Reactivity Hazard: 0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : $C_{24}H_{38}O_4$
Molecular Weight : 390.56 g/mol

Component		Concentration
bis(2-Ethylhexyl) phthalate Included in the Candidate List of Substances of Very High Concern (SVHC) according to Regulation (EC) No. 1907/2006 (REACH)		
CAS-No.	117-81-7	90 100 %
EC-No.	204-211-0	
Index-No.	607-317-00-9	
Registration number	01-2119484611-38-XXXX	

4. FIRST AID MEASURES

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

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

5. FIREFIGHTING MEASURES

Conditions of flammability
Not flammable or combustible.

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

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

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.

Methods and materials for containment and cleaning up
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Moisture sensitive. Store under inert gas.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
bis(2-Ethylhexyl) phthalate	117-81-7	TWA	5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
Remarks	Lower Respiratory Tract irritation Confirmed animal carcinogen with unknown relevance to humans			
		TWA	5 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	10 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5 mg/m3	USA. NIOSH Recommended Exposure Limits
	Potential Occupational Carcinogen See Appendix A			
		ST	10 mg/m3	USA. NIOSH Recommended Exposure Limits
	Potential Occupational Carcinogen See Appendix A			

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) 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).

Hand 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: 0.2 mm
Break through time: 480 min
Material tested:Dermatril® P (KCL 743 / Aldrich Z677388, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 120 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.

Eye 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 and body protection
impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid
Colour	no data available

Safety data

pH	no data available
Melting point/freezing point	-50.0 °C (-58.0 °F)
Boiling point	384.0 °C (723.2 °F)
Flash point	207.0 °C (404.6 °F) - closed cup
Ignition temperature	390 °C (734 °F)
Auto-ignition temperature	390.0 °C (734.0 °F)
Lower explosion limit	0.3 %(V)
Vapour pressure	1.6 hPa (1.2 mmHg) at 93.0 °C (199.4 °F)
Density	0.98 g/cm3
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evapouration rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
LD50 Oral - rat - 30,000 mg/kg

Inhalation LC50
no data available

Dermal LD50
LD50 Dermal - rabbit - 25,000 mg/kg

Other information on acute toxicity
no data available

Skin corrosion/irritation
Skin - rabbit - Mild skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - rabbit - Mild eye irritation - 24 h

Respiratory or skin sensitisation
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (bis(2-Ethylhexyl) phthalate)
NTP:	Reasonably anticipated to be a human carcinogen (bis(2-Ethylhexyl) phthalate)
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

May cause reproductive disorders.

Teratogenicity

May cause congenital malformation in the fetus.

Presumed human reproductive toxicant

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
Lung irritation, Gastrointestinal disturbance

Synergistic effects
no data available

Additional Information
RTECS: TI0350000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - > 0.67 mg/l - 96 h
	LC50 - Oncorhynchus mykiss (rainbow trout) - > 0.32 mg/l - 96 h
	LC50 - Cyprinodon variegatus (sheepshead minnow) - > 0.17 mg/l - 96 h
	LC50 - Lepomis macrochirus (Bluegill) - > 0.20 mg/l - 96 h
	NOEC - other fish - > 0.3 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - > 0.16 mg/l - 48 h

Persistence and degradability
no data available

Biodegradability	Result: - Readily biodegradable. Method: OECD Test Guideline 301

Bioaccumulative potential

Bioaccumulation	Oncorhynchus mykiss (rainbow trout) - 100 d Bioconcentration factor (BCF): 113

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life with long lasting effects.

no data available

13. DISPOSAL CONSIDERATIONS

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: 3082 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, liquid, n.o.s. (bis(2-Ethylhexyl) phthalate)
Reportable Quantity (RQ): 100 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

OSHA Hazards
Carcinogen, Teratogen, Reproductive hazard

SARA 302 Components
SARA 302: 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
bis(2-Ethylhexyl) phthalate	117-81-7	2007-07-01

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
bis(2-Ethylhexyl) phthalate	117-81-7	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
bis(2-Ethylhexyl) phthalate	117-81-7	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
bis(2-Ethylhexyl) phthalate	117-81-7	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. bis(2-Ethylhexyl) phthalate	117-81-7	2009-02-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. bis(2-Ethylhexyl) phthalate	117-81-7	2009-02-01

16. OTHER INFORMATION

Further information

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

Material Safety Data Sheet

Version 5.1
Revision Date 01/02/2013
Print Date 08/14/2013

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Chrysene
Product Number	:	48565-U
Brand	:	Supelco
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Carcinogen, Mutagen

GHS Classification
Germ cell mutagenicity (Category 2)
Carcinogenicity (Category 1B)
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 1)

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H341	Suspected of causing genetic defects.
H350	May cause cancer.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P273	Avoid release to the environment.
P281	Use personal protective equipment as required.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P501	Dispose of contents/ container to an approved waste disposal plant.

HMIS Classification

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

NFPA Rating

Health hazard: 0
Fire: 0
Reactivity Hazard: 0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : $C_{18}H_{12}$ $C_{18}H_{12}$
Molecular Weight : 228.29 g/mol

Component		Concentration
Chrysene		
CAS-No.	218-01-9	-
EC-No.	205-923-4	
Index-No.	601-048-00-0	

4. 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.

5. FIREFIGHTING MEASURES

Conditions of flammability
Not flammable or combustible.

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

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

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.

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.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
Remarks	Cancer Substances for which there is a Biological Exposure Index or Indices (see BEI® section), see BEI® for Polycyclic Aromatic Hydrocarbons (PAHs) Exposure by all routes should be carefully controlled to levels as low as possible. Confirmed animal carcinogen with unknown relevance to humans			
Chrysene	218-01-9	TWA	0.2 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.2 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	0.2 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	0.2 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants

Personal protective equipment

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).

Hand 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 protection
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 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.

Eye 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 and body protection

Impervious clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid
Colour	no data available

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: 252 - 254 °C (486 - 489 °F) - lit.
Boiling point	448 °C (838 °F) - lit.
Flash point	no data available
Ignition temperature	no data available
Auto-ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	no data available
Water solubility	insoluble
Partition coefficient: n-octanol/water	log Pow: 5.73
Relative vapor density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
no data available

Inhalation LC50
no data available

Dermal LD50
no data available

Other information on acute toxicity
LD50 Intraperitoneal - mouse - > 320 mg/kg

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
Laboratory experiments have shown mutagenic effects.
In vitro tests showed mutagenic effects

Carcinogenicity

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Chrysene)
NTP:	Known to be human carcinogen (Chrysene)
	Reasonably anticipated to be a human carcinogen (Chrysene)
NTP:	Known to be human carcinogen (Chrysene)
	Reasonably anticipated to be a human carcinogen (Chrysene)

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information
RTECS: Not available

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 1.90 mg/l - 2 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life with long lasting effects.

no data available

13. DISPOSAL CONSIDERATIONS

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

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Chrysene)
Marine Pollutant: Marine pollutant

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

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

OSHA Hazards
Carcinogen, Mutagen

SARA 302 Components
SARA 302: 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
Chrysene	218-01-9	2007-03-01

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Chrysene	218-01-9	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Chrysene	218-01-9	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Chrysene	218-01-9	2007-03-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Chrysene	218-01-9	2007-09-28

16. OTHER INFORMATION

Further information

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

Material Safety Data Sheet

Version 5.3
Revision Date 01/02/2013
Print Date 08/14/2013

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Dibenz[*a*,*h*]anthracene
Product Number	:	91861
Brand	:	Fluka
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Carcinogen

Target Organs

Liver, Lungs

GHS Classification
Carcinogenicity (Category 1B)
Acute aquatic toxicity (Category 1)

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H350	May cause cancer.
H400	Very toxic to aquatic life.

Precautionary statement(s)

P201	Obtain special instructions before use.
P273	Avoid release to the environment.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.

HMIS Classification

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

NFPA Rating

Health hazard:	0
Fire:	0

Reactivity Hazard: 0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : $C_{22}H_{14}$
Molecular Weight : 278.35 g/mol

Component		Concentration
Dibenz[a,h]anthracene		
CAS-No.	53-70-3	-
EC-No.	200-181-8	
Index-No.	601-041-00-2	

4. 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.

5. FIREFIGHTING MEASURES

Conditions of flammability
Not flammable or combustible.

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

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

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.

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.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

Moisture sensitive.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

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).

Hand 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 protection
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 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.

Eye 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 and body protection
Impervious clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid
Colour	no data available

Safety data

pH	no data available
Melting	Melting point/range: 262 - 265 °C (504 - 509 °F) - lit.

point/freezing point	
Boiling point	524 °C (975 °F) - lit.
Flash point	no data available
Ignition temperature	no data available
Auto-ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	no data available
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapor density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
no data available

Inhalation LC50
no data available

Dermal LD50
no data available

Other information on acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization

no data available

Germ cell mutagenicity
Laboratory experiments have shown mutagenic effects.

Carcinogenicity

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC:	2A - Group 2A: Probably carcinogenic to humans (Dibenz[a,h]anthracene)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	Reasonably anticipated to be human carcinogens. (Dibenz[a,h]anthracene)
	Reasonably anticipated to be a human carcinogen (Dibenz[a,h]anthracene)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information
RTECS: HN2625000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 0.496 mg/l - 24 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

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

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Dibenz[a,h]anthracene)
Reportable Quantity (RQ): 1 lbs
Marine Pollutant:
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. (Dibenz[a,h]anthracene)
Marine Pollutant: No

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Dibenz[a,h]anthracene)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

OSHA Hazards
Carcinogen

SARA 302 Components
SARA 302: 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
Dibenz[a,h]anthracene	53-70-3	2007-03-01

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Dibenz[a,h]anthracene	53-70-3	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Dibenz[a,h]anthracene	53-70-3	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Dibenz[a,h]anthracene	53-70-3	2007-03-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Dibenz[a,h]anthracene	53-70-3	1990-01-01

16. OTHER INFORMATION

Further information

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

Material Safety Data Sheet

Version 5.1
Revision Date 10/09/2012
Print Date 08/14/2013

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Fluoranthene
Product Number	:	423947
Brand	:	Aldrich
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Harmful by ingestion., Carcinogen

GHS Classification
Acute toxicity, Oral (Category 4)
Acute toxicity, Dermal (Category 5)
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 1)

GHS Label elements, including precautionary statements

Pictogram

Signal word: Warning

Hazard statement(s)

H302	Harmful if swallowed.
H313	May be harmful in contact with skin.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P273	Avoid release to the environment.
P501	Dispose of contents/ container to an approved waste disposal plant.

HMIS Classification

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	1
Physical hazards:	0

NFPA Rating

Health hazard:	1
Fire:	1
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	Harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	Harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : Benzo[j,k]fluorene

Formula : $C_{16}H_{10}$

Molecular Weight : 202.25 g/mol

Component		Concentration
Fluoranthene		
CAS-No. EC-No.	206-44-0 205-912-4	-

4. 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.

5. FIREFIGHTING MEASURES

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

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Avoid breathing dust.

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.

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.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator.For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand 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.

Immersion protection
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: > 480 min
Material tested:Dermatril® (Aldrich Z677272, Size M)

Splash protection
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: > 30 min
Material tested:Dermatril® (Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 873000, 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 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.

Eye 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 and 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.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid
Colour	no data available

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: 105 - 110 °C (221 - 230 °F) - lit.
Boiling point	384 °C (723 °F) - lit.
Flash point	198.0 °C (388.4 °F) - closed cup

Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	no data available
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
LD50 Oral - rat - 2,000 mg/kg

Inhalation LC50
no data available

Dermal LD50
LD50 Dermal - rabbit - 3,180 mg/kg

Other information on acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
Laboratory experiments have shown mutagenic effects.

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:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (Fluoranthene)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	Reasonably anticipated to be human carcinogens. (Fluoranthene)
	Reasonably anticipated to be a human carcinogen (Fluoranthene)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	Harmful if swallowed.
Skin	Harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information
RTECS: LL4025000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.0077 mg/l - 96 h
	NOEC - Cyprinodon variegatus (sheepshead minnow) - 560 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - > 0.005 - < 0.01 mg/l - 3 d

Immobilization EC50 - Daphnia magna (Water flea) - 0.78 mg/l - 20 h

NOEC - Daphnia magna (Water flea) - 0.085 mg/l - 48 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life with long lasting effects.

no data available

13. DISPOSAL CONSIDERATIONS

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

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Fluoranthene)
Reportable Quantity (RQ): 100 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

OSHA Hazards
Harmful by ingestion., Carcinogen

SARA 302 Components
SARA 302: 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
Fluoranthene	206-44-0	2007-03-01

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Fluoranthene	206-44-0	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Fluoranthene	206-44-0	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Fluoranthene	206-44-0	2007-03-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Fluoranthene	206-44-0	1990-01-01

16. OTHER INFORMATION

Further information

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

Material Safety Data Sheet

Version 5.1
Revision Date 01/02/2013
Print Date 08/14/2013

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Indeno[1,2,3-*cd*]pyrene
Product Number	:	48499
Brand	:	Supelco
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Carcinogen

GHS Classification
Carcinogenicity (Category 2)

GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)
H351 Suspected of causing cancer.

Precautionary statement(s)
P281 Use personal protective equipment as required.

HMIS Classification

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

NFPA Rating

Health hazard:	1
Fire:	0
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : $C_{22}H_{12}$
Molecular Weight : 276.33 g/mol

Component		Concentration
Indeno[1,2,3-cd]pyrene		
CAS-No.	193-39-5	-
EC-No.	205-893-2	

4. 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.

5. FIREFIGHTING MEASURES

Conditions of flammability
Not flammable or combustible.

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

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

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.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

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).

Hand 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.

Eye 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 and body protection
Impervious clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid
Colour	no data available

Safety data

pH	no data available
Melting point/freezing point	163.6 °C (326.5 °F)
Boiling point	536.0 °C (996.8 °F)
Flash point	no data available
Ignition temperature	no data available
Auto-ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	no data available
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapor density	no data available
Odour	no data available
Odour Threshold	no data available

Evaporation rate no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
no data available

Inhalation LC50
no data available

Dermal LD50
no data available

Other information on acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Indeno[1,2,3-cd]pyrene)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	Reasonably anticipated to be human carcinogens. (Indeno[1,2,3-cd]pyrene)
	Reasonably anticipated to be a human carcinogen (Indeno[1,2,3-cd]pyrene)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a

carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information
RTECS: Not available

12. ECOLOGICAL INFORMATION

Toxicity

no data available

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

no data available

13. DISPOSAL CONSIDERATIONS

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

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

OSHA Hazards
Carcinogen

SARA 302 Components
SARA 302: 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
Indeno[1,2,3-cd]pyrene	193-39-5	2007-03-01

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	2007-03-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Indeno[1,2,3-cd]pyrene	193-39-5	2007-09-28

16. OTHER INFORMATION

Further information

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

Material Safety Data Sheet

Version 5.0
Revision Date 11/13/2012
Print Date 09/24/2013

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	2-Methylnaphthalene (β)
Product Number	:	M57006
Brand	:	Aldrich
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Harmful by ingestion., Irritant

GHS Classification
Acute toxicity, Oral (Category 4)
Skin irritation (Category 2)
Eye irritation (Category 2A)
Specific target organ toxicity - single exposure (Category 3)
Acute aquatic toxicity (Category 2)
Chronic aquatic toxicity (Category 2)

GHS Label elements, including precautionary statements

Pictogram

Signal word: Warning

Hazard statement(s)

H302	Harmful if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H411	Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P273	Avoid release to the environment.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

HMIS Classification

Health hazard:	2
Flammability:	1

Physical hazards: 0

NFPA Rating

Health hazard: 2
Fire: 1
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.
Skin Harmful if absorbed through skin. May cause skin irritation.
Eyes May cause eye irritation.
Ingestion Harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : $C_{11}H_{10}$
Molecular Weight : 142.2 g/mol

Component		Concentration
2-Methylnaphthalene		
CAS-No.	91-57-6	-
EC-No.	202-078-3	

4. FIRST AID MEASURES

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

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

5. FIREFIGHTING MEASURES

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

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

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.

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.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator.For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand 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® (Aldrich Z677272, Size M)

Splash protection
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: > 30 min
Material tested:Dermatril® (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 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.

Eye 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 and 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.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid
Colour	no data available

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: 34 - 36 °C (93 - 97 °F) - lit.
Boiling point	241 - 242 °C (466 - 468 °F) - lit.

Flash point	98.0 °C (208.4 °F) - closed cup
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	1 g/mL at 25 °C (77 °F)
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 3.80
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
LD50 Oral - rat - 1,630 mg/kg

Inhalation LC50
no data available

Dermal LD50
no data available

Other information on acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

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

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
Inhalation - May cause respiratory irritation.

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	Harmful if swallowed.
Skin	Harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information
RTECS: QJ9635000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 2.5 mg/l
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 1.5 mg/l - 48 h

Persistence and degradability

Bioaccumulative potential

Bioaccumulation	Oncorhynchus mykiss (rainbow trout) - 28 d Bioconcentration factor (BCF): 23,500

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

Product
Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (2-Methylnaphthalene)
Marine pollutant: Marine pollutant

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (2-Methylnaphthalene)

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

OSHA Hazards
Harmful by ingestion., Irritant

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

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

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2-Methylnaphthalene	91-57-6	2010-08-02

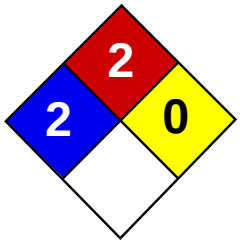
New Jersey Right To Know Components

	CAS-No.	Revision Date
2-Methylnaphthalene	91-57-6	2010-08-02

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

Further information



Material Safety Data Sheet
Naphthalene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Naphthalene

Catalog Codes: SLN1789, SLN2401

CAS#: 91-20-3

RTECS: QJ0525000

TSCA: TSCA 8(b) inventory: Naphthalene

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: C10H8

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Naphthalene	91-20-3	100

Toxicological Data on Ingredients: Naphthalene: ORAL (LD50): Acute: 490 mg/kg [Rat]. 533 mg/kg [Mouse]. 1200 mg/kg [Guinea pig]. DERMAL (LD50): Acute: 20001 mg/kg [Rabbit]. VAPOR (LC50): Acute: 170 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion. Hazardous in case of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (irritant, permeator). Severe over-exposure can result in death.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE]. The substance is toxic to blood, kidneys, the nervous system, the reproductive system, liver, mucous membranes, gastrointestinal tract, upper respiratory tract, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

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

Serious Skin Contact: Not available.

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

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 567°C (1052.6°F)

Flash Points: CLOSED CUP: 88°C (190.4°F). OPEN CUP: 79°C (174.2°F).

Flammable Limits: LOWER: 0.9% UPPER: 5.9%

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

Fire Hazards in Presence of Various Substances: Not available.

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

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

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

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

Large Spill:
Flammable solid. Stop leak if without risk. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

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

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

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
Israel: TWA: 10 (ppm) TWA: 10 STEL: 15 (ppm) from ACGIH (TLV) [1995] TWA: 52 STEL: 79 (mg/m3) from ACGIH [1995] Australia: STEL: 15 (ppm) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

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

Odor: Aromatic.

Taste: Not available.

Molecular Weight: 128.19 g/mole

Color: White.

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

Boiling Point: 218°C (424.4°F)

Melting Point: 80.2°C (176.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.162 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: 4.4 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.038 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties:
Partially dispersed in hot water, methanol, n-octanol. Very slightly dispersed in cold water. See solubility in methanol, n-octanol.

Solubility:
Partially soluble in methanol, n-octanol. Very slightly soluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Highly reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: May attack some forms of rubber and plastic

Polymerization: No.

Section 11: Toxicological Information

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

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 490 mg/kg [Rat]. Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 170 ppm 4 hour(s) [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE]. The substance is toxic to blood, kidneys, the nervous system, the reproductive system, liver, mucous membranes, gastrointestinal tract, upper respiratory tract, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

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

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 305.2 ppm 96 hour(s) [Trout].

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 4.1: Flammable solid.

Identification: : Naphthalene, refined : UN1334 PG: III

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Rhode Island RTK hazardous substances: Naphthalene Pennsylvania RTK: Naphthalene Florida: Naphthalene Minnesota: Naphthalene Massachusetts RTK: Naphthalene TSCA 8(b) inventory: Naphthalene TSCA 8(a) PAIR: Naphthalene TSCA 8(d) H and S data reporting: Naphthalene: 06/01/87 SARA 313 toxic chemical notification and release reporting: Naphthalene: 1% CERCLA: Hazardous substances.: Naphthalene: 100 lbs. (45.36 kg)

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

Other Classifications:

WHMIS (Canada):
CLASS B-4: Flammable solid. CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R36- Irritating to eyes. R40- Possible risks of irreversible effects. R48/22- Harmful: danger of serious damage to health by prolonged exposure if swallowed. R48/23- Toxic: danger of serious damage to health by prolonged exposure through inhalation. R63- Possible risk of harm to the unborn child.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 2

Reactivity: 0

Personal Protection: E

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

Health: 2

Flammability: 2

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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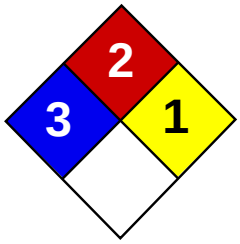
Last Updated: 05/21/2013 12:00 PM



Material Safety Data Sheet
Nitrobenzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Nitrobenzene

Catalog Codes: SLN1582

CAS#: 98-95-3

RTECS: DA6475000

TSCA: TSCA 8(b) inventory: Nitrobenzene

CI#: Not available.

Synonym:

Chemical Formula: C6H5NO2

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Nitrobenzene	98-95-3	100

Toxicological Data on Ingredients: Nitrobenzene: ORAL (LD50): Acute: 780 mg/kg [Rat]. 590 mg/kg [Mouse].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
Extremely hazardous in case of ingestion. Very hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation. Hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to blood, kidneys, lungs, liver, mucous membranes.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

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

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

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

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

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Combustible.

Auto-Ignition Temperature: 482°C (899.6°F)

Flash Points: CLOSED CUP: 87.78°C (190°F).

Flammable Limits: LOWER: 1.8%

Products of Combustion: These products are carbon oxides (CO, CO2), nitrogen oxides (NO, NO2...).

Fire Hazards in Presence of Various Substances: Not available.

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

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

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

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

Large Spill:
Combustible material. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

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

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
TWA: 1 CEIL: 2 (ppm) SKIN TWA: 5 CEIL: 10 (mg/m3) SKINConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Oily liquid.)

Odor: Strong.

Taste: Not available.

Molecular Weight: 123.11 g/mole

Color: Colorless. to Yellow or brown.

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

Boiling Point: 210.8°C (411.4°F)

Melting Point: 5.7°C (42.3°F)

Critical Temperature: Not available.

Specific Gravity: 1.2 (Water = 1)

Vapor Pressure: 0.15 mm of Hg (@ 20°C)

Vapor Density: 4.25 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.37 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

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

Solubility:
Soluble in methanol, diethyl ether, acetone. Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 590 mg/kg [Mouse].

Chronic Effects on Humans: The substance is toxic to blood, kidneys, lungs, liver, mucous membranes.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

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

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Nitrobenzene : UN1662 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Nitrobenzene Massachusetts RTK: Nitrobenzene TSCA 8(b) inventory: Nitrobenzene SARA 302/304/311/312 extremely hazardous substances: Nitrobenzene SARA 313 toxic chemical notification and release reporting: Nitrobenzene CERCLA: Hazardous substances.: Nitrobenzene

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

Other Classifications:

WHMIS (Canada):
CLASS B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F). CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).

DSCL (EEC):
R38- Irritating to skin. R41- Risk of serious damage to eyes. R48/22- Harmful: danger of serious damage to health by prolonged exposure if swallowed.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 2

Reactivity: 0

Personal Protection: h

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

Health: 3

Flammability: 2

Reactivity: 1

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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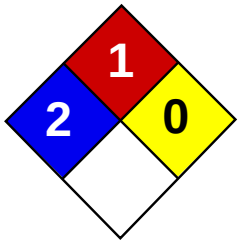

Material Safety Data Sheet
Pyrene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Pyrene

Catalog Codes: SLP3868

CAS#: 129-00-00

RTECS: UR2450000

TSCA: TSCA 8(b) inventory: Pyrene

CI#: Not available.

Synonym: Benzo(D,E,F)phenanthrene

Chemical Name: Pyrene

Chemical Formula: C16-H10

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Pyrene	129-00-00	100

Toxicological Data on Ingredients: Pyrene: ORAL (LD50): Acute: 2700 mg/kg [Rat]. 800 mg/kg [Mouse].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

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

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

Serious Skin Contact: Not available.

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

Serious Inhalation: Not available.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

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

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

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

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of heat, of combustible materials. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of heat. Non-explosive in presence of open flames and sparks.

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

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested,

seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 24°C (75.2°F). Preferably refrigerate.

Section 8: Exposure Controls/Personal Protection

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

Personal Protection: Safety glasses. Synthetic apron. Gloves (impervious).

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

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystalline solid. Powdered solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 202.26 g/mole

Color: Yellow.

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

Boiling Point: 404°C (759.2°F)

Melting Point: 151.2°C (304.2°F)

Critical Temperature: Not available.

Specific Gravity: 1.271 @ 23 C (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 4.9

Ionicity (in Water): Not available.

Dispersion Properties:
Is not dispersed in cold water, hot water. See solubility in diethyl ether.

Solubility:
Soluble in diethyl ether. Insoluble in cold water, hot water. Pyrene is fairly soluble in organic solvents. It is soluble in alcohol, benzene, carbon disulfide, ether, petroleum ether, and toluene

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not available.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 800 mg/kg [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May affect genetic material (mutagenic). May cause cancer (tumorigenic) according to animal data.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause skin irritation. May be absorbed through skin. Eyes: May cause eye irritation. Conjunctival irritation may be noted. Inhalation: May cause respiratory tract irritaiton. Ingestion: May cause gastrointestinal tract irritation. May affect behavior/Central Nervous System (excitation and muscel spasicity), liver and urinary system, and immune system, and blood.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 1.8 mg/l 48 hours [Water flea].

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut carcinogen reporting list.: Pyrene Illinois chemical safety act: Pyrene New York release reporting list: Pyrene Pennsylvania RTK: Pyrene Massachusetts RTK: Pyrene Massachusetts spill list: Pyrene New Jersey: Pyrene New Jersey spill list: Pyrene Louisiana RTK reporting list: Pyrene Louisiana spill reporting: Pyrene California Director's list of Hazardous Substances: Pyrene TSCA 8(b) inventory: Pyrene TSCA 8(a) CAIR: Pyrene TSCA 8(d) H and S data reporting: Pyrene: June 1, 1987-June1, 1997 SARA 302/304/311/312 extremely hazardous substances: Pyrene CERCLA: Hazardous substances.: Pyrene: 5000 lbs. (2268 kg)

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):
R20/21/22- Harmful by inhalation, in contact with skin and if swallowed. S2- Keep out of the reach of children. S36/37- Wear suitable protective clothing and gloves. S46- If swallowed, seek medical advice immediately and show this container or label.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: C

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

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves (impervious). Synthetic apron. Not applicable. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 06:14 PM

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

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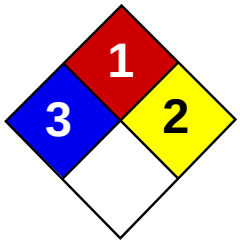

Material Safety Data Sheet
Arsenic MSDS

Section 1: Chemical Product and Company Identification

Product Name: Arsenic

Catalog Codes: SLA1006

CAS#: 7440-38-2

RTECS: CG0525000

TSCA: TSCA 8(b) inventory: Arsenic

CI#: Not applicable.

Synonym:

Chemical Name: Arsenic

Chemical Formula: As

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

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

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

Section 3: Hazards Identification

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

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

Section 4: First Aid Measures

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

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

Serious Skin Contact: Not available.

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

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

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

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

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

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

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

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

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

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

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

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

Section 7: Handling and Storage

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

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

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

Section 8: Exposure Controls/Personal Protection

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

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

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

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

Section 9: Physical and Chemical Properties

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

Odor: Not available.

Taste: Not available.

Molecular Weight: 74.92 g/mole

Color: Silvery.

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

Boiling Point: Not available.

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

Critical Temperature: Not available.

Specific Gravity: 5.72 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

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

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

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

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

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

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

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Arsenic UNNA: UN1558 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

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

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

Other Classifications:

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

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

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 2

Personal Protection: E

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

Health: 3

Flammability: 1

Reactivity: 2

Specific hazard:

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

Section 16: Other Information

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

Other Special Considerations: Not available.

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

Barium Metal

MSDS # 84.00

Section 1: Product and Company Identification

Barium Metal

Synonyms/General Names: Barium
Product Use: For educational use only
Manufacturer: Columbus Chemical Industries, Inc., Columbus, WI 53925.

24 Hour Emergency Information Telephone Numbers

CHEMTREC (USA): 800-424-9300 **CANUTEC (Canada): 613-424-6666**

ScholAR Chemistry; 5100 W. Henrietta Rd, Rochester, NY 14586; (866) 260-0501; www.Scholarchemistry.com

Section 2: Hazards Identification

Soft, silvery, lustrous metal immersed in heavy mineral oil; no odor.

HMIS (0 to 4)

Health	**3**
Fire Hazard	**3**
Reactivity	**2**

WARNING! Flammable solid, dangerous when wet, highly toxic by ingestion.
Flammable solid, keep away from all ignition sources. Contact with water produces flammable gas.
Target organs: Central nervous system, kidneys.

This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Section 3: Composition / Information on Ingredients

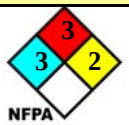
Barium Metal (7440-39-3), 100%

Section 4: First Aid Measures

Always seek professional medical attention after first aid measures are provided.

Eyes: Immediately flush eyes with excess water for 15 minutes, lifting lower and upper eyelids occasionally.
Skin: Immediately flush skin with excess water for 15 minutes while removing contaminated clothing.
Ingestion: Call Poison Control immediately. Rinse mouth with cold water. Give victim 1-2 tbsp of activated charcoal mixed with 8 oz water.
Inhalation: Remove to fresh air. If not breathing, give artificial respiration.

Section 5: Fire Fighting Measures



Flammable solid. When heated to decomposition, emits acrid fumes and explosive hydrogen gas.
Protective equipment and precautions for firefighters: Do Not Use carbon dioxide, foam, water or halogenated extinguishing agents. Use class D extinguisher or smother with dry sand, dry clay, dry ground limestone or dry graphite. Firefighters should wear full fire fighting turn-out gear and respiratory protection (SCBA). Material is not sensitive to mechanical impact or static discharge.

Section 6: Accidental Release Measures

Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Remove all ignition sources and ventilate area. Sweep up spill and place material in a dry container for disposal. See Section 13 for disposal information.

Section 7: Handling and Storage Red

Handling: Use with adequate ventilation and do not breathe dust or vapor. Avoid contact with skin, eyes, or clothing. Wash hands thoroughly after handling.
Storage: Store in Flammable Area [Red Storage] with other flammable materials and away from any strong oxidizers. Store in a dedicated flammables cabinet. Store in a cool, dry, well-ventilated, locked store room away from incompatible materials.

Section 8: Exposure Controls / Personal Protection

Use ventilation to keep airborne concentrations below exposure limits. Have approved eyewash facility, safety shower, and fire extinguishers readily available. Wear chemical splash goggles and chemical resistant clothing such as gloves and aprons. Wash hands thoroughly after handling material and before eating or drinking. Use NIOSH-approved respirator with a dust cartridge. Exposure guidelines: Barium compounds: OSHA PEL: 0.5 mg/m^3 and ACGIH TLV: 0.5 mg/m^3, STEL: N/A.

Section 9: Physical and Chemical Properties

Molecular formula	Ba.	**Appearance**	Silver metal in heavy mineral oil.
Molecular weight	137.33.	**Odor**	No odor.
Specific Gravity	3.62 g/mL @ 20°C..	**Odor Threshold**	N/A.
Vapor Density (air=1)	N/A.	**Solubility**	Reacts violently with water.
Melting Point	850°C.	**Evaporation rate**	N/A *(Butyl acetate = 1).*
Boiling Point/Range	1695°C.	**Partition Coefficient**	N/A *(log P_{OW}).*
Vapor Pressure (20°C)	N/A.	**pH**	N/A.
Flash Point:	N/A.	**UEL**	N/A.
Autoignition Temp.:	N/A.	**LEL**	N/A.

N/A = Not available or applicable

Section 10: Stability and Reactivity

Avoid heat and ignition sources
Stability: Stable under normal conditions of use.
Incompatibility: Water, acids, chlorine, iodine, bromine and oxidizing agents.
Shelf life: Indefinite if stored properly.

Section 11: Toxicology Information

Acute Symptoms/Signs of exposure: ***Eyes***: Stinging pain, burns, watering of eyes, inflammation of eyelids and conjunctivitis. Avoid looking at burning magnesium. ***Skin***: Irritation, redness, burns. Powdered metal ignites readily on skin causing burns. ***Ingestion***: Nausea, vomiting and headache. ***Inhalation***: Rapid irregular breathing, headache, burns to mucous membranes. Inhalation of dust or fumes causes metal fume fever.
Chronic Effects: Repeated/prolonged skin contact may cause dryness or rashes.
Sensitization: none expected
Barium: LD50 [oral, rat]; Not Available; LC50 [rat]; Not Available; LD50 Dermal [rabbit]; Not Available
Material has not been found to be a carcinogen nor produce genetic, reproductive, or developmental effects.

Section 12: Ecological Information

Ecotoxicity (aquatic and terrestrial): Ecological impact has not been determined

Section 13: Disposal Considerations

Check with all applicable local, regional, and national laws and regulations. Local regulations may be more stringent than regional or national regulations. Use a licensed chemical waste disposal firm for proper disposal.

Section 14: Transport Information

DOT Shipping Name:	Barium.	**Canada TDG:**	Barium .
DOT Hazard Class:	4.3, pg II.	**Hazard Class:**	4.3, pg II.
Identification Number:	UN1400.	**UN Number:**	UN1400.

Section 15: Regulatory Information

EINECS: Listed (231-149.1) .
WHMIS Canada: B6:D2B: Reactive Flammable: Toxic Material.
TSCA: All components are listed or are exempt.
California Proposition 65: Not listed.
The product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

Section 16: Other Information

Current Issue Date: January 23, 2009
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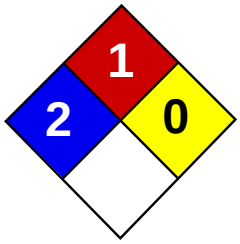

Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Chromium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Chromium

Catalog Codes: SLC4711, SLC3709

CAS#: 7440-47-3

RTECS: GB4200000

TSCA: TSCA 8(b) inventory: Chromium

CI#: Not applicable.

Synonym: Chromium metal; Chrome; Chromium Metal Chips 2" and finer

Chemical Name: Chromium

Chemical Formula: Cr

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Chromium	7440-47-3	100

Toxicological Data on Ingredients: Chromium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, lungs, liver, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

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

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

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

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

Serious Inhalation: Not available.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

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

Auto-Ignition Temperature: 580°C (1076°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

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

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

Special Remarks on Fire Hazards:
Moderate fire hazard when it is in the form of a dust (powder) and burns rapidly when heated in flame. Chromium is attacked vigorously by fused potassium chlorate producing vivid incandescence. Pyrophoric chromium unites with nitric oxide with incandescence. Incandescent reaction with nitrogen oxide or sulfur dioxide.

Special Remarks on Explosion Hazards:
Powdered Chromium metal +fused ammonium nitrate may react violently or explosively. Powdered Chromium will explode spontaneously in air.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

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

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

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
TWA: 0.5 (mg/m3) from ACGIH (TLV) [United States] TWA: 1 (mg/m3) from OSHA (PEL) [United States] TWA: 0.5 (mg/m3) from NIOSH [United States] TWA: 0.5 (mg/m3) [United Kingdom (UK)] TWA: 0.5 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

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

Odor: Odorless.

Taste: Not available.

Molecular Weight: 52 g/mole

Color: Silver-white to Grey.

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

Boiling Point: 2642°C (4787.6°F)

Melting Point: 1900°C (3452°F) +/- !0 deg. C

Critical Temperature: Not available.

Specific Gravity: 7.14 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Insoluble in cold water, hot water. Soluble in acids (except Nitric), and strong alkalies.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

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

Corrosivity: Not available.

Special Remarks on Reactivity:
Incompatible with molten Lithium at 180 deg. C, hydrogen peroxide, hydrochloric acid, sulfuric acid, most caustic alkalies and alkali carbonates, potassium chlorate, sulfur dioxide, nitrogen oxide, bromine pentafluoride. It may react violently or ignite with bromine pentafluoride. Chromium is rapidly attacked by fused sodium hydroxide + potassium nitrate. Potentially hazardous incompatibility with strong oxidizers.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: kidneys, lungs, liver, upper respiratory tract.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause cancer based on animal data. There is no evidence that exposure to trivalent chromium causes cancer in man.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: May cause skin irritation. Eyes: May cause mechanical eye irritation. Inhalation: May cause irritation of the respiratory tract and mucous membranes of the respiratory tract. Ingestion: May cause gastrointestinal tract irritation with nausea, vomiting, diarrhea. Chronic Potential Health Effects: Inhalation: The effects of chronic exposure include irritation , sneezing, reddness of the throat, bronchospasm, asthma, cough, polyps, chronic inflammation, emphysema, chronic bronchitis, pharyngitis, bronchopneumonia, pneumoconoisis. Effects on the nose from chronic chromium exposure include irritation, ulceration, and perforation of the nasal septum. Inflammation and ulceration of the larynx may also occur. Ingestion or Inhalation: Chronic exposure may cause liver and kidney damage.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Chromium Illinois toxic substances disclosure to employee act: Chromium Illinois chemical safety act: Chromium New York release reporting list: Chromium Rhode Island RTK hazardous substances: Chromium Pennsylvania RTK: Chromium Minnesota: Chromium Michigan critical material: Chromium Massachusetts RTK: Chromium Massachusetts spill list: Chromium New Jersey: Chromium New Jersey spill list: Chromium Louisiana spill reporting: Chromium California Director's List of Hazardous Substances: Chromium TSCA 8(b) inventory: Chromium SARA 313 toxic chemical notification and release reporting: Chromium CERCLA: Hazardous substances.: Chromium: 5000 lbs. (2268 kg)

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

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):
R40- Limited evidence of carcinogenic effect S36/37/39- Wear suitable protective clothing, gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

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

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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

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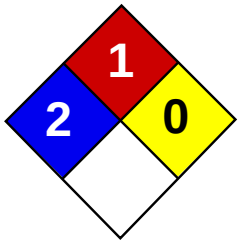

Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Copper MSDS

Section 1: Chemical Product and Company Identification

Product Name: Copper

Catalog Codes: SLC4939, SLC2152, SLC3943, SLC1150, SLC2941, SLC4729, SLC1936, SLC3727, SLC5515

CAS#: 7440-50-8

RTECS: GL5325000

TSCA: TSCA 8(b) inventory: Copper

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: Cu

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Copper	7440-50-8	100

Toxicological Data on Ingredients: Copper LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

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

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

Serious Skin Contact: Not available.

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

Serious Inhalation: Not available.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

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

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Not available.

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

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

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not breathe dust. Avoid contact with eyes Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If you feel unwell, seek medical attention and show the label when possible.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
TWA: 1 (mg/m3) from ACGIH [1990] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 63.54 g/mole

Color: Not available.

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

Boiling Point: 2595°C (4703°F)

Melting Point: 1083°C (1981.4°F)

Critical Temperature: Not available.

Specific Gravity: 8.94 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

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

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: The substance is toxic to lungs, mucous membranes.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Human: passes through the placenta, excreted in maternal milk.

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

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Copper Massachusetts RTK: Copper TSCA 8(b) inventory: Copper CERCLA: Hazardous substances.: Copper

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

Other Classifications:

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

DSCL (EEC): R36- Irritating to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

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

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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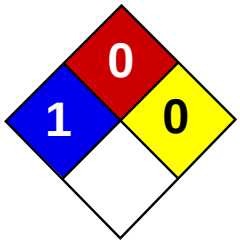

Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Lead MSDS

Section 1: Chemical Product and Company Identification

Product Name: Lead

Catalog Codes: SLL1291, SLL1669, SLL1081, SLL1459, SLL1834

CAS#: 7439-92-1

RTECS: OF7525000

TSCA: TSCA 8(b) inventory: Lead

CI#: Not available.

Synonym: Lead Metal, granular; Lead Metal, foil; Lead Metal, sheet; Lead Metal, shot

Chemical Name: Lead

Chemical Formula: Pb

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Lead	7439-92-1	100

Toxicological Data on Ingredients: Lead LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

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

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

Serious Skin Contact: Not available.

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

Serious Inhalation: Not available.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

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

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

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

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

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

Special Remarks on Fire Hazards: When heated to decomposition it emits highly toxic fumes of lead.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

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

protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

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

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
TWA: 0.05 (mg/m3) from ACGIH (TLV) [United States] TWA: 0.05 (mg/m3) from OSHA (PEL) [United States] TWA: 0.03 (mg/m3) from NIOSH [United States] TWA: 0.05 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

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

Odor: Not available.

Taste: Not available.

Molecular Weight: 207.21 g/mole

Color: Bluish-white. Silvery. Gray

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

Boiling Point: 1740°C (3164°F)

Melting Point: 327.43°C (621.4°F)

Critical Temperature: Not available.

Specific Gravity: 11.3 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, excess heat

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Can react vigorously with oxidizing materials. Incompatible with sodium carbide, chlorine trifluoride, trioxane + hydrogen peroxide, ammonium nitrate, sodium azide, disodium acetylide, sodium acetylide, hot concentrated nitric acid, hot concentrated hydrochloric acid, hot concentrated sulfuric acid, zirconium.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

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

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. May cause damage to the following organs: blood, kidneys, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential: Skin: Lead metal granules or dust: May cause skin irritation by mechanical action. Lead metal foil, shot or sheets: Not likely to cause skin irritation Eyes: Lead metal granules or dust: Can irritate eyes by mechanical action. Lead metal foil, shot or sheets: No hazard. Will not cause eye irritation. Inhalation: In an industrial setting, exposure to lead mainly occurs from inhalation of dust or fumes. Lead dust or fumes: Can irritate the upper respiratory tract (nose, throat) as well as the bronchi and lungsby mechanical action. Lead dust can be absorbed through the respiratory system. However, inhaled lead does not accumulate in the lungs. All of an inhaled dose is eventually abssorbed or transferred to the gastrointestinal tract. Inhalation effects of exposure to fumes or dust of inorganic lead may not develop quickly. Symptoms may include metallic taste, chest pain, decreased physical fitness, fatigue, sleep disturbance, headache, irritability, reduces memory, mood and personality changes, aching bones and muscles, constipation, abdominal pains, decreasing appetite. Inhalation of large amounts may lead to ataxia, deliriuim, convulsions/seizures, coma, and death. Lead metal foil, shot, or sheets: Not an inhalation hazard unless metal is heated. If metal is heated, fumes will be released. Inhalation of these fumes may cause "fume metal fever", which is characterized by flu-like symptoms. Symptoms may include metallic taste, fever, nausea, vomiting, chills, cough, weakness, chest pain, generalized muscle pain/aches, and increased white blood cell count. Ingestion: Lead metal granules or dust: The symptoms of lead poisoning include abdominal pain or cramps (lead cholic), spasms, nausea, vomiting, headache, muscle weakness, hallucinations, distorted perceptions, "lead line" on the gums, metallic taste, loss of appetite, insomnia, dizziness and other symptoms similar to that of inhalation. Acute poisoning may result in high lead levels in the blood and urine, shock, coma and death in extreme cases. Lead metal foil, shot or sheets: Not an ingestion hazard for usual industrial handling.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (female) which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (male) which would require a warning under the statute: Lead California prop. 65 (no significant risk level): Lead: 0.0005 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Lead Connecticut hazardous material survey.: Lead Illinois toxic substances disclosure to employee act: Lead Illinois chemical safety act: Lead New York release reporting list: Lead Rhode Island RTK hazardous substances: Lead Pennsylvania RTK: Lead

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

Other Classifications:

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

DSCL (EEC):
R20/22- Harmful by inhalation and if swallowed. R33- Danger of cumulative effects. R61- May cause harm to the unborn child. R62- Possible risk of impaired fertility. S36/37- Wear suitable protective clothing and gloves. S44- If you feel unwell, seek medical advice (show the label when possible). S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

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

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:21 PM

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

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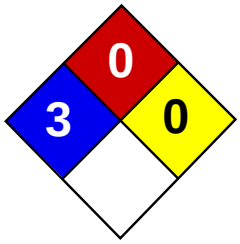

Material Safety Data Sheet
Mercury MSDS

Section 1: Chemical Product and Company Identification

Product Name: Mercury

Catalog Codes: SLM3505, SLM1363

CAS#: 7439-97-6

RTECS: OV4550000

TSCA: TSCA 8(b) inventory: Mercury

CI#: Not applicable.

Synonym: Quick Silver; Colloidal Mercury; Metallic Mercury; Liquid Silver; Hydragyrum

Chemical Name: Mercury

Chemical Formula: Hg

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Mercury	7439-97-6	100

Toxicological Data on Ingredients: Mercury LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation.

Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

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

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

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

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

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
When thrown into mercury vapor, boron phosphodiiodide ignites at once. Flame forms with chlorine jet over mercury surface at 200 deg to 300 deg C. Mercury undergoes hazardous reactions in the presence of heat and sparks or ignition.

Special Remarks on Explosion Hazards:
A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium. CHLORINE DIOXIDE & LIQUID HG, WHEN MIXED, EXPLODE VIOLENTLY. Mercury and Ammonia can produce an

explosive compound. A mixture of the dry carbonyl and oxygen will explode on vigorous shaking with mercury. Methyl azide in the presence of mercury was shown to be potentially explosive.

Section 6: Accidental Release Measures

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

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, metals.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 25°C (77°F).

Section 8: Exposure Controls/Personal Protection

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

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

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

Exposure Limits:
TWA: 0.025 from ACGIH (TLV) [United States] SKIN TWA: 0.05 CEIL: 0.1 (mg/m3) from OSHA (PEL) [United States] Inhalation TWA: 0.025 (mg/m3) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Heavy liquid)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 200.59 g/mole

Color: Silver-white

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

Boiling Point: 356.73°C (674.1°F)

Melting Point: -38.87°C (-38°F)

Critical Temperature: 1462°C (2663.6°F)

Specific Gravity: 13.55 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 6.93 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, metals.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Ground mixtures of sodium carbide and mercury, aluminum, lead, or iron can react vigorously. A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium. Incompatible with boron diiodophosphide; ethylene oxide; metal oxides, metals(aluminum, potassium, lithium, sodium, rubidium); methyl azide; methylsilane, oxygen; oxidants(bromine, peroxyformic acid, chlorine dioxide, nitric acid, tetracarbonynickel, nitromethane, silver perchlorate, chlorates, sulfuric acid, nitrates,); tetracarbonylnickel, oxygen, acetylinic compounds, ammonia, ethylene oxide, methylsiliane, calcium,

Special Remarks on Corrosivity:
The high mobility and tendency to dispersion exhibited by mercury, and the ease with which it forms alloys (amalga) with many laboratory and electrical contact metals, can cause severe corrosion problems in laboratories. Special precautions: Mercury can attack copper and copper alloy materials.

Polymerization: Will not occur.

Section 11: Toxicological Information

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

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May affect genetic material. May cause cancer based on animal data. Passes through the placental barrier in animal. May cause adverse reproductive effects(paternal effects- spermatogenesis; effects on fertility - fetotoxicity, post-implantation mortality), and birth defects.

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Mercury UNNA: 2809 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Mercury California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Mercury Connecticut hazardous material survey.: Mercury Illinois toxic substances disclosure to employee act: Mercury Illinois chemical safety act: Mercury New York acutely hazardous substances: Mercury Rhode Island RTK hazardous substances: Mercury Pennsylvania RTK: Mercury Minnesota: Mercury Massachusetts RTK: Mercury New Jersey: Mercury New Jersey spill list: Mercury Louisiana spill reporting: Mercury California Director's List of Hazardous Substances.: Mercury TSCA 8(b) inventory: Mercury SARA 313 toxic chemical notification and release reporting: Mercury CERCLA: Hazardous substances.: Mercury: 1 lbs. (0.4536 kg)

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

Other Classifications:

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

DSCL (EEC):
R23- Toxic by inhalation. R33- Danger of cumulative effects. R38- Irritating to skin. R41- Risk of serious damage to eyes. R50/53- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S2- Keep out of the

reach of children. S7- Keep container tightly closed. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S39- Wear eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S46- If swallowed, seek medical advice immediately and show this container or label. S60- This material and its container must be disposed of as hazardous waste. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

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

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:22 PM

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

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HEALTH & SAFETY PLAN

APPENDIX B

ON-SITE SAFETY MEETING FORMS

ON-SITE SAFETY MEETING

Project: Astoria Steel Site 3-15 26th Avenue, Astoria, NY
Date:_____ Time:_____ Job No.: 190500789
Address: 3-15 26th Avenue, Astoria, NY

Scope of Work:_____

Weather Temp:_____ Wind direction/speed: _____
Sky Conditions:_____ Humidity:_____
Weather Conditions affecting work: _____

Safety Topics Discussed

Protective Clothing/Equipment: Level D (steel toe boots, hard hat with overhead hazards, etc.)

Chemical Hazards: Petroleum-related VOCs &SVOCs, metals

Physical Hazardous: Slip/trip/fall; weather/heat/cold; overhead hazards during drilling rig and excavator operation; and noise during drilling

Personnel/Equipment Decontamination: Alconox solution and water rinse or high pressure wash

Personnel/Job Functions:_____

Emergency Procedures: Emergency will be signaled verbally or with air or vehicle horn. Appropriate authorities will be contacted and after event, accident reporting procedures will be followed, as appropriate.

Special Equipment:_____

Other:_____

Emergency Phone Numbers/Addresses

Ambulance:	911
Hospital:	Mount Sinai Queens (718) 267-4285
Police:	911
Fire Department:	911

On-Site Safety Meeting

ATTENDEES

Name Printed	**Signature**	**Job Function**
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Meeting Conducted By: _____ _____
Name Printed *Signature*

Site Safety Officer _____ _____
Name Printed *Signature*

Team Leader _____ _____
Name Printed *Signature*

APPENDIX C

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 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

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

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

December 2009

Appendix 1B
Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.

2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.

3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:

(a) Objects to be measured: Dust, mists or aerosols;
(b) Measurement Ranges: 0.001 to 400 mg/m3 (1 to 400,000 :ug/m3);
(c) Precision (2-sigma) at constant temperature: +/- 10 :g/m3 for one second averaging; and +/- 1.5 g/m3 for sixty second averaging;
(d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
(e) Resolution: 0.1% of reading or 1g/m3, whichever is larger;
(f) Particle Size Range of Maximum Response: 0.1-10;
(g) Total Number of Data Points in Memory: 10,000;
(h) Logged Data: Each data point with average concentration, time/date and data point number
(i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
(j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
(k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
(l) Operating Temperature: -10 to 50^{o} C (14 to 122^{o} F);
(m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.

5. The action level will be established at 150 ug/m3 (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m3, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m3 continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM10 at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

(a) Applying water on haul roads;
(b) Wetting equipment and excavation faces;
(c) Spraying water on buckets during excavation and dumping;
(d) Hauling materials in properly tarped or watertight containers;
(e) Restricting vehicle speeds to 10 mph;
(f) Covering excavated areas and material after excavation activity ceases; and
(g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m3 action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

APPENDIX D

Qualifications for Principal Personnel

Michael P. Storonsky

Managing Senior Associate

With more than 28 years of experience from both consulting and regulatory perspectives, Mr. Storonsky is Stantec's Tri-State Region Environmental Management Managing Leader. He regularly works with clients to investigate and remediate contaminated properties, including brownfields. He also coordinates environmental programs involving Phase I and Phase II Environmental Site Assessments, asbestos, and petroleum bulk storage tanks.

EDUCATION

Bachelor of Science, Wildlife Biology, SUNY College of Environmental Science and Forestry, Syracuse, New York, 1979

Associate in Applied Science, Fish and Wildlife Technology, SUNY Agricultural and Technical College, Cobleskill, New York, 1976

MEMBERSHIPS

Board of Directors, Center for Environmental Information

President, Rochester Committee for Scientific Information

PROJECT EXPERIENCE

Border Crossings

Detroit-Windsor Tunnel Plaza

Responsible for the preparation of Phase I Environmental Site Assessments for both the US and Canadian Detroit-Windsor Tunnel Plaza which provided recommendations regarding historic underground storage tanks; vehicle maintenance facilities; transformers oil disposal; maintenance of oil-water separators, floor drains and sumps; suspect asbestos containing building materials; and suspect lead-based paint.

Queenston-Lewiston Plaza – Phase i

Responsible for the preparation of Phase I and Phase II environmental investigations of the Queenston-Lewiston Plaza in 2002 including PCB sampling of stained areas from the toll booth lane heater system, asbestos sampling, soil borings and associated sampling to evaluate two former underground storage tank locations and two septic systems that may have received wastes from a parts washer and maintenance garage, sampling of wastes from the maintenance floor drain, sampling of stockpiled materials, and a review of the NYSDEC approved Beneficial Use Determination 415-9-32 for 14,000 cubic yards of fill material containing elevated levels of lead and chromium that was placed on the site from the Rainbow Bridge.

Environmental Site Management

Sub-Slab Depressurization System (SSDS), Gates, New York (Project Manager)

Responsible for the completion of a pressure extension test, as well as preliminary design and development of an opinion of probable cost to install and operate a sub-slab depressurization system at a large former industrial facility to mitigate soil vapor intrusion. Design and installation are expected to be completed in 2008.

Vacuum Oil, Phase I Environmental Site Assessment, Rochester, New York (Project Manager)

Completed Phase I ESAs of two parcels comprising a portion of a former oil refinery that operated from 1866 until the 1930s. Also responsible for the Phase II ESA of the site, anticipated to be completed in 2008.

Brownfield Cleanup Agreement, Machine Shop Remedial Investigation, Rochester, New York (Project Manager)

Managed a remedial investigation of an active manufacturing facility involving TCE groundwater contamination pursuant to a Brownfields Cleanup Agreement with New York State. On-site and off-site investigations included sub-slab soil vapor surveys to investigate the TCE plume. An interim remedial measure involving the removal of grossly impacted soils from beneath the building was performed during a holiday shutdown period. An Alternatives Analysis report is presently being prepared.

NYS Superfund Site Investigation and Delisting, Rochester, New York (Project Manager)

Managed the DEC Phase II investigation at an apartment complex constructed on the site of a former municipal incinerator ash landfill, which resulted in de-listing of the site from New York State's Superfund list.

Michael P. Storonsky

Managing Senior Associate

Solvent Spill Cleanup, Brighton, New York (Project Manager)
Managed emergency response, remedial investigations, and design of a soil vapor extraction and groundwater collection and treatment system. Also responsible for permitting, agency negotiations, construction observation and system monitoring for an 800 gallon Stoddard solvent spill at an industrial facility. This work resulted in successful closure of the New York State spill file.

Rochester City School District Underground Storage Tank Removal, Rochester, New York (Project Manager)
Developed an investigation, testing, clean up and removal program for 35 underground petroleum and fuel oil storage tanks at 23 facilities owned by the Rochester City School District.

Closure of Five RCRA Hazardous Waste Storage Facilities, Corning, New York (Project Manager)
Managed the preparation and implementation of closure plans for five RCRA hazardous waste storage facilities.

NYS Superfund Site, Storm Sewer Installation, Syracuse, New York (Project Manager)
Managed the installation of a storm sewer within a New York State listed inactive hazardous waste site.

Fast Track Phase I ESAs, Various Locations, New York (Project Manager)
Managed fast-track Phase I ESAs for a pool of 34 properties, involving shopping malls totaling 22 million ft² of building space and proposed mall sites, to prepare them for a proposed sale anticipated to gross between $2-4 billion.

Friable Asbestos Survey, Elmira, New York (Project Manager)
Managed a friable asbestos survey of a regional office building to assess spray-on fireproofing and provide recommendations for long-term management and short-term HVAC maintenance activities.

Petroleum UST Removal, Senior Care Facility, Rochester, New York (Project Manager)
Managed the removal of an abandoned fuel oil tank and contaminated soil at an active senior care facility.

PCB Contaminant Testing*, Hudson River, New York (Wildlife Technician)
Responsible for the collection and preparation of fisheries samples from the Hudson River for PCB contaminant testing relating to the General Electric NPL Superfund site.

Petroleum Spill Site Inactivation Evaluation, Rochester, New York (Project Manager)
Coordinated preparation of a petroleum spill site inactivation evaluation, resulting in successful inactivation of a New York State spill file and, thereby, saving the customer an estimated $100,000 in cleanup costs.

Nursing Home Facility, Abatement of Boiler Room Asbestos, Bath, New York (Project Manager)
Managed Phase I and Phase II ESA's and preparation of design specifications for the abatement of boiler room asbestos at a nursing home facility.

Voluntary Cleanup Agreement, Two Former Industrial Facilities, Big Flats, New York (Project Manager)
Managed the investigation program, preparation of work plans, building demolition, and successful cleanup of two former industrial facilities with PCB and metals soil and groundwater contamination pursuant to the first Voluntary Cleanup Agreement completed in New York State.

Frontier Communications, Rochester, New York (Project Manager)
Managed a hazardous materials compliance audit for 80 buildings and several subsequent site assessment and remedial engineering design projects.

Asbestos Survey, Rochester, New York (Project Manager)
Managed an asbestos survey of the 500,000 ft² multi-story Midtown Plaza commercial office building.

** denotes projects completed with other firms*

Michael P. Storonsky

Managing Senior Associate

Voluntary Cleanup Agreement, Former Railroad Yard, Buffalo, New York (Project Manager)

Managed Brownfield site investigations, remedial alternatives evaluation, work plan preparation, agency negotiations, and successful site remediation at a former railroad yard occupied by a vacant warehouse. Inactive underground storage tanks and the associated petroleum contaminated soils were removed, while elevated levels of lead and various petroleum hydrocarbons were allowed to remain in place.

Voluntary Cleanup Agreement, Service Station, Medina, New York (Project Manager)

Managed the investigations, evaluation of remedial alternatives, preparation of work plans, agency negotiations, risk assessment, and remediation of soil and groundwater contamination at an abandoned gasoline service station pursuant to a Voluntary Cleanup Agreement with New York State.

Voluntary Cleanup Agreement, Former Dry Cleaning Facility, Rotterdam, New York (Project Manager)

Managed the remedial investigation, feasibility study, agency negotiations, design, construction oversight, and operation and monitoring of a combined groundwater sparging/soil vapor extraction system that successfully cleaned up tetrachloroethylene (PCE) contaminated soil and groundwater from a former dry cleaning facility. This was accomplished within one year, pursuant to a Voluntary Cleanup Agreement with New York State on behalf of the nation's largest retail chain.

Voluntary Cleanup Agreement, FLLC Groundwater Remediation System, Geneva, New York (Project Manager)

Managed the Remedial Investigation of a former dry cleaner, including off-site soil vapor surveys, which culminated in the design and installation of a zero valent iron permeable reactive barrier (PRB) pursuant to a Voluntary Cleanup Agreement with New York State to passively treat PCE and TCE contaminated groundwater.

Environmental Restoration Program Site Cleanup, Former Industrial Facility, Buffalo, New York (Project Manager)

Managed an Environmental Restoration Program site cleanup, through the New York State Clean Water/Clean Air Bond Act, of a former industrial facility involving remedial design, construction bid documents, construction management services, field observation/ documentation and a final engineering report. The clean up involved the removal and disposal of approximately 2,600 tons of petroleum impacted soils and miscellaneous surface debris.

Voluntary Cleanup Agreement, Former Dry Cleaning Chemical Distribution Facility, Rochester, New York (Project Manager)

Managed the investigation of a former dry cleaning chemical distribution facility which identified PCE and trichloroethylene (TCE) soil and groundwater contamination pursuant to a Voluntary Cleanup Agreement and recommended installation of a two phase soil vapor and groundwater extraction system which was installed by New York State.

Former Gasoline Service Station Site Investigation and Cleanup, Henrietta, New York (Project Manager)

Managed the investigation, design and remediation of a former gasoline service station involving the excavation, removal and backfilling of approximately 4,300 tons of petroleum impacted soil. Use of petroleum fingerprinting techniques allowed the owner to recoup the majority of the cleanup costs from the prior owner.

Petroleum Impacted Site Investigation, Rochester, New York (Project Manager)

Managed the investigation of a petroleum-impacted site, which underwent successful negotiations regarding a Voluntary Cleanup Agreement with New York State.

Hydrogeologic Investigation, Bolivar, New York (Project Manager)

Managed a hydrogeologic investigation, a remedial program involving closure of lagoons impacted with chlorinated solvents, and the design and construction of an industrial wastewater treatment plant under the terms and conditions of a New York State imposed Consent Order.

** denotes projects completed with other firms*

Michael P. Storonsky

Managing Senior Associate

Superfund Remedial Investigation, Cadmium and Nickel Contaminated Marathon Battery Site*, Foundry Cove, New York (Environmental Scientist)
Assisted in the development, implementation, evaluation and report preparation for the $600,000 NYSDEC/USEPA NPL Superfund Remedial Investigation at the cadmium and nickel contaminated Marathon Battery Site. This program involved the collection, analysis and interpretation of sediment, surface water, aquatic vegetation, and wildlife samples and the resultant data. These data were used for the evaluation, development and eventual successful implementation of the selected remedial alternative.

Manufacturing Facility, Remedial System Operations, Ithaca, New York (Project Manager)
Responsibilities include managing the ongoing operations and maintenance of a two-phase vacuum extraction system designed to remediate chlorinated solvent impacts in bedrock at an inactive hazardous waste site.

Phase I Environmental Site Assessments, Multiple Locations (Project Manager)
Managed fast-track Phase I Environmental Site Assessments of 2.5 million sq. ft. of manufacturing and distribution space involving ten facilities, located in multiple states and countries, with some operations dating back to the civil war.

Phase II Environmental Site Assessment, Former Manufacturing Facility, Henrietta, New York (Project Manager)
Responsible for the soil and groundwater characterization of impacts from a former nickel plating manufacturing facility. Included installation of borings, monitoring wells, analytical sampling, report generation and a remedial cost estimate.

Phase I and Phase II ESAs and Petroleum Corrective Action Plan, Chili, New York (Project Manager)
Managed Phase I and Phase II ESAs, Tank Removal, and Preparation and Implementation of DEC Approval Corrective Action Plan, involving excavation and treatment of 2,200 cubic yards of petroleum impacted soil in an ex-situ bioremediation cell and monitored natural attenuation of groundwater impacts. Implementation of the CAP is nearing completion.

Phase II ESA and Petroleum Cleanup Program, Scottsville, New York (Project Manager)
Managed a Phase II ESA, tank removal, impacted soil removal, application of ORC groundwater treatment and ongoing groundwater monitoring program of a former gas station site that was redeveloped with a bank.

EPA Brownfield Investigation, Elmira, New York (Project Manager)
Managed an EPA Brownfield investigation of a two-mile long railroad spur for the City of Elmira. The corridor, which travels through the heart of the city, is expected to be redeveloped for both commercial purposes adjacent to major thoroughfares and a recreation trail along its entire length.

Petroleum Groundwater Pump and Treatment System, Massena, New York (Project Manager)
Managed Phase II ESA, remedial design and installation of a groundwater pump and treatment system for BTEX contaminated groundwater. System included surfactant application, installation and operation of a pneumatic bladder pump with granular activated carbon treatment and discharge via permit to a storm sewer.

Stewart Terrace, New Windsor, New York (Environmental Program Coordinator)
Managed the preparation of Phase I ESA, Phase II ESA, Environmental Management Plans for asbestos containing materials, lead based paint, mercury-containing equipment, polychlorinated biphenyl-containing light fixtures, hazardous & universal waste, miscellaneous hazardous and toxic substances, pesticides in soil, and mold. Also responsible for asbestos abatement and hazardous material building abatement specifications. This work was performed for a 299-unit military housing subdivision in conjunction with complete site engineering, landscape architecture and surveying services also performed by Stantec.

Building 606, USMA, West Point, New York (Environmental Program Coordinator)
Responsible for completion of an asbestos pre-demolition survey of this historic, 90-year-old, 125,000 ft² masonry multi-use facility. He was responsible for preparing asbestos survey reports and detailed asbestos abatement specifications and drawings.

** denotes projects completed with other firms*

Michael P. Storonsky

Managing Senior Associate

Brownfield Cleanup Agreement, Former AB Dick Facility, Henrietta, New York (Project Manager)
Responsibilities included Phase I ESA, Phase II ESA, Asbestos Pre-Demolition Survey, Asbestos Abatement and Building Demolition Specifications, and Remedial Oversight to assist in the identification and management of environmental hazards at this 167,000 sq. ft. former manufacturing facility. Also responsible for the oversight of remedial cleanup activities by a former tenant. A Brownfield Cleanup Program Remedial Investigation Work Plan was approved by DEC and the Remedial Investigation is ongoing.

Brownfield Site Investigation, Former Laundry and Machine Shop, Rochester, New York (Project Manager)
Responsibilities included conducting a Remedial Investigation of this former laundry and machine shop property. Implementation of remedial measures is expected to be completed in 2008.

Petroleum Investigation and Cleanup, 1650 Elmwood Avenue, Brighton, New York (Project Manager)
Managed the investigation and cleanup of a former gas station to facilitate redevelopment of the site as a drug store in order to obtain inactivation of a DEC petroleum spill file.

Voluntary Cleanup Agreement, Gonsenhauser Farm, Brighton, New York (Project Manager)
Managed Phase I and Phase II ESAs, remedial cost estimate, remedial design, remedial construction and ongoing groundwater monitoring program to address soil and groundwater impacts from three former underground storage tanks at an abandoned farm. The site has been successfully transformed into a public park.

Brownfield Cleanup Agreement, Germanow-Simon Ward Street Site, Rochester, New York (Project Manager)
Managed the investigation of an active manufacturing facility to assess the extent of PCE, TCE, Stoddard Solvent, and petroleum soil and groundwater contamination. Coordinated the proper closure of nine underground storage tanks. Managed the design and construction of a multi-phase vacuum extraction system. Remediation of the site is ongoing. A certificate of completion was obtained in December 2006 allowing the client to apply for the applicable refundable tax credits.

EPA Brownfield Cleanup, 151-191 Mt. Hope Avenue, Rochester, New York (Project Manager)
Managed the implementation of a Corrective Action Plan for the City of Rochester at an EPA-funded city park site that formerly housed three gas stations. Differential GPS was used to provide real-time reports to the client for this 4,500-ton soil cleanup program.

EPA Brownfield Investigation, Former Davidson Collision, Rochester, New York (Project Manager)
Managed the Remedial Investigation and Alternatives Analysis report at this NYS Superfund site and prepared an opinion of probable remedial cost for the City of Rochester. A Remedial Action Work Plan was submitted to NYSDEC.

Environmental Restoration Program Brownfield Site Investigation and Cleanup, Former Contractor's Yard, Rochester, New York (Project Manager)
Managed a $4-million Brownfields Site investigation and cleanup for the City of Rochester pursuant to the New York State Clean Water/Clean Air Bond Act of a former contractor's yard involving a state grant that covered 90% of the costs. Activities completed include Site Investigation, Remedial Alternatives Evaluation, Interim Remedial Measures, Design Phase Investigation, Remedial Design, and Remedial Construction. Implementation of remedial activities included excavation and disposal of over 26,000 cu.yds. of construction and demolition debris as well as petroleum, pesticide and heavy metal contaminated soils. Also included were installation of an oxygen injection system to treat contaminated groundwater and construction of a 5,200 cu.yd. ex-situ bioremediation cell to treat petroleum-contaminated soil. Operations, monitoring and maintenance activities were successfully completed for the two remedial systems. This urban site was redeveloped as a 27-unit single-family residential market rate subdivision. The project won one local award and two state awards for environmental engineering excellence from the American Public Works Association and the American Council of Engineering Consultants.

Environmental Restoration Program Brownfield, Olean Street Revitalization Project, Rochester, New York (Project Manager)
Managed the Phase I and Phase II ESAs, and Remedial Investigation and Alternatives Analysis Report for the City of Rochester to facilitate the development of a single-family residential subdivision pursuant to NYSDEC Environmental Restoration Program Brownfield guidelines.

** denotes projects completed with other firms*

Michael P. Storonsky

Managing Senior Associate

Genesee Marina, Phase I & II Environmental Site Assessments, Geotechnical Investigation and Wetland Delineation, Rochester, New York (Project Manager)

Managed Phase I and Phase II Environmental Site Assessments, preparation of opinions of probable environmental remedial costs, geotechnical investigation and a wetlands delineation of a 29-acre marina located one mile upstream from the Port of Rochester.

Brooks Landing, Environmental Site Assessments and Corrective Action Plans, Rochester, New York (Project Manager)

Managed Phase I and Phase II Environmental Site Assessments and Preparation and Implementation of Corrective Action Plans, a Soil and Groundwater Management Plan, and a sub-slab depressurization system for the City of Rochester. This work allowed the VOC-impacted, cinder-filled waterfront property, containing a former canal, rail line and gas station, to be redeveloped with a hotel.

Corn Hill Landing, Environmental Site Assessments and Corrective Action Plans, Rochester, New York (Project Manager)

Managed Phase I and Phase II Environmental Site Assessments and Preparation and Implementation of Corrective Action Plans and a Soil and Groundwater Management Plan for hazardous waste lead-impacted soil from a former lead works facility and petroleum impacted soil from a former leaking underground tank. This work was to allow the riverfront, cinder-filled, former railroad yard to be redeveloped into a $20 million mixed residential-retail complex.

Platinum Group, Rochester, New York (Project Manager)

Responsibilities included Phase I ESA, Phase II ESA, petroleum spill file closure, pre-demolition asbestos survey and preparation of asbestos containing materials building specifications to allow demolition of four buildings covering the majority of a city block in downtown Rochester.

Phase I and II Environmental Site Assessments, Multiple Locations (Project Manager)

Coordinated, implemented and managed more than 2,500 Phase I and Phase II environmental site assessments at various locations.

** denotes projects completed with other firms*

Peter Nielsen PE

Senior Environmental Engineer

Mr. Nielsen has more than 30 years of consulting and engineering experience involving all types of civil and environmental projects serving both industry and government. He has wide-ranging experience with environmental site investigations, feasibility studies and remediation, design, remedial construction oversight and administration experience.

He has served as Project Manager and Engineer of Record for numerous remediation projects involving contaminants such as chlorinated solvents, pesticides, PCBs, petroleum, metals and. He also has experience performing projects under the requirements of the USEPA Brownfield Assessment and Cleanup Grant programs and the New York State Department of Environmental Conservation Brownfield programs. He has experience with landfill design, capping and closure including landfill gas and leachate collection systems. Vapor instrusion experience includes both investigation and mitigation phases. VI Projects have included schools, industrial and residential structures. He also has extensive experience in New York State regulatory programs with water and wastewater permitting, auditing, compliance, and also the inspection of chemical and petroleum storage systems.

EDUCATION

Bachelor of Science, Rochester Institute of Technology, Rochester, NY, 1976

Master of Business Administration, Rochester Institute of Technology, Rochester, NY, 1990

OSHA Ten-Hour Construction Safety & Health Certification, Rochester, New York, 2008

REGISTRATIONS

WorkSafe Safety Key #31195419, API WorkSafe

Professional Engineer #061499, State of New York

Professional Engineer #030080E, Commonwealth of Pennsylvania

PROFESSIONAL ASSOCIATIONS

Member, New York Water Environment Association, Inc.

Member, Water Environment Federation

PROJECT EXPERIENCE

Vapor Intrusion

Buckeye Pipeline – Westfield St Gasoline Spill, Vapor Intrusion Investigation/Mitigation, Rochester NY* (Engineering Manager)

Engineering manager for vapor intrusion/mitigation response to this gasoline pipeline spill adjacent to a residential neighborhood. The project included assessment of approximately 20 single family houses impacted by the spill to determine conditions of the building foundations, presence of sumps and chemical inventories. A series of indoor air and sub slab samples were then taken using summa canisters per Method TO-15. Several buildings were fitted with sump ventilation system to control potential hazardous levels of VOCs. The project also included preparing communication materials with residents and presentation materials for several neighborhood meetings.

690 St. Paul St. Vapor Intrusion Investigation/ Mitigation Oversight, Rochester, NY (Sr. Engineer)

Senior Engineer on team providing representation to lessee during a time critical vapor intrusion/mitigation project involving a public school. An accelerated sub-slab & indoor air quality investigation program was being implemented by the landlord and their consultant. Reviews were completed of SVI work plans and sampling results. Consulting services were provided to the senior management staff and legal counsel on mitigation requirements and options. Design review and oversight of the eventual sub-slab depressurization was also provided. NYSDEC, NYSDOH and Monroe County DOH were also involved.

Webster Central School District Spry Middle School Addition, Webster, NY. * (Engineering Manager)

Project engineer for the design of vapor barrier and

** denotes projects completed with other firms*

ventilation system to protect the school against vapor intrusion due to residual petroleum contamination in site subsoil. The project included preparation of detailed engineering plans and specifications for the installation of a passive sub-slab ventilation system and vapor barrier. Alternative approaches, designs and materials were considered including estimating of costs. The required design submittals were prepared and submitted to NYSDEC and NYSDOH / MCDOH for approval. Construction oversight was also provided.

Hazardous Waste

Seneca Army Depot, SEAD 59/71 Time Critical Removal Action, Romulus, NY* (Engineering Manager)
Engineering manager for this remedial action project at the Seneca Army Depot. ENSR was awarded the Time Critical Removal Actions at AOC's SEAD 59 and SEAD 71 of the Seneca Army Depot, Romulus, New York. SEAD 59 was a fill area used for the past disposal of concrete, asphalt, metal, wood, chain link fencing, 55 gallon drums, and paint cans. Areas of petroleum hydrocarbon staining had also been documented in SEAD 59. SEAD 71 was an alleged disposal area for paints and/or solvents located immediately north of SEAD 59. A remedial action work plan (RAP), with associated quality assurance (QAPP) and health and safety plan (HASP) and sampling plans (SAP) were developed.

Mohasco Mills Brownfield Project, Amsterdam, NY* (Senior Engineer)
Senior Engineer for the oversight of the remedial design and construction for this 23-acre former carpet mill site. The site included several large abandoned mill buildings and a powerhouse. The topography was challenging due to a creek that ran through the middle of the site, steep grades and adjacent uses. The remedial design included planning and design of asbestos abatement; hot spot cleanup of PCB soils and demolition of the mill buildings. On-site disposal and capping of a portion of the demolition material was also designed into the final site design. Total remediation project cost was $3 million. Funding included grant by the NYSDEC through the Environmental Restoration Program.

USEPA Brownfield Assessment Project, Oswego River Corridor, Oswego County, NY* (Senior Engineer)
Mr. Nielsen provided senior technical support to the staff on this USEPA Brownfield project. Oswego County was awarded a $400,000 brownfield assessment grant to study abandoned industrial and commercial properties along the 23 mile long Oswego River corridor. The area includes a 1-mile strip on both sides of the river. The Oswego River and access to Lake Ontario supported a significant history of industrial development. This river corridor is now the site of over 100 properties that may have been polluted by a hazardous substances/petroleum. Old gas stations, factory buildings, dry cleaning businesses, and vacant lots with a history of chemical or petroleum contamination sit abandoned along the 23 miles of river between Three Rivers and the Oswego Harbor. The project scope included the effort to inventory approximately 125 sites, prepare criteria and evaluate and screen the sites to narrow the sites to 30 for further assessment. The project resulted in conducting detailed assessments of the top 14 sites. A Citizen advisory board was used to obtain community input.

Yates County, Brownfield Site Investigation/Remedial Alternatives Report- Penn Yan Marine, Penn Yan, NY* (Project Manager)
Project Manager for this Brownfield Project in Penn Yan, Yates County, New York. The County had obtained a grant through the NYSDEC Environmental Restoration Program. The initial phase of the project includes the preparation a Phase II Site Investigation Work Plan, the Site Investigation, and preparation of a Remedial Alternatives Report. The site is a 15 acre abandoned boat manufacturing facility that had started in late 1920's. Manufacturing operations included the use of paints, lacquers, varnish and fiberglass. A complete site investigation was conducted as well as Interim Remedial Measures to remove remaining tanks. Upon completion of the Site Investigation, remedial alternatives were evaluated and cost estimates prepared. The result was preparation of a Remedial Alternatives Report. The site was found to have VOC and metals contaminants exceedances. The property is prime real estate, with frontage on the Keuka Lake Outlet and is planning stages for redevelopment.

Chicago Pneumatic Groundwater Pump & Treat System OM&M, Utica, NY* (Principal Engineer)
Principal engineer to provide oversight of groundwater pump and treat system operation, maintenance and monitoring. The system included groundwater interceptor trenches with 2 submersible pump stations, pretreatment and metering then pumping through shallow tray air stripper for removal of VOCs. The discharge was direct to receiving stream with SPDES permit.

Atlantic Richfield, One River Street Remedial Design, Hastings on Hudson, NY* (Senior Environmental Engineer)
Member of remedial design team for Operable Unit 1, (OU-1). Primary responsibility is for permitting task with assistance on wastewater and waste disposal activities. Permitting agencies will include NYSDEC, ACOE, Westchester County and other agencies as the design and project implementation planning is completed. The project site was the former Anaconda Wire Co. located on 28 acres of constructed fill

along the shore of the Hudson River. The site is a State Superfund site and under Federal Consent decree with significant PCB contamination. The issues at the site are complex and require creative and strategic approaches as well as close coordination of the design team.

NYS Office of General Services, Groveland and Midstate Correctional Facilities, Coal Pile Remediation and Groundwater Monitoring, NY* (Project Manager)
Project Manager for groundwater monitoring program for two NYS Dept. of Corrections facilities where coal and ash storage areas were removed. As part of the closure plan, groundwater sampling was conducted where elevated inorganics and metals were found. The monitoring program for Midstate was completed after approximately 10 years with achievement of contaminant concentration levels near background. Periodic reports were submitted to the NYSDEC.

ITT Fluid Technology/Goulds Pumps, Phase II Site Investigations and Remedial Action Planning, Seneca Falls, NY* (Project Manager)
Project Manager and engineer for various phases of extensive Phase II site investigations at this large manufacturing site. Recent work has included the preparation a remedial action work plan submitted to NYSDEC and USEPA for approval. A wide range of parameters in soil and groundwater are involved.

ITT Industries, Goulds Pumps, NW Storage Area, PCB Remedial Design, Seneca Falls, NY* (Engineering Manager)
Engineering Manager for site investigation, remedial action work plan and design for a site within this large industrial manufacturing site. Contaminants of concern included PCBs, VOCs and SVOCs. Remedial alternatives including in-situ, ex-situ treatment, capping and removal were evaluated. The selected remedial alternative was a combination of excavation, off-site disposal and capping with an asphalt cap per TSCA.

Energy East, Rochester Gas & Electric Ashfill Leachate Collection and Treatment, Remedial Design and Construction Russell Station, Rochester, NY* (Project Manager)
Mr. Nielsen was Project Manager for developing concept and final design for controlling an ashfill /coal pile leachate plume impacting an adjacent stream. The remediation design included construction of barrier sheet pile wall and collection trench along with pumping wells and pretreatment system. Pretreatment was required prior to discharge to the POTW because of high iron, manganese, and sulfate. Alternatives for direct discharge were also developed along with cost estimates for capital and operation. In-situ options using sulfate reducing permeable reactive barriers (PRB's) made of limestone and compost were also evaluated. The project costs were approximately $1,000,000.

Southern Connecticut Gas, MGP Site Remediation Groundwater Treatment Plant, Bridgeport, CT*
Provided technical direction and review of this remedial design project to pump and treat coal tar (LNAPL & DNAPL) contaminated groundwater. The project included preparation of plans and specifications for a 150,000-gpd groundwater treatment plant in a new stand-alone building. A stand-alone building was designed to house the process equipment along with all support utilities. Process included oil water separation, filtration (using walnut shells for oil removal), metals precipitation and sludge handling. Secondary containment was provided for process tanks and bulk chemical storage.

United Airlines, Greater Rochester International Airport Fuel Farm/Tank Removal and Remediation, Rochester, NY* (Project Manager)
Project Manager and engineer for the removal and remediation design of former jet fuel tank farm at the Rochester Monroe County Airport. The initial tank removal project included the tanks and equipment (3-25,000 gallon USTs) and disposal of around 800 tons of contaminated soil. A remedial action work plan was developed including design of a multi phase extraction system.

Rocky Mountain Arsenal, Hex Pit ISTD Remediation, Commerce City, CO* (Project Manager)
Project Manager for detailed engineering of In- Situ Thermal Desorption (ISTD) remediation system for this former herbicide and pesticide manufacturing plant. This project was completed in association with TerraTherm LLC. The project goal was to treat approximately 2500 CY of soil posing principal threat and human health exceedance. The design required the installation of over 250 thermal wells including some connected to a vacuum manifold. The vapors driven from the soil matrix were captured and treated through an off gas oxidation and scrubbing system. Electrical power and distribution design was a critical element, as well as a standby generator system to maintain treatment of off gas, should power be interrupted. The system cost approximately $2 million.

Arizona Chemical, RCRA Corrective Measures, Dover, OH* (Engineering Manager)

** denotes projects completed with other firms*

Peter Nielsen PE

Senior Environmental Engineer

Engineering manager for detailed engineering of RCRA corrective measures at this active chemical plant. The design included four of the larger solid waste management units (SWMUs) that were approved by EPA for expedited remedies. A diesel spill area was also included. Corrective measures included concrete and asphalt caps to prevent exposure to contaminated soils. Some areas required excavation and replacement. The design required special consideration of existing utilities, containment of stormwater, replacement of a critical plant waterline and development of construction phasing to allow operation of the plant and meet USEPA approval. Subsequent phases are to include riverbank stabilization and closure of wastewater/sludge lagoon.

The 100% Design submittal included preparation of Construction Workplan, Public Involvement Plan, Health and Safety Plan, Sampling and Analysis Plan, Construction Quality Assurance Plan, O&M Plan, Technical Specifications and Construction Drawings.

Solid Waste

Torrey Landfill Capping/Closure Engineering Management and Permitting, Yates County, NY* (Engineering Manager)

Engineering Manager for design and construction of final remediation measures at a NYSDEC Listed Inactive Hazardous Waste Site. The project included planning, design and construction of a geomembrane/geocomposite cap system, leachate collection and storage, and groundwater interception well system. Complete construction documents (plan & specifications) were prepared. Bidding assistance and complete construction QA/QC oversight was provided under his direction. Mr. Nielsen provided oversight to construction staff and engineers during the construction phase, resulting in the preparation of the construction certification report.

The site had reportedly received industrial waste from various sources and was potentially contaminating area wells. The landfill had been closed for several years with a temporary cap and developed several slope stability problems and leachate outbreaks. Special measures were designed to stabilize the northwest slopes where significant slope failures were occurring. Leachate outbreaks were a significant concern, so a complete system of leachate collection trenches with two main leachate pump stations and storage /loadout system was designed. The cap design was in compliance with Part 360 regulations and included geocomposite membrane system with landfill gas venting. The project involved NYSDEC oversight and funding. Project costs were approximately $6 million.

Victor Insulators, Industrial Landfill Part 360 Permit Renewal, NY* (Project Manager)

Project Manager for the completion of landfill permit renewal for this existing industrial landfill. The landfill received reject ceramic insulators, clay sludge, paper collars and misc. plant waste. One of the primary needs was development of a final closure plan to further guide fill elevations and define limits of the fill. Wetlands had to be reviewed, along with impacts to an adjacent stream. Groundwater monitoring wells had to be upgraded along with development of a Sampling and Analytical Plan. Operation and Maintenance guidelines were developed for the operators and approved by the NYSDEC.

Monroe County Recycling Center (RRT - Materials Recovery Facility) Emerson St. Monroe County, Rochester, NY *(Project Manager of Site/Civil/ Building Engineering)

A 165,000sq ft building was constructed adjacent to the former Monroe County Resource Recovery Facility. He served as Project Manager for the complete site, civil, architectural, building engineering package. Site Work included demolition of major structure including disconnection of all utilities and protection of others. The new building required relocation and new connection of all utilities including storm, sanitary, firemain, electric, telecommunications and gas. Traffic circulation, parking considerations were paramount due to very tight site condition. Pavement replacement and extensions were designed as well as complete site grading and stormwater runoff management system. Total Project Cost was $ 8 million. The site work, building engineering portion was $2 million.

** denotes projects completed with other firms*

Stephanie Reynolds-Smith

Geologist

Ms. Reynolds-Smith has more than 14 years of experience in environmental consulting. This experience includes work on, and management of, a variety of environmental site investigation and remediation projects. She has worked on all stages of these projects, including: proposal writing and costing; formulation of work plans; interaction with clients, regulators, and subcontractors; and overseeing and performing field work, data analysis, and report preparation. Examples of these projects include Phase II Environmental Site Assessments for the U.S. Environmental Protection Agency, Remedial Investigation/Feasibility Studies (RI/FS) for the New York State Department of Environmental Conservation (NYSDEC), and Remedial Design (RD) of, and Operations and Maintenance (O&M) on, treatment systems for clients like the United States Air Force and commercial clients at federal superfund sites.

EDUCATION

Master of Science, Geological Sciences, The Ohio State University, Columbus, Ohio, 1999

Bachelor of Arts, Geological Sciences, State University of New York College at Geneseo, Geneseo, New York, 1997

OSHA Ten-Hour Construction Safety & Health Certification, Rochester, New York, 2008

40-Hour OSHA Hazardous Waste Site Operations, Rochester, New York, 1999

8-Hour Refresher OSHA Hazardous Waste Site Operations, Rochester, New York, 2013

MEMBERSHIPS

Member and Education Committee Chair, Genesee Finger Lakes Chapter, Air & Waste Management Association

Member and Past President, Buffalo Association of Professional Geologists, Inc.

Member, New York State Council of Professional Geologists

PROJECT EXPERIENCE

Brownfield Remediation and Redevelopment

Canandaigua Multi-Brownfield Site Redevelopment, Canandaigua, New York

Prepared Phase II Environmental Site Assessment Work Plan and helped oversee its implementation. The site was accepted into the NYS Brownfield program. Ms. Reynolds-Smith assisted with preparation of the Remedial Investigation Work Plan and coordination of the field program. Preparation of the RI Report is currently underway.

Former Belmont Asphalt Plant, Belmont, New York

Prepared an RI work plan for this NYSDEC Brownfield Cleanup Program site. The site is a former asphalt plant at which an asphalt testing laboratory was located. Trichloroethene (TCE) was used in the testing process and was found in site soils and groundwater. Ms. Reynolds-Smith oversaw the implantation of the work plan, including a passive soil vapor study, test pitting, surface soil sampling, monitoring well installations, development, sampling and aquifer testing. She oversaw the implementation of IRMs including soil removals and groundwater treatment. She then prepared the RI/IRM Report, assisted with preparation of the Site Management Plan and prepared the Final Engineering Report. A Certificate of Completion has been issued by NYSDEC.

Stephanie Reynolds-Smith

Geologist

811 Jefferson Road, Henrietta, New York

Prepared combined Phase I/Phase II Report, NYS Brownfield Cleanup Program application and Remedial Investigation (RI) work plan of a 12± acre parcel. Ms. Reynolds-Smith then oversaw the field program. The site was formerly used for manufacturing photocopying equipment. Via the installation of 32 shallow overburden wells, 6 intermediate overburden wells and 5 deep overburden wells, testpitting, surface soil sampling, surface water sampling, drainage ditch soil sampling, and storm sewer sampling two main areas of chlorinated VOC contamination were delineated. Following completion of the multi-phase field program, Ms. Reynolds-Smith assisted with the preparation of the RI Report, which has been approved by the NYSDEC.

Environmental Assessments

Lighthouse Pointe, Rochester, New York

Coordinated a soil vapor intrusion investigation of two residences in response to a lawsuit filed by the owners and their attorney against the City of Rochester regarding impacts from an adjacent former municipal landfill site. Assisted with and helped coordinate responding to documents submitted by the plaintiffs' consultant and attorney; reviewing current and historic documents, including maps, air photos, reports and work plans; and preparing summary documents and geo-referenced historic filling maps. Stantec's efforts resulted in a mutually beneficial out of court settlement.

BJ's Wholesale Club, Linden, New Jersey

Conducted an RI at this site, which was formerly a major oil storage facility (MOSF) and which currently houses a gasoline station. The investigation found two types of LNAPL and started the delineation of an MTBE plume in groundwater. Ms. Reynolds-Smith oversaw the RI field work, prepared the RI Report, and assisted with planning and coordination for stages of investigation, which are currently underway.

GK Management, Buffalo, Rome, Rochester, and Syracuse, New York

Prepared Remedial Investigation (RI) proposals; performed RI fieldwork, including soil boring installation, monitoring well installation, well development and sampling, water level measurement, and aquifer testing; and prepared RI reports, including data summary and analysis, such as preparing tables and figures (groundwater level contour maps, contaminant contour maps, etc).

Military Reservations*, Georgia and South Carolina

For the USACE Savannah District, she was Site Safety Officer for a field program at Fort Gordon, Georgia, that included installation (with sonic drilling techniques), development, and sampling of 18 deep overburden wells, in addition to sampling of already existing wells and soil at numerous hand auger borings. She also helped compile investigation reports for Fort Gordon, as well as for Fort Jackson in South Carolina.

Monitor Devices*, Wall Township, New Jersey

For the Kansas City District of the USACE, Ms. Reynolds-Smith served as Field Team leader during rotosonic and hollow stem auger drilling for subsurface soil sampling and monitoring well installation.

Foster Wheeler*, Moutaintop, Pennsylvania

For the USEPA, Ms. Reynolds-Smith served as Field Team leader during multimedia sampling, including groundwater, surface soil, sediment, soils, subslab air, soil gas, and wastewater. She was often responsible for client and residential relations.

Additional NYSDEC Sites*, New York

Under a standby contract with NYSDEC Ms. Reynolds-Smith was field team leader for the drilling, development, and sampling of overburden wells at the Luzerne Road RI site. For the final report for the Frontier Chemical RI site, she produced an extensive table comparing historical and recent data and responded to client comments. She led the sampling of on-site wells and assisted in capture zone analysis at the Fourth Street pre-design investigation site in Buffalo. She used gINT software to prepare drill logs for the Sweden Chapman Properties landfill project in Sweden. For the VOC-contaminated Mr. C's Dry Cleaners site in East Aurora, she was Site Safety Officer for active soil-gas air sampling and helped prepare the groundwater sampling work plan. She also contributed to work plan preparation for the former Davis Howland oil recycling facility in Rochester.

** denotes projects completed with other firms*

Stephanie Reynolds-Smith

Geologist

Chemical Sales Site* (Task Manager)
For a PSA for NYSDEC, Ms. Reynolds-Smith was responsible for project planning, scheduling, cost control, and report preparation. The PSA involved background research and a field investigation that included logging and sampling subsurface soil Geoprobe locations; installation, development, and sampling of groundwater monitoring wells, plus surface water/sediment sampling; and management and disposal of investigation-derived waste. Upon receipt of the analytical results for VOCs, SVOCs, pesticides, PCBs, metals, and glycols, Ms. Reynolds-Smith organized and interpreted the data and wrote the final PSA report.

Upper Broadway Barrel* (Preliminary Site Assessment (PSA) Field Team Leader)
As the preliminary site assessment Field Team Leader, she conducted electromagnetic ground conductivity and magnetometer geophysical surveys and completed a passive soil-gas survey over a 560,000-square-foot portion of this NYSDEC program site. As part of the first phase of investigation, her team collected surface soil, storm sewer sediment, and subsurface soil samples; installed and developed three overburden monitoring wells; and sampled and measured the well water levels. The second phase then involved test pit excavation to investigate six geophysical anomalies and sampling of subsurface soil. Following the field effort, Ms. Reynolds-Smith also prepared the PSA report.

National Lead Industries* (Task Manager)
For an immediate investigation work assignment (IIWA) for the NYSDEC, Ms. Reynolds-Smith planned and conducted surface soil sampling at approximately 76 properties. The high-visibility project involved careful attention to public and political concerns. Ms. Reynolds-Smith was responsible for project scheduling, cost control, public relations, field team leadership, and report preparation.

Old Troy Municipal Incinerator Site*, Troy, New York
Field team leader for a NYSDEC site investigation at a former town incinerator site. The fieldwork included surface soil sampling, analysis of landfill cap thickness, monitoring well installations, and surface water/sediment sampling. Subsequent to field activities, Ms. Reynolds-Smith performed data analysis and report preparation, and assisted with scoping for next phase of investigation at the site.

Niagara Falls International Airport-Air Reserve Station*, Niagara Falls, New York (Task Manager)
Basewide groundwater monitoring program and Site 5 interim corrective measure under contract with the United States Air Force Reserve Command, 914th Airlift Wing. Responsible for project planning, scheduling, cost control, and report preparation. Supervised field programs including well installations, inspection and maintenance of 137 monitoring and pumping wells, the semiannual measurement of water levels, and the semiannual sampling of up to 70 monitoring wells and 10 surface water locations.

Western New York Nuclear Service Center*, West Valley, New York
Obtained water elevation measurements and performed groundwater sampling and monitoring of 21 wells and piezometers at the closed, state-licensed disposal area (SDA) for commercial low-level radioactive waste. A trained Radiological Worker II, she conducted field activities in a radiological work area.

Environmental Site Assessments Phase I, II, III

Hudson River PCB Cleanup*, New York State
For EPA Region 2 and the USACE Kansas City District, a member of multidisciplinary performance standards team for the EPA-required dredging action on the historic Hudson River. The $500-million program included construction of sediment processing and water treatment facilities, installation of rail and barge loading facilities, and development/use of innovative dredging techniques. The team identified best locations for sediment processing facilities via Phase II Environmental Site Assessments, determining the most appropriate quality of life performance standards to gauge project success, and determining how that success will be measured.

Environmental Site Remediation

Blades & Sons Phase II and Corrective Action Plan (CAP) Implementation, Milo, New York
Performed a Phase II Environmental Site Assessment (ESA), including water supply well sampling, test pit investigation and subsurface soil sampling. Based on the results of the ESA, a 1,700 ton soil removal was performed and the site was therefore closed by the NYSDEC.

** denotes projects completed with other firms*

Stephanie Reynolds-Smith

Geologist

Brownfields Cleanup Agreement, Germanow-Simon, Rochester, New York

Performed weekly treatment system monitoring, quarterly groundwater sampling and annual report preparation pursuant to a Brownfields Cleanup Agreement with New York State. Remediation of the site is ongoing. A certificate of completion was obtained in December 2006 allowing for the applicable refundable tax credits.

Liberty Industrial Finishing Superfund Site*

Helped prepare the field sampling plan, determined the drilling methodology, and performed three dimensional groundwater flow modeling using MODFLOW for the off-site treatment system. Also served as field team leader or managed field teams during drilling of vertical profile borings, well inspections and groundwater sampling. Responsible for preparing several data analysis reports after these field events.

Griffiss Air Force Base*, Rome, New York

As part of a sitewide bedrock groundwater study for the Kansas City District of the United States Army Corps of Engineers (USACE), Ms. Reynolds-Smith developed, sampled, and slug-tested several on-site wells and contributed to the report writing, construction of cross-section and groundwater contour maps, and updating of the ERPIMS database. She also helped develop a treatability study work plan and was Site Safety Officer for a Geoprobe investigation to identify one area's vertical and horizontal extent of contamination and contaminant source.

To support the Three Mile Creek remedial design at Griffiss AFB, she used the Technical Release 55 (TR-55) model of the USDA Natural Resources Conservation Service to calculate peak discharge during selected storm events; then applied the results to the USACE Hydrologic Engineering Centers River Analysis System (HEC-RAS) model to calculate one-dimensional steady and unsteady flow.

Ms. Reynolds-Smith also served as Field Team leader during installation of approximately 16 monitoring wells, during difficult drilling conditions with many problems with flowing sands.

Spaulding Fibre*, Tonawanda, New York

After assisting with project planning, Ms. Reynolds-Smith served as field team leader for the NYSDEC for a pre-design investigation at a former industrial site. This investigation involved much field-based decision making and included test pitting, installation of direct-push boreholes for subsurface soil sampling, and monitoring and extraction well installation.

Remedial Investigations, Options, Pilot Testing

Rose Valley Landfill*, Utica, New York

For NYSDEC, Ms. Reynolds-Smith supervised the drilling and development of overburden wells, groundwater sampling, and surface water and sediment sampling for analysis for VOCs, semivolatile organic compounds (SVOCs), metals, pesticides, PCBs, cyanide, and leachate indicators. She also led aquifer testing, participated in soil-gas surveys, and helped prepare the RI report.

Former Bright Outdoors Site*, Johnson City, New York

Ms. Reynolds-Smith contributed to the PSA report for this NYSDEC program site, then was a field team leader for the remedial investigation/feasibility study (RI/FS). She served as Site Safety Officer during on-site, sub-slab indoor air sampling as well as during off-site air sampling in the adjacent residential area. She led the aquifer testing, water level measurement, and sampling of on- and off-site wells, and assisted in report preparation.

Steuben County Sites*, Bath and Hornell, New York

Field team leader for six RIs for NYSDEC, she lead a fast-paced multi-media sampling effort at several former dry cleaner sites. Sampling included subsurface soil, groundwater and active soil gas sampling with a Goeprobe, as well as the sampling of existing wells with both passive diffusion bags and traditional bailing methods.

Former Adirondack Steel*, Colonie, New York (Project Manager)

While Conducting the remedial investigation/feasibility study (RI/FS) for the DEC, Ms. Reynolds-Smith was responsible for project planning, scheduling, cost control, and report preparation. The prime components of this former steel foundry site were a manufacturing area, a 9-acre foundry landfill, and soils contaminated with polychlorinated biphenyls (PCBs) as a result of a spill of PCB-containing transformer oil. Ms. Reynolds-Smith lead the field team, whose activities included installing overburden and bedrock monitoring wells, direct-push boreholes, collecting surface soil samples to delineate the PCB contamination, additional surface soil sampling, surface water/sediment sampling, manhole/sump sampling for water and sediment, conducting a geophysical survey (EM31-MK2), performing waste drum inventory and sampling, well development and sampling, and aquifer testing. Subsequent to field activities, Ms. Reynolds-Smith performed data analysis and prepared and oversaw the preparation of the RI report.

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