REMEDIAL INVESTIGATION WORK PLAN

-FOR-

Glenwood Power Plant BCP Site

45 and 45a Water Grant Way
Yonkers, Westchester County, New York
BCP Site ID C360100

Submitted by:

Glenwood POH, LLC

159 Alexander Street
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August 2014
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I, Andrew Grundy, certify that I am currently a New York State licensed Professional Engineer as defined at 6 NYCRR Part 375-1.2(aj) and paragraph 1.3(b)47 and that this Remedial Investigation Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Date: 8-28-14

Signature:

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1.0 INTRODUCTION

PS&S Engineering Inc. (PS&S) has been retained by Glenwood POH, LLC, the Volunteer for Brownfield Cleanup Program (BCP) Site #C360100 known as the former Glenwood Power Plant Site (the Site), to prepare this Remedial Investigation Work Plan (RIWP) as required by the BCP. This RIWP presents a summary of the planned remedial investigation activities at the Site, located at 45 and 45a Water Grant Way, Yonkers, Westchester County, New York (Site).

This RIWP includes details from a previous investigation and assessment of the Site, a summary of the Site's history, a description of the Site setting, and the proposed methodologies for further investigation activities.

The RIWP was developed in accordance with the New York State Department of Environmental Conservation (NYSDEC) DER-10 Technical Guidance for Site Investigation and Remediation (DER-10) issued May 2010 and Commissioner Policy CP-51: Soil Cleanup Guidance issued October 21, 2010.

1.1 Purpose of Investigation Activities

The RIWP is being performed to support the remediation and redevelopment of the Site, supplement the existing soil data, and assist in the development of a remedial strategy. The remedial investigation includes the collection of soil samples obtained from GeoProbe® soil borings, soil vapor samples obtained from GeoProbe® soil vapor probe points, and the collection of groundwater samples obtained from monitoring wells to be installed using hollow stem auger drilling.

1.2 RIWP Organization

This RIWP is organized as follows:

- **Section 1.0 – INTRODUCTION:** This section provides a brief summary of the investigation activities and purpose.
- **Section 2.0 – SITE DESCRIPTION:** This section provides a brief description of the location of the Site, the historical operations performed on the Site and a summary of the geology and hydrogeology of the site.
- **Section 3.0 – NATURE AND EXTENT OF SITE CONTAMINATION:** This section provides a summary of the results of the investigation activities previously conducted on the Site.
- **Section 4.0 – REMEDIAL INVESTIGATION PROGRAM:** This section summarizes the objectives of the proposed investigation activities to be implemented on the Site, identifies the Areas of Concern (AOCs) that warrant investigation and/or remediation, and outlines the specific methods to accomplish the remedial objectives.
- **Section 5.0 – INVESTIGATION PROTOCOLS:** This section discusses laboratory deliverables and data quality. It also presents a description of the health and safety

and air monitoring activities to be conducted during the implementation of the investigation activities.

- **Section 6.0 – APPLICABLE REMEDIAL STANDARDS:** This section describes the remedial standards that will be applied to the analytical results generated from the implementation of the investigation activities described.
- **Section 7.0 – REMEDIAL INVESTIGATION REPORT:** This section presents a summary of the contents of the Remedial Investigation Report to be completed at the conclusion of the investigation program.

2.0 SITE DESCRIPTION

This section provides general information on the setting of the Site. Also included is a description of the land uses, the historical operations performed at the Site, a summary of the regional and local geology, and the hydrogeology of the Site.

2.1 Site Setting

The Site is located at 45 and 45a Water Grant Way, Yonkers, Westchester County, New York. The Site is located on the eastern shore of the Hudson River, west of the Glenwood Metro North Rail Road station and apartment buildings, south of JFK Marina Park and north of the BICC Cables Corporation BCP Site located at One Point Street. The Site has been vacant for 40 years and only utilized by vandals and gangs who trespass on the Site.

The BCP Site area is approximately 1.9412 acres of the upland portion above the mean high water mark of Block 2635, Lots 1, 15, and 19. Approximately 2.3578 acres of underwater land below the mean high water mark of Block 2635, Lots 1, 15, and 19 is not included in the BCP Site. There are three buildings located on the Site. The two main buildings that were previously used as the coal-fired power generation plant include a three-story Turbine Hall/Smoke Stack Building and a three-story Switch House Building to the north. To the west is a one-story Brick Pump House Building. The existing buildings were constructed in approximately 1905 and comprise approximately 62,000 square ft.

Based on a Phase I ESA, the Site was utilized as a coal-fired power generation plant from 1917 to 1978 when Consolidated Edison ("Con Ed") sold the Site to K. Capolino Design & Renovation, Ltd. The on-Site structures have been vacant since 1978. Glenwood POH, LLC acquired the Site in December 2012.

Examination of the USGS Topographic Map, Yonkers Quadrangle, indicates that the elevation of the Site is approximately 2 ft above mean sea level (msl) and the topography slopes to the west.

The location of the Site is depicted on **Figure 1**, Site Location Map.

2.2 Land Use

According to the City of Yonkers Zoning Map, the Site is situated within an industrially zoned district. The Site is also zoned-industrial and is currently vacant. Glenwood POH, LLC submitted a PUR special use permit application for the Site to the City of Yonkers Planning Board in October 2012. This PUR special use permit application for an associated planned commercial project is going through a SEQRA Environmental Impact Statement Process (EIS) project, which commenced in December 2012 and is anticipated to be completed in 2015. The proposed use for the Site is a cultural event center with commercial components including a hotel and restaurants.

2.3 Geology and Hydrogeology

According to the United States Department of Agriculture (USDA) Soil Conservation Service (SCS), the dominant soil composition in the general vicinity of the Site is identified as Urban Land (Uf), which consists of surface areas that are 70 percent covered with asphalt, concrete or other impervious building material, such as, parking lots, shopping centers, and industrial parks or institutional.

Based on review of boring logs from a geotechnical investigation conducted on the Site and surrounding areas by PS&S in January 2013, the Site is underlain by a layer of fill material consisting of sand and gravel mixed with cinders, asphalt, concrete, wood, brick, glass, metal and other miscellaneous debris to depths between 13 and 23 feet (ft) below ground surface (bgs), beneath which is a layer of organic clayey silt including shell fragments to depths between 22 and 30 ft bgs, beneath which is a layer of sand and gravel. The geotechnical investigation report will be provided upon its completion. The underlying bedrock was not encountered in the soil borings completed to depths between 60 and 70 ft bgs. The Statewide Bedrock Geology Map (New York State Geological Survey, July 14, 1999) indicates that the Site is underlain by Inwood Marble.

Local groundwater flow direction, inferred from available topographic mapping of the area, is assumed to be to the west toward the Hudson River. Depth to groundwater at the Site varies with distance from the Hudson River and is an average of approximately 2 ft bgs.

The Hudson River is a potential ecologically sensitive area (i.e., tidal wetland, floodplain) located along the western portion of the Site. In addition, a review of the Overview Map included in the Environmental Data Resources, Inc. database report, included in the Phase I ESA, indicates that the western portion of the Site is included in the National Wetlands Inventory.

3.0 NATURE AND EXTENT OF SITE CONTAMINATION

Soil samples were collected during previous investigations conducted by CA Rich Consultants, Inc. (CA Rich). The findings of these investigations and other environmental documents prepared by CA Rich, and McLaren Engineering Group are presented in detail below.

3.1 Phase I Environmental Site Assessment (ESA) (CA Rich, June 2006)

This investigation was conducted by CA Rich for REMI Companies, a prior BCP Volunteer. The Phase I ESA Report concluded that there were six Recognized Environmental Conditions (RECs). The report also identified that the Site was used as a coal power generation facility from 1917 – 1978. The first owner was New York Central Railroad (currently Metro North) from 1917 until 1936. In 1936, the railroad sold the site to Yonkers Light & Gas, a predecessor of Consolidated Edison. In 1978, most of the Site was sold to K. Capolino and Glenplace Equities (affiliated entities). These owners attempted to sell the Site numerous times, including to prior BCP Volunteer REMI Companies, but each deal fell through principally due to environmental concerns. In 2012, the current Volunteer became interested in redevelopment of the power plant structures and purchased the Site in December 2012.

A list of the Phase I ESA RECs follows below:

- REC-1: Identification of two rusty and dilapidated transformers on the ground in the courtyard causing underlying soils to be impacted.
- REC-2: The former coal ovens contained unknown materials, presumably combustion residue from the burning of coal.
- REC-3: The floor of the former power generation area is covered with soil and debris of unknown quality.
- REC-4: The vacant formerly wooded area located on the south portion of the power plant contains soil of unknown quality.
- REC-5: Based on the age of the buildings on the Site there is a potential for asbestos.
- REC-6: There were eight rusty and dilapidated 55-gallon drums of unknown quantity and material located on the southeast portion of the southern building.

The report also identified one possible storage tank in the southern three-story building; numerous unlabeled 55-gallon drums and rusted paint cans in the court yard; six old gas cylinders, one labeled as dry nitrogen; a small pile of white powder in the northern most three story building; and ten 55 gallon drums in the southern most three story building with one labeled as caustic powdered soda. 29 leaking underground storage tanks

(LUSTs), located upgradient of the Site within ½ mile, were also identified in the Phase I ESA Report.

A Phase II subsurface Remedial Investigation of the Site was recommended and completed as discussed in Section 3.2.

3.2 Limited Phase II ESI (CA Rich, September 2006)

Based on the significant environmental Phase I history related to the Site, CA Rich conducted an initial limited subsurface environmental site investigation (ESI) in July 2006 for prior BCP Volunteer REMI Companies to address RECs identified in the Phase I ESA Report. The goal of the ESI was to determine if the RECs have resulted in soil impacts, which would require additional investigation to provide for characterization and delineation of the identified impacts and support potential remedial decisions for the redevelopment of the property.

Soil samples were collected in the vicinity of three AOCs: the Courtyard Area, the Former Coal Oven Area and the Former Power Generation Area. Eighteen soil samples were collected by CA Rich using a hand auger. The samples in the Courtyard Area were collected at depths of 3 to 20 inches bgs (0 to 2 ft bgs). The samples in the Former Coal Oven Area and Former Power Generation Area were collected from the sediments built up on the concrete floor of the building interiors. The Soil Sampling Locations are depicted on the figure included as **Appendix A**. The samples were analyzed for VOCs per EPA Method 8260, SVOCs per EPA Method 8270, PCBs per EPA Method 8082 and 14 combined RCRA Priority Pollutant Metals. The sample results follow below:

FORMER COAL OVEN AREA - Of the 18 total soil samples, 10 were collected in the former coal oven area, identified as CO-1 through CO-10. Laboratory results indicated the presence of:

- SVOCs – Numerous detections with Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene and Indeno(1,2,3-cd)pyrene exceeding NYSDEC PART 375 Unrestricted limits.

- Metals – Numerous detections with Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, and Zinc exceeding NYSDEC PART 375 Unrestricted limits. Lead concentrations averaged around 6,000 mg/kg with one detection as high as 17,800 mg/kg.

- PCBs – No detections.

FORMER POWER PLANT GENERATING AREA - Four soil samples were collected from the former power generating area, identified as PG-1 through PG-4. Laboratory results indicated the presence of:

- VOCs – Tetrachloroethene (PCE) was the only detection and was below NYSDEC PART 375 Unrestricted limits.

- SVOCs – In one sample, Indeno(1,2,3-cd)pyrene levels exceeded NYSDEC PART 375 Unrestricted limits.

- Metals – Numerous detections with Arsenic, Barium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Silver, and Zinc exceeding NYSDEC PART 375 Unrestricted limits. Lead concentrations in three samples ranged from 11,800 to 13,600 mg/kg.

- PCBs – Aroclor 1260 was detected above and Aroclor 1242 was detected below NYSDEC PART 375 Unrestricted limits.

COURTYARD AREA - Four soil samples were collected from the Courtyard area, identified as CY-1 through CY-4. Laboratory results indicated the presence of:

- VOCs – Several detections; Benzene, Ethylbenzene, Tetrachloroethene, Toluene and Xylenes, all were below NYSDEC PART 375 Unrestricted limits.

- SVOCs – Numerous detections; Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(g,h,i)perylene, Chrysene, Dibenzo(a,h)anthracene and Indeno(1,2,3-cd)pyrene exceeding NYSDEC PART 375 Unrestricted limits.

- Metals – Numerous detections with Arsenic, Cadmium, Copper, Lead, Mercury and Zinc exceeding NYSDEC PART 375 Unrestricted limits.

- PCBs – Aroclor 1260 was detected above the NYSDEC PART 375 Unrestricted limits.

Three composite waste soil samples (one for each of the three AOCs) were also generated from the 18 grab soil samples discussed above and analyzed for VOCs per EPA Method 8260, SVOCs per EPA Method 8270, PCBs per EPA Method 8082, TCLP analysis and RCRA characteristics. According to CA Rich, based on the test results, the soil in the Former Coal Oven Area and Courtyard Area are classified as non-hazardous regulated waste while the soil in the Former Power Generation Area is classified as a characteristic hazardous waste because extract of the sample from the TCLP analysis contained lead at a concentration of 79.7 mg/l, which exceeds the regulatory level of 5 mg/l.

In addition to soil sampling, samples of suspect asbestos containing material (ACM) were collected from the courtyard and inside the buildings and submitted for lab analysis. The results indicated 5 of the 7 samples tested positive for ACM. Pipe and blower insulation materials were identified as ACM. The asbestos abatement was performed by ALR Environmental Corp from February 23 to March 1, 2013, and is detailed in the Asbestos Closure Report, dated April 12, 2013. The Asbestos Closure Report is included as **Appendix F** of this RIWP.

3.3 Phase II ESA Addendum No. 1 (CA Rich, February 28, 2007)

Based on the review comments from the NYSDEC on the Limited Phase II ESA relative to elevated lead levels detected in soil samples collected from the Site, CA Rich researched references for the lead content of coal, coal bottom ash and coal fly ash and prepared an addendum in February 2007 for REMI Companies. Lead concentrations in the three AOCs were: 0.54 to 17.8 parts per million (ppm) in the former Coal Oven Area, 2.8 to 13.6 ppm in the former Power Plant Generating Area, and 0.35 to 3.6 ppm in the Courtyard Area. CA Rich concluded that the elevated lead levels are a direct result of the historic on-site combustion of coal at this facility.

3.4 Interim Remedial Measures Work Plan (IRMWP) (CA Rich and McLaren Engineering Group, April 2007)

An IRMWP was prepared as part of the prior BCP Application (submitted by CA Rich on behalf of REMI Companies) to accomplish three goals:

- Interior demolition within the existing structures
- Classifying the generated waste materials for off-site disposal and
- Disposal of Various Demolition Debris

Essentially, this IRMWP was designed to clean up the on-site debris, and to further sample the material in the Courtyard and Power generation areas for off-site disposal purposes to determine if it would be classified as non-hazardous or hazardous waste. The IRMWP was not completed because the former BCP Volunteer withdrew from the BCP Program.

3.5 Current Interim Remedial Measures

Interim Remedial Measures (IRMs), in the form of above ground cleanup efforts from years of building neglect, are in progress on the Site, and will be completed prior to commencing the RI. These IRM activities include clearing interior sediments and building debris and sorting construction and demolition debris prior to waste disposal. A Waste Classification Sampling Plan related to the IRM activities was submitted to the NYSDEC on February 13, 2013.

4.0 REMEDIAL INVESTIGATION PROGRAM

The remedial investigation (RI) includes the collection of soil, soil vapor and groundwater samples obtained from surface soil samples, soil borings, soil vapor probe points, and monitoring wells that will be installed. The objectives of the RI activities are to define the Site's physical characteristics; the physical and chemical characteristics of contamination sources; the nature and extent of contamination; and the applicable standards, criteria or guidance (SCGs) for the sampled media.

Based on a review of previous investigations, the following six AOCs have been identified as warranting investigation and/or remediation:

- AOC-1 – Historic fill material related to industrial use of the Site including coal combustion for power generation. (To be investigated by on-site surface soil samples and soil borings GPP-SB-S-1 through GPP-SB-S-12.)

- AOC-2 – Historic freight use on the eastern portion of the Site. (To be investigated by on-site surface soil samples and soil borings GPP-SB-S-6 and GPP-SB-S-7.)

- AOC-3 – Building Interior. (Being handled by current IRM activities.) (Also to be investigated by surface soil samples and sub-slab soil samples GPP-IB-S-1 through GPP-IB-S-6.)

- AOC-4 – Former transformer area and elevated PCB concentrations in soil in the Courtyard between the Power Generating Building and the Switch House. (To be investigated by on-site surface soil samples and soil borings GPP-SB-S-8 through GPP-SB-S-11.)

- AOC-5 - Potential groundwater impacts on the Site as a result of soil impacts (with elevated concentrations of SVOCs, Metals and PCBs) that were documented in CA Rich's Limited Phase II ESA. (To be investigated by on-site groundwater monitoring wells GPP-MW-A through GPP-MW-C; which are to be installed in locations based on previous soil investigation results. Although based on previous soil investigation results, the monitoring well locations are limited by site limitations and constraints.

- AOC-6 – Potential soil vapor impacts on the Site as required by DER-10. (To be investigated by on-site soil vapor probe points GPP-SV-1 and GPP-SV-2.)

Figure 2 depicts the AOCs and their proposed soil, soil vapor and groundwater sampling locations. **Table 1** provides a sampling summary for each of the AOCs. All surface soil samples will be collected from a depth of 0 to 2 inches, just below the grass root structure.

4.1 Geophysical Survey

Prior to the start of the investigation, the driller will contact the One Call Center to provide a utility mark out. PS&S also will contact the MTA directly, due to the Site location directly adjoining an active Metro North Rail Road right of way, and will provide **Figure 2** identifying the proposed drilling locations for the soil borings, soil vapor probes and monitoring wells for their consideration. In addition, a private utility locating service contractor will conduct a geophysical survey to clear the proposed soil boring, soil vapor probe and monitoring well locations prior to drilling.

4.2 Sub-Slab Soil Sampling

The Site buildings are underlain by the original concrete slabs and supported by timber piles. The structures are proposed to be renovated for continued use following redevelopment of the Site. The IRM activities in progress include clearing interior sediments and building debris that are currently covering the concrete slabs. As a result a follow up evaluation of the structural integrity of the remaining concrete slabs will be conducted following completion of the IRM activities. When the building stabilization efforts are complete and building interiors are deemed safe enough to allow assessment of the basement floors, a site visit with NYSDEC, NYSDOH and applicant representatives will be scheduled to determine the location and number of the sub-slab soil samples. Based on visual observation of the concrete condition (including cracking, staining, floor drains, etc.) and review of available foundation drawings, it is estimated that six sample locations will be selected to install interior borings (GPP-IB-S-1 through GPP-IB-S-6). Sampling methodologies and depths are to be determined. One analytical soil sample will be collected from each soil boring for laboratory analysis on a standard turnaround time. The analytical soil samples will be placed into laboratory-provided sample containers, labeled, placed in an iced cooler and relinquished to a NYSDEC-ELAP certified laboratory within 48 hours of sampling. Transfer of the samples to the laboratory will be accompanied by standard chain-of-custody documentation for analysis for the presence of Target Compound List (TCL) Volatile Organic Compounds (VOC) plus a 10-peak library search (+10), TCL Semi-volatile Organic Compounds (SVOC) plus a 20-peak library search (+20), Pesticides, Herbicides, PCBs, Target Analyte List (TAL) Metals and Total Cyanide. Total Cyanide has been added to the suite of analytical parameters because it is a contaminant of concern related to the Site's historical use as a coal-fired power generation plant.

4.3 GeoProbe® Soil Borings

A total of 12 soil borings (GPP-SB-S-1 through GPP-SB-S-12) are proposed to be installed on the Site. The soil borings will be advanced using a GeoProbe®. Continuous soil sampling will be conducted until the first confining layer (organic silty clay) is encountered, which is expected at depths between 13 and 23 ft bgs.

The soil recovered in each sample will be "field-screened" with a PID for the presence of organic vapors. Soil samples will be visually classified in the field and this information,

along with other pertinent observations (i.e., PID readings, visual/physical observations) will be recorded in boring logs maintained by our field representative. The soils will be classified using the USCS.

Three analytical soil samples will be collected from each soil boring for laboratory analysis on a standard turnaround time: at 0 to 0.5 ft bgs, at 3 to 5 ft bgs and one additional depth interval below the water table that will be determined based on field screening (i.e., PID readings, staining). NYSDEC input will be included in the choice of interval for the third sample. The analytical soil samples will be placed into laboratory-provided sample containers, labeled, placed in an iced cooler and relinquished to a NYSDEC-ELAP certified laboratory within 48 hours of sampling. Transfer of the samples to the laboratory will be accompanied by standard chain-of-custody documentation for analysis for the presence of TCL VOC+10, TCL SVOC+20, Pesticides, Herbicides, PCBs, TAL Metals and Total Cyanide.

4.4 Monitoring Well Installation and Sampling

A total of 3 shallow 2-inch diameter monitoring wells (GPP-MW-A through GPP-MW-C are proposed to be installed on the Site to approximate depths of 13 ft bgs via hollow stem auger drilling methods. The tidal elevations of the Hudson River vary on average by four feet, and based on previous studies the tidal elevations of the sites ground water vary from 0.7 to 2.1 ft per tidal cycle. Before installation of the new monitoring wells, additional high tide and low tide measurement will be taken from on-site wells and piezometers. The screen interval will be identified based on these readings and water level measurements collected from piezometers installed during the PS&S geotechnical feasibility investigation. Data collected during the geotechnical investigation indicates that depth to groundwater at the site ranges from approximately 5.3 to 11.5 ft bgs at high tide to 7.2 to 12.0 ft bgs at low tide. Piezometric data collected during the geotechnical investigation is included as **Appendix B**. The monitoring well locations have been situated in locations to avoid drilling into the timber piles located beneath the Site building. Well construction will include a screened interval from 3 to 13 ft bgs and solid PVC riser from 0 to 3 ft bgs. The sand pack will be placed in the annular space around the well screen extending 2 ft above the top and six inches below the bottom. A six-inch thick bentonite seal will be placed above the sand pack along with a six-inch finer grained sand pack. Upon completion of the monitoring wells, a 3-foot thick seal will be formed. The top of screen will begin at top of water table in cases where groundwater is encountered less than 3 ft bgs. The actual location of the screens will be determined in the field with NYSDEC concurrence.

Following installation, the wells will be developed by pumping and surging until either five well volumes have been removed or well quality parameters collected on the Horiba U-22 instrument have stabilized including achieving turbidity readings of less than 50 NTUs. There will be a two-week waiting period between the end of well development and the beginning of the first sampling event of the wells. After the wells have stabilized, groundwater samples will be collected using low-flow techniques.

One analytical groundwater sample will be collected from each monitoring well for laboratory analysis on a standard turnaround time. Two rounds of groundwater sampling will be conducted. The analytical groundwater samples will be placed into laboratory-provided sample containers, labeled, placed in an iced cooler and relinquished to a NYSDEC-ELAP certified laboratory. The transfer of the samples to the laboratory will be accompanied by standard chain-of-custody documentation for analysis of the presence of TCL VOCs+10, TCL SVOCs+20, Pesticides, Herbicides, PCBs, TAL Metals (total and dissolved) and Total Cyanide. Additionally, during collection of the groundwater samples, each sample will be field analyzed for temperature, pH, conductivity, dissolved oxygen and oxidation-reduction potential.

Table 1 displays the total number of soil and groundwater samples proposed to be submitted to the laboratory and the analytical parameters.

4.4.1 Groundwater Flow Evaluation

It is anticipated that groundwater beneath the Site will be influenced by tidal fluctuations of the Hudson River. To determine the extent of tidal influence at the Site, well elevations will be surveyed and water level measurements will be collected during peak high and peak low tides at the three new monitoring wells. PS&S proposes to conduct two separate measurement events to establish groundwater flow conditions beneath the Site.

4.5 GeoProbe® Soil Vapor Probe Points

A total of twelve (12) soil vapor probes (GPP-SV-1 thru GPP-SV-12) are proposed on the Site. Due to the low elevation of the existing building basement floors (between 2' and 5'3") and the observed high water table that at times has flooded the building basements, PS&S believes subsurface soil vapor sampling may not be feasible within the building footprints. Therefore the soil vapor probes will be installed in in the higher elevations areas on-site near each structure, and in the court yard between the Switch House and Turbine Hall. The soil vapor probes will be installed biased to the eastern portion of the Site, furthest from the Hudson River, in order to avoid drawing shallow groundwater into the soil vapor probes. The samples will be collected in accordance with NYSDOH Guidance. Sampling and will be performed using a GeoProbe® to drive the sampling apparatus (drive point and steel "hollow" rod sections) to the desired depth. The shaft sections will be driven into the ground to a depth of approximately 3.5 to 4.0 ft bgs, dependent upon the depth to groundwater, to avoid drawing shallow groundwater into the soil vapor probes. Once the target depth is achieved, the rods will be pulled up one foot, to expose the void space, and the sampling apparatus will be set up in the sample hole. Soil vapor sampling will be performed using the following steps: Teflon tubing equipped with a threaded stainless steel fitting will be attached to a disposable soil vapor drive point to prevent infiltration of ambient air directly above the sample hole. A bentonite seal will be created around the GeoProbe® drive rods and the surrounding ground surface. Teflon tape will be used to seal the area surrounding the tubing to the drive rods.

The sample tubing will be purged using a vacuum pump set at a rate of approximately 0.2 liters per minute.

A tracer gas (Helium) will be used to enrich the atmosphere in the immediate vicinity of the sampling location. A container will be placed over the area where the sample tubing intersects the ground surface to test the sample hole seal and verify that ambient air was not being drawn into the sample and causing dilution. A sample will be pulled into a Tedlar® bag via an evacuated chamber and tested for Helium gas using a MGD 2002 portable He detector. Continuous or excessive pumping will be avoided in order not to dilute the soil vapor with surface air or distort the actual soil vapor concentration patterns. The chamber above the sample hole will also be tested for helium. Screening results will not be accepted if the helium detected in the sample tubing is greater than 20 percent of the Helium enriched container located directly above the sample hole.

Following the purging and tracer gas verification steps, the sample tubing will be connected to a calibrated flow regulator connected to a 6-liter Summa canister. The canisters will be equipped with flow controllers (regulator) with an integral vacuum gage adjusted to provide a nominal one-hour integrated sample collection period (approximately 0.1 liters/minute). Summa canisters will be supplied by a certified laboratory and evacuated to a vacuum pressure of approximately 30 inches of mercury (Hg). A vacuum gauge will be used to measure the initial and final vacuum in the canisters to document sample integrity.

Upon completion of the sample collection, the GeoProbe® rods and sampling apparatus will be removed from the sample hole. The sample holes will be will be grouted to the surface utilizing a cement-bentonite grout.

An upwind ambient air sample (GPP-AA) will be collected concurrent with the soil vapor samples using a calibrated flow regulator connected to a 6-liter Summa canister. The canister will be equipped with a flow controller (regulator) with an integral vacuum gage adjusted to provide a nominal one-hour integrated sample collection period (approximately 0.1 liters/minute). The Summa canister will be supplied by a certified laboratory and evacuated to a vacuum pressure of approximately 30 inches of mercury (Hg). A vacuum gauge will be used to measure the initial and final vacuum in the canister to document sample integrity.

Following collection of the samples the canisters will be transferred to the laboratory accompanied by standard chain-of-custody documentation for analysis of the presence of Modified EPA Compendium Method TO-15 using GC/MS in the full scan mode.

Table 1 displays the total number of soil vapor and ambient air samples proposed to be submitted to the laboratory and the analytical parameters.

4.6 Investigation Derived Waste Management

Investigation derived wastes (IDW), including drill cuttings, monitoring well development water, decontamination waters and PPE will be collected and stored within 55-gallon USDOT drums. The drums will be placed in a plastic lined, bermed waste storage area. The location of the waste storage area will be determined prior to the start of the field investigation. PS&S will collect the appropriate samples to characterize the IDW for off-site disposal. The off-site disposal will be the responsibility of Glenwood POH, LLC.

5.0 INVESTIGATION PROTOCOLS

This section discusses laboratory deliverables and data quality. It also presents a description of the health and safety and air monitoring activities to be conducted during the implementation of the investigation activities.

5.1 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) procedures consistent with NYSDEC sampling protocols will be observed for the sampling operations. Samples will be submitted to a laboratory certified under the NYSDOH, Environmental Laboratory Accreditation Program (ELAP). All analytical data will be provided as New York State Category B Data Deliverables package. The data will be submitted to NYSDEC electronically using Equis Data Processor version 5.6.1. All QA/QC protocols are discussed in the Quality Assurance Project Plan (QAPP) and Sampling and Analysis Plan (SAP) included as **Appendix C**. Upon completion of data validation, a Data Usability Summary Report (DUSR) will be prepared and submitted to NYSDEC.

The QAPP and SAP details the means and methods for collecting soil and groundwater samples through various sampling techniques. This plan also provides the sampling forms to be utilized during soil and groundwater sampling activities in order to document the field activities.

5.2 Health and Safety Program

A Site-specific Health and Safety Plan (HASP) has been prepared for this program for use during the investigation activities described in this work plan. A copy of the plan is included as **Appendix D**. The HASP includes the following information:

- A listing of potential physical, chemical, and/or biological hazards;
- A description of the engineering and/or administrative measures to control each hazard, if applicable;
- Personal protective equipment (PPE) requirements for each remedial task based on the potential hazards of the contaminants to be encountered and the type of operation to be performed; and
- Air monitoring requirements to address the frequency, type and duration of the monitoring and the type of instruments required.

A project organization has been developed to identify the roles and responsibilities of the various parties involved with this RI. The organizational structure for this RI includes NYSDEC, PS&S, and the required contractors noted in the preceding sections of this document. Although the Quality Assurance/Quality Control (QA/QC) responsibilities are principally the responsibility of the PS&S Project Manager and Project Quality Assurance Manager (PQAM), proper implementation of QA/QC requirements necessitate that the entire project staff be cognizant of all procedures and goals.

The PS&S team will consist of the following personnel, with a description of their responsibilities:

Andrew Grundy is the Project Manager. He has primary responsibility and authority for implementing and executing the technical, QA, and administrative aspects of the pre-design investigation, including the overall management of the project team. The Project Manager is accountable for ensuring that the RI Field Program is conducted in accordance with applicable plans and guidelines, including the QAPP/SAP, and the Site-Specific HASP. In addition, the Project Manager will communicate all technical, QA and administrative matters to Glenwood POH, LLC.

Hal Newell is the Project Geologist. He has primary responsibility for implementing and executing the RI Field Program in accordance with applicable plans and guidelines, including the QAPP/SAP, and the Site-Specific HASP. In addition, the Project Geologist will communicate all technical and QA matters to the Project Manager and coordinate all RI activities with the selected contractors.

Engineering support for the investigation will be the responsibility of Andrew Grundy, the Project Engineer. His duties include overseeing the preparation of project deliverables.

John Pastorick is the Project Quality Assurance Manager (PQAM) and will be responsible for review of data upon receipt from the analytical laboratory. The PQAM will be responsible for ensuring that all analytical data are in conformance with requirements of this QAPP/SAP.

Scott Salmon is the Field Operations Lead (FOL). He will be responsible for the management and supervision of the field investigation and for providing consultation and decision-making on day-to-day issues relating to the sampling activities. The FOL will monitor the sampling to determine that operations are consistent with plans and procedures, and that the data acquired meets the geotechnical data quality needs. When necessary, the FOL will document any deviations from the plans and procedures for approval.

Mark Lennon is the Health and Safety Coordinator (HSC). The HSC reports to the PS&S Project Manager, and is responsible for the implementation of the HASP. The HSC shall advise project staff on health and safety issues, conduct health and safety training sessions, and monitor the effectiveness of the health and safety program conducted in the field.

In addition, other site personnel may provide support to the Project Manager and FOL on an as-needed basis. Scott Caporizzo and Greg McClellan will be an on-site Field Representative.

The services of an analytical laboratory contractor will also be necessary to perform the supplemental investigation activities. The Project Manager, with assistance from the FOL and PQAM, will be the liaison between PS&S and the analytical laboratory contractor.

Any laboratory utilized for the analysis of environmental samples shall be a NYSDEC certified laboratory. The laboratory shall deal directly with the consultant in regards to analytical parameters, sample handling, and analytical results reporting. The laboratory shall be responsible for providing all materials for sample collection, handling, and transportation in accordance with QA/QC requirements.

5.3 Air Monitoring

Air monitoring will be conducted in order to characterize personnel exposures and fugitive emissions generated from the performance of the investigation activities. The air monitoring procedures to be implemented during the performance of this investigation are as follows:

5.3.1 Work Zone Air Monitoring

Work zone air monitoring will be performed in accordance with the HASP prepared for these investigation activities. A Lower Explosive Limit (LEL)/Oxygen (O_2) meter, or equivalent, will be used to monitor for explosive atmospheres as well as oxygen concentrations. A photoionization detector (PID), or equivalent, will be used to monitor the work zone for the presence of VOCs. Further, a dust monitor will be used to monitor the work zone for the presence of airborne particulates during the performance of the investigation activities. Action levels have been established in the SSHASP and will be communicated to site workers and visitors.

5.3.2 Community Air Monitoring Plan (CAMP)

During drilling activities, calibrated air monitoring instruments will be used to monitor for potential releases of volatile organic vapors and soil particulates from the site. Upwind and downwind air monitoring stations will be established relative to each drilling location. Each monitoring station will contain a data logging PID and soil particulate meter. The air monitoring instruments will be calibrated on a daily basis prior to the start of field work. The calibration records will be maintained in the project file. The data from the stationary air monitoring stations will be electronically downloaded at the conclusion of each work day. A copy of the generic New York State Department of Health (NYSDOH) CAMP guidelines proposed for this investigation is included as **Appendix E**.

6.0 APPLICABLE REMEDIATION STANDARDS AND OBJECTIVES

This section describes the remedial standards that will be applied to the analytical results generated from the implementation of the investigation activities described.

6.1 Soil

Soil samples are being collected and analyzed to gain a greater understanding of the level of impacts in the Site soils relative to current and historical operations and to assist in the development of an appropriate remedial action. The soil analytical results will be compared to the Track 1 Unrestricted Use and the Track 2 Commercial Use Soil Cleanup Objectives (SCOs) and the Protection of Groundwater SCOs from Subpart 375-6: Remedial Program Soil Cleanup Objectives of the NYSDEC Regulations.

6.2 Groundwater

Groundwater samples are being collected and analyzed to gain a greater understanding of the level of impacts in the Site groundwater relative to current and historical operations and to assist in the development of an appropriate remedial action. The groundwater analytical results will be compared to the values listed in the "Ambient Water Quality Standards and Guidance Values" as listed in the Technical and Operational Series (TOGS) 1.1.1. In order to estimate the local groundwater gradient, the depth to the top of groundwater will be measured prior to sampling at each location. Groundwater elevations from all wells will be taken before any well is purged for sampling.

6.3 Soil Vapor

Soil vapor samples are being collected and analyzed to gain a greater understanding of the level of impacts in the Site groundwater relative to current and historical operations and to assist in the development of an appropriate remedial action. The soil vapor analytical results will be compared to Air Guideline Values (AGV) listed in the NYSDOH October 2006 Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York document. If there are any difficulties in collecting the soil vapor or sub-slab soil vapor samples, DEC will be included in any decisions to relocate or cease the extraction of the sample.

7.0 REMEDIAL INVESTIGATION REPORT

PS&S will compile information obtained during implementation of the RI portion of this Work Plan into a final Remedial Investigation Report (RIR). This report will be prepared following completion of the final phase of the RI work. The RIR will discuss the field and analytical data collected during the implementation of the field work. The RIR will also describe the level of detail of the investigation, the selected methods, and analyses used to define the rate of movement, and present the future extent and fate of contaminants to ensure attainment of the applicable remediation standards. The RIR will contain:

- An executive summary,
- A discussion of the Site history and previous investigations,
- A discussion describing the observed geologic and hydrogeologic conditions of the Site,
- A sample location map based on GPS coordinates,
- Soil boring logs,
- Monitoring well construction logs,
- Well development records,
- Summary tables detailing the results of laboratory analytical data collected from all samples of soil and groundwater in comparison to applicable NYSDEC Standards, Criteria and Guidance Values (SCGs) and Ambient Water Quality Standards and Guidance Values (AWQS),
- Summary tables detailing the results of laboratory analytical data collected from all samples of soil vapor in comparison to applicable NYSDOH Air Guideline Values (AGVs),
- A discussion of source areas and the vertical and horizontal extent of contamination within soil, soil vapor and groundwater,
- Sample concentration maps summarizing exceedances of applicable NYSDEC SCGs and AWQS and NYSDOH AGVs),
- Groundwater contour maps,
- Cross section maps,
- A qualitative human exposure assessment,
- A fish and wildlife resources impact analysis,
- A qualitative risk assessment,
- Laboratory analytical reports including results of quality assurance/quality control (QA/QC) samples and data usability summary reports (DUSR),
- Transport Bills of Lading and/or Manifests generated from Investigation Derived Waste, and
- Conclusions and recommendations.

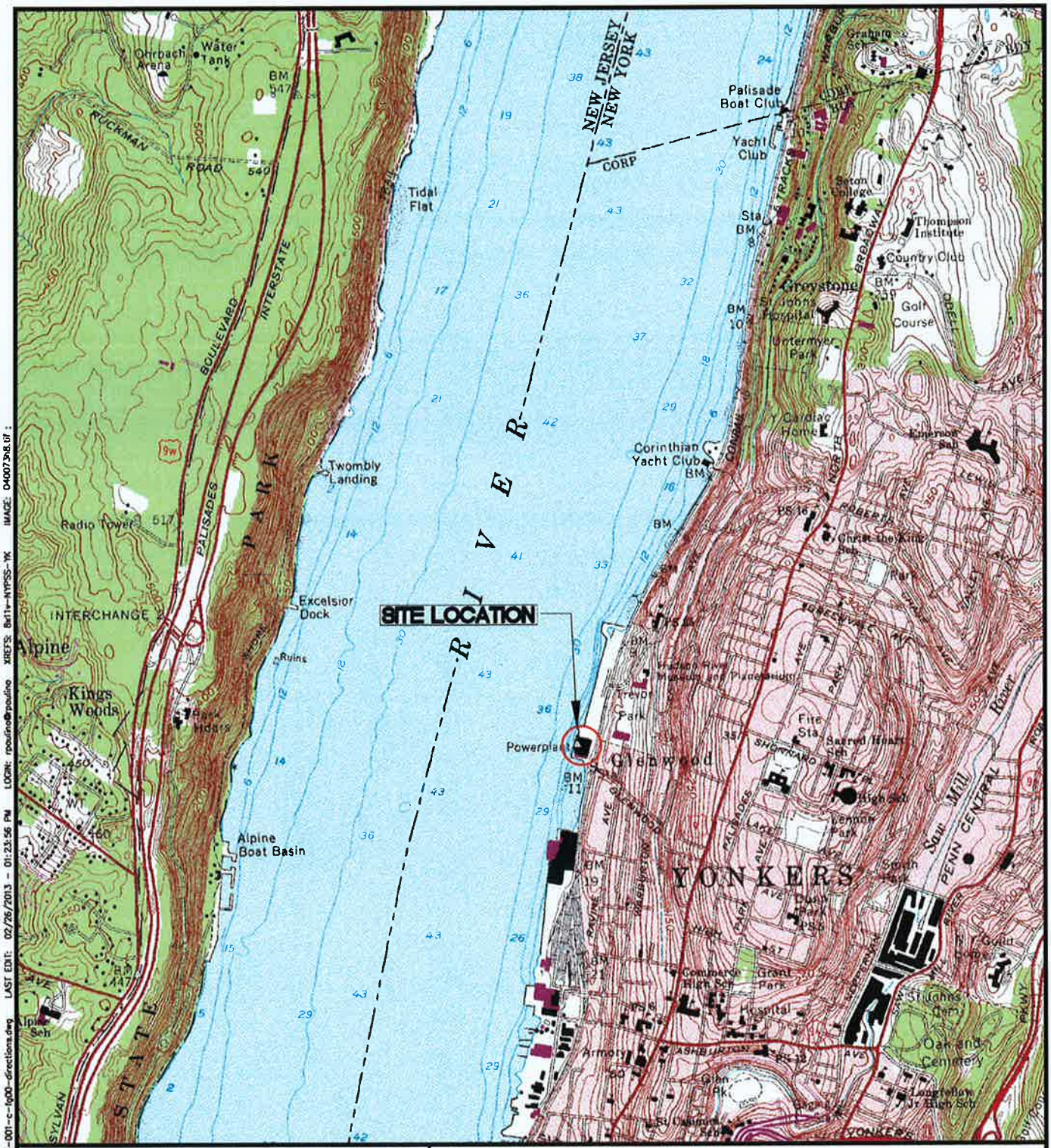
TABLES

Table 1
Proposed Sampling Summary
Glenwood Power Plant Site
Yonkers, New York
August 2014

		Sample Type				Analysis						
Sample ID	**Sample Location/ Rationale**	**Soil**	**Surface Soils**	**Groundwater**	**Soil Vapor/ Ambient Air**	**TCL VOC**	**TCL SVOC**	**TAL Metals**	**PCBs**	**Pesticides/Herbicides**	**Cyanide**	**VOC (TO-15)**
AOC 1												
GPP-SB-S-1 thru GPP-SB-S-12	12 Geoprobe soil borings to be installed and sampled to characterize historic fill material related to industrial site uses. These will be investigated with 3 soil samples per boring at representative locations througout the Site: surface soil (approximately 0-2 inches), subsurface soil (approximately 3-5 feet) and one additional subsurface soil depth interval below the water table that will be determined based on visual impacts, PID readings, etc.	X	X			X	X	X	X	X	X	
AOC 2												
GPP-SB-S-6 and GPP-SB-S-7	2 Geoprobe soil borings (included above for AOC 1) in the eastern portion of the site have the dual purpose of investigating potential impacts from historic freight use.	X	X			X	X	X	X	X	X	
AOC 3												
GPP-IB-S-1 thru GPP-IB-S-6	6 interior soil borings to be installed inside the buildings at locations to be determined following inspection of the concrete slabs	X	X			X	X	X	X	X	X	
AOC 4												
GPP-SB-S-8 thru GPP-SB-S-11	4 Geoprobe soil borings (included above for AOC 1) in the courtyard area between the buildings have the dual purpose of investigating potential impacts from historic transformers and delineating previously identified PCB concentrations in soil.	X	X			X	X	X	X	X	X	
AOC 5												
GPP-MW-A, GPP-MW-B, GPP-MW-C	3 shallow monitoring wells to be installed and sampled to provide an initial characterization of groundwater quality using representative locations on the Site.			X		X	X	X	X	X	X	
AOC 6												
GPP-SV-1 thru GPP-SV-12	12 soil vapor probes to be installed and samples collected from 3.5 - 4.0 feet bgs to provide an initial characterization of soil vapor quality using representative locations on the Site.				X							X
GPP-AA	An upwind ambient air sample to be collected concurrent with the soil vapor samples.				X							X

Notes:
1. The test methods specified are from EPA SW-846.

FIGURES



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PROJECT TITLE

GLENWOOD POWER PLANT
45 WATER GRANT WAY
YONKERS, WESTCHESTER COUNTY, NEW YORK

SHEET TITLE

FIGURE 1
SITE LOCATION MAP
(USGS TOPOGRAPHIC MAP, 7.5 MINUTE SERIES)

DATE:	05/17/2012	DRN. BY:	RP	PROJ. NO.:	K48260001
SCALE:	NTS	CK'D BY:	HN	SHT. NO.:	1

FILE NAME: P:\048260\001\CVDwgs\Figures\048260-001-c-fig00-directions.dwg LAST EDIT: 02/26/2013 - 01:23:56 PM LOGIN: rpaulino@paulino XREFS: 8x11+-NYPSS-YK IMAGE: 040073n8.tif

NOTES:
1. SURVEY INFORMATION IS REFERENCED FROM SURVEY OF PROPERTY PREPARED FOR GLENWOOD POH, LLC, BY WARD CARPENTER ENGINEERS, INC., DATED 03/30/2012.
2. FINAL BORING LOCATIONS WILL BE FIELD COORDINATED WITH NYSDEC.

NORTH

HUDSON RIVER

PUMP HOUSE BUILDING

GPP-SB-S-11 (AOC 1, 4)
GPP-IB-S-3 (AOC 3)
GPP-IB-S-1 (AOC 3) APPROX. LOCATION (TYP.)
GPP-IB-S-5 (AOC 3)
GPP-SB-S-10 (AOC 1, 4)
TURBINE HALL / SMOKE STACK BUILDING
GPP-MW-E (AOC 5)
SWITCH HOUSE BUILDING
GPP-SB-S-9 (AOC 1, 4)

FORMER GLENWOOD POWER PLANT

GPP-SB-S-5 (AOC 1)
AOC 4 - FORMER TRANSFORMERS IN COURTYARD
MEAN HIGH WATER
GPP-SB-S-3 (AOC 1)
MEAN HIGH WATER
GPP-SB-S-8 (AOC 1, 4)
GPP-MW-A (AOC 5)
GPP-SB-S-1 (AOC 1)
GPP-IB-S-2 (AOC 3)
GPP-MW-C (AOC 5)
GPP-SB-S-12 (AOC 1)
GPP-SB-S-4 (AOC 1)
GPP-IB-S-4 (AOC 3)
GPP-MW-D (AOC 5)
GPP-IB-S-6 (AOC 3)

CITY OF YONKERS
JFK PARK

AOC 2 - HISTORIC FRIEGHT USE
GPP-SB-S-2 (AOC 1)
GPP-SV-1 (AOC 6)
GPP-SB-S-6 (AOC 1, 2)
GPP-SB-S-7 (AOC 1, 2)
GPP-MW-B (AOC 5)
GPP-SV-2 (AOC 6)
COMMUTER PLATFORM

GLENWOOD STATION

METRO-NORTH RAILROAD

GRAPHIC SCALE
60 0 30 60 120
(IN FEET)
1 inch = 60 ft.

LEGEND

- PROPOSED SOIL BORING AOC 1 – HISTORIC FILL (SITE WIDE)
- AOC 2 – HISTORIC FREIGHT USE
- AOC 3 – POWER PLANT BUILDING INTERIOR
- AOC 4 – FORMER TRANSFORMERS IN COURTYARD
- PROPOSED MONITORING WELL AOC 5 – GROUNDWATER (SITE WIDE)
- PROPOSED SOIL VAPOR PROBE AOC 6 – SOIL VAPOR (SITE WIDE)
- PROPOSED INTERIOR BORING AOC 3 – BUILDING INTERIOR

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PROJECT TITLE

GLENWOOD POWER PLANT BCP SITE

45 WATER GRANT WAY, YONKERS, WESTCHESTER COUNTY, NY

SHEET TITLE

PROPOSED SOIL BORING, SOIL VAPOR PROBE AND MONITORING WELL LOCATION PLAN

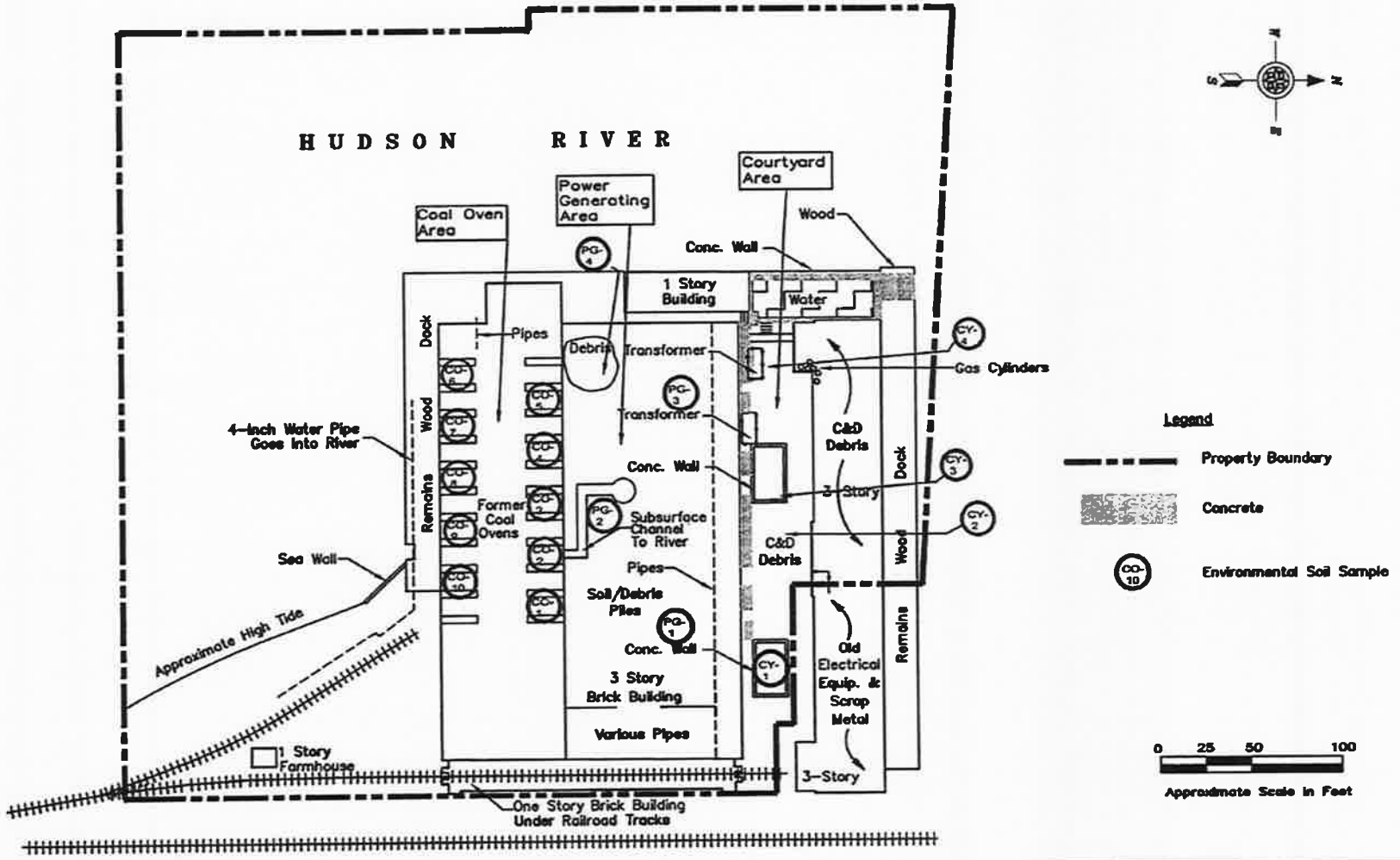
PROJ. NO.	048260004
DATE	02/26/2013
DRN. BY	RP
CHK. BY	SS
SCALE	1"=60'
SHEET NO.	FIGURE 2

FILE NAME: P:\048260\001\C\Dwgs\figures\BWP\048260-001-c-fig2-boringlocation.dwg LOGIN: rpaulino XREFS: 49320-PowerPlant2a-NOHATCH ; EXHIBIT_B_Plan-Section ; GLENWOOD-TOPO ; 11x17h-YK ; 11x17v-NYEngPC-YK IMAGE:
LAST EDIT: 04/18/2014 - 02:52:37 PM

APPENDICES

APPENDIX A

SOIL SAMPLING LOCATIONS
(FROM PHASE II ESA, CA RICH, SEPTEMBER 2006)



Notes:
Map Adapted From Survey of Property by Chas H. Sells, Inc. March 6, 1984.

CA RICH CONSULTANTS, INC.
Certified Groundwater and Environmental Specialists
17 Dupont Street, Plainview, New York 11803

TITLE: Soil Sampling Locations		DATE: 9/15/06
		SCALE AS SHOWN
FIGURE: 2	FORMER GLENWOOD POWER PLANT YONKERS, NEW YORK	DRAWN BY: S.T.M.
DWG NO. 2006-9C		APPR. BY: E.A.W.

APPENDIX B

PIEZOMETRIC DATA

GLENWOOD POWER STATION
04826-0001

GROUNDWATER LEVEL READINGS:

BORING NO.	DATE	TIME	DEPTH OF WATER (BGS-ft.)
PSS-6	1/14/2013	8:00 AM	7.2
	1/14/2013	3:26 PM	6.5
	1/15/2013	7:28 AM	7.6
	1/15/2013	3:10 PM	5.7
	1/16/2013	7:36 AM	7.6
	1/16/2013	3:25 PM	5.3
	1/17/2013	7:18 AM	7.4
	1/17/2013	3:22 PM	6.4
	1/18/2013	7:43 AM	7.4
	1/18/2013	3:20 PM	6.0
	1/21/2013	7:26 AM	7.2
PSS-4	1/17/2013	11:05 AM	12.2
	1/17/2013	3:11 PM	11.5
	1/18/2013	7:37 AM	11.5
	1/21/2013	7:23 AM	11.6
	1/22/2013	7:37 AM	11.9
	1/22/2013	3:32 PM	12.0
PSS-1	1/22/2013	7:28 AM	9.2
	1/22/2013	3:38 PM	10.4

APPENDIX C

QUALITY ASSURANCE PROJECT PLAN (QAPP) & SAMPLING AND ANALYSIS PLAN (SAP)

QUALITY ASSURANCE PROJECT PLAN
AND
SAMPLING AND ANALYSIS PLAN

- FOR -

Glenwood Power Plant Site

45 and 45a Water Grant Way
Yonkers, Westchester County, New York
Site ID C360100

Submitted by:

Glenwood POH, LLC

159 Alexander Street
Yonkers, New York 10701

August 2014

Prepared by:

PS&S

55 Main Street, 3rd floor
Yonkers, NY 10701

TABLE OF CONTENTS

1.0 INTRODUCTION

The purpose of this Quality Assurance Project Plan (QAPP) and Sampling and Analysis Plan (SAP) is to present the organization, objectives, specific quality assurance/quality control (QA/QC) procedures and to outline and detail sample collection and analytical procedures leading to valid data for use during Remedial Investigation (RI) activities at the former Glenwood Power Plant Site ("Site") located at 45 and 45a Water Grant Way in Yonkers, Westchester County, New York.

The plan provides descriptions of protocols to be utilized for field sampling, sample handling and storage, laboratory analysis, record keeping and data evaluation and management. The quantitative and qualitative data generated from the RI will be utilized to identify the nature and extent of contamination, identify impacts and sources of the impacts and aid in preparing remedial options.

2.0 PROJECT ORGANIZATION AND RESPONSIBILTY

A project organization has been developed to identify the roles and responsibilities of the various parties involved with this RI. The organizational structure for this RI includes New York State Department of Environmental Conservation (NYSDEC), PS&S Engineering, Inc. (PS&S), and the required contractors (i.e., analytical testing laboratories, drillers, etc). Although the Quality Assurance/Quality Control (QA/QC) responsibilities are principally the responsibility of the PS&S Project Manager and Project Quality Assurance Manager (PQAM), proper implementation of QA/QC requirements necessitate that the entire project staff be cognizant of all procedures and goals.

The PS&S team will consist of the following personnel, with a description of their responsibilities:

Andrew Grundy is the Project Manager. He has primary responsibility and authority for implementing and executing the technical, QA, and administrative aspects of the pre-design investigation, including the overall management of the project team. The Project Manager is accountable for ensuring that the RI Field Program is conducted in accordance with applicable plans and guidelines, including the QAPP/SAP, and the Site-Specific Health and Safety Plan (HASP). In addition, the Project Manager will communicate all technical, QA and administrative matters to Glenwood POH, LLC.

Hal Newell is the Project Geologist. She has primary responsibility for implementing and executing the RI Field Program in accordance with applicable plans and guidelines, including the QAPP/SAP, and the Site-Specific Health and Safety Plan (HASP). In addition, the Project Geologist will communicate all technical and QA matters to the Project Manager and coordinate all RI activities with the selected subcontractors.

Engineering support for the investigation will be the responsibility of John Bolan, the Project Engineer and Qualified Environmental Professional. His duties include overseeing the preparation of project deliverables.

John Pastorick is the Project Quality Assurance Manager (PQAM) and will be responsible for review of data upon receipt from the analytical laboratory. The PQAM will be responsible for ensuring that all analytical data are in conformance with requirements of this QAPP/SAP.

Christine Beaver is the Field Operations Lead (FOL). She will be responsible for the management and supervision of the field investigation and for providing consultation and decision-making on day-to-day issues relating to the sampling activities. The FOL will monitor the sampling to determine that operations are consistent with plans and procedures, and that the data acquired meets the geotechnical data quality needs. When necessary, the FOL will document any deviations from the plans and procedures for approval.

Jeff Farrell is the Health and Safety Coordinator (HSC). The HSC reports to the PS&S Project Manager, and is responsible for the implementation of the HASP. The HSC shall advise project staff on health and safety issues, conduct health and safety training sessions, and monitor the effectiveness of the health and safety program conducted in the field.

In addition, other site personnel may provide support to the Project Manager and FOL on an as-needed basis. Adrianna Bosco and/or Greg McClellan will be on-site Field Representatives.

The services of an analytical laboratory contractor will also be necessary to perform the supplemental investigation activities. The Project Manager, with assistance from the FOL and PQAM, will be the liaison between PS&S and the analytical laboratory contractor.

Any laboratory utilized for the analysis of environmental samples shall be a NYSDEC certified laboratory. The laboratory shall deal directly with the consultant in regards to analytical parameters, sample handling, and analytical results reporting. The laboratory shall be responsible for providing all materials for sample collection, handling, and transportation in accordance with QA/QC requirements.

3.0 DATA QUALITY REQUIREMENTS

Data quality requirements and assessments will be consistent with the NYSDEC's Division of Environmental Remediation regulations and guidance. Quantification limits, estimated accuracy, accuracy protocol estimate precision and precision protocol will be determined by the laboratory and will be in conformance with NYSDEC requirements.

The methods of analysis will be in accordance with United States Environmental Protection Agency (USEPA) SW846. Specific analytical procedures and laboratory QA/QC descriptions are not included in this QA/QC Plan, but will be available upon request from the laboratory selected to perform the analyses. The laboratory will be a NYSDEC certified laboratory.

3.1 Data Usage

The data generated from the RI will be used to determine the nature, extent and source(s) of contamination at the project site, to aid in preparing plans regarding future remedial options. The data will also be utilized to monitor the health and safety of workers at the site and potential receptors off site.

3.2 Data Comparability

All data will be presented using standard reporting units and reporting formats, including the reporting of QC data. In addition, sample locations, collection procedures and analytical methods from earlier studies will be evaluated for comparability with current procedures/methods.

3.3 Data Completeness

The acceptability of 100% of the data is desired as a goal for this project. The acceptability of less than 100% complete data, meeting all laboratory QA/QC protocols/standards, will be evaluated on a case-by-case basis. The QA officer will provide data validation services to assist in confirming the acceptability of the reported laboratory analytical data. A total of

10% of each laboratory generated data package will be validated to assist in confirming the reliability of the entire laboratory reporting package.

3.4 Laboratory Sample Custody Procedures

A NYSDEC certified laboratory meeting the requirements for sample custody procedures, including cleaning and handling sample containers and analytical equipment, will be used to analyze samples collected during the RI. The selected laboratory's Standard Operating Procedures will be made available upon request.

4.0 SAMPLING PROCEDURES

Environmental sampling may generally include obtaining samples of different media utilizing different techniques. The following summarizes the various environmental media that may be conducted in support of this RI.

- Soil Vapor - Soil vapor samples may be collected as part of a soil vapor survey to identify potential sources of and the potential extent of contamination. The soil vapor survey may also be utilized on a preliminary basis to determine if the presence of subsurface contamination is potentially impacting surface receptors.

- Surface Soil - Surface soil samples may be collected from prescribed on and off-site locations to determine the extent of on-site and/or off-site surface soil contamination.

- Subsurface Soil - Subsurface soil samples will be collected during the advancement of soil borings, test pits and probe locations. Subsurface soil samples may be collected to delineate the extent of on and off-site contamination.

- Groundwater - Groundwater samples may be obtained from monitoring wells, private or public wells and/or probe or Hydropunch sampling devices which may be installed as part of the investigation or from monitoring wells which were installed previously at and in the vicinity of the site. Groundwater samples will be collected to define the horizontal and vertical extent of groundwater contamination on and off site.

- Air - Ambient air samples may be collected on and off site, within buildings and outdoors, to identify potential health risks to workers and to determine if contamination has impacted building interiors.

A detailed discussion of the sampling program for a site and selection of sample matrices and locations will be provided for in the RIWP.

4.1 Analytical Parameters

Surface soil, subsurface soil and groundwater samples collected from property will be analyzed for Target Compound List (TCL) Volatile Organic Compounds (VOC) plus a 10-peak library search (TCL VOCs+10) and TCL Semivolatile Organic Compounds (SVOC) plus a 20-peak library search (TCL SVOCs+20), Pesticides, Herbicides, PCBs, Target

Analyte List (TAL) Metals and Total Cyanide. Soil vapor and ambient air samples collected from the Site will be analyzed for Volatile Organic Compounds on the TO-15 list.

Table 1 presents a summary of the parameters/sample fraction that may be monitored for at the Site, together with the typical sample location, type of sample, sample matrix, type of sample container, method of sample preservation, holding time and analytical method.

Table 1

SUMMARY OF ANALYTICAL PARAMETERS

Sample Matrix	Sample Type	Analytical Parameter	EPA Analytical method	Sample Preservation	Maximum Holding Time	Sample Container
Surface and Subsurface Soil	Grab	TCL VOCs+10	Method 8260-low	Cool to 4°C, MeOH to pH>12	10 days after VTSR for analysis	Encore transferred to Glass, clear/40 ml/ ICHEM 200 series or equivalent
Surface and Subsurface Soil	Grab	TCL SVOCs+20	Method 8270D	Cool to 4°C	10 days after VTSR for extraction, 40 days after extraction for analysis	Glass, clear/8 oz./1 ICHEM 200 series or equivalent
Surface and Subsurface Soil	Grab	PCBs	Method 8082A	Cool to 4°C	10 days after VTSR for extraction, 40 days after extraction for analysis	Glass, clear/8 oz./1 ICHEM 200 series or equivalent
Surface and Subsurface Soil	Grab	Pesticides/Herbicides	Method 8081A/8151A	Cool to 4°C	10 days after VTSR for extraction, 40 days after extraction for analysis	Glass, clear/8 oz./1 ICHEM 200 series or equivalent
Surface and Subsurface Soil	Grab	TAL Metals	Method 6010B/7471A	Cool to 4°C	26 days after VTSR for Hg analysis, 6 months for all other metals	Glass, clear/8 oz./1 ICHEM 200 series or equivalent
Surface and Subsurface Soil	Grab	Total Cyanide	Method 9012B	Cool to 4°C	12 days after VTSR for analysis	Glass, clear/8 oz./1 ICHEM 200 series or equivalent

VTSR - Verified time of sample receipt at the laboratory.

Table 1 (continued)

SUMMARY OF ANALYTICAL PARAMETERS

Sample Matrix	Sample Type	Analytical Parameter	EPA Analytical method	Sample Preservation	Maximum Holding Time	Sample Container
Groundwater	Grab	TCL VOCs+10	Method 8260B	Cool to 4°C, HCL to pH<2	14 days after VTSR for analysis	Glass, clear/40 ml/3 ICHEM 300 series or equivalent
Groundwater	Grab	TCL SVOCs+20	Method 8270D	Cool to 4°C	7 days after VTSR for extraction, 40 days after extraction for analysis	Glass, amber/1 L/2 ICHEM 300 series or equivalent
Groundwater	Grab	PCBs	Method 8082A	Cool to 4°C	7 days after VTSR for extraction, 40 days after extraction for analysis	Glass, amber/1 L/2 ICHEM 300 series or equivalent
Groundwater	Grab	Pesticides/Herbicides	Method 8081A/8151A	Cool to 4°C	7 days after VTSR for extraction, 40 days after extraction for analysis	Glass, amber/1 L/2 ICHEM 300 series or equivalent
Groundwater	Grab	TAL Metals (Total and Dissolved)	Method 6010B/7470A	HNO_3 to pH <2 or None, Cool to 4°C	26 days after VTSR for Hg analysis, 6 months after VTSR for analysis of all other metals	Plastic/1 L/1 ICHEM 300 series or equivalent
Groundwater	Grab	Total Cyanide	Method 335.4	Cool to 4°C, NaOH to pH>12	12 days after VTSR for analysis	Plastic/1L/1 ICHEM 300 series or equivalent

VTSR - Verified time of sample receipt at the laboratory.

Table 1 (continued)

SUMMARY OF ANALYTICAL PARAMETERS

Sample Matrix	Sample Type	Analytical Parameter	EPA Analytical method	Sample Preservation	Maximum Holding Time	Sample Container
Soil Vapor	Grab – 60 minute	VOCs	TO-15	None	7 days after VTSR for analysis	Summa Canister, 6L
Ambient Air	Grab – 60 minute	VOCs	TO-15	None	7 days after VTSR for analysis	Summa Canister, 6L

VTSR - Verified time of sample receipt at the laboratory.

4.2 Detailed Sampling Procedures

Environmental samples to be collected as part of the RI may consist of surface soil, subsurface soil, groundwater, soil vapor and ambient air. Sample locations may consist of monitoring wells, soil probe locations, soil vapor probe locations, soil borings, and surface soils. Actual sample media locations are described in the RIWP. General sampling guidelines, including sample media, depths, equipment, rationale and analytical parameters is provided in Table 2.

During soil sample collection, an attempt will be made to maintain sample integrity by preserving its physical form and chemical composition to as great an extent as possible. An appropriate sampling device (i.e., decontaminated or dedicated equipment) will be utilized to transfer the sample into the sample container. The sample will be transferred into the sample bottle as quickly as possible, with no mixing, to make certain that the volatile fraction is not lost. All laboratory containers would be fitted with seals to minimize volatilization.

The materials involved in groundwater sampling are critical to the collection of high quality monitoring information, particularly where the analyses of volatile organic compounds, pH sensitive or reduced chemical constituents are of interest. The materials of construction for bailers and pump parts will be PTFE (e.g., Teflon^{R}) stainless steel and/or polyethylene.

Table 2

SUMMARY OF SAMPLING PROGRAM

Environmental Media	Sample Location	Sample Point	Sample Depth	Equipment	Rationale	Sample Analysis
Sub-Slab Soil	On Site	Interior Boring (To Be Determined)	To Be Determined	To Be Determined	To determine sub-slab soil contamination.	TCL VOC, TCL SVOC, TAL metals, total cyanide, PCBs, pesticides and herbicides
Surface and Subsurface Soil	On Site	Probe Location	0-6 inches and 3-5 feet below soil surface and 1 depth interval below the water table to be determined based on field screening (i.e. PID readings, staining)	Decontaminated Macrocore sampler with dedicated acetate liner or dedicated polyethylene scoop.	To determine surface and subsurface soil contamination.	TCL VOC, TCL SVOC, TAL metals, total cyanide, PCBs, pesticides and herbicides
Groundwater	On Site	Monitoring Well	At screened interval	Low-flow sampling pump and dedicated tubing.	To determine groundwater contamination	TCL VOC, TCL SVOC, TAL metals (total and dissolved), total cyanide, PCBs, pesticides and herbicides
Soil Vapor	On Site	Probe Location	3.5-4' bgs.	Stainless steel soil vapor probe point with dedicated tubing threaded onto fitting of Summa Canister.	To determine soil vapor contamination.	TO-15
Ambient Air	On Site	Upwind portion of the Site as determined by field conditions	In breathing zone	Direct into Summa Canister	To determine if ambient air concentrations are influencing soil vapor sample concentrations.	TO-15

There will be several steps taken after the transfer of the soil or water sample into the sample container that are necessary to properly complete collection activities. Once the sample is transferred into the appropriate container, the container will be capped and, if necessary, the outside of the container will be wiped with a clean paper towel to remove excess sampling material. The container will not be submerged in water in an effort to clean it. Rather, if necessary, a clean paper towel moistened with distilled/deionized water will be used.

The sample container will then be properly labeled. Information such as sample number, location, collection time and date, sampler's initials and sample description will be recorded on the field log forms. Associated paper work (e.g., Chain of Custody forms) will then be completed and will accompany the sample. During sample transport to the laboratory the samples will be packaged in a manner that will allow the appropriate storage temperature to be maintained during shipment to the laboratory. Samples will be delivered to the laboratory within 48 hours of collection.

4.3 Sample Identification

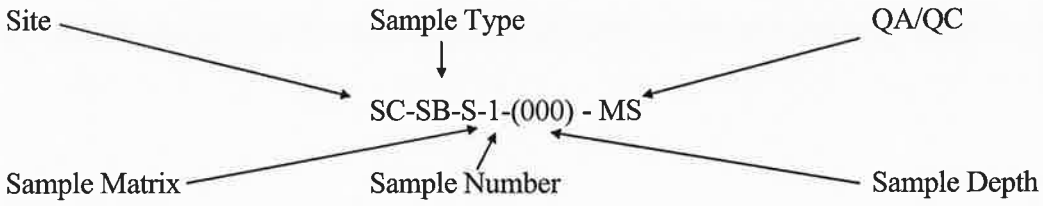
All samples collected will be labeled with a sample identification code. The code will identify the site, sample location, sample matrix and series numbers for sample locations with more than one sample. Samples will be labeled according to the following system:

- Site: – Site name (i.e., Glenwood Power Plant (GPP))
- Sample Type:
  – Soil Boring or Probe "SB"
  – Monitoring Well "MW"
  - Soil Vapor Probe "SV"
- Sample Matrix:
  – Soil "S"
  – Groundwater "GW"
  – Ambient Air "AA"
  – Soil Vapor "SV"
- Sample Number: – For circumstances where more than one sample of the same type and/or from the same location will be

collected, a consecutive sample number will be assigned. When more than one sample is collected from a borehole in a sampling round at different depths, the depth will be indicated on the sample container and in the field log book.

- Quality Assurance/ Quality Control (QA/QC):
  - Matrix Spike "MS"
  - Matrix Spike Duplicate "MSD"
  - Field Blank "FB"
  - Trip Blank "TB"

Based upon the above sample identification procedures, an example of a sample label may be:



4.4 Sample Handling, Packaging and Shipping

All samples will be placed in the appropriate containers in accordance with NYSDEC requirements. The holding time criteria identified in the ASP will be followed as specified in Table 1.

Prior to packaging any samples for shipment, the sample containers will be checked for proper identification and compared to the field log forms for accuracy. The samples will then be wrapped with a cushioning material and placed in a cooler (or laboratory shuttle) with a sufficient amount of bagged ice or "blue ice" packs in order to keep the samples at 4°C until arrival at the laboratory. If an office trailer is located on-site and equipped with a sample refrigerator, the samples may be maintained in the sample refrigerator prior to placement in laboratory shuttle container.

All necessary documentation required to accompany the sample during shipment will be placed in a sealed plastic bag and taped to the underside of the cooler lid. The cooler will then be sealed with fiber (duct) or clear packing tape, and custody seals will be placed in such a manner that any opening of the cooler prior to arrival at the laboratory can be detected.

All samples will be shipped to the laboratory receipt within 48 hours of sample collection in accordance with NYSDEC requirements. The laboratory will be notified prior to the shipment of the samples.

4.5 Sampling Methodologies

4.5.1 Soil Vapor

1. Be certain that the sample location is noted on Location Sketch.
2. Drive the decontaminated stainless steel probe with removable inner rod into the ground to the desired depth, above the zone of saturation, leaving approximately one-foot of the probe exposed above the ground surface.
3. Connect new silicon/teflon tubing to the probe and the personal sampling pump. Turn on pump. Allow the pump to run until the soil vapor within the probe has reached equilibrium.*
4. Perform Helium test.
5. Collect a vapor sample using a gas tight syringe, sorbent tube or SUMMA canister.
6. Shut off pump and disconnect tubing.
7. Extract probe from the ground and decontaminate according to the procedures in Section 5.

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*In order to establish the amount of time required for the soil vapor to reach equilibrium in the probe, two approaches can be utilized:

a. Once the personal sampling pump is turned on, collect a sample every 1 to 2 minutes and analyze on the portable GC. Continue to collect samples until two consecutive samples yield comparable results. Do this at two or three locations in order to establish a pumping time.

b. Instead of using a personal sampling pump, attach the silicon tubing from the probe directly to a PID or FID. Once a steady reading is obtained, the system is considered to be in equilibrium. (Not recommended if low levels of volatile organic vapors are present [i.e., <1 ppm].)

4.5.2 Soil (Surface)

1. Be certain that the sample location is noted on Location Sketch.

2. If a dedicated sampling device is not used, be certain that the sampling equipment has been decontaminated utilizing the procedures outlined in Section 5.

3. Remove laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Summary Form and Chain of Custody Form 5.

4. At the sample location, clear surface debris (e.g., vegetation, rocks, twigs, etc.). First, collect the sample for VOC analysis. Collect an adequate amount of soil from a selected depth interval (i.e. 0 to 6 inches) using a dedicated Terracore sampler. Terracore samplers should be filled completely. Confirm that the Terracore sampler contains 5 grams of soil using a portable field scale. Transfer the sample directly the sample container preserved with Methanol.

5. For remaining analysis, collect an adequate amount of soil from a depth of 0 to 6 inches using a decontaminated or disposable scoop and/or sterile wooden tongue depressor. Transfer the sample directly into the precleaned sample container from sample cooler and label the sample container.

6. Return the sample container to the cooler or refrigerator. If the sample is obtained directly with a sample container, dry the exterior of the container before placing into cooler or refrigerator.

7. If reusable, decontaminate the sampling equipment according to the procedures described in Section 5.

8. Place all disposable personal protective equipment and disposable sampling equipment into a 55-gallon drum and store in a secure area (fenced, if possible).

4.5.3 Soil (Probe)

1. Be certain that the sample location is noted on Location Sketch.

2. Remove laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Summary Form and Chain of Custody Form.

3. Drive the probe to the desired sampling depth.

4. Retrieve the soil probe and immediately after opening it, obtain an organic vapor measurement with a FID or PID and complete boring log form.

5. First, collect the sample for VOC analysis. Collect an adequate amount of soil from a selected depth interval using a dedicated Terracore sampler. Terracore samplers should be filled completely. Confirm that the Terracore sampler contains 5 grams of soil using a portable field scale. Transfer the sample directly the sample container preserved with Methanol.

6. For remaining analysis, remove a sample aliquot from the soil probe using a disposable scoop or sterile wooden tongue depressor, place into the open sample container and replace the container cover.

7. Return the sample container to the cooler or refrigerator. If the sample is obtained directly with a sample container, dry the exterior of the container before placing into cooler or refrigerator

8. If reusable, decontaminate the sampling equipment according to the procedures described in Section 5.

9. Place all disposable personal protective equipment and disposable sampling equipment into a 55-gallon drum and store in a secure area (fenced, if possible).

4.5.4 Groundwater (Monitoring Well)

1. Measure the depth of water using a decontaminated water level indicator and compute the volume of standing water in the well.

2. Remove three to five times the volume of standing water from the well until field measurements (pH, conductivity, temperature and turbidity) stabilize, or until the well is dry, whichever occurs first. Turbidity should be less than 50 NTUs prior to collection of a sample for metals analysis. If utilizing "Low-Flow" purging continuously monitor field measurements (pH, conductivity, turbidity, temperature, dissolved oxygen and redox potential) until stabilization.

3. Remove the laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Summary Form and Chain of Custody Form.

4. Obtain a sample by using a disposable polyethylene bailer or from the discharge point when utilizing "Low Flow" purging.

5. If the turbidity of the sample is greater than 50 NTUs, the metals portion of the sample will be filtered in the field or by the laboratory. Both the filtered and unfiltered portion of the sample will be analyzed.

6. Gently pour the sample into the sample container taking care not to spill on the outside of the container, spill any of the preservative or overfill container and replace the cover on the sample container. Samples for volatile organic analyses will have no air space in the sample vial prior to sealing. This is done by filling the vial such that there is a meniscus on top. Carefully slide the septum, Teflon side down, onto the top of the vial and cap the vial. Check for bubbles by turning the vial upside down and tapping it lightly. If bubbles appear, reopen the vial, remove the septum and add more sample (or resample). Replace the septum, recap and check for bubbles. Continue until vial is bubble-free.

7. Return sample container to sample cooler or refrigerator.

8. Place all disposable personal protective equipment and disposable sampling equipment into a 55-gallon drum and store in a secure area (fenced, if possible).

4.6 Grab Sampling and Composite Sampling

Grab sampling consists of collecting a sample from a discrete interval, utilizing the appropriate sampling tool, and submitting that sample for analysis. The discrete intervals for Grab Samples should be outlined in the Site-specific Work Plan for the subject site. Composite sampling consists of homogenizing different grab samples, of the same material, into one sample for analysis. Composite sampling should be performed by collecting the individual grab samples and combining them in a decontaminated stainless steel pan or bowl where the soils can be combined prior to being placed in the sample container. The number of composite samples collected will depend on the amount of material being sampled and the respective sample analysis. Composite samples for volatile organics will be collected from each discrete grab samples and placed in the sample container prior to the remainder of the soils being mixed.

4.7 Monitoring Well Installation

To provide for the collection of representative groundwater samples permanent two-inch diameter monitoring wells will be installed. Groundwater monitoring wells will be constructed of threaded two-inch-diameter Schedule 40 PVC well casing equipped with 20-slot well screen. Well construction will include a 10-foot screened interval and solid PVC riser to grade as determined by field conditions. The length of well screen extending above the top of the water table will be determined based on field conditions. The appropriate clean silica sand size should be used for the screen being utilized (i.e., No. 2 sand for 20-slot screen) shall be placed in the annular space around the well from one foot below the screened interval extending to a minimum of two feet above the top of the well screen. A six-inch bentonite seal shall then be placed above the sand pack and wetted with potable water for a minimum of 15 minutes before backfilling the remaining space with a cement-bentonite grout. Upon completion of the monitoring well, a 3-foot thick seal will be formed. If warranted by depth, backfilling will be completed using a tremie pipe placed below the surface of the grout. Solid PVC riser, attached to the well screen, will extend approximately to grade for flush-mount installations or approximately two feet above grade for above-ground mount installations. A flush-mount or above-grade mount protective casing with a locking water-tight well cap will then be installed and a measuring point marked on each PVC well riser. Well construction diagrams will be prepared for each well. Modifications to the well installation/construction procedures may be warranted if subsurface conditions (presence of finer grained materials or DNAPL) indicate that they may be necessary. Any modifications must be approved by the Project Manager and Glenwood POH, LLC.

4.8 Well Development

Following their installation, the groundwater monitoring wells will be developed, using a two-inch diameter Grundfos submersible pump(s) (or equivalent) until the water is reasonably free of turbidity and field readings (pH, conductivity, temperature, and dissolved oxygen) sufficiently stabilize. Fifty nephelometric turbidity units (NTUs) or less will be the turbidity goal but not an absolute value. To minimize suspended material, the wells will be developed very carefully using low-flow submersible pump techniques. The wells will be

developed at low pumping rates, on the order of 0.5 to one gallons per minute (gpm). Bailers will not be used for developing these wells (nor will bailers be used for sampling except for VOC compounds). The wells will be allowed to equilibrate for 14 days prior to sampling. The volume of water removed, the well development time, and field instrument readings will be recorded on the field forms.

5.0 DECONTAMINATION PROCEDURES

Whenever possible, all field sampling equipment should be sterile/disposable and dedicated to a particular sampling point. In instances where this is not possible, a field cleaning/decontamination procedure will be used to mitigate cross contamination between sample locations. A decontamination station/pad will be established for all field sampling activities. This will be an area located away from the source of contamination so as not to adversely impact the decontamination procedure, but close enough to the sampling locations to keep equipment transport handling to a minimum after decontamination.

5.1 Field Decontamination Procedures

All nondisposable equipment will be decontaminated at appropriate intervals (e.g., prior to initial use, prior to moving to a new sampling location and prior to leaving the site). Different decontamination procedures are used for various types of equipment that are used to collect samples. When using field decontamination, sampling should commence in the area of the site with the lowest contamination, if known or probable, and proceed through to the areas of highest contamination. It may be necessary to repeat a decontamination procedure if the sampler is used to obtain a Non Aqueous Phase Liquid (NAPL) sample.

5.2 Decontamination Procedure for Drilling/Probing Equipment

All equipment such as drill rigs and other mobile equipment will receive an initial cleaning prior to use at the site. The frequency of decontamination while on site will depend on how the equipment is actually used in relation to collecting environmental samples. All wash/rinse solutions will be collected and containerized on site until testing results provide for an appropriate disposal option.

After the initial decontamination, cleaning may be reduced to those areas that are in close proximity to materials being sampled. Drill rig/probe items such as augers, drill/probe rods and drill bits will be cleaned in between sample locations.

Drilling/probing equipment will be decontaminated in the following manner:

- Wash thoroughly with nonresidual detergent (alconox) and tap water using a brush to remove particulate matter or surface film. Pressure washing will be utilized, if necessary, to remove any oil and/or tar accumulations on the back of the rig, auger flights, drill rods, drill head, etc. Any loose paint chips, paint flakes and rust must also be removed.
- Steam clean (212°F).
- Once decontaminated, remove all items from the decontamination area.

Also, following the general cleaning procedures described above, all downhole/drilling sampling items, such as split spoon samplers, Shelby tubes, rock corers, or any other item of equipment which will come in direct contact with a sample during drilling, will be decontaminated by the methods outlined in this section.

5.3 Decontamination Procedure for Sampling Equipment

Teflon, PVC, polyethylene, stainless steel and downhole sampling equipment decontamination procedures will be the following:

- Wash thoroughly with nonresidual detergent (alconox) and clean potable tap water using a brush to remove particulate matter or surface film. Pressure washing will be utilized, if necessary, to remove oil and/or tar.
- Steam clean (if necessary to remove oil and/or tar).
- Rinse thoroughly with tap water.
- Rinse thoroughly with distilled water.
- Rinse with Nitric Acid (10% solution), in a well-ventilated area, if sampling for metals.
- Rinse thoroughly with distilled water.
- Rinse with methanol (pesticide grade), in a well-ventilated area and air dry.

- Rinse thoroughly with distilled water and air dry.
- Wrap completely in clean aluminum foil with dull side against the equipment. For small sampling items, such as scoops, decontamination will take place over a drum specifically used for this purpose.

Methanol has been chosen because it is not an analyte of concern on the Target Compound List. The solvent will be allowed to evaporate and then a final distilled/deionized water rinse will be performed.

5.4 Decontamination Procedure for Well Casing and Development Equipment

Field cleaning of PVC, steel, stainless steel well casings will consist of a manual scrubbing to remove foreign material and steam cleaning, inside and out, until all traces of oil, grease and tar are removed. This material will then be stored in such a manner so as to preserve it in this condition. Special attention to threaded joints will be necessary to remove cutting oil or weld burn residues of steel and stainless steel material, if necessary.

Materials and equipment that will be used for the purposes of well development will also be decontaminated by steam cleaning. An additional step will involve flushing the interior of any hose, pump, etc. with a nonphosphate detergent solution and potable water rinse prior to the development of the next well. This liquid waste will be containerized on site, until testing results provide for an appropriate disposal option.

6.0 DOCUMENTATION

Proper management and documentation of field activities is essential to provide that all necessary work is conducted in accordance with the sampling plan and QA/QC Plan in an efficient and high quality manner. Field management procedures will include following proper chain of custody procedures to track a sample from collection through analysis, noting when and how samples are split (if required); preparing a Location Sketch; completing Sample Summary Forms, Chain of Custody Forms, Boring, Drilling and Well Construction Logs; maintaining a daily Field Forms; completing Daily Equipment Calibration Logs; preparing Daily Field Activity Reports; completing Field Change Forms; filling out a Daily Air Monitoring Form and maintenance of Photographic documentation. Copies of each of these forms are included in the Attachments Section. Proper completion of these forms and the field forms are necessary to support the consequent actions that may result from the sample analysis. This documentation will support that the samples were collected and handled properly.

6.1 Location Sketch

The location of Site activities will be based on the Sample Location Plan in Attachment A. For each sampling point, a Location Sketch will be completed using permanent references and distances to the sampling point noted, if possible.

6.2 Sample Summary Form

At each sampling location, a Sample Summary Form is filled out including, but not limited to, the following information:

- Site Name
- Client Name
- Sample identification number
- Date
- Time of sample collection

- Sample Matrix
- Sample Depth
- Analysis to be performed
- PID readings

6.3 Chain of Custody

The Chain of Custody (COC) form is initiated at the laboratory with container preparation and shipment to the site. The form remains with the sample(s) at all times and bears the name of the person assuming responsibility for the samples. This person is tasked with providing secure and appropriate handling of the containers and samples. When the COC form is complete, it will indicate that there was no lapse in sample accountability.

A sample is considered to be in an individual's custody if any of the following conditions are met:

- It is in the individual's physical possession, or
- It is in the individual's view after being in his or her physical possession, or
- It is secured by the individual so that no one can tamper with it, or
- The individual puts it in a designated and identified secure area.

In general, the Chain of Custody form is provided by the laboratory selected to perform the analytical services. At a minimum, the following information will be provided on these forms:

- Project name and address
- Project number
- Sample identification number

- Date
- Time
- Sample location
- Sample type/description
- Sample matrix
- Analysis requested
- Number of containers and volume taken
- Remarks
- Type of waste
- Sampler(s) name(s) and signature(s)
- Spaces for relinquished by/received by signature and date/time.
- Required laboratory deliverables/format

Chain of Custody forms to be utilized at a site will be those provided by the chosen analytical laboratory.

The Chain of Custody form will be filled out and signed by the person performing the sampling. The original of the form will travel with the sample and will be signed and dated each time the sample is relinquished to another party, until it reaches the laboratory or analysis is completed. The field sampler will keep one copy and a copy will be retained for the project file. The sample bottle will also be labeled with an indelible marker with a minimum of the following information:

- Project identification/number/site name
- Sample number
- Analysis to be performed
- Date and time of collection

A copy of the completed form will be returned by the laboratory with the analytical results.

6.4 Split Samples

Whenever samples are being split with another party, a record of this activity should be maintained in the field log book. A copy of the Chain of Custody form shall indicate the split sample.

6.5 Field Logs

All pertinent information regarding the Site, Site activities and sampling procedures will be documented in the field logs. Notations will be made in logs, noting the time and date of all entries. Information recorded in the logs will include, but not be limited to, the following:

The first page of the log will contain the following information:

- Project name and address
- Name, address and phone number of field contact
- Client and address, if different from above
- Site personnel
- Arrival and departure of all on-site personnel
- Weather
- Activity to be performed

Daily entries will be made for the following information:

- Purpose of sampling
- Location of sampling point
- Number(s) and volume(s) of sample(s) taken

- Description of sampling point and sampling methodology
- Date and time of sample collection
- Collector's sample identification number(s)
- Sample distribution and method of storage and transportation
- References, such as sketches of the sampling site or photographs of sample collection
- Field observations, including results of field analyses (e.g., pH, temperature, specific conductance), water levels, drilling logs, and organic vapor and dust readings
- Signature of personnel responsible for completing log entries.

6.6 Daily Field Activity Report

At the end of each day of field work, the Field Operations Manager, or designee, will complete this form noting personnel on site and summarizing the work performed that day, equipment, materials and supplies used, results of field analyses, problems and resolutions. This form will be signed and subject to review.

6.7 Field Changes and Corrective Actions

Whenever there is a required or recommended change or correction in the investigation/sampling procedures. This field change will be completed by the Field Operations Manager and approved by a Glenwood POH, LLC representative and the NYSDEC Project Manager, if required.

7.0 CALIBRATION PROCEDURES

With regard to field equipment, the following will be maintained at the project site:

1. Equipment calibration records and operating procedures which will include provisions for documentation of frequency of calibration, conditions, calibration standards and records reflecting the calibration procedures, methods of usage and repair history of the measurement system. Calibration of field equipment will be performed daily at the sampling site prior to commencement of work activities so that any background contamination can be taken into consideration and the instrument calibrated accordingly. The equipment operation manuals shall also be maintained on site.

2. A schedule of preventive maintenance tasks, consistent with the instrument manufacturer's specific operation manuals, which will be carried out to minimize down time of the equipment.

3. Spare bulbs, filters and manufacturer manuals will be on hand to facilitate equipment maintenance and simple repair.

Analytical instrumentation calibration procedures and preventive maintenance, in accordance with NYSDEC requirements, for laboratory equipment, will be contained in the laboratory's standard operating procedures (SOP) which will be available upon request.

7.1 Performance of Field Audits

During field activities, the QA/QC officer will accompany sampling personnel into the field, in particular during the initial phase of the field program, to verify that the site sampling program is being properly conducted, and to detect and define problems so that corrective action can be taken early in the field program. All findings will be documented and provided to the Field Operations Manager.

7.2 Control and Disposal of Contaminated Material

During construction and sampling of the monitoring wells and soil borings, contaminated waste, soil and water may be generated from drill cuttings, drilling fluids, decontamination

water, development water and purge water. All soil cuttings generated during the investigation will be handled in a manner consistent with NYSDEC requirements.

All water generated during the investigation, including decontamination water, drill water and well development/purge water, will be containerized on site. The RIWP will provide detailed information on the disposal of water generated during the investigation.

Department of Transportation approved 55-gallon drums, roll off and/or water holding tank will be used for the containment of soil cuttings and water, and for disposal of personal protective clothing and disposable sampling equipment (i.e., bailers, scoops, tongue depressors, etc.). The drums will be sealed, marked and labeled with a description of the contents and from what location they were collected. All waste containers will be stored on Site in a secure area.

8.0 DATA REDUCTION, VALIDATION AND REPORTING

A NYSDEC certified laboratory meeting the New York State requirements for documentation, data reduction and reporting will be used. All data will be cataloged according to sampling locations and sample identification nomenclature.

8.1 Data Validation

A summary document regarding data validation will be completed by the laboratory, using the appropriate NYSDEC required forms and submitted with the data package. Data validation will be performed in order to define and document analytical data quality. The data validation process will assist in confirming that all analytical requirements specific to this work plan, including the QA/QC Plan are followed.

The data validation process will provide an assessment of the laboratory's performance based upon contractual requirements and applicable analytical criteria. The report generated as a result of the data validation process will provide an interpretation of the usefulness of the data that can be evaluated by the end user of the analytical results. The overall level of effort and specific data validation procedure to be used will be for a "10% validation."

During the review process, it will be determined whether the contractually required laboratory submittals for sample results are supported by sufficient back-up data and QA/QC results to enable the reviewer to conclusively determine the quality of data. Each data package will be checked for completeness and technical adequacy of the data. Upon completion of the review, the reviewers will develop a QA/QC data validation report for each analytical data package.

"Qualified" analytical results for any one field sample will be established and presented based on the results of specific QC samples and procedures associated with its sample analysis group or batch. Precision and accuracy criteria (i.e., QC acceptance limits) will be used in determining the need for qualifying data. Where test data have been reduced by the

laboratory, the method of reduction will be described in the report. Reduction of laboratory measurements and laboratory reporting of analytical parameters will be verified in accordance with the procedures specified in the NYSDEC program documents for each analytical method (i.e., recreate laboratory calculations and data reporting in accordance with the method specific procedure). The standard operating guideline manuals and any special analytical methodology required will specify documentation needs and technical criteria and will be taken into consideration in the validation process. Copies of the complete data package and the validation report, including the laboratory results data report sheets, with any qualifiers deemed appropriate by the data reviewer, and a supplementary field QC sample result summary statement, will be submitted to the NYSDEC.

The following is a description of the two-phased approach to data validation which will be used in the investigation. The first phase is called checklisting and the second phase is the analytical quality review, with the former being a subset of the latter.

- Checklisting - The data package will be checked for correct submission of the contract required deliverables, correct transcription from the raw data to the required deliverable summary forms and proper calculation of a number of parameters.
- Analytical Quality Review - The data package will be closely examined to recreate the analytical process and verify that proper and acceptable analytical techniques have been performed. Additionally, overall data quality and laboratory performance will be evaluated by applying the appropriate data quality criteria to the data to reflect conformance with the specified, accepted QA/QC standards and contractual requirements.

At the completion of the data validation, a Summary Data Validation/Usability Report will be prepared and submitted to NYSDEC.

8.2 Performance and System Audits

A NYSDEC certified laboratory which has satisfactorily completed performance audits and performance evaluation samples will be used to perform sample analyses for the investigation.

8.3 Corrective Action

A NYSDEC certified laboratory will meet the requirements for corrective action protocols, including sample "clean up" to attempt to eliminate/mitigate matrix interference. High levels of matrix interference may be present in waste, soil and sediment samples. This interference may prevent the achievement of detection limits if no target compounds are found. In order to avoid unnecessary dilutions, the cleanup methods may be required to be performed by the laboratory as necessary.

8.4 Trip Blanks

The primary purpose of a trip blank is to detect other sources of contamination that might potentially influence contaminant values reported in actual samples, both quantitatively and qualitatively. The following have been identified as potential sources of contamination:

- Laboratory reagent water;
- Sample containers;
- Cross contamination in shipment;
- Ambient air or contact with analytical instrumentation during preparation and analysis at the laboratory; and
- Laboratory reagents used in analytical procedures.

A trip blank will consist of a set of 40 ml sample vials filled at the laboratory with laboratory demonstrated analyte free water. Trip blanks will be handled, transported and analyzed in the same manner as the samples acquired that day, except that the sample containers themselves

are not opened in the field. Rather, these sample containers only travel with the sample cooler. The temperature of the trip blanks will be maintained at 4°C while on site and during shipment. Trip blanks will return to the laboratory with the same set of bottles they accompanied in the field.

The purpose of a trip blank is to control sample bottle preparation and blank water quality as well as sample handling. Thus, the trip blank will travel to the site with the empty sample bottles and back from the site with the collected samples in an effort to simulate sample handling conditions. Contaminated trip blanks may indicate inadequate bottle cleaning or blank water of questionable quality. Trip blanks will be implemented only when collecting water samples and analyzed for volatile organic compounds only at a frequency of one per day.

8.5 Method Blanks/Holding Blanks

A method blank is an aliquot of laboratory water or soil which is spiked with the same internal and surrogate compounds as the samples. The purpose of the method blank is to define and determine the level of laboratory background contamination. Frequency, procedure and maximum laboratory containment concentration limits should be in accordance with NYSDEC requirements. A holding blank is an aliquot of analyte-free water that is stored with the environmental samples in order to demonstrate that the samples have not been contaminated during laboratory storage. This blank will be analyzed using the same analytical procedure as the samples.

8.6 Matrix Spikes/Matrix Spike Duplicates and Spiked Blanks

Matrix spike samples are quality control procedures used by the laboratory as part of its internal Quality Assurance/Quality Control program. The matrix spikes (MS) and matrix spike duplicates (MSD) will be aliquots of a designated sample (water or soil) which are spiked with known quantities of specified compounds. These QA/QC samples will be used to evaluate the matrix effect of the sample upon the analytical methodology, as well as to

determine the precision of the analytical method used. A matrix spike blank will be an aliquot of analyte-free water, prepared in the laboratory, and spiked with the same solution used to spike the MS and MSD. The matrix spike blank (MSB) will be subjected to the same analytical procedure as the MS/MSD and used to indicate the appropriateness of the spiking solution by calculating the spike compound recoveries. The frequency regarding the MSB will be as per NYSDEC certified laboratory requirements. The MS/MSD will be collected at a frequency of 1 for every 20 collected samples for all sample media.

8.7 Field Blanks

The primary purpose of a field blank is to detect other sources of contamination that might potentially influence contaminant values reported in actual samples, both quantitatively and qualitatively. The following have been identified as potential sources of contamination:

- Sample containers;
- Cross contamination; and
- Improper decontamination procedures.

A field blank will be generated by pouring laboratory supplied analyte free water over decontaminated sampling equipment and placed into laboratory supplied containers. Field blanks will be handled, transported and analyzed in the same manner as the collected environmental samples. The temperature of the field blanks will be maintained at 4°C while on site and during shipment.

The purpose of a field blank is to identify whether improper decontamination procedures were employed or cross contamination has occurred. Field blanks will be implemented at a frequency of one per twenty (20) samples collected or once per week whichever is greater and will be analyzed for the most comprehensive suite of parameters within the field blank set of 20 environmental samples.

8.8 Blind Duplicates

The purpose of a blind duplicate is to confirm the accuracy of the analytical laboratory. Blind duplicates will be implemented at a frequency of one per twenty (20) samples collected or once per week, whichever is greater. The blind duplicate will be collected at the same interval as one of the collected environmental samples and will be identified and labeled with a similar identification scheme as previously noted. The sampler will identify in the field log forms the sample number indicating that it was collected as a blind duplicate. The blind duplicate and will be analyzed for the same parameters as the sample it mimics.

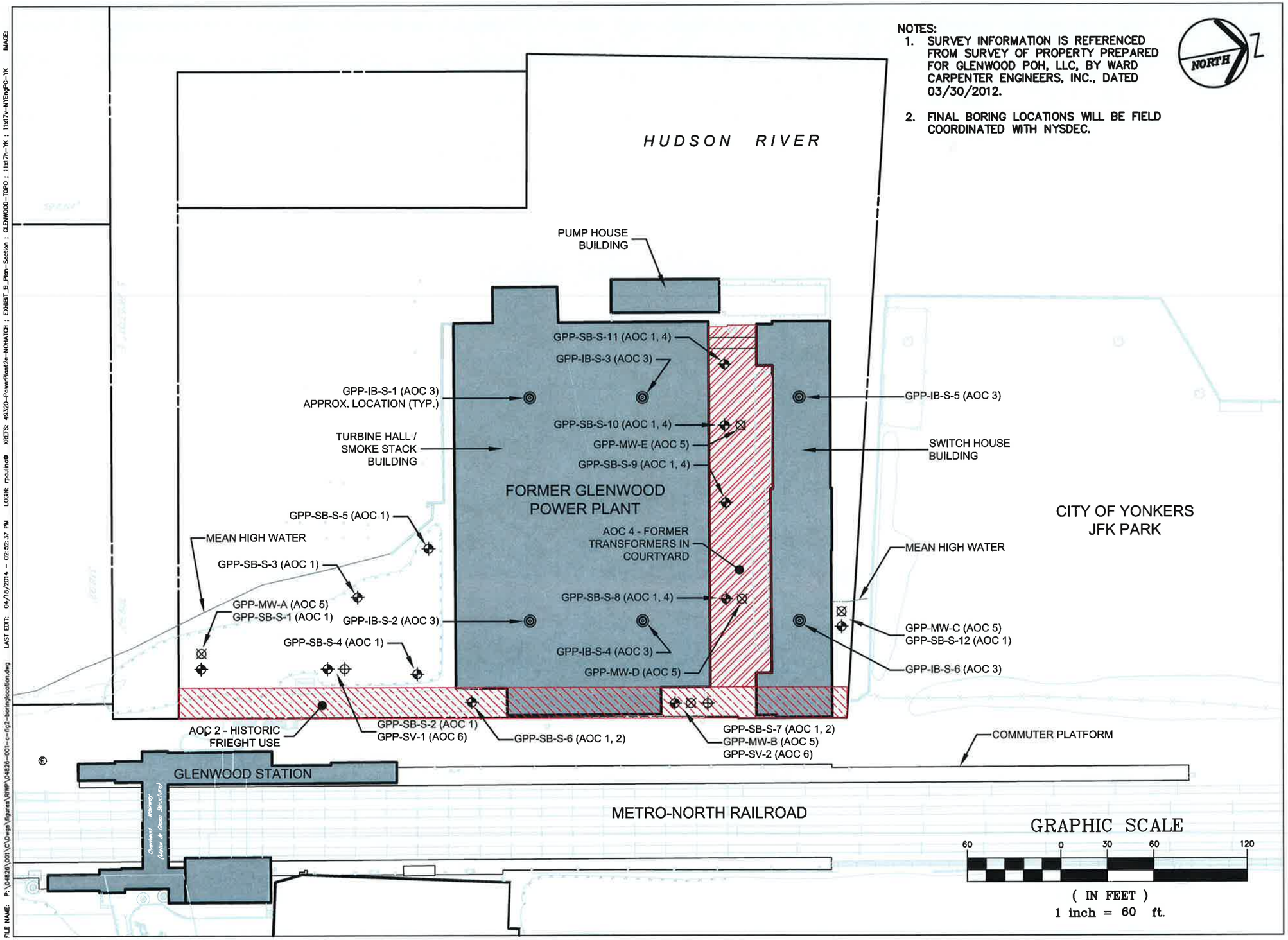
8.9 Field Management Forms

Field management forms are included in Attachments B through P.

ATTACHMENT A

SAMPLE LOCATION PLAN

NOTES:
1. SURVEY INFORMATION IS REFERENCED FROM SURVEY OF PROPERTY PREPARED FOR GLENWOOD POH, LLC, BY WARD CARPENTER ENGINEERS, INC., DATED 03/30/2012.
2. FINAL BORING LOCATIONS WILL BE FIELD COORDINATED WITH NYSDEC.



LEGEND

- PROPOSED SOIL BORING AOC 1 – HISTORIC FILL (SITE WIDE)
- AOC 2 – HISTORIC FREIGHT USE
- AOC 3 – POWER PLANT BUILDING INTERIOR
- AOC 4 – FORMER TRANSFORMERS IN COURTYARD
- PROPOSED MONITORING WELL AOC 5 – GROUNDWATER (SITE WIDE)
- PROPOSED SOIL VAPOR PROBE AOC 6 – SOIL VAPOR (SITE WIDE)
- PROPOSED INTERIOR BORING AOC 3 – BUILDING INTERIOR

PS&S
integrating design & engineering
PAULUS, SOKOLOWSKI AND SARTOR ENGINEERING, PC
55 MAIN STREET
3RD FLOOR
YONKERS, NEW YORK 10701
PHONE: (914) 509-8600
FAX: (914) 407-1679

PROJECT TITLE

GLENWOOD POWER PLANT BCP SITE

45 WATER GRANT WAY, YONKERS, WESTCHESTER COUNTY, NY

SHEET TITLE

PROPOSED SOIL BORING, SOIL VAPOR PROBE AND MONITORING WELL LOCATION PLAN

PROJ. NO.	048260004
DATE	02/26/2013
DRN. BY	RP
CHK. BY	SS
SCALE	1"=60'
SHEET NO.	FIGURE 2

FILE NAME: P:\04826\001\C\Dwgs\figures\BWP\04826-001-c-fig2-boringlocation.dwg LAST EDIT: 04/18/2014 - 02:52:37 PM LOGIN: rpaulino XREFS: 49320-PowerPlant2a-NOHATCH ; EXHIBT_B_Plan-Section ; GLENWOOD-TOPO ; 11x17h-YK ; 11x17v-NYEngPC-YK IMAGE:

ATTACHMENT B

ANALYTICAL SAMPLE SUMMARY FORMS

TABLE
CLIENT NAME
SITE NAME
ANALYTICAL SOIL SAMPLE SUMMARY TABLE

SAMPLE NO.	LABORATORY SAMPLE ID NUMBER	LABORATORY DATA PACKAGE NUMBER	SAMPLE DATE	SAMPLE TIME	SAMPLE DEPTH	SAMPLE MATRIX	COLLECTED BY	ANALYTICAL PARAMETERS

NOTES:

ATTACHMENT C

CHAIN OF CUSTODY FORM

>>> Select a Laboratory <<<

#N/A
#N/A
#N/A
#N/A

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager:	Site Contact:	Date:	COC No:
Your Company Name here	Tel/Fax:	Lab Contact:	Carrier:	____ of ____ COCs
Address	Analysis Turnaround Time			For Lab Use Only:
City/State/Zip	Calendar (C) or Work Days (W) ____			Walk-in Client:
(xxx) xxx-xxxx Phone	TAT if different from Below ____			Lab Sampling:
(xxx) xxx-xxxx FAX	☑ 2 weeks			Job / SDG No.:
Project Name:	☐ 1 week			
Site:	☐ 2 days			Sampler:
P O #	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type	Matrix	# of Cont.	Filtered Sample (Y / N)	Composite = C / Grab = G																				Sample Specific Notes:

Preservation Used: 1= Ice, 2= HCl; 3= H_2SO_4; 4=HNO_3; 5=NaOH; 6= Other ____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☐ Disposal by Lab ☐ Archive for____ Months

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

ATTACHMENT D

FIELD INVESTIGATION SUMMARY FORM

Daily Field Investigation Summary

Project:	
Field Personnel:	
Location:	
Date:	
Weather:	
Job No.:	
Purpose:	
Contacts:	

FIELD OBSERVATIONS:

ATTACHMENT E

FIELD DRILLING LOG FORM

Paulus, Sokolowski, & Sartor
Field Drilling Log

Page _____ of _____

Job Name: _____
Job Name: _____

Boring Log Number: _____
Date: _____
Weather: _____

Drilling Company: _____
Driller/Helper: _____

Depth	Recovery	PID ppm	HCN ppm	Description	Environmental Description

ATTACHMENT F

TEST PIT LOG FORM

Paulus, Sokolowski & Sartor	**TEST PIT LOG**	TEST PIT NUMBER

PROJECT NUMBER:
PROJECT NAME:
LOCATION:
EXCAVATION CO:
EXCAVATION METHOD:
OPERATOR:
ENVIRONMENTAL SCIENTIST:

WEATHER:
TOTAL DEPTH:
GROUND SURFACE ELEVATION:
DATE BEGUN:
DATE COMPLETED:

DEPTH	SAMPLE NUMBER	PID (ppm)	HCN (ppm)	WATER LEVEL	SOIL DESCRIPTION	USCS SYMBOL	LITHOLOGY	ENVIRONMENTAL DESCRIPTIONS	VISUAL OBSERVATIONS
0									
2									
4									
6									
8									
10									

ATTACHMENT G

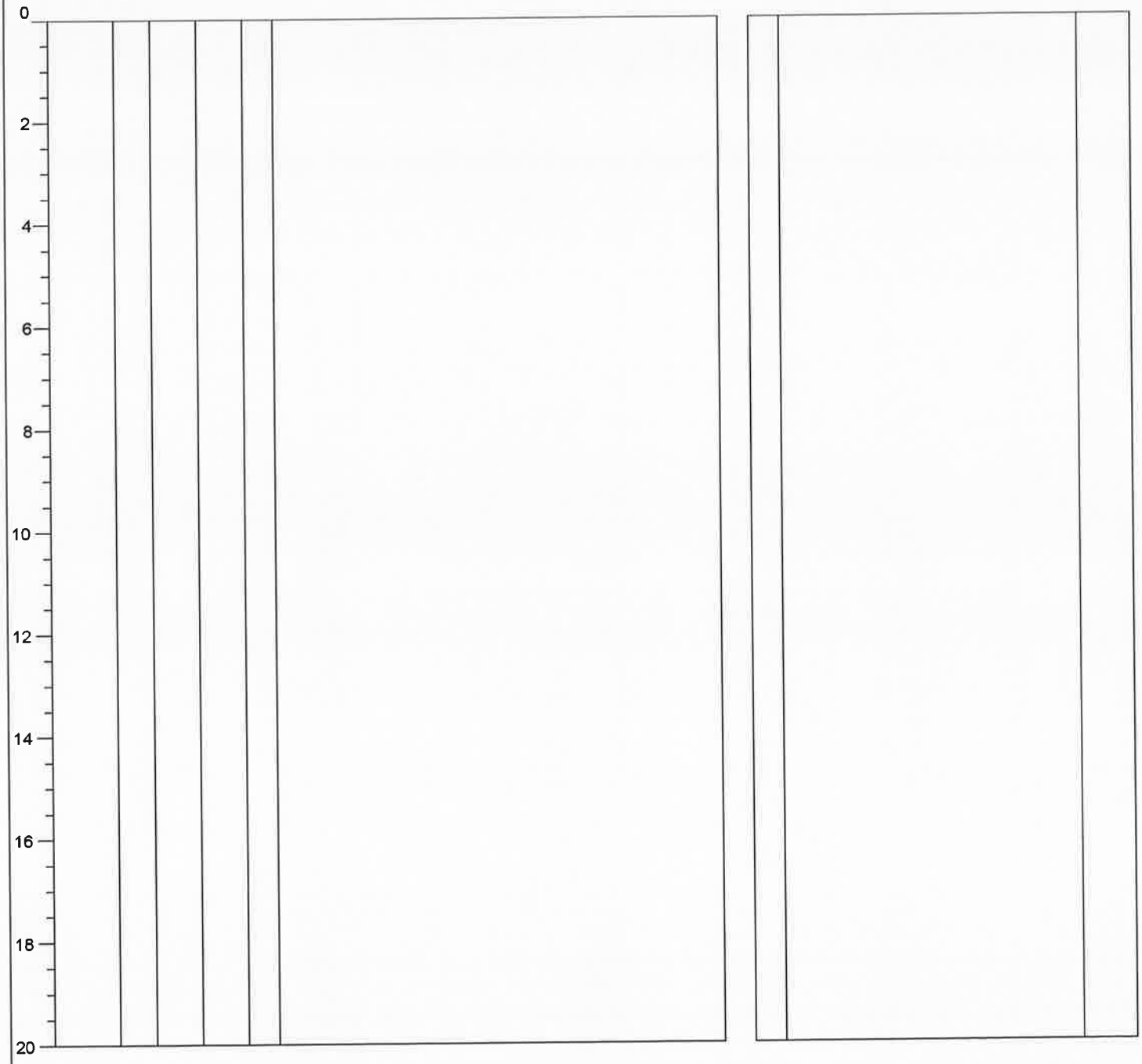
SOIL BORING LOG FORM

Paulus, Sokolowski & Sartor	**BORING LOG**	BOREHOLE NUMBER -

PROJECT NUMBER:
PROJECT NAME:
LOCATION:
DRILLING CO:
DRILLING METHOD:
DRILLER / HELPER:
ENVIRONMENTAL SCIENTIST:

WEATHER:
TOTAL DEPTH:
GROUND SURFACE ELEVATION:
DATE BEGUN:
DATE COMPLETED:

DEPTH	SAMPLE NUMBER	RECOVERY (in)	PID (ppm)	HCN (ppm)	WATER LEVEL	SOIL DESCRIPTION	USCS SYMBOL	LITHOLOGY	ENVIRONMENTAL DESCRIPTIONS	VISUAL OBSERVATIONS



ATTACHMENT H

WELL CONSTRUCTION LOG FORM

Paulus, Sokolowski, & Sartor	WELL CONSTRUCTION LOG	WELL NUMBER -

PROJECT NUMBER:
PROJECT NAME:
LOCATION:
DRILLING CO:
DRILLING METHOD:
DRILLER/HELPER :
ENVIRONMENTAL SCIENTIST:

WEATHER :
TOTAL DEPTH:
GROUND SURFACE ELEVATION:
DATE BEGUN:
DATE COMPLETED:

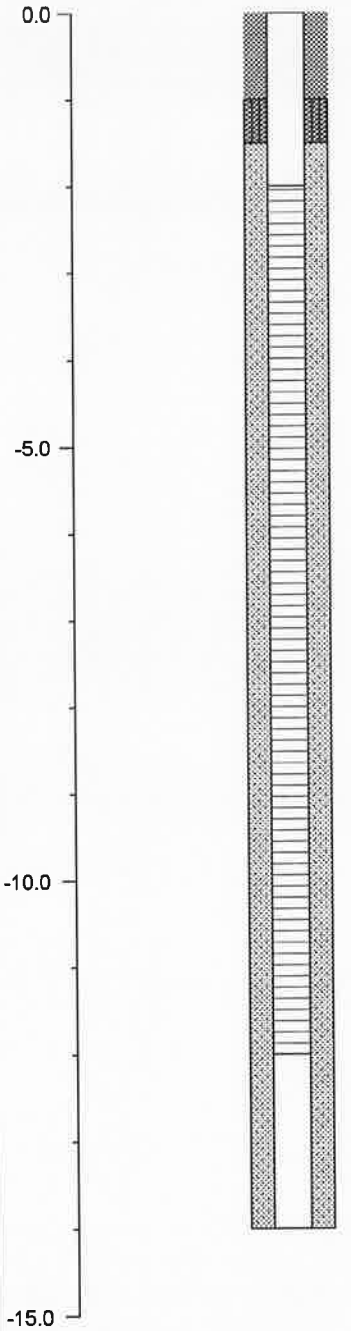
PVC CASING (DIA.) -
SCREEN (DIA.) -
PVC CASING (DIA.):

MATERIAL 1 -
MATERIAL 2 -
MATERIAL 3 -

LENGTH 1 -
LENGTH 2 -
LENGTH 3 -

DEPTH

WELL CONSTRUCTION



WELL SCHEMATICS

CEMENT SEAL 0 - 0.5'

BENTONITE SEAL 0.5' - 1.5'

SOLID PVC CASING 0 - 2'

SAND PACK 1.5' - 14'

PVC 20 SLOT SCREEN 2' - 12'

SOLID PVC CASING 12' - 14'

ATTACHMENT I

EQUIPMENT CALIBRATION LOGS

PS&S DUST TRAK INSTRUMENT CALIBRATION FORM

Job Name: _____ **Personnel:** _____

Job No: _____ **Weather:** _____

Location: _____ **Page :** _____

Date: _____

Date	Serial No.	Time	Zero Calibration No. mg/m^3

NOTES:

PS&S AIR MONITORING INSTRUMENT CALIBRATION LOG

Job Name: ____________________
Job Number: ____________________
Location: ____________________
Date: ____________________
Instument Type: ____________________

Personel: ____________________
Weather ____________________
Instrument No.: ____________________

Date	Calibration Gac Conc.	Calibration Y/N	Reading	Maintenance Notes
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
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	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		

INSTRUMENT CALIBRATION FORM

Job Name: ____________________ **Personnel:** ____________________

Job No: ____________________ **Weather:** ____________________

Location: ____________________ **Boring Location:** ____________________

Date: ____________________

Instrument: ____________________

Serial No. : ____________________

Sensor	Cal. Gas [illegible]		A juste		A juste ea ing	Calibration [illegible]	Calibration [illegible]
H_2S	25		Yes	No			
CO	50		Yes	No			
LEL	50		Yes	No			
HCN	10		Yes	No			
O_2	20.9		Yes	No			

Instrument: ____________________

Serial No. : ____________________

Sensor	Cal. Gas [illegible]	Instrument [illegible]	A juste		A juste ea ing	Calibration [illegible]	Calibration [illegible]
H_2S	25		Yes	No			
CO	50		Yes	No			
LEL	50		Yes	No			
HCN	10		Yes	No			
O_2	20.9		Yes	No			

Instrument: ____________________

Serial No. : ____________________

Sensor	Cal. Gas [illegible]	Instrument [illegible]	A juste		A juste ea ing	Calibration [illegible]	Calibration [illegible]
H_2S	25		Yes	No			
CO	50		Yes	No			
LEL	50		Yes	No			
HCN	10		Yes	No			
O_2	20.9		Yes	No			

Instrument: ____________________

Serial No. : ____________________

Sensor	Cal. Gas [illegible]	Instrument [illegible]	A juste		A juste ea ing	Calibration [illegible]	Calibration [illegible]
H_2S	25		Yes	No			
CO	50		Yes	No			
LEL	50		Yes	No			
HCN	10		Yes	No			
O_2	20.9		Yes	No			

Instrument: ____________________

Serial No. : ____________________

Sensor	Cal. Gas [illegible]	Instrument [illegible]	A juste		A juste ea ing	Calibration [illegible]	Calibration [illegible]
H_2S	25		Yes	No			
CO	50		Yes	No			
LEL	50		Yes	No			
HCN	10		Yes	No			
O_2	20.9		Yes	No			

Paulus, Sokolowski & Sartor
Soil Gas Screening
Air Sampling Equipment Calibration Data Sheet

Project Name:_____ By:_____

Project Location:_____ Sampling Date:_____

Calibration Gases:

Screening Instrument To Be Calibrated	Pollutant To Be Measured	Calibration Gas Concentration	Calibration Gas Lot/Serial Number	Calibration Gas Manufacturer

Calibration Record:

Screening Instrument With Serial No.	Calibrated Pollutants	Instrument Response	Calibration Time	Reason for Calibration: (scheduled, unexpected response, etc.)

Comments:_____

_____

WATER METER CALIBRATION RECORD

Job Name:_____ Job Number._____

Instrument and Serial Number: _____

Name:_____Date:_____Time: _____

A) **Temperature** Check (°) Read_____Thermometer _____
(Single Point Check)

B) **pH Calibration (Standard Units)**

Solution Standard	ADC Value	Check Value	NOTES:
4.00	_____	_____	_____
7.00	_____	_____	_____
10.00	_____	_____	_____

C) **Conductivity Calibration (US/cm, MS/CM)**

Solution Standard	ADC Value	Check Value	NOTES:
73.9 US/CM	_____	_____	_____
7.17 US/CM	_____	_____	_____
6.67 MS/CM	_____	_____	_____
58.64 MS/CM	_____	_____	_____

D) **Dissolved Oxygen Calibration**

		NOTES
Dissolved Oxygen (%)	_____	_____
ADC Value:	_____	_____
Dissolved Oxygen (ppm):	_____	_____
Temperature (C):	_____	_____
Winkler Calibration Date:	_____	_____

5) Comments

_____

_____

ATTACHMENT J

MONITORING WELL SAMPLING RECORD FORM

MONITORING WELL SAMPLING RECORD

Client:

Project Number:

Location:

Personnel:

Date:

Weather:

Conversion Data	
Well dia. (In)	Gallon/ft
2.0"	0.16
2.5"	0.255
4.0"	0.65
5.0"	1.02
5.5"	1.23
6.0"	1.47
8.0"	2.61

1. MONITORING WELL DATA:

Well Permit No: _____

Well No:_____Well Dia. (in):_____

Ground Surface Elevation (Ft):_____

Top of Well Casing Elevation (Ft):_____

Stand-up/Flush Mount (Ft):_____

Well Depth-Top of Casing (Ft):_____

Depth to Water-Top of Casing (Ft):_____

Depth to Water-Ground Surface (Ft):_____

Water Level Elevation (Ft):_____

Static Head of Water (Ft):_____

VOLUME FACTOR USED:

Gallons/Foot: _____

One Well Volume:_____

Three Well Volumes:_____

Start of Purge: _____

Finish of Purge :_____

Flow Rate (GPM):_____

Gallons Purged:_____

Method of Purge:_____

2. MONITORING WELL SAMPLING AND FIELD MEASUREMENTS

Initial Headspace Reading _____ Instrument _____

Parameter	Pre-Purge	Post Purge	Sample
Time:	_____	_____	_____
HDSPC (ppm):	_____	_____	_____
Depth to Water (Ft):	_____	_____	_____
Product Thickness:	_____	_____	_____
Visual:	_____	_____	_____
Temperature ( ):	_____	_____	_____
pH (SU):	_____	_____	_____
Conductivity ( ):	_____	_____	_____
Dissolved Oxygen (mg/L):	_____	_____	_____

Time, Start Sampling: _____ Time, End Sampling: _____

Sampling Method:_____

Sample Filtering Required:_____Method:_____

Field Preservation Required: _____ Analysis:_____

Sample Analysis Required: _____

3. COMMENTS AND NOTES:

_____

_____

_____

_____

_____

_____

ATTACHMENT K

"LOW-FLOW" WELL SAMPLING FORM

PS&S "LOW-FLOW" SAMPLING TECHNIQUE
GROUNDWATER QUALITY PARAMETER READINGS

Project Name.: _____ Personnel: _____

_____ Weather: _____

Project Number: _____ Location: _____

Date: _____

WELL INFORMATION

Well Number: _____ Screened Interval: _____ Pump Start Time: _____ Total Purged: _____

Well Depth: _____ Pump Intake Depth: _____ Pump Stop Time: _____ Purge Method: _____

PID (ppm): _____ Pumping Rate: _____ Sample Time: _____ Initial Depth to Water: _____

TIME	TEMPERATURE (°C)	pH (SU)	CONDUCTIVITY (mS/cm)	DISSOLVED OXYGEN (ppm)	TURBIDITY (ntu)	REDUCTION POTENTIAL (mv)	WATER LEVEL (ft.)	Flow Rate (ml/min.)
Criteria	*3%*	*0.1*	*0.030*	*10%*	*10%*	*+/- 10mv*	*0.3 ft*	*200 - 500*

Comments: _____

_____

_____

_____

ATTACHMENT L

MONITORING WELL WATER AND PRODUCT LEVEL MEASUREMENTS FORM

Monitoring Well Water and Product Level Measurements

Monitoring Well	) FYJßTK% 2 JFXZWJR JßY	) JJYM%YT% < FYJW	) JJYM%YT% 5WTIZHY	) JJYM%YT% ' TYYTR	5WTIZHY%S% < JJ: Y/N

ATTACHMENT M

SLUG TEST DATA FORM

SLUG TEST DATA

Test Well:	Length of Gravel Pack:
Test Date:	Gravel Pack Radius:
Depth to Water - GS:	Well Casing Radius:
Depth of Well - GS:	Slug Volume Added:
Depth to Well Screen - GS:	Slug Volume Removed:
Length of Well Screen/Open Hole:	One Well Volume:
Job Name:	Job Number:

	TIME	TIME INTERVAL	DEPTH		TIME	TIME INTERVAL	DEPTH
1				51			
2				52			
3				53			
4				54			
5				55			
6				56			
7				57			
8				58			
9				59			
10				60			
11				61			
12				62			
13				63			
14				64			
15				65			
16				66			
17				67			
18				68			
19				69			
20				70			
21				71			
22				72			
23				73			
24				74			
25				75			
26				76			
27				77			
28				78			
29				79			
30				80			
31				81			
32				82			
33				83			
34				84			
35				85			
36				86			
37				87			
38				88			
39				89			
40				90			
41				91			
42				92			
43				93			
44				94			
45				95			
46				96			
47				97			
48				98			
49				99			
50				100			

NOTES:

ATTACHMENT N

SOIL VAPOR SAMPLING FORM

Paulus, Sokolowski & Sartor Date: _____

Summa Canister Record By: _____

Project Name: _____

Project Location: _____

Canister ID No. _____

Flow Control ID No. _____

Flow Setting: _____

	Canister Vacuum (in Hg)	Barometric Pressure (in Hg)	Ambient Temperature (degrees Farenheit)
Pre-Test (a)			
Post-Test			

Notes:

(a) Compare Pre-test canister vacuum with laboratory setting as shipped.
Do not use canister if vacuum readings do not agree within 1.0 inch Hg.

Sample Start Time	Sample End Time	Sample Period	Comments

Field Screening _____ ppm H_2S

_____ % CH_4

Chain-of-Custody Sheet No._____

Air Bill Tracking No._____

ATTACHMENT O

SOIL VAPOR MONITORING DATA FORM

Paulus, Sokolowski & Sartor
SOIL GAS MONITORING DATA SHEET

Page: _____ of _____

By:

Project Name:
Project Location:

Ambient Temperature:_____
Barometric Pressure:_____
Weather Conditions:_____
Ground Conditions (wet/dry):_____

Bar Hole or Well Pt. ID	Time	Percent	Percent	Percent	VOC	Slam	

Additional Comments:

ATTACHMENT P

DATA USABILITY SUMMARY REPORT FORM

Data Usability Summary Report

Site:		Case Number:
SDG Number(s):	Date Rec'd by Lab :	Lab Report Date:
Reviewed by:		Date Reviewed:

Number of samples of each matrix in data package: ___ water ___ soil
Analyses requested: Volatile organics Semivolatile organics Metals/cyanide

1. Is the data package complete as defined under the requirements for NYSDEC ASP Category B deliverables? **Yes** No
   Actions: _____ Details attached

2. Have all holding times been met (see QA/QC Plan)? **Yes** No
   Exceptions: _____
   Actions/effect on results: Details attached

3. Do all the QC data fall within the protocol required limits and specifications? **Yes** No
   (blanks, instrument tunings, calibration standards, calibration verifications, surrogate recoveries, spike recoveries, replicate analyses, laboratory controls, sample data)
   Reported exceptions: _____ Details attached
   Actions/effect on results: _____ Details attached

4. Have all of the data been generated using established and agreed upon analytical protocols? Test method(s): _____ **Yes** No
   Reported exceptions: _____ Details attached
   Actions/effect on results: _____ Details attached

5. Does an evaluation of the raw data confirm the results provided in the data summary sheets and quality control verification forms? **Yes** No NA
   Exceptions: _____ Details attached
   Actions/effect on results: _____ Details attached

6. Have the correct data qualifiers been used by the laboratory? **Yes** No
   Details attached

Specific issues reported by laboratory (check all that apply):
- Sample(s) reanalyzed at dilution _____ Details attached
- Blank contamination _____ Details attached
- Matrix effects _____ Details attached
- Other: Details attached

Changes by reviewer (attach markup of data form):
- Data qualifiers added/changed Details attached
- Some data rejected (R) Details attached

APPENDIX D

HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN

- FOR -

Glenwood Power Plant Site

45 and 45a Water Grant Way
Yonkers, Westchester County, New York
Site ID C360100

Submitted by:

Glenwood POH, LLC

159 Alexander Street
Yonkers, New York 10701

August 2014

Prepared by:

55 Main Street, 3rd Floor
Yonkers, New York 10701

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

1.1 Purpose and Requirements

This Health and Safety Plan (HASP) addresses the health and safety practices that will be employed by the personnel of the selected contractor and Paulus Sokolowski and Sartor (PS&S) for the work at the former Glenwood Power Plant BCP Site (the Site). The work includes the following: visual inspection, GeoProbe® soil borings with soil samples collected at each location; GeoProbe® soil vapor probe points with soil vapor samples collected at each location; installation, surveying, gauging and groundwater sampling of shallow monitoring wells. A geophysical survey and utility locating firm will attempt to identify subsurface utilities prior to drilling activities.

The HASP considers hazards generally inherent to the Site and presents requirements to be followed by contractor personnel in order to avoid and, if necessary, protect against health and/or safety hazards. Activities performed under this HASP will comply with applicable parts of the Occupational Safety and Health Association (OSHA) Regulations, primarily 29 CFR parts 1910 and 1926. Modifications to the HASP may be made with the approval of the PS&S Project Manager.

This plan assigns responsibilities, establishes standard operations procedures, and provides for contingencies that may arise while operations are being conducted at contaminated sites. All project personnel will abide to the HASP. Personnel who engage in project activities will be familiar with this plan and comply with its requirements. All project personnel must sign off on the Plan Acceptance Form (see appended) before beginning work on the Site. The contractor will comply with all applicable provisions of OSHA.

1.2 Site Description

The Site is located at 45 and 45a Water Grant Way in Yonkers, Westchester County, New York (see Figure 1: Site Location Map). The Site is approximately 1.9412 acres of the upland portion above the mean high water mark of Block 2635, Lots 1, 15 and 19. The Site is located on the eastern shore of the Hudson River, west of the Glenwood Metro North Rail Road station and apartment buildings, south of JFK Marina Park and north of the BICC Cables Corporation BCP Site located at One Point Street. There are three buildings located on the Site covering approximately 62,000 square feet as well as soil and grass covered areas. The Site is a former coal-fired electric power generating plant and has been vacant since 1978.

1.3 Scope of Work

The Remedial Investigation (RI) activities are proposed to include the visual inspection and advancement of 6 interior borings, advanced of 12 soil borings and 2 soil vapor probe points using Geoprobe® drilling, installation of 3 shallow groundwater monitoring wells, surface and subsurface sampling to characterize fill material, and soil, soil vapor and groundwater sampling.

Project Team organization will include the following positions: PS&S Project Manager, Project Geologist, Field Operations Lead, Health and Safety Coordinator, Head Driller/Site Foreman, Second Man and/or Field Technician.

1.3.1 PS&S Project Managers

Andrew Grundy	Project Manager (PM)
Hal Newell	Project Geologist (PG)
Christine Beaver	Field Operations Lead (FOL)

1.3.2 PS&S Health and Safety Coordinators

Jeff Farrell	Health and Safety Coordinator (HSC)
Adrianna Bosco/ Greg McClellan	On-Site Field Representative

The Health and Safety Coordinator responsibilities will include:

- Monitors and ensures that all Site personnel comply with the HASP and Site safety rules.
- Ensuring that work is scheduled with properly trained personnel, and appropriate equipment and resources to complete the job safely.
- Identifying operational changes that require modification of the HASP.
- Ensuring that plan modifications are documented and approved by the PS&S PM.
- Ensure that workers utilize proper personnel safety equipment.
- Determines upgrade or downgrade of personnel protection equipment (PPE) based on site conditions or results of real-time monitoring results.
- Ensures that monitoring equipment is properly calibrated.
- Maintains health and safety field log book.
- Notifies PM of all accidents or incidents.

1.3.3 Site Personnel

Site personnel will report any unsafe or potentially hazardous conditions to the HSC and to the PS&S FOL. The PS&S FOL will also discuss such conditions with the Property Owner Representative/BCP Volunteer, Glenwood POH, LLC. Site personnel will also comply with requirements set forth in the HASP, including any revisions.

2.0 RISK ANALYSIS

2.1 Chemical Analysis

Based on the prior Phase I and II Environmental Reports prepared by CA Rich Consultants, Inc. in 2006 the contaminants of concern for the Site are Asbestos, Semi Volatile Organic Compounds (benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene and chrysene), Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium and zinc) and PCBs (Aroclor 1260). These contaminants exist in the soil, sediment and surface water at the Site. High concentrations of lead (up to 17,800 mg/kg) were noted. Material Safety Data Sheets (MSDS) for the contaminants of concern are provided in Appendix A.

Prior approval is required by PS&S if the contractor wants to bring any chemicals to the Site, such as acids/organic compounds, and decontamination fluids. Before working with these materials on-site, Material Safety Data Sheets (MSDS) should be reviewed by all potentially affected personnel. Laboratory sample bottles will be preserved with hydrochloric acid, methanol, sodium hydroxide and nitric acid. Methanol and nitric acid will be used as part of equipment decontamination procedures. Helium will be used as a tracer gas during soil vapor sampling.

Task Specific Hazard Assessment

To simplify the hazard assessment two categories of tasks will be established:

Category 1 - Operations with little or no Soil, Groundwater, Soil Vapor Contact

Category 2 - Operations with medium to high potential Soil, Groundwater, Soil Vapor Contact

It is anticipated each job task will fit in one of the two categories as detailed below. The site HSC will make determinations in the field as necessary.

Category 1 – Little or No Soil, Groundwater, or Soil Vapor Contact

It is anticipated that the following activities require minimal soil, groundwater, or soil vapor contact, and should not result in contact with potentially contaminated soil, groundwater, or soil vapor. These activities should not require additional considerations beyond good Health and Safety (H&S) practices for physical hazards for this type of project. These tasks may include:

- Site Mobilization
- Demobilization

Potential exposure to contaminated soil is not anticipated; however these operations will be conducted within the investigation work zone and will be evaluated by the HSC. Access to the investigation work zone is limited to Project Personnel, Project Support Personnel, and Authorized Visitors. Initially, exclusion zones will not be established until intrusive activities are ready to begin. However, exclusion zones may be established during site mobilization and demobilization if visual evidence of contamination is seen and/or instrument readings exceeding the action levels are detected during site mobilization or demobilization.

Personnel must meet the training requirements as defined in this HASP. Personal protective equipment above Level D will not be required unless exclusion zones are established or as determined by the HSC.

Site Mobilization and Demobilization
This includes such activities as marking out utilities, identifying sampling points, moving drilling rigs, and other equipment into place, and subsequently removing any such equipment. This activity should have a low potential for coming into contact with contaminated soil, water, or soil vapor. No exclusion zones are anticipated to be required during site mobilization and demobilization.

Category 2 – Medium to High Contact with Soil, Groundwater or Soil Vapor

It is anticipated that personnel working in the following activities have some reasonable potential to come into contact with potentially contaminated soil, groundwater, or soil vapor. These activities may include:

- Drilling Activities
- Obtaining Soil/Groundwater/Soil Vapor Samples
- Exclusion Zone Air Monitoring
- Equipment Decontamination
- Personnel Decontamination

These activities may result in potential exposures to contaminated soil, groundwater, or soil vapor. These activities will be evaluated and monitored by the HSC and exclusion zones may be established if necessary. All Project Personnel required to work in designated exclusion zones must meet the training requirements for working in an exclusion zone as outlined in Section 4.2 of this HASP. Personal protective clothing will be worn as defined in Section 4.1 of this HASP, or as determined by the HSC.

Drilling Activities
Persons involved with drilling activities will have a moderate potential for coming into contact with contaminated materials. Exposure may occur by direct contact with soil, groundwater, or soil vapor. An exclusion zone will be established around all drilling sites while the drilling operation is being conducted. The exclusion zone will be removed following completion of the drilling activities.

Obtaining Soil, Groundwater and Soil Vapor Samples
Persons involved with obtaining samples will have a moderate to high potential for coming into contact with contaminated materials. Exposure may occur by direct contact with contaminated soil, groundwater, or soil vapor. This sampling will be done within an established exclusion zone.

Exclusion Zone Air Monitoring
A person conducting air monitoring within the exclusion zone will have a low to moderate potential for coming into contact with contaminated materials. Exposure may occur by direct contact with contaminated soil, groundwater, or soil vapor.

Equipment Decontamination
Persons involved with cleaning the machinery, tools and other field equipment that have been used in designated exclusion zones will have a high potential for coming into contact with contaminated materials. Exposure may occur by direct contact with contaminated materials.

Personnel Decontamination
Persons involved with assisting personnel in removal of protective clothing and cleaning will have a high potential of coming into contact with contaminated materials. The levels of protection may be varied by the HSC depending upon the hazards encountered by site personnel.

2.2 Physical Hazards

Physical hazards will be addressed as necessary, primarily through site-specific training. PS&S safety procedures are provided when applicable. Site physical hazards can include overhead hazards, uneven working and walking surfaces, vehicle traffic, etc.

The following Safe Operating Procedures (SOPs) from PS&S's Health and Safety Program that are applicable to the Site are provided in Appendix B: SOP 19: Working Over or Near Water.

2.2.1 Cold Stress

At certain times of the year, workers may be exposed to the hazards of working in cold environments. Potential hazards in cold environments include frostbite, trench foot or immersion foot, hypothermia as well as slippery surfaces, brittle equipment, poor judgment and unauthorized procedural changes. Measures such as the use of appropriate clothing, training, work/rest schedules with access to heated areas and/or vehicles and modification of work tasks (if possible) will be utilized.

2.2.2 Heat Stress

Heat stress is a significant potential hazard, which is greatly exacerbated with the use of PPE in hot environments. The potential hazards of working in hot environments include dehydration, cramps, heat rash, heat exhaustion, and heat stroke. A heat stress prevention program will be implemented when ambient temperatures exceed 70 degrees F for personnel wearing impermeable clothing. Measures such as the use of appropriate clothing, training, work/rest schedules with access to cooled areas and/or vehicles and modification of work tasks (if possible) will be utilized.

2.2.3 Confined Space

Entry into Confined Spaces is not anticipated, and is not permitted under any circumstances without the prior approval of the Health and Safety Coordinator (HSC). Atmospheric testing will be conducted by the HSC prior to entry of a confined space. If a confined space is determined to be Permit-Required, entry may only be performed by qualified, trained personnel. The entry will be conducted in accordance with 29 CFR 1910.146. A confined space is a space that:

- "Is large enough and so configured that an employee can bodily enter and perform assigned work;
- Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry);
- Is not designed for continuous employee occupancy."

A *permit-required* confined space is a confined space that:

- "Contains or has the potential to contain a hazardous atmosphere;
- Contains a material that has the potential for engulfing an entrant;
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls, or by a floor which slopes downward and tapers to a smaller cross-section;
- Contains any other recognized serious safety or health hazard."

A permit-required confined space may be downgraded to an *alternate* space under the following conditions:

- The only hazard present is an atmospheric hazard
- The atmospheric hazard can be controlled by means of continuous forced-air ventilation
- The condition of the atmosphere can be continuously monitored with direct-reading instruments

2.2.4 Noise

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps and generators. Site workers who will perform suspected high noise tasks and operations for short durations (less than one hour) will be provided with earplugs. If deemed necessary by the FOL, the PM and HSC will be consulted on the need for additional hearing protection and the need to monitor sound levels for site activities.

2.2.5 Hand and Power Tools

In order to complete the various tasks for the project, personnel may utilize hand and power tools. The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire and electrocution. Work gloves, safety glasses, and hard hats will be worn by the operating personnel at all times when utilizing hand and power tools and GFI-equipped circuits will be used for all electric power tools.

2.2.6 Slips, Trips and Falls

Working in and around the Site will pose slip, trip and fall hazards due to slippery surfaces that may be oil covered, or from surfaces that are wet from rain or ice.

2.2.7 Manual Lifting

Manual lifting of heavy objects may be required. Failure to follow proper lifting technique can result in back injuries and strains. Site workers will be instructed to evaluate loads before trying to lift them (i.e. they should be able to easily tip the load and then return it to its original position). Carrying heavy loads with a buddy and proper lifting techniques, 1) make sure footing is solid, 2) make back straight with no curve or slouching, 3) center body over feet, 4) grasp the object firmly and as close to your body as possible, 5) left with legs, and 6) turn with your feet, don't twist, will be stressed. Back injuries are a serious concern as they are the most common workplace injury, often resulting in lost or restricted work time, and long treatment and recovery periods.

2.2.8 Steam, Heat and Splashing

Exposure to steam/heat/splashing hazards can occur during steam cleaning activities. Exposure to steam/heat/splashing can result in scalding/burns, eye injury, and puncture wounds. Proper PPE will be worn during all steam cleaning activities including rain gear or Tyvek, hardhat equipped with splashguard, and water resistant gloves and boots.

2.2.9 Flammable/Explosive

The potential exists for flammable atmospheres to form as a result of ground contamination. The HSC will monitor drilling activities with a Combustible Gas Indicator (CGI). Any reading above 10% of the Lower Explosive Limit (LEL) will be considered hazardous, and will require work to stop until the condition can be resolved. Any electronic equipment used within a designated exclusion zone must be rated as intrinsically safe for use in Class 1, Div 1, groups A, B, C, and D.

2.2.10 General Construction/Heavy Equipment

The greatest potential hazard at work sites is related to the operation of heavy equipment, especially in the case of malfunction, misuse or improper operation. Only qualified personnel should operate heavy equipment. Personnel not directly involved with equipment operation should stand a safe distance away from the machinery. All personnel should wear hard-hats, safety glasses, and safety boots when working near heavy equipment and any time there is a potential hazard from overhead or falling or flying objects.

2.2.11 Utility Lines

At least 3 and no more than 10 working days prior to intrusive activities, the drilling contractor shall call the Westchester "One-Call Network"

NY one call: 1-800-962-7962

Underground utility lines shall be marked out prior to the start of any digging or drilling.

2.2.12 Electrical Safety

The location of any overhead lines shall be noted, and all project equipment (drill rigs) will be kept at least 15 feet away from overhead lines. If it is not possible to maintain this clearance, the utility will be contacted to de-energize lines. All drilling work is to utilize proper grounding procedures. Always look for overhead utilities when climbing ladders, etc. or when raising drill rig masts, crane booms, etc.

All appropriate 120/240 volt electrical equipment will be equipped with ground fault circuit interrupters (GFCI).

3.0 MEDICAL EMERGENCY

Medical emergencies can be described as situations which present a significant threat to the health of personnel involved in the implementation of the subsurface assessment activities. These can result from chemical exposure, heat stress, cold stress, and poisonous insect bites. Medical emergencies must be dealt with immediately and proper care should be administered. This may be in the form of first aid and emergency hospitalization. All Site workers that have First Aid training will need to be identified prior to the start of work. In addition, a first aid kit will be brought and maintained on Site at all times during the work.

In case of a medical emergency, assess whether or not the victim can be safely transported to medical facilities. If the victim cannot be moved without the risk of aggravating their condition, refer to Section 3.2 "Emergency Notification" and summon an ambulance and appropriate emergency response personnel.

3.1 Transporting Victims

If the victim can be safely transported without risk of additional injury, the nearest hospital is St. John's Riverside Hospital (967 North Broadway, Yonkers NY - **Telephone 914-964-4444).**

The hospital is located on North Broadway between Gateway Road and Odell Avenue. The most direct route from the Site to the hospital is as follows (see Figure 2: Hospital Route Map):

1). Start out going north on Water Grant St. toward Van der Donck St.
2). Turn first right onto Pier Point St./Main St.
3). Turn left onto US Routes 9/9A North (Also known as Warburton Ave. which becomes Manor House Square which becomes North Broadway)
3). Travel about 2.5 miles north.
4). Arrive at the hospital on left side of road.

Total travel time is estimated to be Eight minutes.

3.2 Emergency Notification

In case of any situation or unplanned occurrence requiring assistance, a contact list is provided below. For emergencies, contact will first be made by the PS&S FOL with the Property Owner Representative/BCP Volunteer (Glenwood POH, LLC) who will notify emergency personnel who will in turn contact the appropriate response teams. The emergency contact list outlined below will be posted in an easily accessible location of the Site. The following is the list of telephone numbers for emergency response personnel/contacts. Information pertaining to the nearest hospital is provided in Section 3.1.

Property Owner Representative Ron Shemesh	914-309-3544
PS&S Project Manager Andrew Grundy (cell phone)	203-912-9914
PS&S Project Geologist Hal Newell (cell phone)	516-428-5599
PS&S, Field Operations Lead Christine Beaver (cell phone)	732-595-6840
PS&S, Health and Safety Coordinator Jeff Farrell (cell phone)	732-754-4083
PS&S, On-Site Field Representatives (as needed):	
Greg McClellan (cell phone)	516-318-7249
Scott Caporizzo (cell phone)	203-252-4015
St. John's Hospital	**914-964-4444**

Fire Emergency	911
Ambulance/Rescue Squad	911
Yonkers City Police	911
NYSDEC Spill Hotline	800-457-7362
Westchester County Department of Health	914-813-5000
Poison Control Center	800-222-1222/800-336-6997
NYSDEC Region III Headquarters	845-256-3000
MTA	212-878-7000

4.0 PERSONAL PROTECTION ON-SITE

Based on currently available information, Level D protection should be adequate for most of the work to be performed on-site. For the purpose of this Health and Safety Plan, Level D areas are defined as areas where gross ambient organic vapor levels (monitoring in real time) range from site background to 5 parts per million (ppm) over background. Background readings will be obtained each day within the work area before commencement of work and along the perimeter of the work site.

For the purpose of this Health and Safety Plan, during implementation of remedial investigation activities, Level D personnel protection will be required. Level D protection includes: coveralls or similar work clothes, leather work gloves, ANSI-approved safety glasses, safety boots, and a hard hat. No shorts will be allowed on site during any of the work.

If concentrations of organic vapors, as monitored in real time, exceed 5 ppm over site background on a non-transitory basis, work will temporarily stop to make work adjustments to alleviate the condition. Personal protection will be upgraded to Level C if the conditions cannot be alleviated and similar conditions persist.

Level C protection adds a full-face air-purifying respirator to the Level D protection described above and requires Tyvek coveralls, chemical resistant gloves, and boots. The full-face air-purifying respirator will be fitted with the appropriate cartridge according to on site conditions as determined by the HSC. The cartridges will follow a changing schedule and described by the cartridge user directions.

4.1 Basic Equipment

Basic safety equipment will be provided by the drilling contractor to monitor site conditions and respond to emergencies. This equipment includes, but is not limited to, the following:

1.) First Aid Kits

2.) Portable eyewash

3.) Type ABC fire extinguisher

4.2 Personnel Training

All personnel working on-site who have the potential for coming into contact with site soils during implementation of investigative efforts will be required to show documentation of meeting the Health and Safety HAZWOPER training medical requirements outlined in 29 CFR 1910.120(f) and 29 CFR 1910.134. Copies of certificates and medical surveillance will be provided to the Health and Safety Coordinator two (2) weeks before the commencement of field efforts. This documentation will be maintained on site.

5.0 FIELD PROCEDURES

Exclusion zones that require applicable Level 'C' or 'D' PPE will be clearly defined. Each exclusion zone will be cordoned off while work is taking place. Access to these zones will be provided only to those persons directly involved in the field operations and with the appropriate level of training and personal protection equipment. All equipment and personnel will be subjected to decontamination procedures before leaving an area of restricted access. Separate work zones and decontamination zones will be pre-designated in areas requiring Level C protection.

5.1 Air Monitoring

During the performance of the work, air monitoring will be performed by the PS&S FOL within the breathing zone and immediately downwind of the exclusion zone. This air monitoring will consist of monitoring organic vapors using a photo ionization detector (PID); monitoring LEL and oxygen using a combustible gas meter, and monitoring air particulates using a dust meter.

On a daily basis, the following readings will be recorded upwind of the exclusion zone to establish background levels:

- A PID will be used to monitor for organic vapors prior to the start of work and at least once during the morning and afternoon of each work day;

- A combustible gas meter will be used to monitor for LEL and oxygen prior to the start of work and during all site operations which have the potential for coming into contact with contaminated materials, and
- A dust meter will be used to monitor for particulates prior to the start of work and during site operations which have the potential to create a dust hazard.

Throughout the duration of construction activities, air quality will be monitored within the breathing zone and immediately downwind of the exclusion zone using a photo ionization detector (PID) supplemented by benzene colorimetric tubes, a combustible gas meter, and a dust meter. Work will stop should the following conditions apply:

- Organic vapors are identified to exceed 5 ppm;
- Oxygen levels are identified outside the 19.5% to 22% range;
- LEL is identified to be greater than 10%; or if
- Dust is identified to be greater than 150 ug/m^3.

5.2 Record Recording

The onsite PS&S FOL will maintain a record of all individuals present at the work site, levels of worker protection, and general conformance with this HASP. Photo ionization detector and combustible gas indicator readings will be periodically recorded in addition to noting observed peak readings. In addition, air monitoring equipment will be calibrated on a daily basis and calibration records will be kept.

6.0 DECONTAMINATION

Immediately upon mobilization to the Site, a decontamination area will be designated by the drilling contractor. The decontamination station will consist of a plastic lined, bermed or curbed, and walled area that will contain and allow for the collection of all decontamination fluids. Decontamination activities for hand tools and sampling equipment may be conducted in a portable decontamination container (i.e., 55-gallon United States Department of Transportation (USDOT) specification drum). The location of the decontamination area will be selected in the field. During the investigation, the excavator bucket and all downhole drilling equipment and the rear of the drilling rig will be decontaminated between each monitoring well, boring and test pit.

Personnel and equipment leaving the Exclusion Zone shall be decontaminated as required by the HSC. The standard Level D Decontamination Protocol shall be used unless conditions require an upgrade to Level C PPE and Decontamination Protocols.

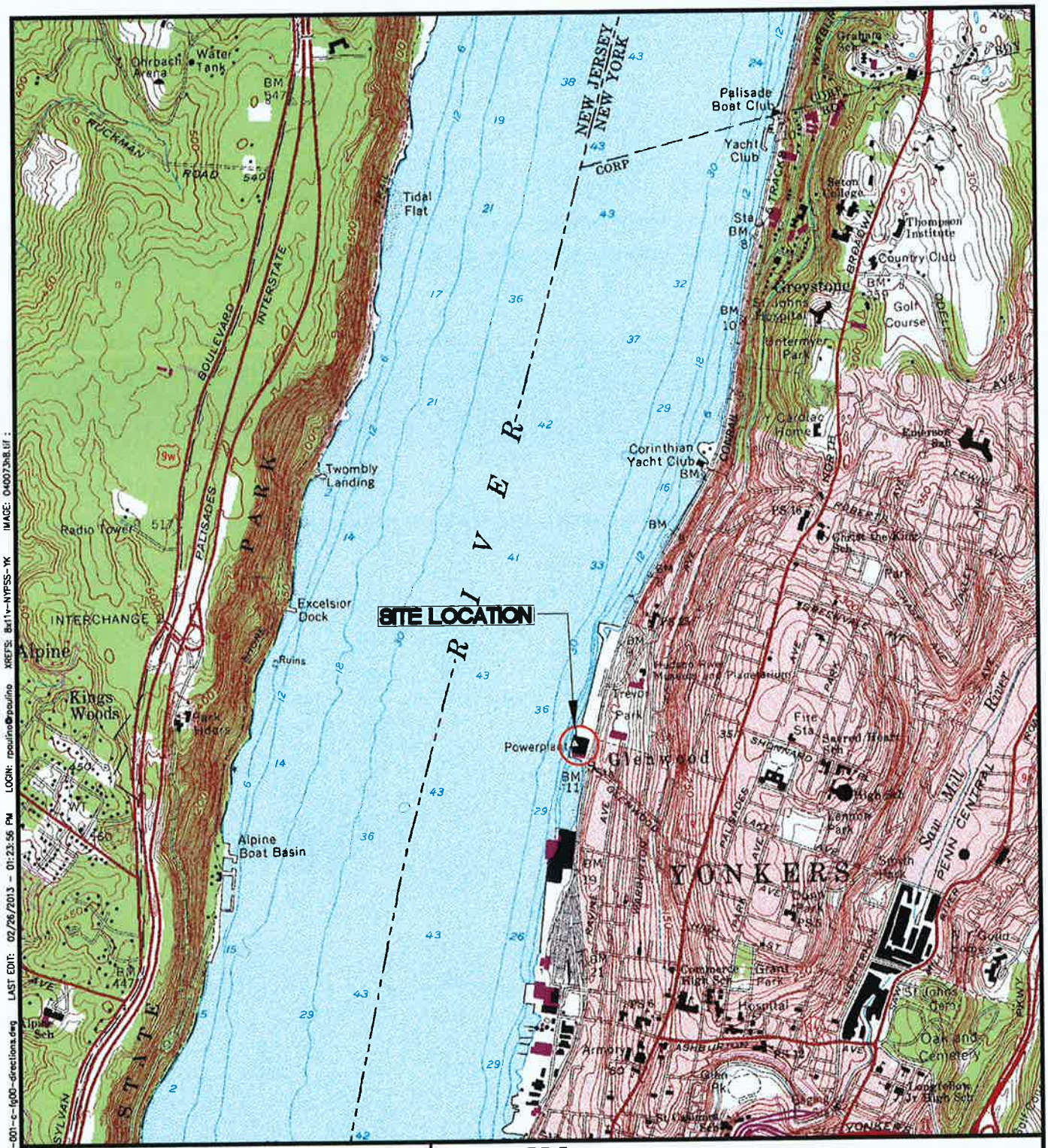
6.1 Level D Areas

Before leaving Level D work areas, loose soil will be brushed from equipment and clothing. Equipment will be rinsed with potable water. Disposable coveralls, gloves, etc. will be placed in plastic bags and disposed as non-hazardous solid waste

I have read, or have been informed of, the Health and Safety Plan and understand the information presented. I will comply with the provisions contained therein.

Name (Print and Sign)	Company Name	Date

FIGURES



PS&S
integrating design & engineering
PAULUS, SOKOLOWSKI AND SARTOR
55 MAIN STREET
3RD FLR
YONKERS, NEW YORK 10701
PHONE: (914) 509-8600
FAX: (914) 407-1679

PROJECT TITLE

GLENWOOD POWER PLANT
45 WATER GRANT WAY
YONKERS, WESTCHESTER COUNTY, NEW YORK

SHEET TITLE

FIGURE 1
SITE LOCATION MAP
(USGS TOPOGRAPHIC MAP, 7.5 MINUTE SERIES)

DATE:	05/17/2012	DRN. BY:	RP	PROJ. NO.:	K48260001
SCALE:	NTS	CK'D BY:	HN	SHT. NO.:	1

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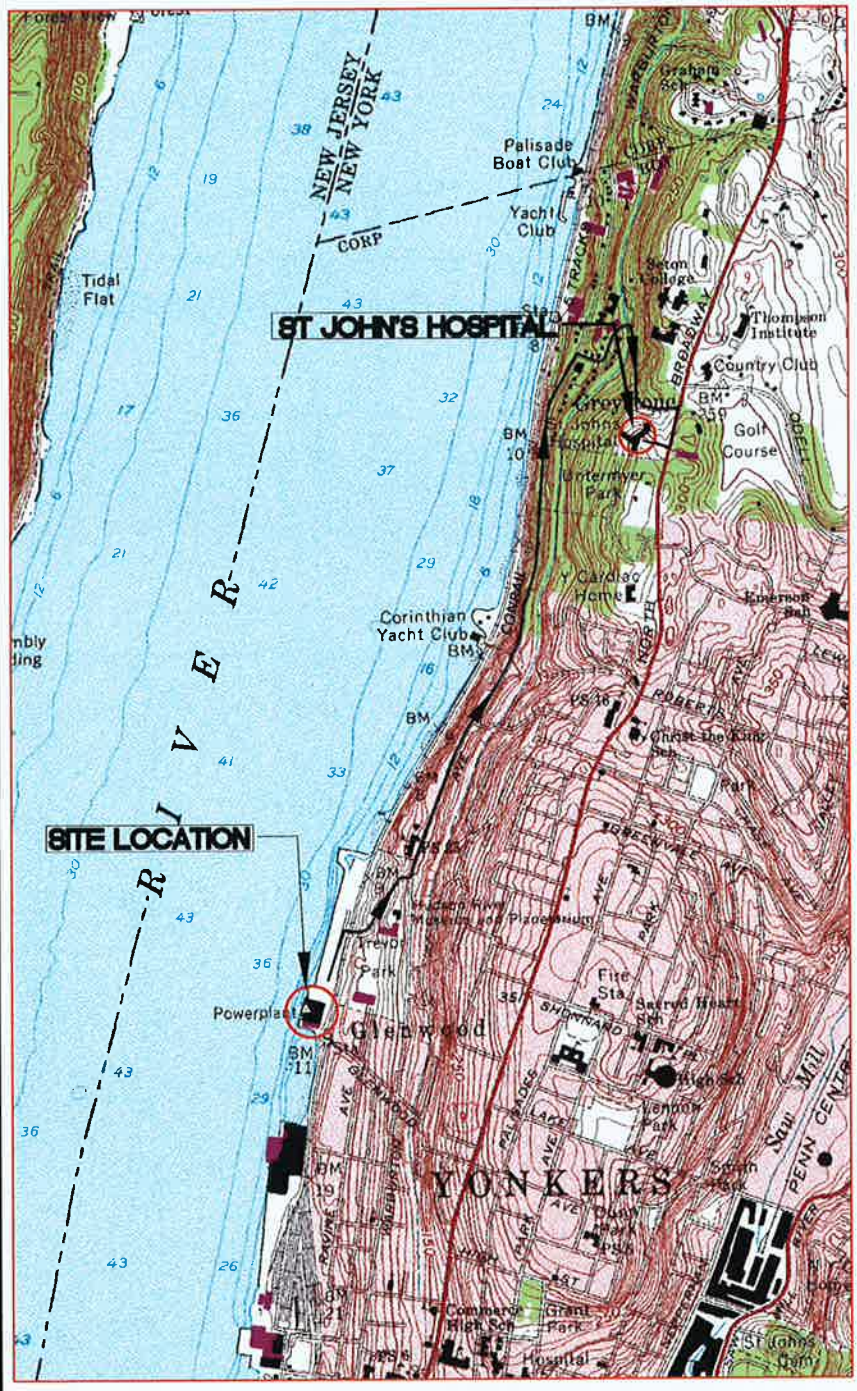
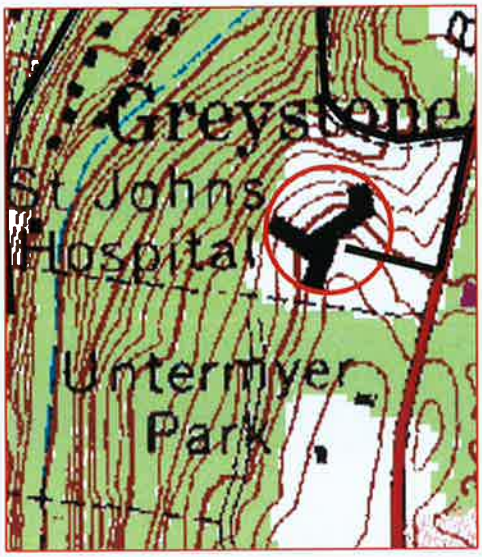
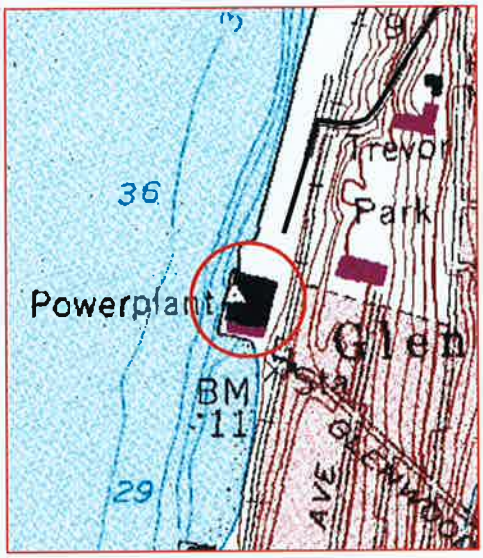




ST. JOHN'S HOSPITAL
EMERGENCY ROOM



GLENWOOD POWER PLANT
SITE LOCATION

PS&S
integrating design & engineering
PAULUS, SOKOLOWSKI AND SARTOR
55 MAIN STREET
3RD FLR
YONKERS, NEW YORK 10701
PHONE: (914) 509-8600
FAX: (914) 407-1679

PROJECT TITLE
GLENWOOD POWER PLANT
45 WATER GRANT WAY
YONKERS, WESTCHESTER COUNTY, NEW YORK

SHEET TITLE
HOSPITAL ROUTE MAP

DATE: 05/17/2012	DRN. BY: RP	PROJ. NO.: K48260001
SCALE: NTS	CK'D BY: HN	SHT. NO.: 2

APPENDIX A

International Chemical Safety Cards

CHRYSOTILE

ICSC: 0014

CHRYSOTILE
Serpentine chrysotile
White asbestos
$Mg_6Si_4H_8O_{18}$ / $Mg_6(Si_4O_{10})(OH)_8$
Molecular mass: 554

CAS # 12001-29-5
RTECS # CI16478500
ICSC # 0014
UN # 2590 (white asbestos)

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible.		In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!	
• INHALATION	Cough.	Breathing protection. Closed system and ventilation.	
• SKIN		Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
• EYES			First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• INGESTION		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Consult an expert! Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place (extra personal protection: complete protective clothing including self-contained breathing apparatus).	Well closed.	Use dust-proof packaging. UN Hazard Class: 9 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0014 Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993

International Chemical Safety Cards

CHRYSOTILE

ICSC: 0014

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** WHITE, GREY, GREEN OR YELLOWISH FIBROUS SOLID. **PHYSICAL DANGERS:** **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV: 2 fibres/cc (as TWA) A1 ppm; mg/m^3 (ACGIH 1992-1993). MAK: class III A1 (1993).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The substance may have effects on the lungs , resulting in pulmonary fibrosis and mesothelioma. This substance is carcinogenic to humans.
PHYSICAL PROPERTIES	Melting point: see Notes°C	Relative density (water = 1): 2.55
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to air.	

NOTES

The substance is heat resistant up to 500°C and completely decomposed at temperature of 1000°C. Smoking enhances harmful effects. Depending on the degree of exposure, periodic medical examination is indicated. Do NOT take working clothes home. The recommendations on this Card also apply to other forms of asbestos.

Transport Emergency Card: TEC (R)-913

ADDITIONAL INFORMATION

ICSC: 0014 **CHRYSOTILE**

International Chemical Safety Cards

BENZ(a)ANTHRACENE

ICSC: 0385

BENZ(a)ANTHRACENE
1,2-Benzoanthracene
Benzo(a)anthracene
2,3-Benzphenanthrene
Naphthanthracene
$C_{18}H_{12}$
Molecular mass: 228.3

CAS # 56-55-3
RTECS # CV9275000
ICSC # 0385
EC # 601-033-00-9

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.		Water spray, powder. In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		AVOID ALL CONTACT!	
• **INHALATION**		Local exhaust or breathing protection.	Fresh air, rest.
• **SKIN**		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
• **EYES**		Safety goggles, face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place (extra personal protection: complete protective clothing including self-contained breathing apparatus).	Well closed.	T symbol R: 45 S: 53-45

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0385	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993

International Chemical Safety Cards

BENZ(a)ANTHRACENE

ICSC: 0385

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** COLOURLESS TO YELLOW-BROWN FLUORESCENT FLAKES OR POWDER. **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV not established.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation, through the skin and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is probably carcinogenic to humans.
PHYSICAL PROPERTIES	Sublimation point: 435°C Melting point: 162°C Relative density (water = 1): 1.274	Solubility in water: none Vapour pressure, Pa at 20°C: 292 Octanol/water partition coefficient as log Pow: 5.61
ENVIRONMENTAL DATA	In the food chain important to humans, bioaccumulation takes place, specifically in seafood.	

NOTES

This substance is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles. However, it may be encountered as a laboratory chemical in its pure form. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home. Tetraphene is a common name.

ADDITIONAL INFORMATION

IMPORTANT LEGAL NOTICE:	Neither the CEC or the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

International Chemical Safety Cards

BENZO(B)FLUORANTHENE

ICSC: 0720

BENZO(B)FLUORANTHENE
Benzo(e)acephenanthrylene
2,3-Benzofluoroanthene
$C_{20}H_{12}$
Molecular mass: 252.3

CAS # 205-99-2
RTECS # CU1400000
ICSC # 0720

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, powder.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID ALL CONTACT!	IN ALL CASES CONSULT A DOCTOR!
• INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
• SKIN	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention. Wear protective gloves when administering first aid.
• EYES		Safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• INGESTION		Do not eat, drink, or smoke during work.	Wear protective gloves when inducing vomiting. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Tightly closed.	Unbreakable packaging; put breakable packaging into closed unbreakable container.

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0720

International Chemical Safety Cards

BENZO(B)FLUORANTHENE

ICSC: 0720

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS TO YELLOW CRYSTALS. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV not established.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Melting point: 168°C Solubility in water: none	Vapour pressure, Pa at 20°C: <10 Octanol/water partition coefficient as log Pow: 6.04
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to the total environment. In the food chain important to humans, bioaccumulation takes place, specifically in oils and fats.	

NOTES

Depending on the degree of exposure, periodic medical examination is indicated. Data are insufficiently available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home.

ADDITIONAL INFORMATION

ICSC: 0720 **BENZO(B)FLUORANTHENE**

International Chemical Safety Cards

BENZO(K)FLUORANTHENE

ICSC: 0721

BENZO(K)FLUOROANTHENE
11,12-Benzofluoroanthene
Dibenzo(b,j,k)fluorene
$C_{20}H_{12}$
Molecular mass: 252.3

CAS # 207-08-9
RTECS # DF6350000
ICSC # 0721

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, powder.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID ALL CONTACT!	IN ALL CASES CONSULT A DOCTOR!
• INHALATION		Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
• SKIN	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention. Wear protective gloves when administering first aid.
• EYES		Safety goggles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• INGESTION		Do not eat, drink, or smoke during work.	Wear protective gloves when inducing vomiting. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Separated from strong oxidants. Tightly closed.	

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0721

International Chemical Safety Cards

BENZO(K)FLUORANTHENE

ICSC: 0721

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** YELLOW CRYSTALS. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. Reacts with strong oxidants. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV not established.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 480°C Melting point: 215.7°C	Solubility in water: none Octanol/water partition coefficient as log Pow: 6.84
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to the total environment. In the food chain important to humans, bioaccumulation takes place, specifically in oils and fats.	

NOTES

Data are insufficiently available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home.

ADDITIONAL INFORMATION

International Chemical Safety Cards

BENZO(G,H,I)PERYLENE

ICSC: 0739

BENZO(G,H,I)PERYLENE
1,12-Benzoperylene
$C_{22}H_{12}$
Molecular mass: 276.3

CAS # 191-24-2
RTECS # DI6200500
ICSC # 0739

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, powder.
EXPLOSION			
EXPOSURE			
• **INHALATION**			
• **SKIN**	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
• **EYES**			
• **INGESTION**		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing.	

SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

BENZO(G,H,I)PERYLENE

ICSC: 0739

I M P O R T	**PHYSICAL STATE; APPEARANCE:** PALE YELLOW-GREEN CRYSTALS.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin.
	PHYSICAL DANGERS:	**INHALATION RISK:** No indication can be given about the rate in which a harmful concentration in the air is
	CHEMICAL DANGERS:	

A N T D A T A	Upon heating, toxic fumes are formed. Reacts with NO and NO2 to form nitro derivatives. **OCCUPATIONAL EXPOSURE LIMITS (OELs):**	reached on evaporation of this substance at 20° C. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
PHYSICAL PROPERTIES	Melting point: 278.3°C	
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to the total environment. In the food chain important to humans, bioaccumulation takes place, specifically in oils and fats.	

NOTES

Data are insufficiently available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION

ICSC: 0739 **BENZO(G,H,I)PERYLENE**

Material Safety Data Sheet
Chrysene, 98%

ACC# 95251

Section 1 - Chemical Product and Company Identification

MSDS Name: Chrysene, 98%
Catalog Numbers: AC224140000, AC224140010, AC224140050, AC224145000
Synonyms: 1,2-Benzophenanthrene; Benzo(a)phenanthrene; 1,2,5,6-Dibenzonaphthalene.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
218-01-9	Chrysene	98	205-923-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: very light beige solid.
Caution! May cause eye and skin irritation. May cause respiratory tract irritation. May cause cancer in humans.
Target Organs: Liver, skin.

Potential Health Effects
Eye: May cause eye irritation.
Skin: May cause skin irritation.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea.
Inhalation: May cause respiratory tract irritation.
Chronic: May cause cancer according to animal studies.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air

immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. This material in sufficient quantity and reduced particle size is capable of creating a dust explosion.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or chemical foam.
Flash Point: Not applicable.
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: ; Flammability: 1; Instability:

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Wash thoroughly after handling. Avoid contact with eyes, skin, and clothing. Use only with adequate ventilation. Avoid breathing dust.
Storage: Store in a tightly closed container. Store in a cool, dry area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Chrysene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (benzene soluble fraction) (listed under Coal tar pitches).

OSHA Vacated PELs: Chrysene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Solid
Appearance: very light beige
Odor: Not available.
pH: Not available.
Vapor Pressure: Not available.
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 448 deg C @ 760 mm Hg
Freezing/Melting Point:250-255 deg C
Decomposition Temperature: Not available.
Solubility: insoluble
Specific Gravity/Density: Not available.
Molecular Formula:C18H12
Molecular Weight:228.29

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Dust generation.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 218-01-9: GC0700000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 218-01-9:

- **ACGIH:** A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans

- **California:** carcinogen, initial date 1/1/90
- **NTP:** Known carcinogen (listed as Coal tar pitches).
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: Chrysene was mutagenic to S. Typhimurium in the presence of an exogenous metabolic system.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Water flea LC50 = 1.9 mg/L; 2 Hr.; Unspecified Fish toxicity : LC50 (96hr) Neauthes arenacedentata >1ppm.(Rossi,S.S. et al Marine Pollut. Bull. 1978) Invertebrate toxicity : lethal treshold concentration (24hr) Daphnia Magna 0,7æg/l.(* Newsted,J.L. et al Environ. Toxicol. Chem. 1987) Bioaccumulation : 24hr Daphnia Magna log bioconcentration factor 3.7845 (*)
Environmental: Degradation studies : biodegradated by white rot fungus (Proc.Annu.Meet.Am.Wood-Preserv.Assoc.1989) May be utilised by axenic cultures of microorganisms e.g. Pseudomonas pancimobilis EPA505, which may have novel degradative systems(Mueller,J.G. et al ppl.Environ.Microbiol.1990; Mueller, J.G. et al Environ.Sci.Technol.1991).
Physical: Not found.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 218-01-9: waste number U050.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	DOT regulated - small quantity provisions apply (see 49CFR173.4)	No information available.
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 218-01-9 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 218-01-9: 100 lb final RQ; 45.4 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
Section 313
This material contains Chrysene (CAS# 218-01-9, 98%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 218-01-9 is listed as a Priority Pollutant under the Clean Water Act.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 218-01-9 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65
The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:
WARNING: This product contains Chrysene, a chemical known to the state of California to cause cancer.
California No Significant Risk Level: CAS# 218-01-9: 0.35 æg/day NSRL (oral)

European/International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
T
Risk Phrases:
R 45 May cause cancer.
R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

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

S 53 Avoid exposure - obtain special instructions before use.
S 60 This material and its container must be disposed of as hazardou
s waste.
S 61 Avoid release to the environment. Refer to special instructions
/safety data sheets.

WGK (Water Danger/Protection)
CAS# 218-01-9: No information available.

Canada - DSL/NDSL
CAS# 218-01-9 is listed on Canada's DSL List.

Canada - WHMIS
This product has a WHMIS classification of D2A.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List
CAS# 218-01-9 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 6/30/1999
Revision #5 Date: 11/20/2008

International Chemical Safety Cards

ARSENIC

ICSC: 0013

ARSENIC
Grey arsenic
Metallic arsenic
As
Atomic mass: 74.9

CAS # 7440-38-2
RTECS # CG0525000
ICSC # 0013
UN # 1558
EC # 033-001-00-X

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames. NO contact with strong oxidizers. NO contact with hot surfaces.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Risk of fire and explosion is slight if in the form of fine powder or dust when exposed to hot surfaces or flames.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		AVOID ALL CONTACT!	IN ALL CASES CONSULT A DOCTOR!
• INHALATION	Cough. Diarrhoea. Shortness of breath. Sore throat. Vomiting. Weakness. Grey skin.	Closed system and ventilation.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
• SKIN	Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
• EYES	Redness.	or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• INGESTION	Diarrhoea. Nausea. Sore throat. Unconsciousness. Vomiting (further see Inhalation).	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Sweep spilled substance into sealable containers. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment (extra personal protection: complete protective clothing including self-contained breathing apparatus).	Provision to contain effluent from fire extinguishing. Separated from strong oxidants, acids, halogens, food and feedstuffs. Well closed. Keep in a well-ventilated room.	Do not transport with food and feedstuffs. T symbol R: 23/25 S: (1/2-)20/21-28-45 UN Hazard Class: 6.1 UN Packing Group: II Marine pollutant.

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0013

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International Chemical Safety Cards

ARSENIC

ICSC: 0013

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** ODOURLESS, BRITTLE, GREY, METALLIC-LOOKING CRYSTALS. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. Reacts violently with strong oxidants and halogens causing fire and explosion hazard. Reacts with nitric acid, hot sulfuric acid. Toxic arsine gas may be formed in contact with acid or acidic substances and certain metals, such as galvanized or light metals. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV: ppm; 0.01 mg/m^3 (as TWA) A1 (ACGIH 1994-1995). **ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance irritates the eyes, the skin and the respiratory tract. The substance may cause effects on the circulatory system, nervous system, kidneys and gastrointestinal tract , resulting in convulsions, kidney impairment, severe hemorrhage, losses of fluids, and electrolytes, shock and death. Exposure may result in death. The effects may be delayed. Medical observation is indicated. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis. Repeated or prolonged contact may cause skin sensitization. The substance may have effects on the mucous membranes, skin, kidneys, liver , resulting in neuropathy, pigmentation disorders, perforation of nasal septum and tissue lesions. This substance is carcinogenic to humans.
PHYSICAL PROPERTIES	Sublimation point: 613°C Relative density (water = 1): 5.7 Solubility in water: none
ENVIRONMENTAL DATA	The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment because it persists in the environment.

NOTES

The substance is combustible but no flash point is available in literature. Depending on the degree of exposure, periodic medical examination is indicated. Do NOT take working clothes home. Refer also to cards for specific arsenic compounds, e.g., Arsenic pentoxide (ICSC # 0377), Arsenic trichloride (ICSC # 0221), Arsenic trioxide (ICSC # 0378), Arsine (ICSC # 0222).

ADDITIONAL INFORMATION

ICSC: 0013 ARSENIC

IMPORTANT LEGAL NOTICE:	Neither the CEC or the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

International Chemical Safety Cards

CADMIUM

ICSC: 0020

CADMIUM
(powder)
Cd
Molecular mass: 112.4

CAS # 7440-43-9
RTECS # EU9800000
ICSC # 0020
UN # 2570 (cadmium compounds)

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable in powder form. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames, NO sparks, and NO smoking. NO contact with heat or acids.	Dry sand. Special powder. No other agents.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE!	IN ALL CASES CONSULT A DOCTOR!
• **INHALATION**	Cough. Headache. Symptoms may be delayed (see Notes).	Local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration if indicated. Refer for medical attention.
• **SKIN**		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
• **EYES**	Redness. Pain.	Face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**	Abdominal pain. Diarrhoea. Headache. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Extinguish ignition sources. Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place (extra personal protection: P3 filter respirator for toxic particles).	Fireproof. Separated from strong oxidants, strong acids, food and feedstuffs.	Airtight. Unbreakable packaging; put breakable packaging into closed **unbreakable container. Do not transport** with food and feedstuffs. UN Hazard Class: 6.1

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0020 Prepared in the context of cooperation between the International Programme on Chemical Safety & the

International Chemical Safety Cards

CADMIUM

ICSC: 0020

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** SOFT BLUE-WHITE METAL LUMPS OR GREY POWDER. MALLEABLE. TURNS BRITTLE ON EXPOSURE TO 80°C AND TARNISHES ON EXPOSURE TO MOIST AIR. **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** Reacts with acids giving off flammable hydrogen gas. Dust reacts with oxidants, hydrogen azide, zinc, selenium or tellurium, causing fire and explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV (as dust): ppm; 0.05 mg/m^3 as TWA (ACGIH 1991-1992).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance irritates the eyes and the respiratory tract. Inhalation of fume may cause lung oedema (see Notes). Inhalation of fume may cause metal fever. The effects may be delayed. Medical observation is indicated. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Lungs may be affected by repeated or prolonged exposure to dust particles. The substance may have effects on the kidneys , resulting in proteinuria and kidney dysfunction. This substance is probably carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 765°C Melting point: 321°C Relative density (water = 1): 8.6	Solubility in water: none Auto-ignition temperature: 250°C (cadmium metal dust)°C
ENVIRONMENTAL DATA		

NOTES

Reacts violently with fire extinguishing agents such as water, foam, carbon dioxide and halons. Depending on the degree of exposure, periodic medical examination is indicated. The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Do NOT take working clothes home.

ADDITIONAL INFORMATION

LEGAL NOTICE:	IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

International Chemical Safety Cards

CHROMIUM

ICSC: 0029

CHROMIUM
Chrome
(powder)
Cr (metal)
Atomic mass: 52.0

CAS # 7440-47-3
RTECS # GB4200000
ICSC # 0029

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible if in very fine powder. Gives off irritating or toxic fumes (or gases) in a fire.	No open flames if in powder form.	In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE!	
• INHALATION	Cough.	Local exhaust or breathing protection.	Fresh air, rest.
• SKIN	Redness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
• EYES	Redness.	Face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Vacuum spilled material. Carefully collect remainder, then remove to safe place (extra personal protection: P2 filter respirator for harmful particles).	Fireproof. Separated from strong oxidants.	

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0029

International Chemical Safety Cards

CHROMIUM

ICSC: 0029

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** STEEL GREY LUTROUS METAL. **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** Reacts violently with strong oxidants such as hydrogen peroxide, causing fire and explosion hazard. Reacts with diluted hydrochloric and sulfuric acids. Incompatible with alkalis and alkali carbonates. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV: ppm; 0.5 mg/m^3 (as TWA) (ACGIH 1994-1995).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact may cause skin sensitization.
PHYSICAL PROPERTIES	Boiling point: 2642°C Melting point: 1900°C	Relative density (water = 1): 7.14 Solubility in water: none
ENVIRONMENTAL DATA		

NOTES

Explosive limits are unknown in literature. Depending on the degree of exposure, periodic medical examination is indicated.

ADDITIONAL INFORMATION

ICSC: 0029 **CHROMIUM**

International Chemical Safety Cards

COPPER

ICSC: 0240

COPPER
(powder)
Cu
Atomic mass: 63.5

CAS # 7440-50-8
RTECS # GL5325000
ICSC # 0240

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Special powder, dry sand, NO other agents.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST!	
• INHALATION	Cough. Headache. Shortness of breath. Sore throat.	Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
• SKIN	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
• EYES	Redness. Pain.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• INGESTION	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers. Carefully collect remainder. Then remove to safe place (extra personal protection: P2 filter respirator for harmful particles).	Separated from: see Chemical Dangers.	

SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

COPPER

ICSC: 0240

	PHYSICAL STATE; APPEARANCE:	ROUTES OF EXPOSURE:

I M P O R T A N T D A T A	RED POWDER, TURNS GREEN ON EXPOSURE TO MOIST AIR. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Shock-sensitive compounds are formed with acetylenic compounds, ethylene oxides and azides. Reacts with strong oxidants like chlorates, bromates and iodates, causing explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV: ppm; 0.2 mg/m^3 fume (ACGIH 1992-1993). TLV (as Cu, dusts & mists): ppm; 1 mg/m^3 (ACGIH 1992-1993).	The substance can be absorbed into the body by inhalation and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed. **EFFECTS OF SHORT-TERM EXPOSURE:** Inhalation of fume may cause metal fever (see Notes). **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact may cause skin sensitization.
PHYSICAL PROPERTIES	Boiling point: 2595°C Melting point: 1083°C	Relative density (water = 1): 8.9 Solubility in water: none
ENVIRONMENTAL DATA		

NOTES

The symptoms of metal fume fever do not become manifest until several hours.

ADDITIONAL INFORMATION

ICSC: 0240 **COPPER**

International Chemical Safety Cards

LEAD

ICSC: 0052

LEAD
Lead metal
Plumbum
(powder)
Pb
Atomic mass: 207.2

CAS # 7439-92-1
RTECS # OF7525000
ICSC # 0052

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Finely divided lead powder is flammable. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames, NO sparks, and NO smoking (if in powder form).	In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!	IN ALL CASES CONSULT A DOCTOR!
• INHALATION	Abdominal cramps. Drowsiness. Headache. Nausea. Vomiting. Weakness. Wheezing. Pallor. Hemoglobinuria. Collapse.	Ventilation (not if powder). Avoid inhalation of fine dust and mist. Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
• SKIN			
• EYES			
• INGESTION	Abdominal cramps (further see Inhalation).	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Carefully collect	Separated from strong oxidants, strong bases, strong acids, food and feedstuffs.	

remainder, then remove to safe place. Do NOT let this chemical enter the environment (extra personal protection: P2 filter respirator for harmful particles).		

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0052 Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993

International Chemical Safety Cards

LEAD

ICSC: 0052

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** BLUISH-WHITE OR SILVERY-GREY SOLID IN VARIOUS FORMS. TURNS TARNISHED ON EXPOSURE TO AIR. **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. Reacts with hot concentrated nitric acid, boiling concentrated hydrochloric and sulfuric acids. Attacked by pure water and by weak organic acids in the presence of oxygen. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV: ppm; 0.15 mg/m^3 (as TWA) (ACGIH 1993-1994).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance may cause effects on the gastrointestinal tract, blood, central nervous system and kidneys , resulting in colics, shock, anemia, kidney damage and encephalopathy. Exposure may result in death. The effects may be delayed. Medical observation is indicated. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The substance may have effects on the gastrointestinal tract, nervous system, blood, kidneys and immune system , resulting in severe lead colics, paralysis of muscle groups of the upper extremities (forearm, wrist and fingers), anemia, mood and personality changes, retarded mental development, and irreversible nephropathy. May cause retarded development of the new-born. Danger of cumulative effect.
PHYSICAL PROPERTIES	Boiling point: 1740°C Melting point: 327.5°C	Relative density (water = 1): 11.34 Solubility in water: none
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to air and water. In the food chain important to humans, bioaccumulation takes place, specifically in plants and water organisms, especially shellfish.	

NOTES

Explosive limits are unknown in literature. Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is indicated. Do NOT take working clothes home. Refer also to cards for specific lead compounds, e.g., lead chromate (ICSC # 0003), lead(II) oxide (ICSC # 0288).

Transport Emergency Card: TEC (R)-61G12b

ADDITIONAL INFORMATION

ICSC: 0052	**LEAD**

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International Chemical Safety Cards

MERCURY

ICSC: 0056

MERCURY
Quicksilver
Liquid silver
Hydrargyrum
Hg
Atomic mass: 200.6

CAS # 7439-97-6
RTECS # OV4550000
ICSC # 0056
UN # 2809
EC # 080-001-00-0

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO contact with flammable substances.	In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION	Risk of fire and explosion on contact with incompatible substances (see Chemical Dangers).		In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!	IN ALL CASES CONSULT A DOCTOR!
• **INHALATION**	Abdominal pain. Cough. Diarrhoea. Shortness of breath. Vomiting.	Local exhaust or breathing protection.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
• **SKIN**	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
• **EYES**		Face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**		Do not eat, drink, or smoke during work. Wash hands before eating.	Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Consult an expert! Ventilation. Collect leaking and spilled liquid in sealable non-metallic containers as far as possible. Do NOT	Provision to contain effluent from fire extinguishing. Separated from azides, acetylene, ammonia, food and feedstuffs. Well closed. Ventilation	Special material. Do not transport with food and feedstuffs. T symbol R: 23-33

wash away into sewer. Do NOT let this chemical enter the environment (extra personal protection: complete protective clothing including self-contained breathing apparatus).	along the floor.	S: (1/2-)7-45 UN Hazard Class: 8 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0056 Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993

International Chemical Safety Cards

MERCURY

ICSC: 0056

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** ODOURLESS, HEAVY AND MOBILE SILVERY LIQUID METAL. **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. Reacts violently with alkali metals, acetylene, azides, ammonia gas, chlorine, chlorine dioxide, sodium carbide and ethylene oxide. Attacks copper and many other metals forming amalgams. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV: ppm; 0.025 mg/m^3 (as TWA) (skin) (ACGIH 1994-1995). MAK: 0.01 ppm; 0.1 mg/m^3; (1992).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation and through the skin , also as a vapour! **INHALATION RISK:** A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** Inhalation of the vapours may cause pneumonitis. The substance may cause effects on the kidneys and the central nervous system. The effects may be delayed. Medical observation is indicated. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The substance may have effects on the central nervous system and kidneys , resulting in emotional and psychic instability, tremor mercurialis, cognitive disturbances, speech disorders. Danger of cumulative effects. Animal tests show that this substance possibly causes toxic effects upon human reproduction.
PHYSICAL PROPERTIES	Boiling point: 357°C Melting point: -39°C Relative density (water = 1): 13.5 Solubility in water: none	Vapour pressure, Pa at 20°C: 0.26 Relative vapour density (air = 1): 6.93 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.009
ENVIRONMENTAL DATA	The substance is very toxic to aquatic organisms. In the food chain important to humans, bioaccumulation takes place, specifically in fish.	

NOTES

Depending on the degree of exposure, periodic medical examination is indicated. No odour warning if toxic concentrations are present. Do NOT take working clothes home.

ADDITIONAL INFORMATION

ICSC: 0056	MERCURY

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International Chemical Safety Cards

NICKEL

ICSC: 0062

NICKEL
(powder)
Ni
Molecular mass: 58.7

CAS # 7440-02-0
RTECS # QR5950000
ICSC # 0062
EC # 028-002-00-7

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable as dust. Toxic fumes may be released in a fire.		Water in large amounts, foam, dry sand, NO carbon dioxide.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE!	
• INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
• SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
• EYES		Safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• INGESTION		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Vacuum spilled material. Carefully collect remainder, then remove to safe place (extra personal protection: P2 filter respirator for harmful particles).	Separated from strong acids.	Xn symbol R: 40-43 S: (2-)22-36

SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

NICKEL

ICSC: 0062

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** ODOURLESS SILVERY METALLIC SOLID IN VARIOUS FORMS. **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** Reacts violently, in powder form, with titanium powder and potassium perchlorate, and oxidants such as ammonium nitrate, causing fire and explosion hazard. Reacts slowly with non-oxidizing acids and more rapidly with oxidizing acids. Toxic gases and vapours (such as nickel carbonyl) may be released in a fire involving nickel. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV: ppm; 1 mg/m^3 (as TWA) (ACGIH 1993-1994).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of the dust and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed. **EFFECTS OF SHORT-TERM EXPOSURE:** Inhalation of the fumes may cause pneumonitis. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis. Repeated or prolonged contact may cause skin sensitization. Repeated or prolonged inhalation exposure may cause asthma. Lungs may be affected by repeated or prolonged exposure. The substance may have effects on the nasal sinuses , resulting in inflammation and ulceration.
PHYSICAL PROPERTIES	Boiling point: 2730°C Melting point: 1455°C	Relative density (water = 1): 8.9 Solubility in water: none
ENVIRONMENTAL DATA		

NOTES

Depending on the degree of exposure, periodic medical examination is indicated. The symptoms of asthma often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Anyone who has shown symptoms of asthma due to this substance should avoid all further contact with this substance.

ADDITIONAL INFORMATION

ICSC: 0062 **NICKEL**

International Chemical Safety Cards

SELENIUM

ICSC: 0072

SELENIUM
(powder)
Se
Atomic mass: 79.0

CAS # 7782-49-2
RTECS # VS7700000
ICSC # 0072
UN # 2658 (powder)
EC # 034-001-00-2

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames. NO contact with oxidants.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Risk of fire and explosion with oxidants.		Use extinguishing media appropriate to surrounding fire conditions. NO contact with water.
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE!	
• INHALATION	Irritation of nose. Cough. Dizziness. Headache. Laboured breathing. Nausea. Sore throat. Vomiting. Weakness. Symptoms may be delayed (see Notes).	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
• SKIN	Redness. Skin burns. Pain. Discolouration.	Protective gloves. Protective clothing.	Rinse skin with plenty of water or shower. Refer for medical attention. Remove and isolate contaminated clothes.
• EYES	Redness. Pain. Blurred vision.	Safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• INGESTION	Metallic taste. Diarrhoea. Chills. Fever (further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Do NOT wash away into sewer. Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place (extra personal protection: P3 filter respirator	Fireproof. Separated from strong oxidants, strong acids, food and feedstuffs. Dry.	Airtight. Do not transport with food and feedstuffs. T symbol R: 23/25-33 S: (1/2-)20/21-28-45 UN Hazard Class: 6.1

for toxic particles).		UN Packing Group: III
SEE IMPORTANT INFORMATION ON BACK		
ICSC: 0072	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993	

International Chemical Safety Cards

SELENIUM

ICSC: 0072

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** ODOURLESS SOLID IN VARIOUS FORMS. DARK RED-BROWN TO BLUISH-BLACK AMORPHOUS SOLID OR RED TRANSPARENT CRYSTALS OR METALLIC GREY TO BLACK CRYSTALS. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. Reacts violently with oxidants and strong acids. Reacts with water at 50°C forming flammable hydrogen (see ICSC # 0001) and selenious acids. Reacts with incandescence on gentle heating with phosphorous and metals such as nickel, zinc, sodium, potassium, platinum. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV: ppm; 0.2 mg/m^3 as TWA (ACGIH 1991-1992).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation, through the skin and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly by dispersion. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance irritates the eyes and the respiratory tract. Inhalation of dust may cause lung oedema (see Notes). Inhalation of fume may cause symptoms of asphyxiation, chills and fever and bronchitis. The effects may be delayed. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the respiratory tract, gastrointestinal tract, and skin , resulting in nausea, vomiting, cough, yellowish skin discolouration, loss of nails, garlic breath and bad teeth.
PHYSICAL PROPERTIES	Boiling point: 685°C Melting point: 170-217°C Relative density (water = 1): 4.8	Solubility in water: none Vapour pressure, Pa at 20°C: 0.1
ENVIRONMENTAL DATA		

NOTES

Do NOT take working clothes home.

ADDITIONAL INFORMATION

IMPORTANT LEGAL NOTICE:	for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

International Chemical Safety Cards

ZINC POWDER

ICSC: 1205

ZINC POWDER
Blue powder
Merrillite
(powder)
Zn
Atomic mass: 65.4

CAS # 7440-66-6
RTECS # ZG8600000
ICSC # 1205
UN # 1436 (zinc powder or dust)
EC # 030-001-00-1

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable. Many reactions may cause fire or explosion. Gives off irritating or toxic fumes (or gases) in a fire.	**NO open flames, NO sparks, and** NO smoking. NO contact with **acid(s), base(s) and incompatible** substances (see Chemical Dangers).	Special powder, dry sand, NO other agents. NO water.
EXPLOSION	Risk of fire and explosion on contact with acid(s), water, base (s) and incompatible substances.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Prevent deposition of dust.	In case of fire: cool drums, etc., by spraying with water but avoid contact of the substance with water.
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE!	
• **INHALATION**	Metallic taste and metal fume fever. **Symptoms may be delayed** (see Notes).	Local exhaust.	Fresh air, rest. Refer for medical attention.
• **SKIN**	Dry skin.	Protective gloves.	Rinse and then wash skin with water and soap.
• **EYES**		Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Extinguish or remove all ignition sources. Do NOT wash away into sewer. **Sweep spilled substance into dry** containers, then remove to safe place (extra personal protection: self-	Fireproof. Separated from strong oxidants, strong bases, strong acids, oxidants, acids and bases. Dry.	Airtight. F symbol R: 15-17 S: (2-)7/8-43 UN Hazard Class: 4.3

contained breathing apparatus).		UN Subsidiary Risks: 4.2

SEE IMPORTANT INFORMATION ON BACK

ICSC: 1205 Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993

International Chemical Safety Cards

ZINC POWDER

ICSC: 1205

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
ODOURLESS GREY TO BLUE POWDER.

PHYSICAL DANGERS:
Dust explosion possible if in powder or granular form, mixed with air. If dry, it can be charged electrostatically by swirling, pneumatic transport, pouring, etc.

CHEMICAL DANGERS:
Upon heating, toxic fumes are formed. The substance is a strong reducing agent and reacts violently with oxidants. Reacts with water and reacts violently with acids and bases giving off highly flammable hydrogen gas. Reacts violently with sulfur, halogenated hydrocarbons and many other substances causing fire and explosion hazard.

OCCUPATIONAL EXPOSURE LIMITS (OELs):
TLV not established.

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation and by ingestion.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

EFFECTS OF SHORT-TERM EXPOSURE:
Inhalation of fume may cause metal fever. The effects may be delayed.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis.

PHYSICAL PROPERTIES

Boiling point: 907°C
Melting point: 419°C
Relative density (water = 1): 7.14
Solubility in water: reaction
Vapour pressure, kPa at 487°C°C: 0.1
Auto-ignition temperature: 460°C

ENVIRONMENTAL DATA

NOTES

Zinc may contain trace amounts of arsenic, when forming hydrogen, may also form toxic gas arsine (see ICSC # 0001 and ICSC # 0222). Reacts violently with fire extinguishing agents such as water, halons, foam and carbon dioxide. The symptoms of metal fume fever do not become manifest until several hours later. Rinse contaminated clothes (fire hazard) with plenty of water.

Transport Emergency Card: TEC (R)-43G14
NFPA Code: H0; F1; R1;

ADDITIONAL INFORMATION

ICSC: 1205 **ZINC POWDER**

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SUPELCO INC -- P12 3.2ML AROCLOR 1260 T 45MG/KG, 42828 -- 6630-00N039211

========== Product Identification ==========

Product ID:P12 3.2ML AROCLOR 1260 T 45MG/KG, 42828
MSDS Date:08/04/1992
FSC:6630
NIIN:00N039211
MSDS Number: BRHZS
=== Responsible Party ===
Company Name:SUPELCO INC
Address:SUPELCO PARK
City:BELLEFONTE
State:PA
ZIP:16823-0048
Country:US
Info Phone Num:814-359-3441
Emergency Phone Num:814-359-3441
CAGE:54968
=== Contractor Identification ===
Company Name:SIGMA-ALDRICH INC.
Address:3050 SPRUCE STREET
Box:14508
City:ST. LOUIS
State:MO
ZIP:63103
Country:US
Phone:314-771-5765/414-273-3850X5996
CAGE:54968

========== Composition/Information on Ingredients ==========

Ingred Name:POLYCHLORINATED BIPHENYL (AROCLOR 1260).
LD50:(ORAL,RAT)1315 MG/KG
CAS:11096-82-5
RTECS #:TQ1362000
Fraction by Wt: 0.005%
OSHA PEL:0.05 MG/M3 (MFR)
ACGIH TLV:0.05 MG/M3 (MFR)
EPA Rpt Qty:1 LB
DOT Rpt Qty:1 LB

Ingred Name:DIALA AX OIL. LD50:(ORAL,RAT) 10,000 MG/KG
Fraction by Wt: 99-100%
ACGIH TLV:5 MG/M3 (MFR)

========== Hazards Identification ==========

LD50 LC50 Mixture:SEE INGREDIENT NAME
Routes of Entry: Inhalation:YES Skin:YES Ingestion:YES
Reports of Carcinogenicity:NTP:NO IARC:NO OSHA:NO
Health Hazards Acute and Chronic:CONTAINS LOW CONCENTRATION(S) OF MATERIAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER. SUCH CONCENTRATION(S) IS/ARE SUBSTANTIALLY BELOW OSHA-HCS THRESHOLDS WHICH WOULD REQUIRE LISTING HEREIN A S A COMPONENT OF THIS MIXTURE. IRRITATES SKIN. DERMATITIS. IRRITATES NOSE AND THROAT. GI DISTURBANCES.
Explanation of Carcinogenicity:NOT RELEVANT
Effects of Overexposure:SEE HEALTH HAZARDS.

Medical Cond Aggravated by Exposure:NONE SPECIFIED BY MANUFACTURER.

========== First Aid Measures ==========

First Aid:EYES: FLUSH WITH WATER FOR AT LEAST 15 MINUTES. SKIN: FLUSH WITH LARGE VOLUMES OF WATER. PROMPTLY WASH SKIN WITH MILD SOAP AND LARGE VOLUMES OF WATER. REMOVE CONTAMINATED CLOTHING. INHAL: IMMEDIATELY MOVE TO FRESH AIR. INGEST: NEVER GIVE ANYTHING BY MOUTH TO AN UNCON PERSON. NEVER TRY TO MAKE AN UNCON PERSON VOMIT. DO NOT INDUCE VOMIT. CONTACT A PHYSICIAN.

========== Fire Fighting Measures ==========

Flash Point:295F,146C
Extinguishing Media:CARBON DIOXIDE, DRY CHEMICAL, ALCOHOL FOAM.
Fire Fighting Procedures:WEAR NIOSH/MSHA APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT .
Unusual Fire/Explosion Hazard:THE FOLLOWING TOXIC VAPORS ARE FORMED WHEN THIS MATERIAL IS HEATED TO DECOMPOSITION. HYDROGEN CHLORIDE.

========== Accidental Release Measures ==========

Spill Release Procedures:TAKE UP WITH ABSORBENT MATERIAL. VENTILATE AREA. ELIMINATE ALL IGNITION SOURCES.
Neutralizing Agent:NONE SPECIFIED BY MANUFACTURER.

========== Handling and Storage ==========

Handling and Storage Precautions:STORE IN SEALED CONTAINER IN COOL, DRY LOCATION.
Other Precautions:AVOID EYE OR SKIN CONTACT.

========== Exposure Controls/Personal Protection ==========

Respiratory Protection:NIOSH/MSHA APPROVED RESPIRATORY PROTECTION.
Ventilation:USE ONLY IN WELL VENTILATED AREA.
Protective Gloves:IMPERVIOUS GLOVES .
Eye Protection:CHEMICAL WORKERS GOGGLES .
Work Hygienic Practices:NONE SPECIFIED BY MANUFACTURER.
Supplemental Safety and Health
NONE SPECIFIED BY MANUFACTURER.

========== Physical/Chemical Properties ==========

Boiling Pt:B.P. Text:>302F,>150C
Melt/Freeze Pt:M.P/F.P Text:-58F,-50C
Spec Gravity:0.883(H*2O=1)
Solubility in Water:0
Appearance and Odor:WHITE LIQUID, HYDROCARBON ODOR.
Percent Volatiles by Volume:0

========== Stability and Reactivity Data ==========

Stability Indicator/Materials to Avoid:YES
Hazardous Decomposition Products:HYDROGEN CHLORIDE.

========== Disposal Considerations ==========

Waste Disposal Methods:COMPLY WITH ALL APPLICABLE FEDERAL, STATE, OR LOCAL REGULATIONS.

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International Chemical Safety Cards

POLYCHLORINATED BIPHENYL (AROCLOR 1254)

ICSC: 0939

POLYCHLORINATED BIPHENYL (AROCLOR 1254)
Chlorobiphenyl (54% chlorine)
Chlorodiphenyl (54% chlorine)
PCB
Molecular mass: 327 (average)

CAS # 11097-69-1
RTECS # TQ1360000
ICSC # 0939
UN # 2315
EC # 602-039-00-4

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Irritating and toxic gases may be generated in a fire.		Powder, carbon dioxide.
EXPLOSION			
EXPOSURE		PREVENT GENERATION OF MISTS! STRICT HYGIENE!	
• **INHALATION**		Ventilation.	Fresh air, rest. Refer for medical attention.
• **SKIN**	MAY BE ABSORBED! Dry skin. Redness. Chloracne (further see Inhalation).	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
• **EYES**	Redness. Pain.	Safety goggles, face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**	Headache. Numbness. Fever.	Do not eat, drink, or smoke during work.	Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Consult an expert! Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment (extra personal protection: complete protective clothing including self-contained breathing apparatus).	Separated from food and feedstuffs. Cool. Dry. Keep in a well-ventilated room.	Unbreakable packaging; put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs. Xn symbol R: 33 S: 35 Note: C UN Hazard Class: 9 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0939	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993

International Chemical Safety Cards

POLYCHLORINATED BIPHENYL (AROCLOR 1254)

ICSC: 0939

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** LIGHT YELLOW VISCOUS LIQUID. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** The substance decomposes in a fire producing irritating and toxic gases. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV: ppm; 0.5 mg/m^3 (skin) (ACGIH 1991-1992).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion. **INHALATION RISK:** A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance irritates the eyes (see Notes). **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis chloracne. The substance may have effects on the liver. Animal tests show that this substance possibly causes toxic effects upon human reproduction.
PHYSICAL PROPERTIES	Relative density (water = 1): 1.5 Solubility in water: none	Vapour pressure, Pa at 25°C: 0.01 Octanol/water partition coefficient as log Pow: 6.30 (estimated)
ENVIRONMENTAL DATA	In the food chain important to humans, bioaccumulation takes place, specifically in water organisms. It is strongly advised not to let the chemical enter into the environment.	

NOTES

Changes into a resinous state (pour point) at 10°C. Distillation range: 365°-390°C. No open cup flash point to boiling. The symptoms other than the chloracne and liver effects may be in part due to contaminants of the PCB.

Transport Emergency Card: TEC (R)-914

ADDITIONAL INFORMATION

ICSC: 0939 **POLYCHLORINATED BIPHENYL (AROCLOR 1254)**

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Hydrogen chloride

Synonyms & Trade Names Anhydrous hydrogen chloride; Aqueous hydrogen chloride (i.e., Hydrochloric acid, Muriatic acid) [Note: Often used in an aqueous solution.]

CAS No. 7647-01-0	**RTECS No.** MW4025000 (/niosh-rtecs/MW3D6AA8.html)	**DOT ID & Guide** 1050 125 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=125) (http://www.cdc.gov/Other/disclaimer.html) (anhydrous) 1789 157 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=157) (http://www.cdc.gov/Other/disclaimer.html) (solution)
Formula HCl	**Conversion** 1 ppm = 1.49 mg/m3	**IDLH** 50 ppm See: 7647010 (/niosh/idlh/7647010.html)
Exposure Limits **NIOSH REL** : C 5 ppm (7 mg/m3) **OSHA PEL** : C 5 ppm (7 mg/m3)		**Measurement Methods** **NIOSH** 7903 (/niosh/docs/2003-154/pdfs/7903.pdf); **OSHA** ID174SG (http://www.osha.gov/dts/sltc/methods/partial/t-id174sg-pv-01-8602-m/t-id174sg-pv-01-8602-m.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless to slightly yellow gas with a pungent, irritating odor. [Note: Shipped as a liquefied compressed gas.]

MW: 36.5	**BP:** -121°F	**FRZ:** -174° F	Sol(86° F): 67%	**VP:** 40.5 atm	**IP:** 12.74 eV
	Fl.P: NA	**UEL:** NA	**LEL:** NA	**RGasD:** 1.27	

Nonflammable Gas

Incompatibilities & Reactivities Hydroxides, amines, alkalis, copper, brass, zinc [Note: Hydrochloric acid is highly corrosive to most metals.]

Exposure Routes inhalation, ingestion (solution), skin and/or eye contact

Symptoms irritation nose, throat, larynx; cough, choking; dermatitis; solution: eye, skin burns; liquid: frostbite; in animals: laryngeal spasm; pulmonary edema

Target Organs Eyes, skin, respiratory system

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact (solution)/Frostbite
Eyes: Prevent eye contact/Frostbite
Wash skin: When contaminated (solution)
Remove: When wet or contaminated (solution)
Change: No recommendation
Provide: Eyewash (solution), Quick drench (solution), Frostbite wash

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately (solution)/Frostbite
Skin: Water flush immediately (solution)/Frostbite
Breathing: Respiratory support
Swallow: Medical attention immediately (solution)

Respirator Recommendations
NIOSH/OSHA

Up to 50 ppm:
(APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern*
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern
(APF = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern*
(APF = 10) Any supplied-air respirator*
(APF = 50) Any self-contained breathing apparatus with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted acid gas canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0163 (/niosh/ipcsneng/neng0163.html) See MEDICAL TESTS: 0116 (/niosh/docs/2005-110/nmed0116.html)

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Methyl alcohol

Synonyms & Trade Names Carbinol, Columbian spirits, Methanol, Pyroligneous spirit, Wood alcohol, Wood naphtha, Wood spirit

CAS No. 67-56-1	**RTECS No.** PC1400000 (/niosh-rtecs/PC155CCo.html)	**DOT ID & Guide** 1230 131 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=131) (http://www.cdc.gov/Other/disclaimer.html)
Formula CH_3OH	**Conversion** 1 ppm = 1.31 mg/m3	**IDLH** 6000 ppm See: 67561 (/niosh/idlh/67561.html)
Exposure Limits **NIOSH REL** : TWA 200 ppm (260 mg/m3) ST 250 ppm (325 mg/m3) [skin] **OSHA PEL** † (nengapdxg.html): TWA 200 ppm (260 mg/m3)		**Measurement Methods** **NIOSH** 2000 (/niosh/docs/2003-154/pdfs/2000.pdf), 3800 (/niosh/docs/2003-154/pdfs/3800.pdf); **OSHA** 91 (http://www.osha.gov/dts/sltc/methods/organic/org091/org091.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid with a characteristic pungent odor.

MW: 32.1	**BP:** 147° F	**FRZ:** -144°F	**Sol:** Miscible	**VP:** 96 mmHg	**IP:** 10.84 eV
Sp.Gr: 0.79	**Fl.P:** 52° F	**UEL:** 36%	**LEL:** 6.0%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Strong oxidizers

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, upper respiratory system; headache, drowsiness, dizziness, nausea, vomiting; visual disturbance, optic nerve damage (blindness); dermatitis

Target Organs Eyes, skin, respiratory system, central nervous system, gastrointestinal tract

Personal Protection/Sanitation (See protection codes (protect.html)) **Skin:** Prevent skin contact **Eyes:** Prevent eye contact **Wash skin:** When contaminated **Remove:** When wet (flammable) **Change:** No recommendation	**First Aid** (See procedures (firstaid.html)) **Eye:** Irrigate immediately **Skin:** Water flush promptly **Breathing:** Respiratory support **Swallow:** Medical attention immediately

Respirator Recommendations
NIOSH/OSHA

Up to 2000 ppm:
(APF = 10) Any supplied-air respirator

Up to 5000 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

Up to 6000 ppm:
(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0057 (/niosh/ipcsneng/neng0057.html)
See MEDICAL TESTS: 0137 (/niosh/docs/2005-110/nmed0137.html)

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Nitric acid

Synonyms & Trade Names Aqua fortis, Engravers acid, Hydrogen nitrate, Red fuming nitric acid (RFNA), White fuming nitric acid (WFNA)

CAS No. 7697-37-2	**RTECS No.** QU5775000 (/niosh-rtecs/QU581E98.html)	**DOT ID & Guide** 2031 157 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=157) (http://www.cdc.gov/Other/disclaimer.html) (other than red fuming) 2032 157 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=157) (http://www.cdc.gov/Other/disclaimer.html) (fuming)
Formula HNO_3	**Conversion** 1 ppm = 2.58 mg/m3	**IDLH** 25 ppm See: 7697372 (/niosh/idlh/7697372.html)
Exposure Limits **NIOSH REL** : TWA 2 ppm (5 mg/m3) ST 4 ppm (10 mg/m3) **OSHA PEL** † (nengapdxg.html) : TWA 2 ppm (5 mg/m3)		**Measurement Methods** **NIOSH** 7903 (/niosh/docs/2003-154/pdfs/7903.pdf) ; **OSHA** ID165SG (http://www.osha.gov/dts/sltc/methods/inorganic/id165sg/id165sg.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless, yellow, or red, fuming liquid with an acrid, suffocating odor. [Note: Often used in an aqueous solution. Fuming nitric acid is concentrated nitric acid that contains dissolved nitrogen dioxide.]

MW: 63.0	**BP:** 181° F	**FRZ:** -44°F	**Sol:** Miscible	**VP:** 48 mmHg	**IP:** 11.95 eV
Sp.Gr (77°F): 1.50	**Fl.P:** NA	**UEL:** NA	**LEL:** NA		

Noncombustible Liquid, but increases the flammability of combustible materials.

Incompatibilities & Reactivities Combustible materials, metallic powders, hydrogen sulfide, carbides, alcohols [Note: Reacts with water to produce heat. Corrosive to metals.]

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, mucous membrane; delayed pulmonary edema, pneumonitis, bronchitis; dental erosion

Target Organs Eyes, skin, respiratory system, teeth

Personal Protection/Sanitation (See protection codes (protect.html)) **Skin:** Prevent skin contact **Eyes:** Prevent eye contact **Wash skin:** When contaminated **Remove:** When wet or contaminated	**First Aid** (See procedures (firstaid.html)) **Eye:** Irrigate immediately **Skin:** Water flush immediately **Breathing:** Respiratory support **Swallow:** Medical attention immediately

Change: No recommendation
Provide: Eyewash (pH<2.5), Quick drench (pH<2.5)

Respirator Recommendations
NIOSH/OSHA

Up to 25 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode*
(APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern¿
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern¿
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern¿
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0183 (/niosh/ipcsneng/neng0183.html) See MEDICAL TESTS: 0158 (/niosh/docs/2005-110/nmed0158.html)

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Sodium hydroxide

Synonyms & Trade Names Caustic soda, Lye, Soda lye, Sodium hydrate

CAS No. 1310-73-2	**RTECS No.** WB4900000 (/niosh-rtecs/WB4AC4A0.html)	**DOT ID & Guide** 1823 154 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=154) (http://www.cdc.gov/Other/disclaimer.html) (dry, solid) 1824 154 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=154) (http://www.cdc.gov/Other/disclaimer.html) (solution)
Formula NaOH	**Conversion**	**IDLH** 10 mg/m3 See: 1310732 (/niosh/idlh/1310732.html)
Exposure Limits **NIOSH REL** : C 2 mg/m3 **OSHA PEL** † (nengapdxg.html) : TWA 2 mg/m3		**Measurement Methods** **NIOSH** 7401 (/niosh/docs/2003-154/pdfs/7401.pdf) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless to white, odorless solid (flakes, beads, granular form).

MW: 40.0	**BP:** 2534° F	MLT: 605°F	**Sol:** 111%	**VP:** 0 mmHg (approx)	**IP:** NA
Sp.Gr: 2.13	**Fl.P:** NA	**UEL:** NA	**LEL:** NA		

Noncombustible Solid, but when in contact with water may generate sufficient heat to ignite combustible materials.

Incompatibilities & Reactivities Water; acids; flammable liquids; organic halogens; metals such as aluminum, tin & zinc; nitromethane [Note: Corrosive to metals.]

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, mucous membrane; pneumonitis; eye, skin burns; temporary loss of hair

Target Organs Eyes, skin, respiratory system

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: Daily
Provide: Eyewash, Quick drench

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Water flush immediately
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations
NIOSH/OSHA

Up to 10 mg/m3:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode£
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.£
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0360 (/niosh/ipcsneng/neng0360.html) See MEDICAL TESTS: 0210 (/niosh/docs/2005-110/nmed0210.html)

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Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name: Helium, compressed (MSDS No. P-4602-G)	**Trade Names:** Helium, LaserStar™ Helium, Medipure® Helium, UltraLift® Helium
Chemical Name: Helium	**Synonyms:** Helium-4, refrigerant gas R-704
Chemical Family: Rare gas	**Product Grades:** Industrial; Ultralift; 6.0 research/chromatographic; 5.5 ECD, trace analytical; 5.0 UHP; 4.7, 5.0, 5.5 LaserStar; 4.6 zero, oxygen-free; 5.0 methanizer FID gas; 4.5; 5.0, 5.5, 6.0 semiconductor process gas

Telephone: **Emergencies:** 1-800-645-4633* **Company Name:** Praxair, Inc.
CHEMTREC: 1-800-424-9300* 39 Old Ridgebury Road
Routine: 1-800-PRAXAIR Danbury, CT 06810-5113

**Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier, Praxair sales representative, or call 1-800-PRAXAIR (1-800-772-9247).*

2. Hazards Identification

EMERGENCY OVERVIEW

CAUTION! High-pressure gas.
Can cause rapid suffocation.
May cause dizziness and drowsiness.
Self-contained breathing apparatus may be required by rescue workers.
Under ambient conditions, this is a colorless, odorless, tasteless gas.

OSHA REGULATORY STATUS: This material is considered hazardous by the OSHA Hazard Communications Standard (29 CFR 1910.1200).

POTENTIAL HEALTH EFFECTS:

Effects of a Single (Acute) Overexposure

Inhalation. Asphyxiant. Effects are due to lack of oxygen. Moderate concentrations may cause headache, drowsiness, dizziness, excitation, excess salivation, vomiting, and unconsciousness. Lack of oxygen can kill.

Skin Contact. No harm expected.

Swallowing. This product is a gas at normal temperature and pressure.

Eye Contact. No harm expected.

Effects of Repeated (Chronic) Overexposure. No harm expected.

Other Effects of Overexposure. Helium is an asphyxiant. Lack of oxygen can kill.

A vertical line in the left margin indicates revised or new material.

Medical Conditions Aggravated by Overexposure. The toxicology and the physical and chemical properties of helium suggest that overexposure is unlikely to aggravate existing medical conditions.

CARCINOGENICITY: Helium is not listed by NTP, OSHA, or IARC.

POTENTIAL ENVIRONMENTAL EFFECTS: None known. For further information, see section 12, Ecological Information.

3. Composition/Information on Ingredients

This section covers materials of manufacture only. See sections 8, 10, 11, and 16 for information on by-products generated during use in welding and cutting. See section 16 for important information about mixtures.

COMPONENT	CAS NUMBER	CONCENTRATION
Helium	7440-59-7	>99%*

**The symbol > means "greater than."*

4. First Aid Measures

INHALATION: Immediately remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may give oxygen. Call a physician.

SKIN CONTACT: An unlikely route of exposure. This product is a gas at normal temperature and pressure.

SWALLOWING: An unlikely route of exposure. This product is a gas at normal temperature and pressure.

EYE CONTACT: An unlikely route of exposure. This product is a gas at normal temperature and pressure.

NOTES TO PHYSICIAN: *There is no specific antidote. This product is inert. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.*

5. Fire Fighting Measures

FLAMMABLE PROPERTIES: Nonflammable.

SUITABLE EXTINGUISHING MEDIA: Helium cannot catch fire. Use media appropriate for surrounding fire.

PRODUCTS OF COMBUSTION: Not applicable.

PROTECTION OF FIREFIGHTERS: CAUTION! High-pressure gas. Evacuate all personnel from danger area. Immediately deluge cylinders with water from maximum distance until cool; then move them away from fire area if without risk. Self-contained breathing apparatus may be required by rescue workers. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

Specific Physical and Chemical Hazards. Heat of fire can build pressure in cylinder and cause it to rupture. No part of cylinder should be subjected to a temperature higher than 125°F (52°C). Helium cylinders are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.)

Protective Equipment and Precautions for Firefighters. Firefighters should wear self-contained breathing apparatus and full fire-fighting turnout gear.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

CAUTION! High-pressure gas.

Personal Precautions. Helium is an asphyxiant. Lack of oxygen can kill. Evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Shut off leak if without risk. Ventilate area of leak or move cylinder to a well-ventilated area. Test for sufficient oxygen, especially in confined spaces, before allowing reentry.

Environmental Precautions. Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. If necessary, call your local supplier for assistance.

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN HANDLING: ***Protect cylinders from damage.*** Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. ***Never attempt to lift a cylinder by its cap;*** the cap is intended solely to protect the valve. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. ***Open valve slowly.*** If valve is hard to open, discontinue use and contact your supplier. Close valve after each use; keep closed even when empty. ***Never apply flame or localized heat directly to any part of the cylinder.*** High temperatures may damage the cylinder and could cause the pressure relief device to fail prematurely, venting the cylinder contents. For other precautions in using helium, see section 16.

PRECAUTIONS TO BE TAKEN IN STORAGE: ***Store and use with adequate ventilation.*** Store only where temperature will not exceed 125°F (52°C). ***Firmly secure cylinders upright to keep them from falling or being knocked over.*** Screw valve protection cap firmly in place by hand. ***Store full and empty cylinders separately.*** Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.

RECOMMENDED PUBLICATIONS: For further information on storage, handling, and use, see Praxair publication P-14-153, *Guidelines for Handling Gas Cylinders and Containers.* Obtain from your local supplier.

8. Exposure Controls/Personal Protection

See section 16 for important information on by-products generated during use in welding and cutting.

COMPONENT	OSHA PEL	ACGIH TLV-TWA (2007)
Helium	Not Established.	Simple asphyxiant

IDLH = Not available.

ENGINEERING CONTROLS:

Local Exhaust. Use a local exhaust system, if necessary, to prevent oxygen deficiency, and in welding, to keep hazardous fumes and gases in the worker's breathing zone below all applicable exposure limits.

Mechanical (General). General exhaust ventilation may be acceptable if it can maintain an adequate supply of air and keep hazardous fumes and gases in the worker's breathing zone below all applicable exposure limits.

Special. None

Other. None

PERSONAL PROTECTIVE EQUIPMENT:

Skin Protection. Wear work gloves when handling cylinders; welding gloves for welding. Metatarsal shoes for cylinder handling. Select in accordance with OSHA 29 CFR 1910.132 and 1910.133. For welding, see section 16. Regardless of protective equipment, never touch live electrical parts.

Eye/Face Protection. Per input or existing MSDS.

Respiratory Protection. Use air-purifying or air-supplied respirators where local or general exhaust ventilation is inadequate to keep worker exposure below all applicable exposure limits for fumes, gases, and other by-products of welding with helium. See section 16 for details. Air-supplied respirators must be used in confined spaces. Respiratory protection must conform to OSHA rules as specified in 29 CFR 1910.134.

9. Physical and Chemical Properties

APPEARANCE:	Colorless gas
ODOR:	None
ODOR THRESHOLD:	Not applicable.
PHYSICAL STATE:	Gas at normal temperature and pressure
pH:	Not applicable.
MELTING POINT:	-456.5°F (-271.39°C)
BOILING POINT at 1 atm:	-452.07°F (-268.93°C)
FLASH POINT (test method):	Not applicable.
EVAPORATION RATE (Butyl Acetate = 1):	Not applicable.
FLAMMABILITY:	Nonflammable
FLAMMABLE LIMITS IN AIR, % by volume:	**LOWER:** Not applicable. **UPPER:** Not applicable.
VAPOR PRESSURE at 68°F (20°C):	Not applicable.
VAPOR DENSITY at 70°F (21.1°C) and 1 atm:	0.0104 lb/ft^3 (0.166 kg/m^3)
LIQUID DENSITY at boiling point and 1 atm:	7.802 lb/ft^3 (124.98 kg/m^3)
SPECIFIC GRAVITY (Air = 1) at 70°F (21.1°C) and 1 atm:	0.138
SOLUBILITY IN WATER 32°F (0°C) and 1 atm:	0.0094
PARTITION COEFFICIENT: n-octanol/water:	Not available.

AUTOIGNITION TEMPERATURE:	Not applicable.
DECOMPOSITION TEMPERATURE:	None
PERCENT VOLATILES BY VOLUME:	100
MOLECULAR WEIGHT:	4.003
MOLECULAR FORMULA:	He

10. Stability and Reactivity

CHEMICAL STABILITY: ☐ Unstable ☒ Stable

CONDITIONS TO AVOID: None known.

INCOMPATIBLE MATERIALS: None known. Helium is chemically inert.

HAZARDOUS DECOMPOSITION PRODUCTS: None known.

POSSIBILITY OF HAZARDOUS REACTIONS: ☐ May Occur ☒ Will Not Occur

11. Toxicological Information

ACUTE DOSE EFFECTS: Helium is a simple asphyxiant.

STUDY RESULTS: None known.

12. Ecological Information

ECOTOXICITY: No known effects.

OTHER ADVERSE EFFECTS: Helium does not contain any Class I or Class II ozone-depleting chemicals.

13. Disposal Considerations

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.

14. Transport Information

DOT/IMO SHIPPING NAME: Helium, compressed

HAZARD CLASS:	2.2	**PACKING GROUP/Zone:**	NA*	**IDENTIFICATION NUMBER:**	UN1046	**PRODUCT RQ:**	None

SHIPPING LABEL(s):	NONFLAMMABLE GAS
PLACARD (when required):	NONFLAMMABLE GAS

*NA–Not applicable.

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, nonventilated compartment of a vehicle can present serious safety hazards.

Shipment of compressed gas cylinders that have been filled without the owner's consent is a violation of federal law [49 CFR 173.301(b)].

MARINE POLLUTANTS: Helium is not listed as a marine pollutant by DOT.

15. Regulatory Information

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, state, and local regulations.

U.S. FEDERAL REGULATIONS:

EPA (ENVIRONMENTAL PROTECTION AGENCY)

CERCLA: COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (40 CFR Parts 117 and 302):

Reportable Quantity (RQ): None

SARA: SUPERFUND AMENDMENT AND REAUTHORIZATION ACT:

SECTIONS 302/304: Require emergency planning based on Threshold Planning Quantity (TPQ) and release reporting based on Reportable Quantities (RQ) of Extremely Hazardous Substances (EHS) (40 CFR Part 355):

TPQ: None
EHS RQ (40 CFR 355): None

SECTIONS 311/312: Require submission of MSDSs and reporting of chemical inventories with identification of EPA hazard categories. The hazard categories for this product are as follows:

IMMEDIATE: No
DELAYED: No
PRESSURE: Yes
REACTIVITY: No
FIRE: No

SECTION 313: Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR Part 372.

Helium is not subject to reporting under Section 313.

40 CFR 68: RISK MANAGEMENT PROGRAM FOR CHEMICAL ACCIDENTAL RELEASE PREVENTION: Requires development and implementation of risk management programs at facilities that manufacture, use, store, or otherwise handle regulated substances in quantities that exceed specified thresholds.

Helium is not listed as a regulated substance.

TSCA: TOXIC SUBSTANCES CONTROL ACT: Helium is listed on the TSCA inventory.

OSHA: OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:

29 CFR 1910.119: PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS: Requires facilities to develop a process safety management program based on Threshold Quantities (TQ) of highly hazardous chemicals.

Helium is not listed in Appendix A as a highly hazardous chemical.

STATE REGULATIONS:

CALIFORNIA: Helium is not listed by California under the SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (Proposition 65).

PENNSYLVANIA: Helium is subject to the PENNSYLVANIA WORKER AND COMMUNITY RIGHT-TO-KNOW ACT (35 P.S. Sections 7301-7320).

16. Other Information

Be sure to read and understand all labels and instructions supplied with all containers of this product.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE: ***High-pressure gas.*** Use piping and equipment adequately designed to withstand pressures to be encountered. Use a backflow prevention device in any piping. ***Never work on a pressurized system.*** If there is a leak, close the cylinder valve. Blow the system down in an environmentally safe manner in compliance with all federal, state, and local laws; then repair the leak. ***Never place a compressed gas cylinder where it may become part of an electrical circuit.***

SPECIAL PRECAUTIONS: ***Use in welding and cutting.*** Read and understand the manufacturer's instructions and the precautionary label on the product. See American Standard Z49.1, *Safety in Welding, Cutting, and Allied Processes*, published by the American Welding Society, www.aws.org—order from Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112-5776 and OSHA Publication 2206 (29CFR 1910), US Government Printing Office, Washington, DC 20402, for more information.

Arcs and sparks can ignite combustible materials. Prevent fires. Refer to NFPA 51B, *Standard for Fire Prevention in Welding, Cutting, and Other Hotwork.* ***Do not strike an arc on the cylinder.*** The defect produced by an arc burn could lead to cylinder rupture.

Use in Underwater Breathing. Suitability of this product for use in underwater breathing must be determined by or under supervision of someone experienced in the use of underwater breathing gas mixtures. This person must be familiar with *how* the product is used; the frequency, duration, and effects of use; the hazards and side effects of use, and the precautions to take to avoid or control them.

Mixtures. When you mix two or more gases or liquefied gases, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Remember, gases and liquids have properties that can cause serious injury or death.

HAZARD RATING SYSTEMS:

NFPA RATINGS:		**HMIS RATINGS:**	
HEALTH	= 0	HEALTH	= 0
FLAMMABILITY	= 0	FLAMMABILITY	= 0
INSTABILITY	= 0	PHYSICAL HAZARD	= 3
SPECIAL	= SA (CGA recommends this to designate Simple Asphyxiant.)		

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED:	0-3000 psig	CGA-580
	3001-5500 psig	CGA-680
	5001-7500 psig	CGA-677
PIN-INDEXED YOKE:		CGA-930 (medical use)
ULTRA-HIGH-INTEGRITY CONNECTION:		CGA-718

Use the proper CGA connections. **DO NOT USE ADAPTERS.** Additional limited-standard connections may apply. See CGA pamphlet V-1 listed below.

Ask your supplier about free Praxair safety literature as referred to in this MSDS and on the label for this product. Further information can be found in the following materials published by the Compressed Gas Association, Inc. (CGA), 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923, Telephone (703) 788-2700, http://www.cganet.com/Publication.asp.

AV-1	*Safe Handling and Storage of Compressed Gases*
G-9.1	*Commodity Specification for Helium*
P-1	*Safe Handling of Compressed Gases in Containers*
P-2	*Characteristics and Safe Handling of Medical Gases*
P-9	*Inert Gases—Argon, Nitrogen, and Helium*
SB-2	*Oxygen-Deficient Atmospheres*
SB-8	*Use of Oxy-Fuel Gas Welding and Cutting Apparatus*
V-1	*Compressed Gas Cylinder Valve Inlet and Outlet Connections*
V-7.1	*Standard Method Of Determining Cylinder Valve Outlet Connections For Medical Gases*
—	*Handbook of Compressed Gases, Fourth Edition*

Praxair asks users of this product to study this MSDS and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this MSDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of the product are not within the control of Praxair, Inc., it is the user's obligation to determine the conditions of safe use of the product.

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PRAXAIR®

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APPENDIX B

PS&S
integrating design & engineering

SOP #19 Working Over or Near Water

Table of Contents

PS&S
integrating design & engineering

SOP #19 Working Over or Near Water

1.0 PURPOSE

This guideline provides necessary information to establish safe procedures for employees who may be exposed to the hazards while working on or near bodies of water at project locations.

2.0 SCOPE

This procedure applies to all project sites that are located on or near bodies of water.

3.0 DEFINITIONS

Lifesaving Skiffs – A boat used for rescuing persons that have fallen into bodies of water.

Personal Flotation Device (PFD) – Equipment that, when selected and used properly, acts as a life saving device in water. These devices must be approved by the U.S. Coast Guard approved pursuant to 46 CFR part 160 (Type I, II, III, or V PFD) and marked for use as a work vest, for commercial use, or for use on vessels.

Ring Buoy – A circular water rescue device designed to be thrown to a person in the water. Ring buoys must be approved by the U.S. Coast Guard pursuant to 46 CFR part 160 (Type IV PFD.)

4.0 RESPONSIBILITIES

Corporate Safety Officer (CSO) – The CSO is responsible for periodic review of the guidelines in this policy.

Group Health & Safety Officer (GSO) and/or Department Health & Safety Officer (DSO) – The GSO/DSO is responsible for making required training available to personnel who may work over or near water.

Human Resources (HR) – HR is responsible for maintaining training records.

Department Manager (DM) – The DM is responsible for the overall implementation of this program. The DM is also responsible for providing appropriate personnel and resources so that operations can be conducted in compliance with this program.

Project Manager (PM) and Site Representative (SR) – The PM and/or SR is responsible for establishing safe work practices and enforcing the requirements of this SOP when employees work over or near water. The PM/SR should be able to identify different types of water hazard situations associated with the job site, maintain the appropriate supply of personal flotation devices, ring buoys, or lifesaving skiffs, and enforce the correct use of these devices when required.

Field Personnel (FP) – FP are responsible for observing all safety guidelines and wearing PFD when working over or near water. Employees will inspect the PFD assigned to them prior to and after use. Any damage or deficiencies must be brought to the PM/SR attention immediately and a replacement PFD provided.

5.0 GUIDELINES

These guidelines should be used to communicate the hazards that may be encountered when PS&S personnel work over or near water where these hazards include:

- Impact injury from falls into water
- Drowning
- Hypothermia from falls into frigid water
- In general, PS&S employees should not work alone on potentially hazardous sites such as performing bridge or rooftop inspections, working over or near water, excavations (if the construction contractor is not present), or certain surveys. The need for a second team member to be available for assistance should be evaluated by the SR in consultation with the PM or GSO/DSO.

5.1 Personal Flotation Devices

Employees working over or near water, where the danger of drowning exists, shall be provided with U.S. Coast Guard-approved life jacket or buoyant work vests. Employees will wear Personal flotation devices when working on or in the following areas:

- On small boats
- On floating rafts, stages, or piers
- When working on structures without adequate guard rails that extend over, or are adjacent to water
- When working near or on any riverbank or stream.

Personal flotation devices shall be maintained in safe condition and shall be inspected for defects that would alter their strength or buoyancy prior to, and after each use. Personal flotation devices shall be considered unserviceable when damaged in a manner that affects buoyancy or fastening capability. Defective units shall not be used and will be tagged, "Damaged, Do Not Use", or destroyed.

5.2 Water Rescue Devices

Ring buoys with at least 90 feet of line will be provided and readily available for emergency rescue operations. Distance between ring buoys shall not exceed 200 feet.

At least one lifesaving skiff will be immediately available at locations where employees are working over or adjacent to water.

5.3 Boarding Watercrafts or Barges

PS&S personnel working on watercrafts or barges will board these vessels via gangways, never by jumping across open water. A gangway of not less than 20 inches in width, of adequate strength, maintained in safe repair and safely secured shall be used. Handrails with a minimum height of 33 inches measured perpendicularly from rail to walking surfaces at the stanchion, with a mid-rail, must be on both sides of the gangway. Handrails may be made of wood, pipe, chain, wire, rope or materials of equivalent strength and shall be kept taut at all times. When the gangway overhangs the water so that there is danger of employees falling between the ship and the dock, a net or suitable protection shall be provided to prevent employees from receiving serious injury from falls to a lower level.

If a gangway is not practicable, a straight ladder meeting the requirements of 29 CFR 1918.24 that extends at least 36 inches above the upper landing surface and is secured against shifting or slipping shall be provided.

When conditions are such that neither a gangway nor straight ladder can be used, a Jacob's ladder meeting the following requirements may be used.

- Jacob's ladders shall be of the double rung or flat tread type.
- Well maintained and properly secured.
- A Jacob's ladder shall either hang without slack from its lashings or be pulled up entirely.

- Spacers (bumpers) shall be hung between the vessel, barge, or other structure to which the barge is tied alongside, or other equally effective means shall be provided to prevent damage to the bottom rungs of the ladder.
- When there is a danger of an employee falling or being crushed between the vessel, barge, or other structure (pier), suitable protection shall be provided.

Personnel can be severely injured or killed from falls between watercraft. PS&S personnel will comply with all safety policies of the watercraft owners/operators while on board the vessel.

5.4 Floating Cranes and Derricks

OSHA has instituted a regulation that addresses safety for floating cranes and derricks. While PS&S employees will not be operating such equipment, they may be on vessels where this equipment is operated by others. It is important to note that there must be clear warning of the hazard zone around any crane or derrick and that the equipment and vessel need to be inspected monthly.

6.0 TRAINING

All PS&S employees who may be exposed to water hazards will receive training as part of discipline specific training in:

- Safe work practices for working over or near water
- Safe work practices when onboard watercraft or barges
- Proper use and inspection of PFDs
- Proper use of rescue equipment

7.0 REFERENCES

OSHA 29 CFR 1926.106
OSHA 29 CFR 1918 Subpart C

APPENDIX E

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 F

ASBESTOS CLOSURE REPORT

Environmental Management Services, Inc

23-24 Sound Street, Ground Floor
Astoria, NY 11105
Tel: 347-396-5556
Fax: 347-242-3803

04/1/13

To: Glenwood POH, LLC
159 Alexander Street
Yonkers, NY 10701

Re: 45 Water Grant Street, Yonkers, NY

Dear: Mr. Shemesh

Asbestos abatement work was performed at the above building from February 23, to March 1, 2013. ALR Environmental Corp was the abatement contractor, and Environmental Management Services, Inc. performed the air monitoring during the asbestos abatement project. The following chart indicates the completed work area locations:

Work Area Location	Type of ACM
Building C	Pipe Insulation

The purpose of air monitoring was to determine the air quality during and after the asbestos abatement was completed, in accordance with New York State Industrial Code Rule 56. Project Monitor Alton Papavangjeli (AH# 12-15939) conducted the air test in the above areas. Final air clearance for re-occupancy was achieved in the above referenced locations on 03/01/13. Based upon the visual inspection and the air sample results, the ACM, indicated in the above table, has been removed. The above referenced locations have met re-occupancy criteria as defined in all applicable federal, state and local regulations.

Sincerely

Kosta Kamberis, P.E.
Project Manager

DEPARTMENT OF HOUSING & BUILDINGS

87 Nepperhan Avenue
City of Yonkers, New York 10701

BUILDING CERTIFICATE OF COMPLETION

DISTRICT ZONE: IP

DATE: May 28, 2013

ISSUED TO: GLENWOOD POH, LLC

APPLICATION NO: B0011379

LOCATION: 45 WATER GRANT

BLOCK: 2635 LOT: 15

ADDRESS: 159 ALEXANDER STREET
YONKERS, NEW YORK 10701

DESCRIPTION OF WORK COMPLETED:

REMOVED ASBESTOS CONTAINING MATERIAL AS PER DOCUMENTS SUBMITTED.
(NOTHING BELOW THIS LINE)

This is to certify that the building or premises identified above may be used and/or occupied in accordance with all applicable provisions of the Zoning Ordinance, Building Code, Electrical Code and all other applicable laws, rules and regulations.

William J. Schneider, P.E. for
Acting Commissioner
Department of Housing and Buildings