FORMER LIBERTY BRASS SITE
38-01 QUEENS BOULEVARD
QUEENS, NEW YORK
NYSDEC BCP SITE NO: C241178

REMEDIAL INVESTIGATION
WORK PLAN

SUBMITTED TO:

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

PREPARED FOR:

Curbcut Queens Blvd LLC
95-25 Queens Boulevard, 10th Floor
Rego Park, New York 11374

PREPARED BY:

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PWGC Project Number: CUP1601

MARCH 2016

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ACRONYMS

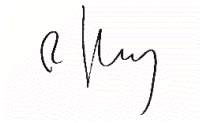
ACT	Advanced Cleanup Technologies, Inc.
AGV	Air Guidance Value
AHA	Activity Hazard Analysis
AOC	Area of Concern
ASP	Analytical Services Protocol
AST	Aboveground Storage Tank
BCP	Brownfield Cleanup Program
bgs	Below Ground Surface
CAH	Chlorinated Aliphatic Hydrocarbon
CAMP	Community Air Monitoring Plan
CBS	Chemical Bulk Storage
CFR	Code of Federal Regulations
COC	Chain-of-Custody
COPC	Constituents of Potential Concern
CSM	Conceptual Site Model
CUSCO	Commercial Use Soil Cleanup Objective
DCE	cis-1,2-dichloroethene
DER	Division of Environmental Remediation
DER-10	Technical Guidance for Site Investigation and Remediation
DNAPL	Dense Non-Aqueous Phase Liquid
DUSR	Data Usability Summary Report
EDD	Electronic Data Deliverable
EIMS	Environmental Information Management System
ELAP	Environmental Laboratory Approval Program
EM	Electromagnetic
ESA	Environmental Site Assessment
ESI	Environmental Site Investigation
GPR	Ground Penetrating Radar
GQS	Groundwater Quality Standard
GV	Guidance Value
HASP	Health & Safety Plan
HFM	Historic Fill Material
HSM	Health & Safety Manager
IDW	Investigative Derived Waste
IH	Industrial Hygiene
IRM	Interim Remedial Measure
JBA	J.C. Broderick & Associates, Inc.
JWC	Jacques Whitford Company, Inc.
Langan	Langan Engineering, Environmental, Surveying, & Landscape Architecture, D.P.C.
LEG	Lawrence Environmental Group, LLC
LNAPL	Light Non-Aqueous Phase Liquid
MDL	Method Detection Limit
NYCDEP	New York City Department of Environmental Protection
NYCRR	New York Codes, Rules, & Regulations
NYSDEC	New York State Department of Environmental Conservation

NYSDOH	New York State Department of Health
PBS	Petroleum Bulk Storage
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
PG	Professional Geologist
PID	Photo-ionization Detector
PPE	Personal Protective Equipment
PVE	PVE Sheffler, LLC
PWGC	P.W. Grosser Consulting Engineer & Hydrogeologist, P.C.
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QEP	Qualified Environmental Professional
REC	Recognized Environmental Condition
RI	Remedial Investigation
RIR	Remedial Investigation Report
RIWP	Remedial Investigation Work Plan
SCG	Standards, Criteria, & Guidance
SCO	Soil Cleanup Objective
SDG	Sample Delivery Group
SI	Subsurface Investigation
SQG	Small Quantity Generator
SVOC	Semi-Volatile Organic Compound
TAGM	Technical and Administrative Guidance Memorandum
TAL	Target Analyte List
TCE	Trichloroethene
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
UUSCO	Unrestricted Use Soil Cleanup Objective
VES	VERTEX Environmental Services, Inc.
VOC	Volatile Organic Compound

CERTIFICATION

I, Richard T. Kampf, PG, certify that I am currently a Qualified Environmental Professional (QEP) as defined in Title 6 New York Codes, Rules, and Regulations (NYCRR) Part 375 and that this Remedial Investigation Work Plan (RIWP) was prepared in accordance with applicable statutes and regulations and in substantial conformance with the New York State Department of Environmental Conservation's (NYSDECs) Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10).

Richard T. Kampf, PG
QEP Name



QEP Signature

March 18, 2016
Date

1.0 INTRODUCTION

P.W. Grosser Consulting Engineer & Hydrogeologist, P.C. (PWGC) has prepared the following RIWP to outline procedures and a scope of work intended to delineate subsurface impacted areas of concern at the Site located at 38-01 Queens Boulevard in Queens, New York (the Site).

The Site has been accepted into the NYSDEC's Brownfield Cleanup Program (BCP). Curbcut Queens Blvd LLC, the Site owner, will perform the investigation and remediation as a Volunteer. BCP number C241178 has been assigned to the Site. This investigation is intended to delineate potential areas of concern within the Site boundary and evaluate if off-site adjacent properties may be impacted.

1.1 Site Background

The Site is located at 38-01 Queens Boulevard in an Industrial Business Zone (IBZ) in an industrial / commercial part of Queens, New York. The Site consists of a 22,500-square foot lot, which is improved with a one-story building that occupies the entire lot. The manufacture of the brass spray tops for perfume bottles and metal plating was conducted on the Site from 1917 to approximately 1950 by Ideal Trading Co. Since approximately 1950, Liberty Brass Turning Company (Liberty Brass) has occupied the Site for the manufacture of metal parts and screws. The equipment and machinery utilized at the Site included screw machines, milling machines, lathes, centrifuges, and a vapor degreaser. Liberty Brass ceased operating at the Site in December 2015, and is currently selling all of its equipment and vacating the Site.

Curbcut Queens Blvd LLC plans to remediate the Site for redevelopment of a commercial building. Adjacent properties include a former auto repair facility / gasoline service station, which is presently operating as a car wash, to the east, and which is hydraulically up-gradient of the Site. The gas station is an upgradient source of dissolved-phase petroleum hydrocarbon-related constituents in groundwater which has the potential to migrate onto the Site. Based upon the long history of industrial usage in the surrounding area, other regional upgradient sources of dissolved-phase CAHs in groundwater have potentially migrated onto the Site. Finally dissolved phase constituents of potential concern (COPCs) from this Site may have also migrated off-Site. A Vicinity Map is included as **Figure 1**. A Site Plan is included as **Figure 2**.

1.2 Previous Investigations

1.2.1 *Phase I Environmental Site Assessment – May 2007*

A Phase I Environmental Site Assessment (ESA) was performed at the Site in May 2007 by Jacques Whitford Company, Inc. (JWC). The Phase I ESA identified the following recognized environmental conditions (RECs):

- Current and historical use of the Site for manufacturing;
- Petroleum staining in the vicinity of machinery and tank fill ports and vent pipes;
- Current and former aboveground storage tanks (ASTs) and underground storage tanks (USTs); and
- Historical use of the adjoining property to the east for auto repair and as a gasoline filling station, and the property's listing in several government databases including a small quantity generator (SQG) of hazardous materials, leaking UST, and NYSDEC's petroleum bulk storage (PBS) database.

1.2.2 *Phase II Limited Subsurface Investigation – June 2007*

A subsurface investigation (SI) was performed at the Site between May 31, 2007 and June 11, 2007 by VERTEX Environmental Services, Inc. (VES). The scope of work for the SI consisted of the installation of 11 soil borings and the collection of 15 soil samples. The findings and conclusions of the investigation are as follows:

- Field screening identified the presence of volatile organic vapors in eight of the 11 soil borings.
- Volatile organic compounds (VOCs) were detected above laboratory method detection limits (MDLs) in thirteen of the fifteen soil samples. The detections were limited to cis-1,2-dichloroethene (DCE), tetrachloroethene (PCE) and trichloroethene (TCE). TCE exceeded Title 6 NYCRR Part 375 unrestricted use soil cleanup objectives (UUSCOs) in two of the eleven soil borings. The highest concentration of TCE was observed in the shallow interval from B-3, which is located adjacent to an abandoned 5,000-gallon UST and floor drain. PCE and TCE did not exceed UUSCOs.
- Semi-volatile organic compounds (SVOCs) were detected above MDLs in two soil samples were collected from soil boring (B-3), which is located adjacent to an abandoned 5,000-gallon fuel oil UST and floor drain. Multiple SVOCs in these samples exceeded UUSCOs.
- Metals were detected above MDLs in each of the fifteen soil samples. Arsenic, chromium, lead, and/or mercury were detected above UUSCOs in five soil samples collected from a total of four soil borings.
- Heavy petroleum staining was observed throughout the Site.
- Historic fill was observed in borings throughout the Site.

SI sample locations and a summary of exceedances of the applicable regulatory criteria for soil, groundwater, and soil vapor are illustrated in **Figures 3** through **5**. Metals and PAH hot spots were found throughout the Site. The most significant VOC hot spot was found in the vicinity of an abandoned 5000 gallon UST near B-3 in the northwest corner of the Site.

1.2.3 *Additional Phase II Limited Subsurface Investigation – August 2007*

An additional SI was performed at the Site on July 24, 2007 by VES. The scope of work for the additional SI consisted of the advancement of two soil borings and the installation of two groundwater monitoring wells and three soil vapor probes. The findings and conclusions of the investigation are as follows:

- VOCs were detected above MDLs in each of the two soil samples. The detections were limited to TCE. TCE exceeded UUSCOs in one of the two soil borings.
- Metals were detected above MDLs in each of the two soil samples. Lead and mercury were detected above UUSCOs in one of the two soil samples.
- Light non-aqueous phase liquid (LNAPL) was observed in one of the two groundwater monitoring wells. Approximately 0.10-inch of LNAPL was detected at monitoring well VMW-1.
- VOCs were detected above MDLs but below 6 NYCRR Part 703 groundwater quality standards (GQS) in each groundwater sample.
- Metals were detected above MDLs in each of the two groundwater samples. Arsenic, chromium, and lead were detected above GQS in one of the two groundwater samples.
- Several VOCs were detected in the soil vapor samples above MDLs. TCE was detected at levels that would require mitigation in accordance the October 2006 New York State Department of Health (NYSDOH) Decision Matrices.
- Results were not conclusive regarding the source of dissolved-phase TCE in groundwater.

Additional SI sample locations and a summary of exceedances of the applicable regulatory criteria for soil, groundwater, and soil vapor are illustrated in **Figures 3** through **5**.

1.2.4 *Supplemental Subsurface Investigation – December 2007*

A supplemental SI was performed at the Site on October 24, 2007 by Advanced Cleanup Technologies, Inc. (ACT). The scope of work for the supplemental SI consisted of the installation of one groundwater monitoring well and two soil vapor probes. In addition, sediment samples were collected from the eastern floor drain located within the loading dock area in the northern portion of the property and from with a sump pit / cleanout located within the interior of the building. The findings and conclusions of the investigation are as follows:

- Sediments from the floor drains and sump contained VOCs and / or metals in excess of UUSCOs.

- VOCs, commonly associated with gasoline products, as well as metals, were detected in excess of GQS in monitoring well MW-3, which is located in the vicinity of the 5,000-gallon fuel oil UST and adjacent floor drain.
- Several VOCs were detected in the soil vapor samples above MDLs. TCE was detected at levels that would require mitigation in accordance the NYSDOH Decision Matrices.
- Groundwater was estimated to flow northwest based on survey and monitoring data collected from VMW-1, VMW-2, and MW-3. Supplemental SI sample locations and a summary of exceedances of the applicable regulatory criteria for soil, groundwater, and soil vapor are illustrated in **Figures 3** through **5**.

1.2.5 *Limited Subsurface Investigation – March 2010*

A limited SI was performed at the Site on February 22, 2010 by J.C. Broderick & Associates, Inc. (JBA). The scope of work for the limited SI consisted of a geophysical survey and the installation of five soil borings. The findings and conclusions of the investigation are as follows:

- The geophysical survey confirmed the presence of the 5,000-gallon UST at the Site.
    - The depth of the 5,000-gallon fuel oil UST, as measured through the fill port, was determined to be approximately seven feet and nine inches below ground surface (bgs).
- VOCs were detected above MDLs but below UUSCOs in three of the five soil samples. The detections were limited to 1,2,4-trimethylbenzene, benzene, naphthalene, o-xylene, and toluene.
- SVOCs were detected above MDLs in four of the five soil samples. Multiple SVOCs in these samples exceeded UUSCOs.

The limited SI sample locations and a summary of exceedances of the applicable regulatory criteria for soil, groundwater, and soil vapor are illustrated in **Figures 3** through **5**.

1.2.6 *Phase I Environmental Site Assessment – April 2015*

A Phase I ESA was performed at the Site in April, 2015. The Phase I ESA was prepared by PVE Sheffler, LLC (PVE) & Lawrence Environmental Group, LLC (LEG). The Phase I ESA identified the following RECs:

- Oil was observed covering machinery and on the floor around the machinery, and dry granular absorbent material was present on the floor.
- Four floor drains were observed throughout the building, two of which are within the loading dock area in the northern portion of the property, including one in close proximity to the former 5,000

gallon heating oil UST and another located approximately 35 ft to the east, as well as two in the basement, including one on the north side of the furnaces and another on the south side of the furnaces.

- An open petroleum spill (No. 8904831) is associated with leaking gasoline USTs at the adjoining Site to the east.

1.2.7 *Phase II Environmental Site Investigation – October 2015*

A Phase II Environmental Site Investigation (ESI) was performed at the Site between August 26, 2015 and September 10, 2015 by Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. (Langan). The scope of work for the Phase II ESI consisted of a geophysical survey, installation of six soil borings, two groundwater monitoring wells, and three soil vapor probes. The findings and conclusions of the investigation are as follows:

- The geophysical survey confirmed the presence of the 5,000-gallon UST at the Site.
- VOCs were detected above MDLs in twelve of the thirteen soil samples. Multiple VOCs were detected including compounds associated with both petroleum products (gasoline/fuel oil) and industrial solvents. TCE and DCE exceeded UUSCOs in one of the thirteen soil borings. This soil boring was located in close proximity to B-3 which also had elevated TCE detections.
- SVOCs were detected above MDLs in eleven of the thirteen soil samples. Multiple SVOCs were detected above UUSCOs in one of the thirteen soil samples. This soil boring was located adjacent an abandoned 5,000-gallon UST.
- Metals were detected above MDLs in each of the thirteen soil samples. Copper, lead, mercury, nickel, and zinc were detected above UUSCOs in five of the thirteen soil samples.
- VOCs were detected above GQS in each groundwater sample.
- SVOCs were detected above GQS in two of the four groundwater samples.
- Metals were detected above GQS/Guidance Values (GVs) in each of the four groundwater samples.
- Several VOCs were detected in the soil vapor samples above MDLs. TCE was detected at levels that would require mitigation in accordance the NYSDOH Decision Matrices.
- Groundwater was estimated to flow southwest; however, this appears to have been based on topographic, rather than empirical, data.
- Historic fill was documented to be approximately six to 10 ft thick.

ESI sample locations and a summary of exceedances of the applicable regulatory criteria for soil, groundwater, and soil vapor are illustrated in **Figures 3** through **5**.

2.0 SITE DESCRIPTION AND HISTORY

2.1 Site Description

The Site is located at 38-01 Queens Boulevard in Queens, New York and is a 22,500-square foot lot which is improved with a one-story building that occupies the entire lot. The Site is bordered on the north by a commercial Site, on the east by a gasoline fueling station, on the west by 38th Street, and on the south by Queens Boulevard and the elevated Metropolitan Transit Authority (MTA) 7 train. . To the north is a taxi storage and repair shop. A Site Plan is included as **Figure 1**.

2.2 Site History

The Site has a long history of manufacturing brass hardware parts. The manufacture of the brass spray tops for perfume bottles and metal plating was conducted on the Site from 1917 to approximately 1950. Since approximately 1950, Liberty Brass has occupied the Site for the manufacture of metal parts and screws.

2.3 Regional Geology/Hydrogeology

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

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

2.4 Site Geology/Hydrogeology

The Site is located over the Long Island aquifer system, which underlies all of Nassau, Suffolk, Kings (Brooklyn), and Queens Counties. The unconsolidated aquifer formations form a southward-dipping wedge that attains a maximum thickness in Kings County about eight-hundred (800) feet in southeast area of Brooklyn. Overlying

bedrock in the area is the Lloyd, Magothy, Jameco, and Upper Glacial aquifer systems. The Upper Glacial aquifer overlies all underlying units and is found at the surface in nearly all of Kings and Queens Counties.

The Site overlies an interconnected aquifer system consisting of the upper glacial deposits and the underlying Magothy Formation. Depth to groundwater in the underlying glacial aquifer is approximately 46 feet bgs. The lithologic description of the sediments from soil borings installed during previous investigations at the Site identifies the contaminated fill material from zero to approximately twelve feet bgs underlain by layers of fine to medium silty sands and silt.

Regional groundwater flow direction is northeast to southwest. Municipal water supply is provided by the New York City Department of Environmental Protection (NYCDEP).

2.5 Site Features

The Site elevation is approximately 65 feet above mean sea level, and is generally level. The Site is developed with a one-story building. There are no exposed areas of vegetation.

2.6 Current and Future Site Use

The Site is currently being vacated by the former Liberty Brass Turning Company's operations and equipment. This company ceased operations at the Site in December 2015 and will permanently vacate the premises by the end of January 2016. The proposed development would consist of a 9-story mixed use building with retail, office, and community facility space. The planned goal of the remediation will be to attempt to achieve Track 1; however, it is understood that that the project may need to be considered for Track 2 or 4.

2.7 Site Visit

PWGC performed a Site visit on January 12, 2016 to ground-truth site conditions and features and refine the conceptual site model (CSM) prior to preparing this RIWP. The Site visit included a walkthrough of the interior and exterior portions of the Site. The following presents a summary of significant results of the Site visit.

2.7.1 *General Observations*

The Site is improved with one building which is utilized as a metal machine shop. The first floor was utilized for production. The equipment and machinery utilized at the Site included screw machines, milling machines, lathes, centrifuges, and a vapor degreaser. A partial second floor is located in the front (southern) portion of the building which contains office space. A small office space is also located in the southeast corner of the first floor. A loading area is located in the northern portion of the building. The northeastern portion of the

building was utilized for storage. Bathrooms and a locker room are located on the eastern side of the eastern portion of the building.

A partial 1,200 square foot (sf) basement is located in the northwest portion of the building which contains two fuel oil-fired boilers for heating the building. A second, small, 112 sf basement vault is located in the southwest corner of the building. A substantial amount of fluid was observed on the floor of the western portion of the building, which is believed to be cutting oil or kerosene. Saw dust was utilized to absorb the fluid in the production areas of the western portion of the first floor.

2.7.2 *Fuel Oil Storage*

The building was heated by fuel oil and natural gas. The natural gas service enters through the western wall of the building. Fuel oil to heat the building is stored in a 1,000-gallon AST located in the northeast corner of the building. The fill port for this AST is located in the northern portion of the building. This AST feeds the two boilers located in the basement.

A 5,000-gallon fuel oil UST is located in the northwest corner of the building. This AST was abandoned in place. A fuel oil fill port is located in the sidewalk on the west side of the building. The fill port is filled with concrete.

2.7.3 *Cutting Oil Storage*

Most of the machinery located within the building required cutting oil to operate. Numerous cutting oil containers were located throughout the building including 55-gallon drums, which are being removed by the end of January 2016.

A 1,000-gallon cutting oil AST is located in the northern portion of the building. There are three 500-gallon cutting oil USTs located under the western portion of the building, which have reportedly been abandoned.

Once the machining process was complete, the parts were ejected into a holding tray and excess cuttings were transferred to a centrifuge where the excess oil was collected in the catch basin and then pumped into a 250-gallon AST. The oil was then recycled and reused in the machinery. The competed parts in the holding trays were transported to a shaking table where excess metal was removed. The part was then taken to either the vapor degreaser, or for aluminum parts, a kerosene dip.

2.7.4 *Kerosene Storage*

Kerosene was utilized in the operation of much of the Liberty Brass machinery. The kerosene was contained in 55-gallon drums located in the central area of the building. The kerosene was transported to the machinery in buckets.

2.7.5 *Vapor Degreaser*

A closed system vapor degreaser, which utilized TCE as the degreasing medium, was located in the southern portion of the building along the western wall. This system was used to clean metal parts. TCE was fed into the system from a 285-gallon AST which was located adjacent to the system until it was closed in 2006 after which TCE was manually added to the system.

2.7.6 *Floor Drains*

A total of four floor drains were observed during the Site visit. Two floor drains are located in the basement and two floor drains are located in the northern portion of the building. The floor drains in the northern portion of the building receive a substantial amount of storm water, as the roof in the northern portion of the building is partially open. The floor drains in the basement reportedly discharge to a sump in the basement. It is not clear where the northern floor drains discharge.

2.7.7 *Sumps and Cleanouts*

Three features, which appeared to be sumps or cleanouts, were observed inside the building immediately south of the loading dock area. These features appeared to have a dirt bottom. A sump is located along the eastern wall of the basement. Water collected in the sump is reportedly pumped to the boilers.

2.7.8 *Monitoring Wells*

A total of six monitoring wells were observed at the Site, three inside the building and three outside the building.

3.0 STANDARDS, CRITERIA, AND GUIDANCE

Based on previous investigations at the Site, the primary chemicals of potential concern (COPC) to be encountered at the Site are VOCs, SVOCs, and metals.

Applicable regulations at NYSDEC Title 6 NYCRR Part 375-6.8(a) provide the Track 1 soil cleanup objectives (SCOs) to the extent a Track 1 cleanup may be achieved. Applicable regulations at NYSDEC Title 6 NYCRR Part 375-6.8(b) provide the Track 2 soil cleanup objectives (SCOs) to the extent a Track 2 commercial cleanup may be achieved. Finally, Track 4 cleanup option may include complete removal of contaminated hot spot soils with surface capping, and Institutional Controls and/or Engineering Controls to prevent exposure of workers and future inhabitants to COPCs. In addition, the protection of groundwater standards in 6 NYCRR Part 375-6.8(b) will be evaluated for any soil contaminant that may continue to represent a potential source to the groundwater.

Groundwater sample results will be compared to 6 NYCRR Part 703 GQS/GVs.

Soil vapor samples will be compared against the NYSDOH decision matrices and new EPA June 2015 Soil Vapor Guidance document.

4.0 CONCEPTUAL SITE MODEL

Pursuant to DER-10 Section 3.22, a CSM has been prepared to develop a general understanding of the Site and evaluate potential human exposure pathways and impacts to the environment. This CSM considers Site history and context, including the factors that influence distribution, and fate and transport of remedy-relevant constituents, as well as potential receptors and pathways for exposure. These factors include potential sources and release mechanisms, the physical-chemical mechanisms that control constituent fate and transport, and the likely exposure pathways that govern the potential for adverse effects to human and ecological receptors. The CSM will be used to identify remedy relevant data gaps that will be addressed as part of the remedial investigation (RI).

4.1 Potential Sources

4.1.1 *Petroleum Hydrocarbons*

Petroleum hydrocarbon-related VOCs, SVOCs, and LNAPL has been detected in groundwater and soil at the Site.

Typical petroleum products utilized at the Site have included kerosene, cutting oil, lubrication oil, lithium greases, and fuel oil. The operations consumed approximately 110-gallons of kerosene each month, 200-gallons of cutting oil each month, 400-gallons of lubrication oil each year and 14-gallons of lithium grease each year. The kerosene was stored in 55-gallon drums. The cutting oil was stored in bulk in a 1,000-gallon AST located near in the northern portion of the Site. Recently, the lubrication oil was stored in 55-gallon drums; however, previously it was stored in one of the 1,000-gallon ASTs located at the Site. Lithium grease was stored in kegs, and fuel oil was stored in one of the 1,000-gallon ASTs located at the Site. The 5,000-gallon UST that was formerly utilized for fuel oil storage failed a tank tightness test and has reportedly been closed-in place. Some cutting oil was also stored in 55-gallon drums situated on several rolling drum dollies. The dollies were then moved to the machinery as needed and the manual pumps attached to the drums were utilized to transfer the chemicals.

A NYSDEC PBS Program Facility Information report (PBS No. 2-045128) indicates that four tanks have been registered at the Site with NYSDEC including:

- One (1) active 1,000-gallon fuel oil AST installed on 08/20/99 presently located in the northeast corner of the Site,
- One (1) active 1,000-gallon cutting oil AST installed on 08/20/99 presently located in the central northern portion of the Site,

- One (1) active 250-gallon used cutting oil AST installed on 08/20/99 presently located in the central portion of the Site,
- One (1) 5,000-gallon No. 2 fuel oil UST is presently located in the northwestern portion of the Site. The UST was installed in 1950 and reportedly closed-in place on 01/12/11. Spill Nos. 0612297 and 0613333 were opened in connection with failed tightness tests and reportedly closed in December 2010.

In addition, the available information indicates that three 500-gallon cutting oil USTs have been abandoned in place in the western portion of the Site during the late 1990s.

The process for the manufacturing of materials at the Site involved the removal of the raw barstock from storage, loading the barstock into the appropriate machinery (lathes, mills, or automatic screw machines). The barstock was then processed by the machine and the part was then ejected into a holding tray. The excess cuttings were transferred to a centrifuge where the excess cutting oil was collected in a partially in-ground catch basin, and then pumped into a 250-gallon AST. The cutting oil was then recycled and reused in the machinery. The completed parts in the holding trays were transported to a shaking table where excess metal was removed. The part was then taken to either the vapor degreaser or a kerosene dip (for aluminum parts).

There is no indication in the investigation reports to date that any of the ASTs have leaked. Previous investigations indicate the presence of SVOCs and metals at concentrations that exceed their respective NYSDEC commercial use SCOs (CUSCOs) at several borings advanced in the vicinity of the former UST located in the northwestern portion of the Site. The SVOCs and metals in soil may be associated with the presence of contaminated historic fill.

4.1.2 *Chlorinated Aliphatic Hydrocarbons*

Dissolved-phase chlorinated aliphatic hydrocarbon (CAH) - related constituents, including TCE and PCE, have been detected in soil, groundwater, and soil vapor at the Site and are likely attributed to releases associated with historical operations.

A closed system vapor degreaser is present in the southwestern portion of the Site. When in operation, the system utilized TCE as the degreasing medium. Depending upon the volume of work performed at the Site, approximately 50 to 100 gallons of virgin TCE was delivered to the Site, and approximately 50 to 100 gallons of spent TCE was removed from the Site, on a monthly basis. TCE was manually added to the system from materials stored in a 55-gallon drum stored adjacent to the system. Prior to 2006, the system was fed TCE by a 285-gallon AST located adjacent to the system. The NYSDEC chemical bulk storage (CBS) database indicates

that the 285-gallon TCE AST is listed under CBS No. 2-000226. This stainless steel alloy tank was reportedly registered in 1989 and removed in 2006. No spills or stains were visually observed to date in any of the prior investigations in the vicinity of the vapor degreasing system.

However, the data indicate that past historical operations may have resulted in the discharge of CAHs into the subsurface, both in the vicinity of the vapor degreaser as well as through the floor drain collection system.

4.2 Environmental Fate and Transport

Chemicals are transported or transformed in the environment through physical and kinetic processes. Physical processes including dissolution, vaporization, and adsorption result in the transfer the substances across media and phases. Kinetic processes, which include biotic and abiotic chemical transformations, decrease the concentration of a chemical by degrading it into other products. The current understanding of the fate and transport of petroleum hydrocarbon-related constituents is summarized below for each of the environmental media of interest at the Site.

4.2.1 *Soil*

4.2.1.1 Petroleum Hydrocarbons

In 2007, approximately 0.1-inch of petroleum-related light non-aqueous phase liquid (LNAPL) was reportedly observed at monitoring well VMW-1, which is approximately 15 to 20 ft west of the former 5,000 gallon UST. There has been no reported presence of dense non-aqueous phase liquid (DNAPL) in any monitoring wells at the Site.

(NAPL is acted upon by three distinct forces due to: (1) gravity, (2) capillary pressure, and (3) hydrodynamic pressure. Upon release, LNAPL will migrate downward under the force of gravity. If a small volume is released, a fraction of the hydrocarbons will be retained in the soil pores, and the LNAPL mass will become depleted until it no longer moves. If sufficient LNAPL is released, it will migrate downward until it reaches a physical barrier, or until it reaches the capillary fringe above the water table. When it reaches the capillary fringe, some of the LNAPL may move laterally due to gravity capillary forces causing the LNAPL to share pore space with both water and air.

In the subsurface, LNAPL competes with water, air, and other fluids for available pore space. Below the groundwater table, the pores are initially saturated with water (i.e., water saturation is 100 percent). As the thickness of oil grows, the vertical pressure increases until the oil begins displacing the water from some of the pores. Generally, water is the preferred wetting fluid for the soil, and as such, it remains in the smaller

voids or pore throats, allowing the oil to enter the larger pores. In the saturated soil below the water table, LNAPL constituents may exist in the LNAPL phase, or the dissolved-phase, or it may partition to the soil. Saturation is the relative fraction of total pore space containing a particular fluid in a representative volume of a porous medium. The mobility of LNAPL is related to its degree of saturation. The percentage of LNAPL filling the total pore space is termed the LNAPL saturation.

Within the subsurface, LNAPL may occur as residual LNAPL and as mobile LNAPL. LNAPL movement can only occur as a continuous phase within the pore network. Hence LNAPL residing in the larger pores requires connection with LNAPL in adjacent pores in order to travel efficiently through the aquifer. Otherwise, water, generally the less viscous and the preferential wetting fluid, will flow around the oil when a gradient is applied, trapping the oil in the formation. When LNAPL is retained as isolated globules and beads within the pore network, it is essentially immobile. The saturation level whereby a LNAPL becomes immobilized by capillary forces is known as the "residual saturation." LNAPL that is retained by soil capillary forces, or is trapped within pore spaces, is termed residual LNAPL. When the volume of product is greater than that retained in a residual phase, this volume is considered mobile LNAPL. Mobile LNAPL may migrate vertically or laterally. Increased viscosity and decreased grain size may result in a site-specific increase the residual saturation level thereby reducing the mobility of the petroleum hydrocarbon material.

4.2.1.2 Chlorinated Aliphatic Hydrocarbons

Pure TCE and PCE are considered DNAPL because they are heavier than, and therefore sinks in, water, in contrast to LNAPL, which is lighter than water. The physical and chemical properties of subsurface DNAPLs can vary considerably from that of pure DNAPL compounds due to the presence of complex chemical mixtures, the effects of in-situ weathering, and the fact that much DNAPL waste consists of off-specification materials, production process residues, and spent materials.

DNAPL chemicals migrate in the subsurface as volatiles in soil gas, dissolved in groundwater, and as a mobile, separate phase liquid. This migration is governed by transport principles and the following chemical and media specific properties: saturation, interfacial tension, wettability, capillary pressure, residual saturation, relative permeability, solubility vapor pressure, volatilization, density, and viscosity. Like LNAPL, subsurface DNAPL is acted upon by three distinct forces due to: (1) gravity, (2) capillary pressure, and (3) hydrodynamic pressure.

Gravity promotes the downward migration of DNAPL. The fluid pressure exerted at the base of a DNAPL body due to gravity is proportional to the DNAPL body height, the density difference between DNAPL and

water in the saturated zone, and the absolute DNAPL density in the vadose zone. Capillary pressure resists the migration of non-wetting DNAPL from larger to smaller openings in water-saturated porous media. Fine-grained layers with small pore radii may as capillary barriers to DNAPL migration. Alternatively, fractures, root holes, and coarse-grained strata with relatively large openings may provide preferential pathways for non-wetting DNAPL migration. Capillary pressure effects cause lateral spreading of DNAPL above capillary barriers and also act to immobilize DNAPL at residual saturation and in stratigraphic traps. Trapped DNAPL is a long-term source of groundwater contamination.

The hydrodynamic force due to hydraulic gradient can promote or resist DNAPL migration and is usually minor compared to gravity and capillary pressures. The control on DNAPL movement exerted by the hydrodynamic force increases with (1) decreasing gravitational pressure due to reduced DNAPL density and thickness (2) decreasing capillary pressure due to the presence of coarse media, low interfacial tension, and a relatively high contact angle, and (3) increasing hydraulic gradient. Mobile DNAPL can migrate along capillary barriers (such as bedding planes) in a direction opposite to the hydraulic gradient.

Previous investigations indicate that the western floor drain, located in the exterior loading dock area, does not have a solid bottom and the eastern floor has a solid bottom at approximately 9-inches bgs. In addition, a 4-inch diameter pipe appears to exit the western floor drain on the eastern side at approximately 3-inches bgs. A 4-inch diameter pipe appears to exit the eastern floor drain on the western side at approximately 3-inches bgs. Each pipe appears to extend only about one-foot from the floor drain. It is not clear where the floor drains discharge. Several features which appeared to be sumps or cleanouts, located inside the building immediately south of the loading dock area, appeared to have a dirt bottom. It is not clear how these features are connected and / or whether they are connected to the floor drains located in the exterior loading dock area.

However, the concrete slab throughout the facility is at least six inches thick and intact. The intact concrete slab throughout the facility is expected to have prevented the migration of any COPCs that may have spilled on the surface of the slab; however, such releases have the potential to enter the subsurface through preferential migration pathways such as cracks in the slab, floor drains, cleanouts, and / or sumps.

Boring logs indicate the presence of a localized clay layer beneath the 5,000 gallon UST. The clay layer is at least 2 ft thick and begins at 10 ft bgs. Boring logs in the vicinity of the 5,000-gallon UST did not indicate petroleum staining. As noted above, in 2007, approximately 0.1-inch of LNAPL was reportedly observed at monitoring well VMW-1, which is approximately 15 to 20 ft west of the former 5,000 gallon UST. The available

information does not indicate the presence of petroleum stained or saturated soils or a persistent presence of LNAPL at VMW-1. Additional lines of evidence do not corroborate with this observation and it is not clear whether a release has actually taken place in connection with this UST.

The available information to date indicates the presence of CAHs in shallow soil in the vicinity of the 5,000-gallon UST and floor drain collection system located in the northern portion of the Site as well as in the vicinity of the parts washing equipment in the southwestern portion of the Site.

One of the purposes of this Remedial Investigation is to confirm whether LNAPL and / or DNAPL is or is not present and to further characterize "hot spot" areas in soil that may contain source material.

4.2.2 *Groundwater*

The fate and transport mechanisms that affect groundwater include advection, dispersion, dissolution, and natural degradation which may work to reduce the concentration of any dissolved-phase petroleum hydrocarbon-related constituents in groundwater.

The results of groundwater sampling performed to date indicate the presence of dissolved-phase petroleum hydrocarbon-related constituents in groundwater above NYSDEC criteria at MW-3 and MW-6, which are located in close proximity to the former 5,000-gallon UST, as well as MW-03, which is located in the northeastern portion of the Site A former gasoline service station located adjacent east of the Site may represent a potential up-gradient source of dissolved-phase petroleum hydrocarbon-related constituents in groundwater in the northern portion of the Site.

The results of groundwater sampling performed to date indicate the presence of dissolved-phase CAH-related constituents in groundwater above NYSDEC criteria at MW1, MW-3, and MW-6. Groundwater sampling results indicate the presence of dissolved-phase DCE in groundwater which indicates the potential for reductive dechlorination of PCE and/or TCE. Geochemical and biological indicator data has not been collected to establish the potential for natural attenuation of dissolved-phase petroleum hydrocarbon and / or CAH-related constituents in groundwater. Therefore, one of the purposes of this investigation will be to close this data gap.

4.2.3 *Soil Vapor*

Petroleum hydrocarbon and CAH -related and dissolved-phase CAH-related constituents in soil and groundwater have the potential to volatilize and enter buildings through cracks and joints in foundation walls. The sumps and floor drains may represent a potential preferential pathway for the migration of dissolved-phase chlorinated solvents constituents into the building in the vapor phase.

The results of soil vapor sampling performed to date indicate the presence of dissolved-phase CAH-related constituents in soil vapor at concentrations that are orders of magnitude above their respective AGVs throughout the Site with the greatest concentrations in the vicinity of the 5,000-gallon UST and floor drains located in the northern portion of the Site as well as the in the vicinity of the parts washing equipment in the southwestern portion of the Site. The data indicate that these vapors may have become trapped beneath the slab.

4.3 Potential Sensitive Receptors and Exposure Pathways

A complete exposure pathway is needed for a potential human or ecological health risk to be present. Potential receptors at the Site include construction/utility workers, ground water and future building occupants. Based on the peer-reviewed principles of environmental risk assessment, there is no risk to a receptor when either (1) no receptor is present or (2) there is no complete exposure pathway for that receptor.

Excavation to be performed during future redevelopment activities are expected to remove any potential source material that may remain on the Site as part of an overall remedy that will be protective of human health and the environment. If required, engineering controls including soil vapor barriers and / or a sub-slab depressurization system and site-wide cover system may be need to address exposure from residual contaminated groundwater and soil vapor.

5.0 AREAS OF CONCERN

The following Areas of Concern (AOCs) have been identified at the Site.

5.1 AOC 1 - Contaminated Historic Fill Material

AOC 1 is reportedly located throughout the Site, which is approximately 100 ft wide by 225 ft in length.

5.2 AOC 2 - Floor Drain Collection System

AOC 2 is located in the northern portion of the Site, and includes the two floor drains located in the exterior loading dock as well as sumps and / or cleanouts and related piping in the interior or the building. AOC 2 consists of AOC 2a, which includes the western floor drain, is approximately six ft wide and 10 ft long, AOC 2b, which includes the eastern floor drain, is approximately six ft wide and six ft long, and AOC 2c, which includes a sump, clean-outs, and related piping, is approximately eight ft wide and 32 ft long.

5.3 AOC 3 - Former 5,000-gallon Fuel Oil UST

AOC 3 is located in the northern portion of the Site, and includes the Former 5,000-gallon Fuel Oil UST and related piping. AOC 3 is approximately 12 ft by 20 ft in size.

5.4 AOC 4 - 1,000-gallon Fuel Oil AST

AOC 4 is located in the northwestern portion of the Site and is approximately eight ft by 18 ft in size.

5.5 AOC 5 - 1,000-gallon Cutting Oil AST

AOC 5 is located in the northern portion of the Site. AOC 5 includes the 1,000-gallon Cutting Oil AST as well as the former location of the 1,000-gallon Fuel Oil AST which was moved to its present location. AOC 5 is approximately eight ft by 18 ft in size.

5.6 AOC 6 - 250-gallon Used Cutting Oil AST, Centrifuge, and Catch Basin

AOC 6 is located in the central portion of the Site, and includes a 250-gallon used cutting oil AST, a cutting oil catch basin that extends below grade, and centrifuge. AOC 6 is approximately five ft by 12 ft in size.

5.7 AOC 7 - Former 500-gallon Cutting Oil USTs

AOC 7 is located in the western central portion of the Site and includes three abandoned 500-gallon cutting oil USTs and related pits and piping. AOC 7 is approximately 12 ft by 40 ft in size.

5.8 AOC 8 - Vapor Degreaser and Former 285-gallon TCE AST

AOC 8 is located in the southwestern portion of the Site, and includes the vapor degreaser and a former 285-gallon TCE AST. AOC 8 is approximately eight ft by 10 ft in size.

5.9 AOC 9 - Unknown Former Tank

AOC 9 is located in the basement and includes a tank, the contents and usage of which are unknown, and which appears to have been removed. AOC 9 is approximately five feet by 12 feet in size.

6.0 KEY DATA GAPS AND AREAS OF INTEREST

Based on the Conceptual Site Model (CSM), there does not appear to be any immediate and/or significant threat to human health or the environment since the building is no longer occupied. However, several remedy-relevant data gaps have been identified that are pertinent to the evaluation of remedial alternatives and the selection of a remedy required for the Site. A RI will be conducted to address these data gaps, refine the CSM, determine whether any potential completed exposure pathways exist, and identify remedial actions and/ or mitigation measures and engineering or institutional controls to reduce or eliminate unacceptable risk to human or ecological receptors.

The following section lists the remedy-relevant data gaps.

1. Location and characterization of additional key subsurface features including abandoned cutting oil USTs, UST piping, floor drain / sump collection system features and / or piping, and any potential additional floor drains, piping, sumps, pits, and / or penetrations of the slab;
2. Vertical and horizontal extent of chlorinated aliphatic and/or petroleum related hydrocarbon-contaminated soil/source material that exceeds the applicable SCOs, including NAPL;
3. Vertical and horizontal extent of contaminated historic fill material (HFM);
4. Waste classification of soils targeted for off-Site disposal;
5. Vertical and horizontal extent of any dissolved-phase and/or petroleum hydrocarbon-related constituents chlorinated in groundwater above NYSDEC standards;
6. Potential for Site conditions to support the monitored natural attenuation of dissolved-phase chlorinated aliphatic and/or petroleum hydrocarbon-related constituents in groundwater after source removal;
7. Monitoring well network to sufficiently characterize dissolved-phase chlorinated aliphatic and/or petroleum hydrocarbon-related constituents in groundwater, as necessary;
8. Potential for off-Site sources to contribute to the presence of dissolved-phase chlorinated aliphatic and/or petroleum hydrocarbon-related constituents in soil and/or groundwater at the Site;
9. Groundwater flow direction,
10. Need for vapor mitigation measures; and
11. Data necessary to develop remedial alternatives, and identify the potential need and scope of any Interim Remedial Measures (IRMs).

7.0 SITE PREPARATION ACTIVITES

The premises will be vacated by the current tenant in advance of the RI. Any ASTs that are not bolted down will be removed by Liberty Brass. Any ASTs that are bolted down will be emptied, cleaned, and registered by Liberty Brass. The building will be demolished in approximately April 2016. The USTs will be removed as part of the remediation after the demolition of the building. Any tanks that remain on the property will be registered and properly closed as part of the remediation.

8.0 OBJECTIVES, SCOPE AND RATIONALE

The primary objective of the RI is to collect the information and field data necessary to address on-Site data gaps identified in Section 6. The Scope of Work includes the following tasks:

1. Visual inspection
2. Geophysical investigation
3. Tank registration and closure
4. Characterization of floor drain/sump collection system
5. Subsurface soil characterization
6. Soil vapor characterization
7. Groundwater Characterization
8. Qualitative human health exposure assessment

8.1 Visual Inspection

PWGC will perform a visual inspection of the Site after the property has been vacated by Liberty Brass to identify any potential data gaps that had not previously been revealed while the equipment was still in place. The inspection will seek to identify any additional perforations, penetrations, and / or cracks in the slab as well as the presence of any additional floor drains, sumps, or other features which may represent a preferential pathway for the migration of COPCs into the subsurface once all the facility equipment has been removed. This information will be used to determine if, and or / where, any additional borings may be added to the scope of the investigation.

8.2 Geophysical Investigation

A geophysical investigation will be performed to evaluate the presence / location of piping in connection with the floor drain / sump collection system, confirm the presence of known former USTs and any associated underground piping, and / or identify any potential additional subsurface anomalies that may require additional investigation.

8.2.1 *Electromagnetic Survey*

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

technique particularly well suited to identifying buried metal objects such as USTs, metallic wastes, buried drums, pipelines, reinforced building foundations, or other metal components of buried structures. It is, however, equally sensitive to metal objects on the ground surface, and it is important to take careful field notes that indicate the position of surface metal to avoid mis-interpretation.

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

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

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

8.2.2 *Ground Penetrating Radar Survey*

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

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

8.2.3 *Tank Registration and Closure*

Any tanks that remain on the property will be registered and properly closed as part of the remediation.

8.3 Characterization of Floor Drain Collection System

PWGC will investigate the floor drain collection system to determine the construction of each structure and to further evaluate the presence / location / characteristics of bottoms and / or piping in connection with these structures. The material within these features may be removed using a vac-truck or equivalent, and stored on-site for proper disposal during the remediation. In order to determine the quality of soil in the vicinity of the floor drains and sumps, soil borings will be advanced adjacent each floor drain as shown on **Figures 8** and **9**. **Table 1** details the rationale for soil boring locations.

Confirmatory soil borings would be advanced at each identified floor drain and sump / cleanout features. Soil samples would be collected of the material contained within each sump / cleanout. Additional soil samples would be collected approximately 2 ft below the bottom of each sump / cleanout continuously to an approximate depth of 20 feet bgs. Each soil core will document soil types, changes in lithology, and wastes (if any) encountered. PWGC will utilize a photo-ionization detector (PID) to screen the soils from the soil cores for volatile organic vapors, which are commonly associated with petroleum products and industrial solvents. A soil boring log will be developed for each location.

Visual observations and analytical results of the soil samples from the confirmatory borings (with expedited laboratory turn-around times, if necessary) will be evaluated to determine whether, and to what depth, any additional sampling at step-out locations may be required to compete the vertical and horizontal delineation of constituents of concern.

8.3.1 *Soil Boring Protocol*

Prior to performing soil borings, 10-mil polyethylene sheeting, sufficiently large to hold the anticipated number of soil cores will be laid on the ground in the area where the soil boring will be performed.

Prior to drilling, soil borings locations will be opened using a concrete coring equipment. Soil borings will be installed utilizing a Geoprobe® direct-push drill rig outfitted with a dual-core sampler or closed piston sampler and dedicated acetate liners. If necessary, air rotary tooling may be required to advance the boring through subsurface obstructions such as cobbles or boulders. Soils will be collected continuously from ground surface to an approximate depth of 20 feet bgs. Each soil core will document soil types, changes in lithology, and wastes (if any) encountered. PWGC will utilize a photo-ionization detector (PID) to screen the soils from the soil cores for volatile organic vapors, which are commonly associated with petroleum products and industrial solvents. A soil boring log will be developed for each location.

Borings in the southern portion of the building will require a "No Objection" letter from the NYC MTA.

8.3.2 *Sampling Protocol*

A soil sample will be collected to from the two-foot interval located beneath the bottom of each floor drain to evaluate soil quality. Additional soil samples will be collected from soil intervals where visual staining or PID response are observed. Soil samples will be analyzed for VOCs by United States Environmental Protection Agency (USEPA) Method 8260.

Samples collected for VOC analysis will be collected directly from the acetate liners utilizing tera-core sampling devices. Samples will be shipped under proper chain-of-custody (COC) procedures to a NYSDOH Environmental Laboratory Approval Program (ELAP) certified laboratory for analysis individually following NYSDEC Analytical Services Protocol (ASP) - Category B Deliverables.

8.4 Subsurface Soil Characterization

Previous investigations have identified several areas of contamination on the Site, which have not been fully delineated. In order to determine the quality of soil in these areas, soil borings will be installed as shown on **Figures 8** and **9**. **Table 1** details the rationale for soil boring locations.

8.4.1 *Soil Boring Protocol*

Prior to drilling, soil borings locations will be opened using concrete coring equipment. Soil borings will be installed utilizing a Geoprobe® direct-push drill rig outfitted with a dual-core sampler or closed piston sampler and dedicated acetate liners. If necessary, air rotary tooling may be required to advance the boring through subsurface obstructions such as cobbles or boulders. Soils will be collected continuously from ground surface to an approximate depth of 20 feet bgs. Each soil core will document soil types, changes in lithology, and wastes (if any) encountered. PWGC will utilize a PID to screen the soils from the soil cores for volatile organic

vapors, which are commonly associated with petroleum products and industrial solvents. A soil boring log will be developed for each location.

8.4.2 *Sampling Protocol*

Soil samples will be collected in accordance with the rationale listed in **Table 1** to evaluate soil quality. Soil samples will be analyzed for one or more of the following:

- VOCs by USEPA Method 8260;
- SVOCs by USEPA Method 8270;
- Metals by USEPA Methods 6010/7471; and
- Pesticides/Polychlorinated Biphenyls (PCBs)

Samples collected for VOC analysis will be collected directly from the acetate liners utilizing tera-core sampling devices. The remaining sample volume will be transferred to a stainless steel bowl and homogenized. Once homogenized, samples will be transferred to laboratory supplied glassware and packed in a cooler with ice and shipped under proper chain-of-custody procedures to a NYSDOH ELAP certified laboratory for analysis individually following NYSDEC ASP - Category B Deliverables.

8.5 Soil Vapor Characterization

To determine whether soil vapor intrusion may be a potential concern for the proposed redevelopment of the Property, a total of three soil vapor sampling points will be installed. Proposed soil vapor sampling points are illustrated in **Figures 8** and **9**.

Soil vapor sampling point installation and sample collection will be performed in accordance with the NYSDOH *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (October 2006), and USEPA Standard Operating Procedure (SOP) 2042, *Soil Gas Sampling*.

Sampling points will be installed using a Geoprobe® direct-push drill rig or manually driven rods to a depth of approximately 22 feet below existing grade to correspond to the planned depth of the cellar of the proposed building. Sampling points will be constructed of a dedicated stainless steel screen fitted with inert tubing (e.g. polyethylene or Teflon®) to grade. Porous, inert backfill material (e.g., glass beads, washed #1 crushed stone, etc...) will be added to create a sampling zone 1 to 2 feet in length. The sampling point will be sealed above the sampling zone with bentonite slurry for a minimum distance of 3 feet to prevent outdoor air infiltration and the remainder of the borehole will be backfilled with clean material.

Prior to sampling approximately two to three probe volumes will be purged at a flow rate less than 0.2 liters per minute. VOC concentrations will be recorded during purging utilizing a PID. As part of the vapor intrusion evaluation, a tracer gas will be used in accordance with NYSDOH protocols to serve as a quality assurance/quality control (QA/QC) device to verify the integrity of the soil vapor probe seal. Helium will be used as the tracer gas and a box will serve to keep it in contact with the probe during testing. A portable monitoring device will be used to analyze a sample of soil vapor for the tracer prior to sampling. If the tracer sample results show a significant presence of the tracer, the probe seals will be adjusted to prevent infiltration. At the conclusion of the sampling round, tracer monitoring will be performed a second time to confirm the integrity of the probe seals.

Soil vapor samples will be collected using one liter SUMMA® canisters fitted with a pre-set flow regulator (approximately 8.3 mL/min). The laboratory will provide certified-clean canisters with an initial vacuum of approximately 26 inches of mercury (in. of Hg) for sample collection and flow regulators pre-set to provide uniform sample collection over an approximate 2-hour sampling period. Sample collection will be ceased (i.e., the valve on the canister closed) when approximately 2 in. of Hg vacuum remains in the canister, leaving a vacuum in the canister as a means for the laboratory to verify the canister did not leak while in transit.

8.6 Groundwater Characterization

Prior to RI mobilization, the northing and easting, top of casing, and grade level at existing groundwater monitoring wells will be surveyed relative to mean sea level and monitored for depth-to-water in order to confirm groundwater flow direction.Groundwater monitoring activities will consist of collecting and recording depth-to-water, depth-to-LNAPL, LNAPL thickness, and total well depth measurements for the groundwater monitoring wells. Water level measurements will be converted into groundwater elevation data to prepare a groundwater contour map and determine flow direction.

Groundwater samples would be collected from all existing monitoring wells. In addition, a groundwater sample would be collected from SB-22 using direct-push sampling technology. At each Geoprobe® groundwater sampling location, a four-foot long screen point sampler will be driven to the desired depth (three feet below the water table). This will allow the sampler screen to intersect the water table. At the desired depth, disposable polyethylene tubing with a stainless steel check valve will be inserted through the probe rods into the water bearing zone. The tubing will then be hand oscillated to purge the well prior to sampling. After purging each well volume field measurements will be collected using portable field instruments. Turbidity, pH, temperature, and conductivity measurements will be collected. Groundwater

samples will be collected after readings stabilize. Stabilization is considered achieved when consecutive readings within five percent of each other are collected between purge volumes. If turbidity cannot be reduced to 50 NTUs, but other parameters stabilize, samples will be collected. All monitoring well purging data will be recorded in a well sampling log.

The groundwater samples will be collected in compliance with the USEPA Low-flow Groundwater Purging and Sampling Procedure (USEPA, 1998) and DER-10. The groundwater sample will be analyzed for the following:

- VOCs by USEPA Method 8260;
- SVOCs by USEPA Method 8270;
- Metals by USEPA Methods 6010/7471 (Total and Dissolved); and
- Pesticides/PCBs

Groundwater samples would also analyzed for geochemical and biological indicators to evaluate the potential for aerobic or anaerobic biodegradation of dissolved-phase petroleum hydrocarbons and / or dissolved-phase CAH-related constituents including pH, oxidation/reduction potential, conductivity, temperature, dissolved oxygen, total and dissolved iron, total and dissolved manganese, total and dissolved organic carbon (TOC and DOC), chloride, nitrate, sulfate, alkalinity, and total dissolved solids. Field-analyzed parameter measurements would be collected at, or immediately after, parameter stabilization.

8.7 Qualitative Human Health Exposure Evaluation

A qualitative human health exposure assessment will be completed for the Site, characterizing the current and future exposure setting, identifying exposure pathways, and evaluating contaminant fate and transport. The Qualitative human health exposure assessment will follow DER-10, appendix 3B and Section 3.3 (b) 8.

9.0 QUALITY ASSURANCE PROJECT PLAN

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

9.1 Project Organization

The investigative efforts defined in this RIWP will be coordinated by PWGC on behalf of Curbcut Queens Blvd LLC. The following identifies the responsibilities of various organizations supporting the RI:

- The NYSDEC Project Manager (Robert Filkins) will be responsible for reviewing and approving this work plan, coordinating approval of requested modifications, and providing guidance on regulatory requirements.
- The PWGC Program Manager (Richard T. Kampf, PG) will provide technical expertise for review of the project plans, reports and ongoing field activities. The Program Manager will act as the project's Quality Assurance Manager.
- PWGC Project Manager (John Eichler) will be responsible for the day-to-day project management, task leadership, and project engineering support and for the planning and implementation of RI activities. The Project Manager is responsible for ensuring that the requirements of this RI work plan are implemented. The project manager will also act as the Site Health and Safety Manager (HSM).
- PWGC Field Team Leader (Usman Chaudhry) will be responsible for sample collection, oversight of subcontractor personnel, and coordination of daily field activities. The Field Team Leader will act as the Site Health and Safety Officer ensuring implementation of the Site Health and Safety Plan.
- A NYSDOH ELAP certified laboratory (to be determined) will be contracted to perform required analyses and reporting, including ASP Category B Deliverables, which will allow for data validation.
- Subcontractors will perform surveying, drilling, and/or sampling at the direction of the Field Team Leader in accordance with this work plan.

Qualifications of the principal personnel participating in the investigation are included in **Appendix A**.

9.2 Laboratory Analysis

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

ANALYTICAL METHODS

(SOIL)

Sample Matrix	Sample Type	Parameters	EPA Method	Sample Preservation	Holding Time	Sample Container
Soil	Grab	VOCs	8260C/5035 (High Level)	5ml MeOH Cool to 4°C	14 days	40 ml vials
Soil	Grab	VOCs	8260C/5035 (Low Level)	5ml Water Cool to 4°C	48 Hrs freeze 14 Days analysis	(2) 40 ml vials
Soil	Grab	SVOCs	8270	Cool to 4°C	14 days	4 oz. wide mouth glass
Soil	Grab	TAL Metals	6010	Cool to 4°C	6 months (28 days for Mercury)	4 oz. wide mouth glass
Soil	Grab	PCBs	8082	Cool to 4°C	14 Days (Extraction)	4 oz. wide mouth glass
Soil	Grab	Pesticides	8081	Cool to 4°C	14 Days (Extraction)	4 oz. wide mouth glass

ANALYTICAL METHODS

(GROUNDWATER)

Sample Matrix	Sample Type	Parameters	EPA Method	Sample Preservation	Holding Time	Sample Container
Groundwater	Grab	VOCs	8260	HCL to pH <2.4 Cool to 4°C	14 days	(3) 40-mil vials
Groundwater	Grab	SVOCs	8270	Cool to 4°C	7 days	(2) 1 L amber glass jars.
Groundwater	Grab	TAL Metals	6010	HNO_3 to pH<2 Cool to 4°C	6 months (28 days for Mercury)	0.5 L Plastic.
Groundwater	Grab	Pesticides/PCBs	8081/8082	Cool to 4°C	7 days	1 L amber glass jars.

Soil samples will be collected as described in Section 7.4. Analysis will conform to NYSDEC ASP Category B data deliverables will be submitted.

9.3 Field/Laboratory Data Control Requirements

QC procedures will be followed in the field and at the laboratory to facilitate that reliable data are obtained. When performing field sampling, care shall be taken to prevent the cross-contamination of sampling equipment, sample bottles, and other equipment that could compromise sample integrity. QC samples, will include blind duplicates, equipment blanks, trip blanks, method blanks, matrix spike and matrix spike duplicates.

9.4 Sample Identification

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

- SB19 @ 0-2' (geoprobe sample, soil boring #19 from 0 to 2 feet)

- SB19 (GW) @ 48-50' (geoprobe groundwater sample, soil boring #19 from 48 to 50 feet)

The step-out boring locations surrounding the confirmatory soil borings advanced at each of the floor drain and sump / cleanout features as indicated above in Section 8.3 would be identified with an additional letter to indicate the step-out direction, e.g., SB03N would be used to indicate the step-out boring located to the north of the confirmatory soil boring located at SB03.

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

9.5 Chain-of-Custody, Sample Packaging and Shipment

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

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

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

9.6 Data Usability and Validation

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

9.6.1 *Data Usability and Validation Requirements*

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

9.6.2 *Data Usability and Validation Methods*

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

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

9.7 Field Equipment Calibration

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

9.8 Equipment Decontamination

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

9.8.1 *General Procedures*

Drilling equipment will be decontaminated in a designated area. Sampling equipment and probes will be decontaminated in an area covered with plastic sheeting near the sampling location. Waste material generated during decontamination activities will be containerized, stored and disposed of in accordance with the procedures detailed in Section 8.9. Decontamination of sampling equipment shall be kept to a minimum, and wherever possible, dedicated sampling equipment shall be used. Personnel directly involved in equipment decontamination shall wear appropriate personal protective equipment (PPE).

9.8.2 *Drilling Equipment*

Drilling equipment shall be decontaminated prior to performance of the first boring/excavation and between all subsequent borings/excavations. This shall include hand tools, casing, augers, drill rods, temporary well material and other related tools and equipment. Water used during drilling and/or steam cleaning operations shall be from a potable source.

9.8.3 *Sampling Equipment*

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

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

9.8.4 *Meters and Probes*

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

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

9.9 Management of Investigation Derived Waste

Waste materials generated from the field operations may consist of soil cuttings, purge water, and miscellaneous solid materials such as (PPE) and supplies. Investigative derived waste (IDW) generated during field operations will be disposed of in accordance with applicable regulations.

Soil cuttings generated from soil boring and well installation activities will be stored in 55-gallon drums. Drums will be labeled to indicate the source of the soil and will be stored in a designated area onsite. Soil cores and soil cuttings will be field screened using a PID, while performing drilling operations. Drummed soils will be sampled to determine if spreading on-site is appropriate or off-site disposal is required. Following receipt of the analytical results, recommendations for disposition of the drummed soil will be provided to the NYSDEC.

Development and purge water generated during the field activities will be stored in a portable holding tank and/or 55-gallon drums. Drums will be labeled to indicate the source of the fluid and will be stored in a

designated area onsite. Drummed groundwater will be sampled to determine if discharge to the surface of the site is appropriate or off-site disposal is required. Following receipt of the groundwater sampling results, recommendations for disposition of the water will be provided to NYSDEC.

Based upon correspondence with NYSDEC Division of Solid and Hazardous Materials, investigation and remedial derived wastes will be disposed of as hazardous or non-hazardous waste based upon their characteristic qualities. Non-hazardous waste streams will be approved by NYSDEC in advance.

9.10 Field Documentation

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

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

10.0 REMEDIAL INVESTIGATION REPORT PREPARATION

The Remedial Investigation Report (RIR) will incorporate the methods and findings of the investigation activities performed as outlined in this work plan. The report will identify specific contamination concentrations throughout each media (e.g. soil, groundwater, etc), delineate the nature and extent of the contamination in soil, groundwater, and soil vapor, evaluate potential exposure pathways, and provide conclusions and recommendations for additional investigation and/or remedial action. Electronic copies of the Investigation Report will be submitted to the NYSDEC along with hard copies. Analytical results of the investigation will be submitted in the electronic data delivery (EDD) format through the Department's environmental information management system (EIMS).

11.0 HEALTH AND SAFETY

Field operations will be performed in accordance with the health and safety requirements to be provided in the site specific Health and Safety Plan (HASP). The HASP is included as **Appendix B**. The HASP outlines the requirements for training, medical surveillance, daily tailgate meetings, emergency response, and accident and injury reporting.

Activity hazard analyses (AHAs) have been completed for identified work activities planned for the investigation.

The PWGC Field Team Leader will be responsible for implementing the HASP, completing the daily tailgate safety meetings and performing necessary Industrial Hygiene (IH) monitoring as specified in the HASP.

12.0 COMMUNITY AIR MONITORING PLAN

A site specific Community Air Monitoring Plan (CAMP) has been prepared to provide measures for protection for on-site workers and the downwind community from potential airborne contaminants as a direct result of the RI. The CAMP is included as **Appendix C**.

The CAMP will be implemented and executed in accordance with 29 code of federal regulations (CFR) 1910.120(h), the NYSDOH Generic CAMP, and the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) #4031.

13.0 PROJECT SCHEDULE

The field work is anticipated to be performed in April 2016, following approval of this RIWP by NYSDEC. A draft RIR should be submitted to the NYSDEC by June 2016.

14.0 REFERENCES

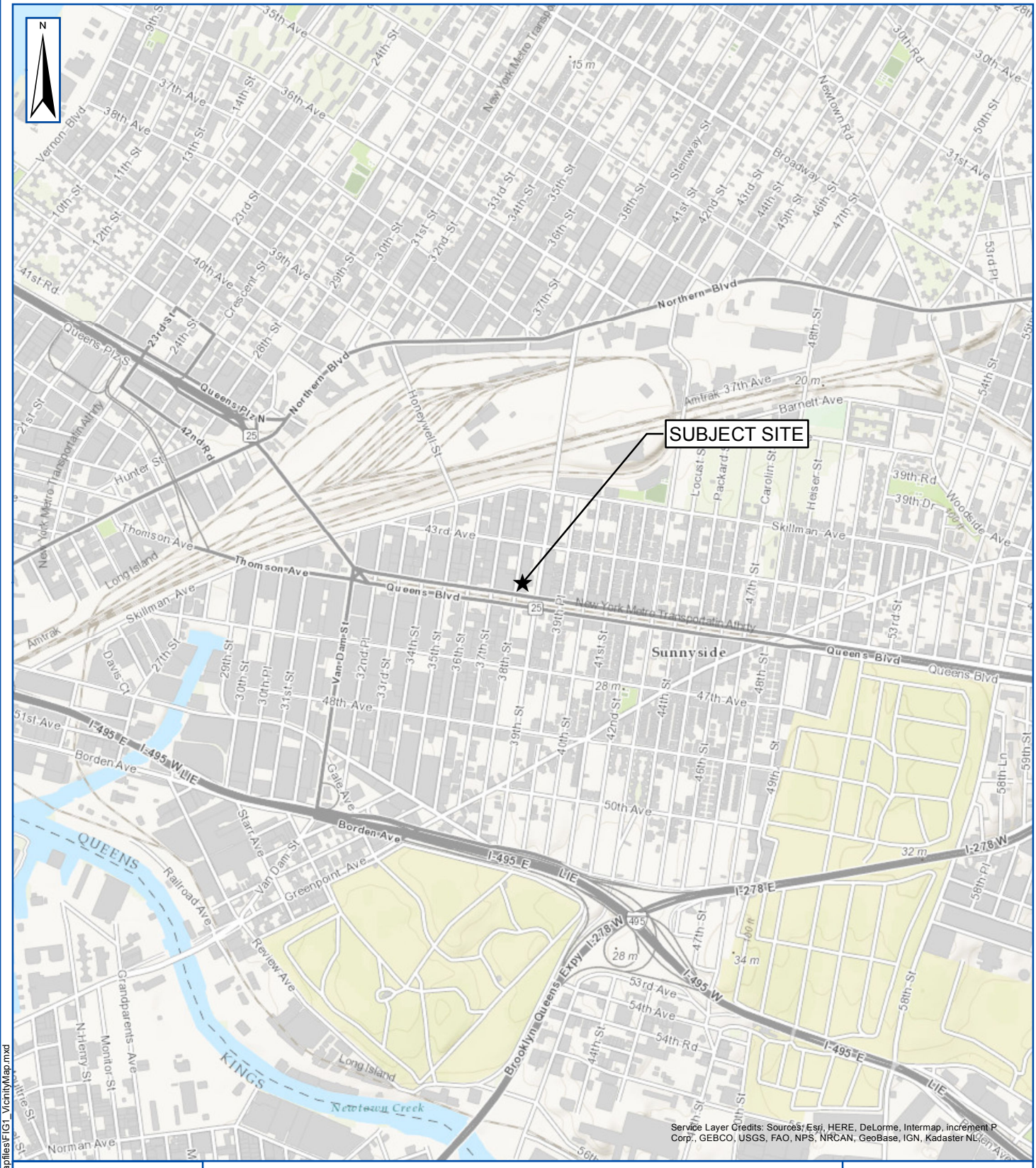
NYSDEC, DER, December 2006, 6 NYCRR Part 375 Subpart 6, Remedial Program Soil Cleanup Objectives.

NYSDEC, DER, May 2010, DER-10, Technical Guidance for Site Investigation and Remediation.

NYSDOH, October 2006 Soil Vapor Guidance Document

USEPA, June 2015 Soil Vapor Guidance Document

FIGURES



SUBJECT SITE VICINITY

38-01 QUEENS BLVD
QUEENS, NY

0 ¼ ½ ¾ 1 Miles

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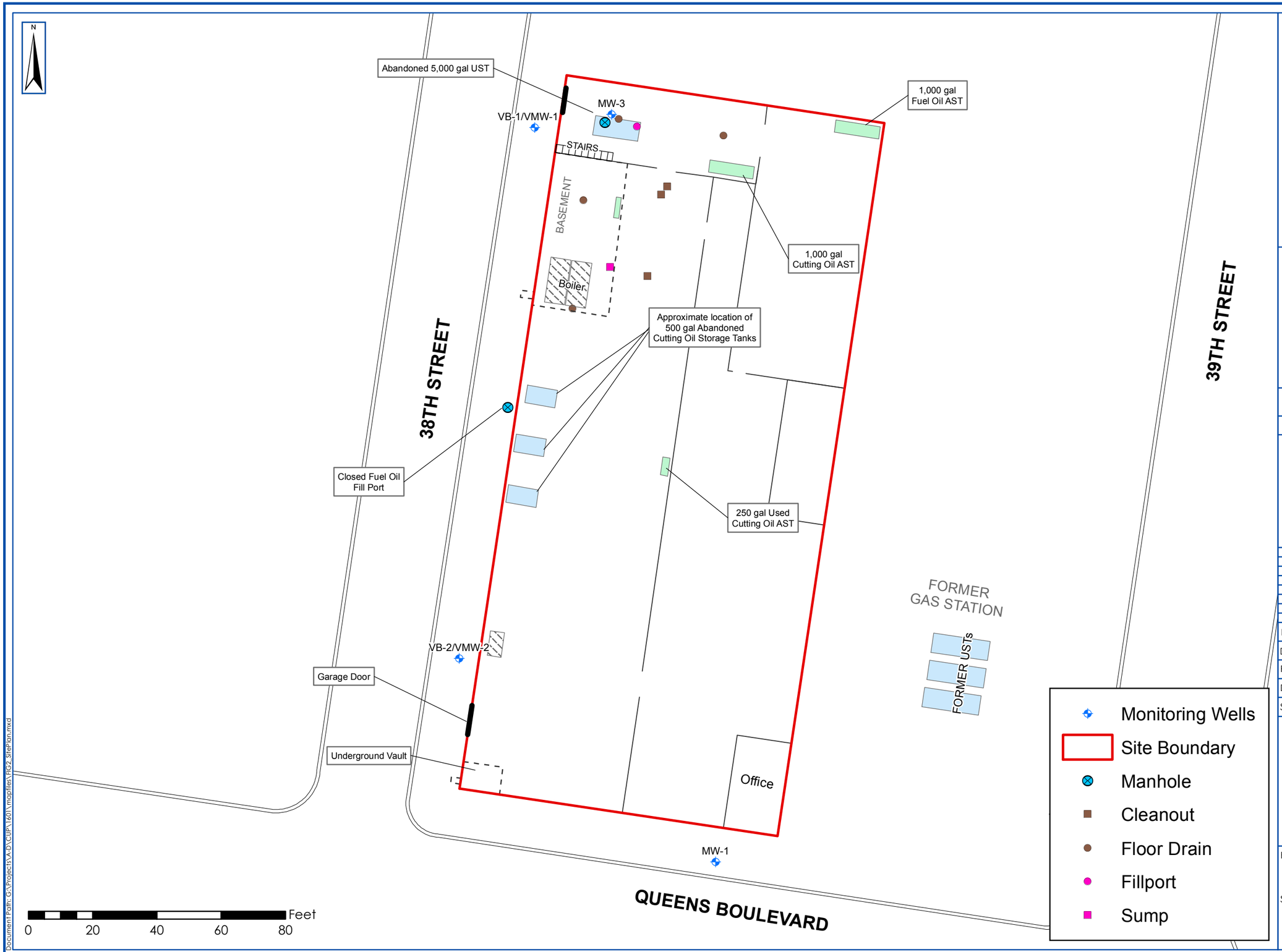
Designed by:	RK
Drawn by:	JCG
Approved by:	RK
Figure No:	1

Document Path: G:\Projects\A-D\CUP1601\mapfiles\FIG1_VicinityMap.mxd



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DRAWING INFORMATION:

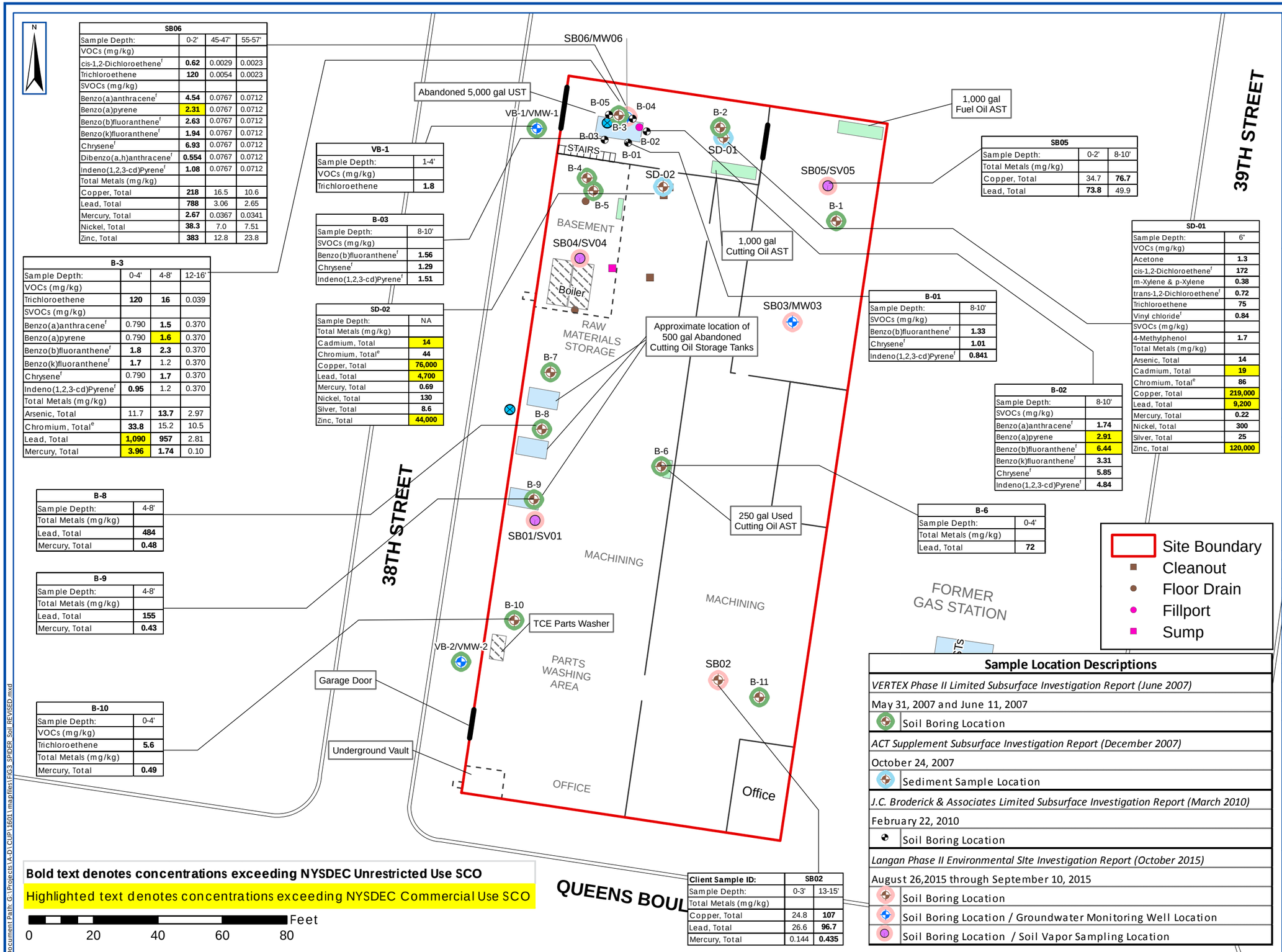
Project:	CUP1601	Designed by:	RK
Date:	1/18/2016	Drawn by:	JCG
Scale:	AS SHOWN	Approved by:	RK

SITE PLAN

38-01 QUEENS BLVD
QUEENS, NY

FIGURE NO:
2

SHEET:



SB06			
Sample Depth:	0-2'	45-47'	55-57'
VOCs (mg/kg)			
cis-1,2-Dichloroethene[f]	**0.62**	0.0029	0.0023
Trichloroethene	**120**	0.0054	0.0023
SVOCs (mg/kg)			
Benzo(a)anthracene[f]	**4.54**	0.0767	0.0712
Benzo(a)pyrene	**2.31**	0.0767	0.0712
Benzo(b)fluoranthene[f]	**2.63**	0.0767	0.0712
Benzo(k)fluoranthene[f]	**1.94**	0.0767	0.0712
Chrysene[f]	**6.93**	0.0767	0.0712
Dibenzo(a,h)anthracene[f]	**0.554**	0.0767	0.0712
Indeno(1,2,3-cd)Pyrene[f]	**1.08**	0.0767	0.0712
Total Metals (mg/kg)			
Copper, Total	**218**	16.5	10.6
Lead, Total	**788**	3.06	2.65
Mercury, Total	**2.67**	0.0367	0.0341
Nickel, Total	**38.3**	7.0	7.51
Zinc, Total	**383**	12.8	23.8

VB-1	
Sample Depth:	1-4'
VOCs (mg/kg)	
Trichloroethene	**1.8**

B-03	
Sample Depth:	8-10'
SVOCs (mg/kg)	
Benzo(b)fluoranthene[f]	**1.56**
Chrysene[f]	**1.29**
Indeno(1,2,3-cd)Pyrene[f]	**1.51**

SD-02	
Sample Depth:	NA
Total Metals (mg/kg)	
Cadmium, Total	**14**
Chromium, Total[e]	**44**
Copper, Total	**76,000**
Lead, Total	**4,700**
Mercury, Total	**0.69**
Nickel, Total	**130**
Silver, Total	**8.6**
Zinc, Total	**44,000**

B-3			
Sample Depth:	0-4'	4-8'	12-16'
VOCs (mg/kg)			
Trichloroethene	**120**	**16**	0.039
SVOCs (mg/kg)			
Benzo(a)anthracene[f]	0.790	**1.5**	0.370
Benzo(a)pyrene	0.790	**1.6**	0.370
Benzo(b)fluoranthene[f]	**1.8**	**2.3**	0.370
Benzo(k)fluoranthene[f]	**1.7**	1.2	0.370
Chrysene[f]	0.790	**1.7**	0.370
Indeno(1,2,3-cd)Pyrene[f]	**0.95**	1.2	0.370
Total Metals (mg/kg)			
Arsenic, Total	11.7	**13.7**	2.97
Chromium, Total[e]	**33.8**	15.2	10.5
Lead, Total	**1,090**	**957**	2.81
Mercury, Total	**3.96**	**1.74**	0.10

B-8	
Sample Depth:	4-8'
Total Metals (mg/kg)	
Lead, Total	**484**
Mercury, Total	**0.48**

B-9	
Sample Depth:	4-8'
Total Metals (mg/kg)	
Lead, Total	**155**
Mercury, Total	**0.43**

B-10	
Sample Depth:	0-4'
VOCs (mg/kg)	
Trichloroethene	**5.6**
Total Metals (mg/kg)	
Mercury, Total	**0.49**

SB05		
Sample Depth:	0-2'	8-10'
Total Metals (mg/kg)		
Copper, Total	34.7	**76.7**
Lead, Total	**73.8**	49.9

B-01	
Sample Depth:	8-10'
SVOCs (mg/kg)	
Benzo(b)fluoranthene[f]	**1.33**
Chrysene[f]	**1.01**
Indeno(1,2,3-cd)Pyrene[f]	**0.841**

SD-01	
Sample Depth:	6"
VOCs (mg/kg)	
Acetone	**1.3**
cis-1,2-Dichloroethene[f]	**172**
m-Xylene & p-Xylene	**0.38**
trans-1,2-Dichloroethene[f]	**0.72**
Trichloroethene	**75**
Vinyl chloride[f]	**0.84**
SVOCs (mg/kg)	
4-Methylphenol	**1.7**
Total Metals (mg/kg)	
Arsenic, Total	**14**
Cadmium, Total	**19**
Chromium, Total[e]	**86**
Copper, Total	**219,000**
Lead, Total	**9,200**
Mercury, Total	**0.22**
Nickel, Total	**300**
Silver, Total	**25**
Zinc, Total	**120,000**

B-02	
Sample Depth:	8-10'
SVOCs (mg/kg)	
Benzo(a)anthracene[f]	**1.74**
Benzo(a)pyrene	**2.91**
Benzo(b)fluoranthene[f]	**6.44**
Benzo(k)fluoranthene[f]	**3.31**
Chrysene[f]	**5.85**
Indeno(1,2,3-cd)Pyrene[f]	**4.84**

B-6	
Sample Depth:	0-4'
Total Metals (mg/kg)	
Lead, Total	**72**

Client Sample ID:	SB02	
Sample Depth:	0-3'	13-15'
Total Metals (mg/kg)		
Copper, Total	24.8	**107**
Lead, Total	26.6	**96.7**
Mercury, Total	0.144	**0.435**

Bold text denotes concentrations exceeding NYSDEC Unrestricted Use SCO

Highlighted text denotes concentrations exceeding NYSDEC Commercial Use SCO

Sample Location Descriptions

VERTEX Phase II Limited Subsurface Investigation Report (June 2007)

May 31, 2007 and June 11, 2007

Soil Boring Location

ACT Supplement Subsurface Investigation Report (December 2007)

October 24, 2007

Sediment Sample Location

J.C. Broderick & Associates Limited Subsurface Investigation Report (March 2010)

February 22, 2010

Soil Boring Location

Langan Phase II Environmental SIte Investigation Report (October 2015)

August 26,2015 through September 10, 2015

Soil Boring Location

Soil Boring Location / Groundwater Monitoring Well Location

Soil Boring Location / Soil Vapor Sampling Location

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DRAWING PREPARED FOR:

REVISION	DATE	INITIAL	COMMENTS

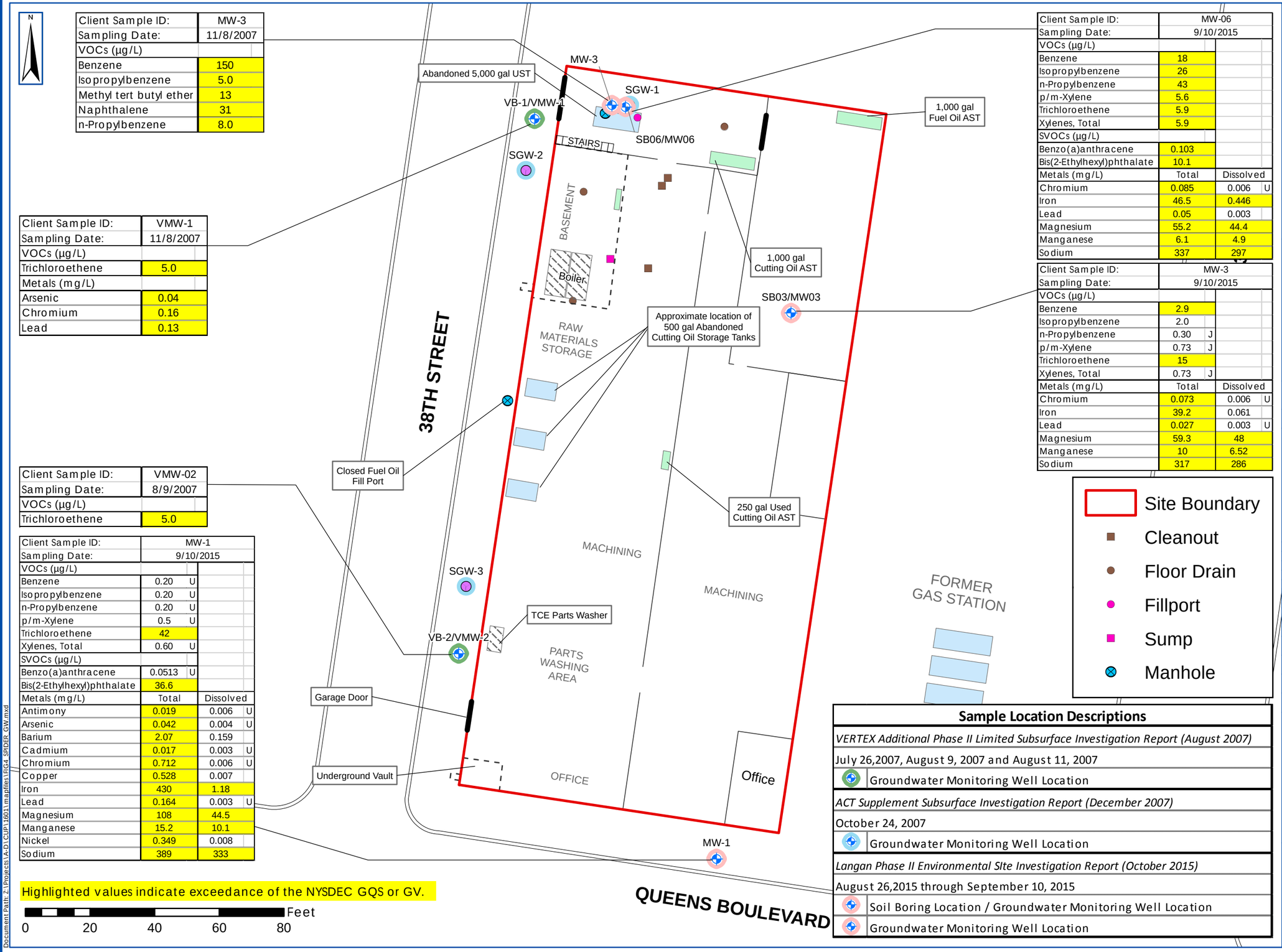
DRAWING INFORMATION:			
Project:	CUP1601	Designed by:	RK
Date:	1/29/2016	Drawn by:	JCG
Scale:	AS SHOWN	Approved by:	RK

SOIL EXCEEDANCES

38-01 QUEENS BLVD
QUEENS, NY

FIGURE NO: 3

SHEET:



Client Sample ID:	MW-3
Sampling Date:	11/8/2007
VOCs (µg/L)	
Benzene	150
Isopropylbenzene	5.0
Methyl tert butyl ether	13
Naphthalene	31
n-Propylbenzene	8.0

Client Sample ID:	VMW-1
Sampling Date:	11/8/2007
VOCs (µg/L)	
Trichloroethene	5.0
Metals (mg/L)	
Arsenic	0.04
Chromium	0.16
Lead	0.13

Client Sample ID:	VMW-02
Sampling Date:	8/9/2007
VOCs (µg/L)	
Trichloroethene	5.0

Client Sample ID:	MW-1		
Sampling Date:	9/10/2015		
VOCs (µg/L)			
Benzene	0.20	U	
Isopropylbenzene	0.20	U	
n-Propylbenzene	0.20	U	
p/m-Xylene	0.5	U	
Trichloroethene	42		
Xylenes, Total	0.60	U	
SVOCs (µg/L)			
Benzo(a)anthracene	0.0513	U	
Bis(2-Ethylhexyl)phthalate	36.6		
Metals (mg/L)	Total		Dissolved
Antimony	0.019		0.006 U
Arsenic	0.042		0.004 U
Barium	2.07		0.159
Cadmium	0.017		0.003 U
Chromium	0.712		0.006 U
Copper	0.528		0.007
Iron	430		1.18
Lead	0.164		0.003 U
Magnesium	108		44.5
Manganese	15.2		10.1
Nickel	0.349		0.008
Sodium	389		333

Client Sample ID:	MW-06		
Sampling Date:	9/10/2015		
VOCs (µg/L)			
Benzene	18		
Isopropylbenzene	26		
n-Propylbenzene	43		
p/m-Xylene	5.6		
Trichloroethene	5.9		
Xylenes, Total	5.9		
SVOCs (µg/L)			
Benzo(a)anthracene	0.103		
Bis(2-Ethylhexyl)phthalate	10.1		
Metals (mg/L)	Total		Dissolved
Chromium	0.085		0.006 U
Iron	46.5		0.446
Lead	0.05		0.003
Magnesium	55.2		44.4
Manganese	6.1		4.9
Sodium	337		297

Client Sample ID:	MW-3		
Sampling Date:	9/10/2015		
VOCs (µg/L)			
Benzene	2.9		
Isopropylbenzene	2.0		
n-Propylbenzene	0.30	J	
p/m-Xylene	0.73	J	
Trichloroethene	15		
Xylenes, Total	0.73	J	
Metals (mg/L)	Total		Dissolved
Chromium	0.073		0.006 U
Iron	39.2		0.061
Lead	0.027		0.003 U
Magnesium	59.3		48
Manganese	10		6.52
Sodium	317		286

Highlighted values indicate exceedance of the NYSDEC GQS or GV.

Sample Location Descriptions

VERTEX Additional Phase II Limited Subsurface Investigation Report (August 2007)

July 26,2007, August 9, 2007 and August 11, 2007

Groundwater Monitoring Well Location

ACT Supplement Subsurface Investigation Report (December 2007)

October 24, 2007

Groundwater Monitoring Well Location

Langan Phase II Environmental SIte Investigation Report (October 2015)

August 26,2015 through September 10, 2015

Soil Boring Location / Groundwater Monitoring Well Location

Groundwater Monitoring Well Location

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REVISION	DATE	INITIAL	COMMENTS

DRAWING INFORMATION:

Project:	CUP1601	Designed by:	RK
Date:	2/11/2016	Drawn by:	JCG
Scale:	AS SHOWN	Approved by:	RK

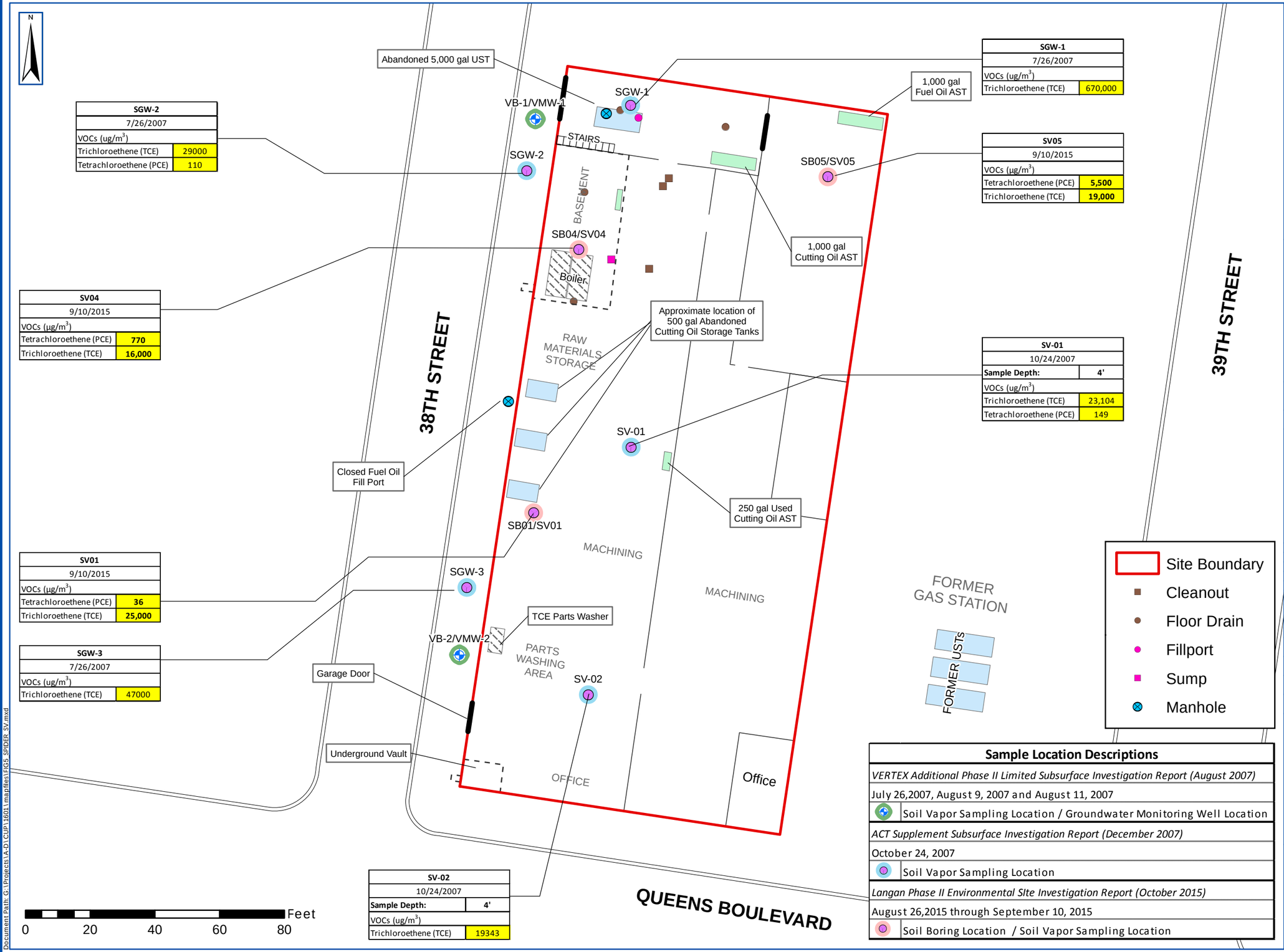
GROUNDWATER EXCEEDANCES

38-01 QUEENS BLVD
QUEENS, NY

FIGURE NO:
4

SHEET:

Document Path: Z:\Projects\A-D\CUP1601\maps\fig4_SPIDER_GW.mxd



SGW-2	
7/26/2007	
VOCs (ug/m^3)	
Trichloroethene (TCE)	29000
Tetrachloroethene (PCE)	110

SV04	
9/10/2015	
VOCs (µg/m^3)	
Tetrachloroethene (PCE)	**770**
Trichloroethene (TCE)	**16,000**

SV01	
9/10/2015	
VOCs (µg/m^3)	
Tetrachloroethene (PCE)	**36**
Trichloroethene (TCE)	**25,000**

SGW-3	
7/26/2007	
VOCs (ug/m^3)	
Trichloroethene (TCE)	47000

SV-02	
10/24/2007	
Sample Depth:	**4'**
VOCs (ug/m^3)	
Trichloroethene (TCE)	19343

SGW-1	
7/26/2007	
VOCs (ug/m^3)	
Trichloroethene (TCE)	670,000

SV05	
9/10/2015	
VOCs (µg/m^3)	
Tetrachloroethene (PCE)	**5,500**
Trichloroethene (TCE)	**19,000**

SV-01	
10/24/2007	
Sample Depth:	**4'**
VOCs (ug/m^3)	
Trichloroethene (TCE)	23,104
Tetrachloroethene (PCE)	149

Sample Location Descriptions
VERTEX Additional Phase II Limited Subsurface Investigation Report (August 2007)
July 26,2007, August 9, 2007 and August 11, 2007
Soil Vapor Sampling Location / Groundwater Monitoring Well Location
ACT Supplement Subsurface Investigation Report (December 2007)
October 24, 2007
Soil Vapor Sampling Location
Langan Phase II Environmental SIte Investigation Report (October 2015)
August 26,2015 through September 10, 2015
Soil Boring Location / Soil Vapor Sampling Location

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DRAWING INFORMATION:

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Scale:	AS SHOWN	Approved by:	RK

SOIL VAPOR EXCEEDANCES

38-01 QUEENS BLVD QUEENS, NY

FIGURE NO: 5

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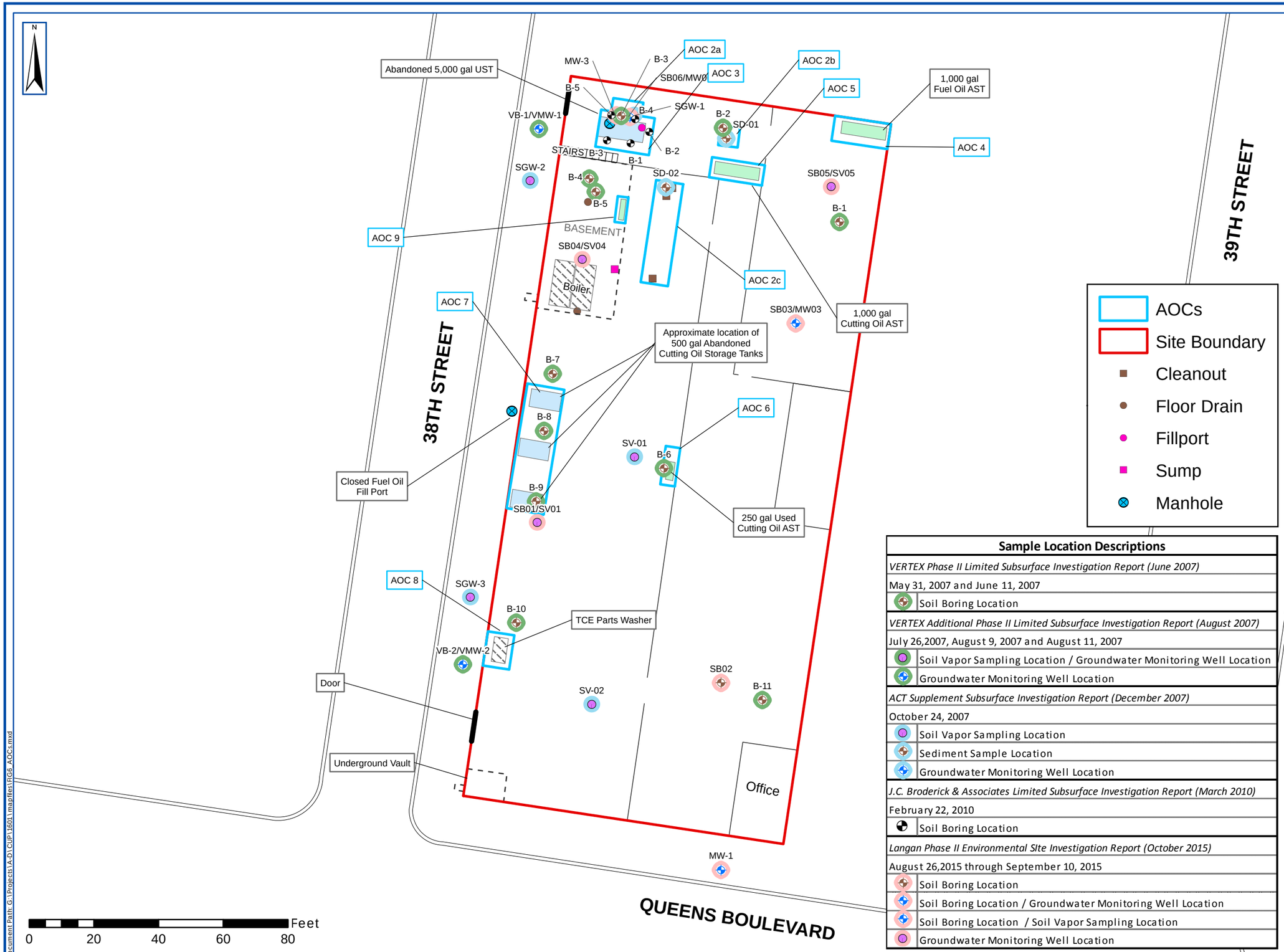

AOCs
Site Boundary
Cleanout
Floor Drain
Fillport
Sump
Manhole

Sample Location Descriptions

VERTEX Phase II Limited Subsurface Investigation Report (June 2007)

May 31, 2007 and June 11, 2007

- Soil Boring Location

VERTEX Additional Phase II Limited Subsurface Investigation Report (August 2007)

July 26,2007, August 9, 2007 and August 11, 2007

- Soil Vapor Sampling Location / Groundwater Monitoring Well Location
- Groundwater Monitoring Well Location

ACT Supplement Subsurface Investigation Report (December 2007)

October 24, 2007

- Soil Vapor Sampling Location
- Sediment Sample Location
- Groundwater Monitoring Well Location

J.C. Broderick & Associates Limited Subsurface Investigation Report (March 2010)

February 22, 2010

- Soil Boring Location

Langan Phase II Environmental Site Investigation Report (October 2015)

August 26,2015 through September 10, 2015

- Soil Boring Location
- Soil Boring Location / Groundwater Monitoring Well Location
- Soil Boring Location / Soil Vapor Sampling Location
- Groundwater Monitoring Well Location

PWGC
Strategic Environmental and Engineering Solutions
P.W. GROSSER CONSULTING ENGINEER AND HYDROGEOLOGIST, P.C.
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DRAWING PREPARED FOR:

REVISION	DATE	INITIAL	COMMENTS

DRAWING INFORMATION:

Project:	CUP1601	Designed by:	RK
Date:	1/18/2016	Drawn by:	JCG
Scale:	AS SHOWN	Approved by:	RK

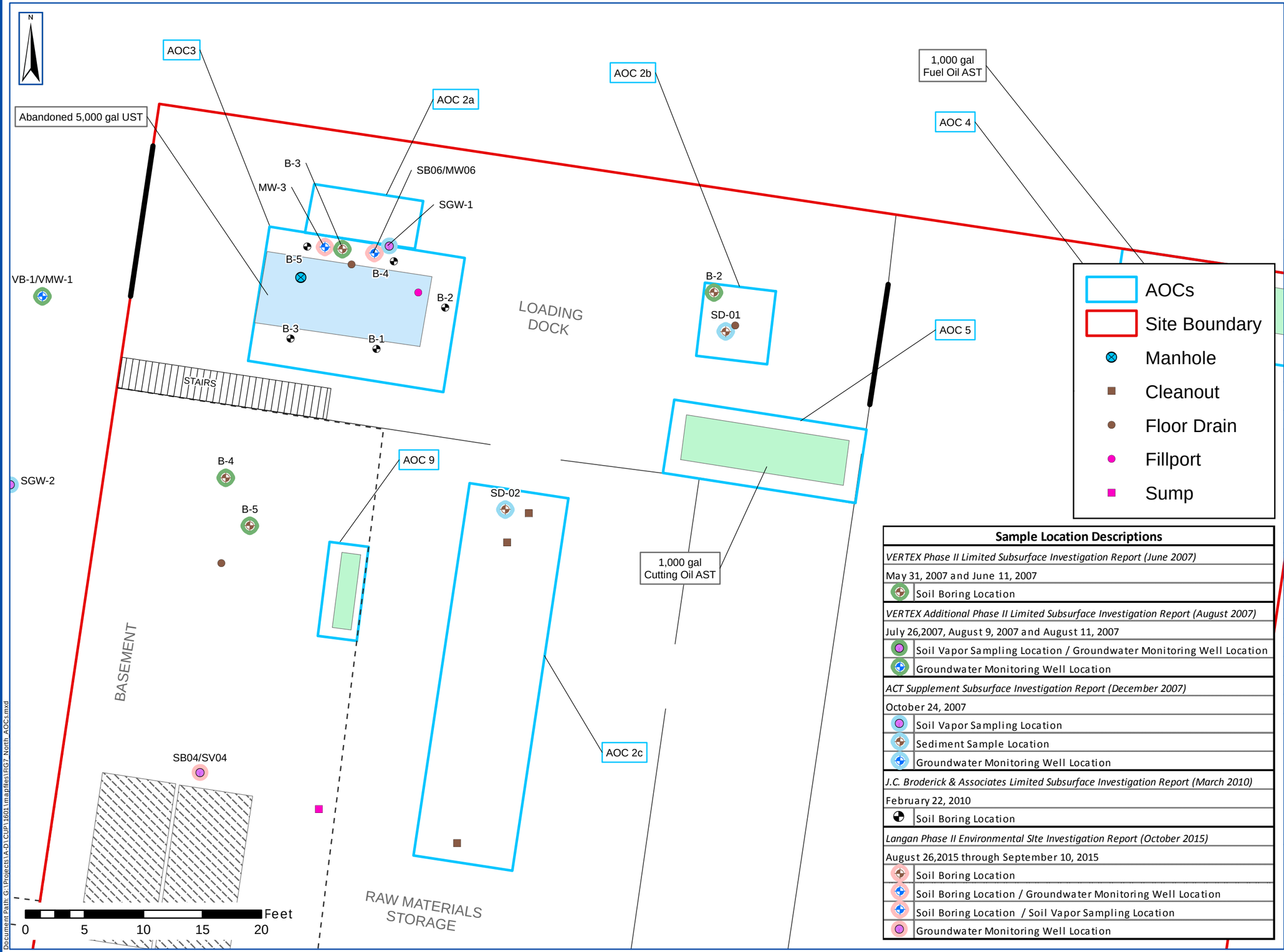
AREAS OF CONCERN

38-01 QUEENS BLVD
QUEENS, NY

FIGURE NO:
6

SHEET:

Document Path: G:\Projects\AD\CUP1601\mapfiles\FIG6_AOCs.mxd



Sample Location Descriptions	
VERTEX Phase II Limited Subsurface Investigation Report (June 2007)	
May 31, 2007 and June 11, 2007	
	Soil Boring Location
VERTEX Additional Phase II Limited Subsurface Investigation Report (August 2007)	
July 26,2007, August 9, 2007 and August 11, 2007	
	Soil Vapor Sampling Location / Groundwater Monitoring Well Location
	Groundwater Monitoring Well Location
ACT Supplement Subsurface Investigation Report (December 2007)	
October 24, 2007	
	Soil Vapor Sampling Location
	Sediment Sample Location
	Groundwater Monitoring Well Location
J.C. Broderick & Associates Limited Subsurface Investigation Report (March 2010)	
February 22, 2010	
	Soil Boring Location
Langan Phase II Environmental SIte Investigation Report (October 2015)	
August 26,2015 through September 10, 2015	
	Soil Boring Location
	Soil Boring Location / Groundwater Monitoring Well Location
	Soil Boring Location / Soil Vapor Sampling Location
	Groundwater Monitoring Well Location

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Scale:	AS SHOWN	Approved by:	RK

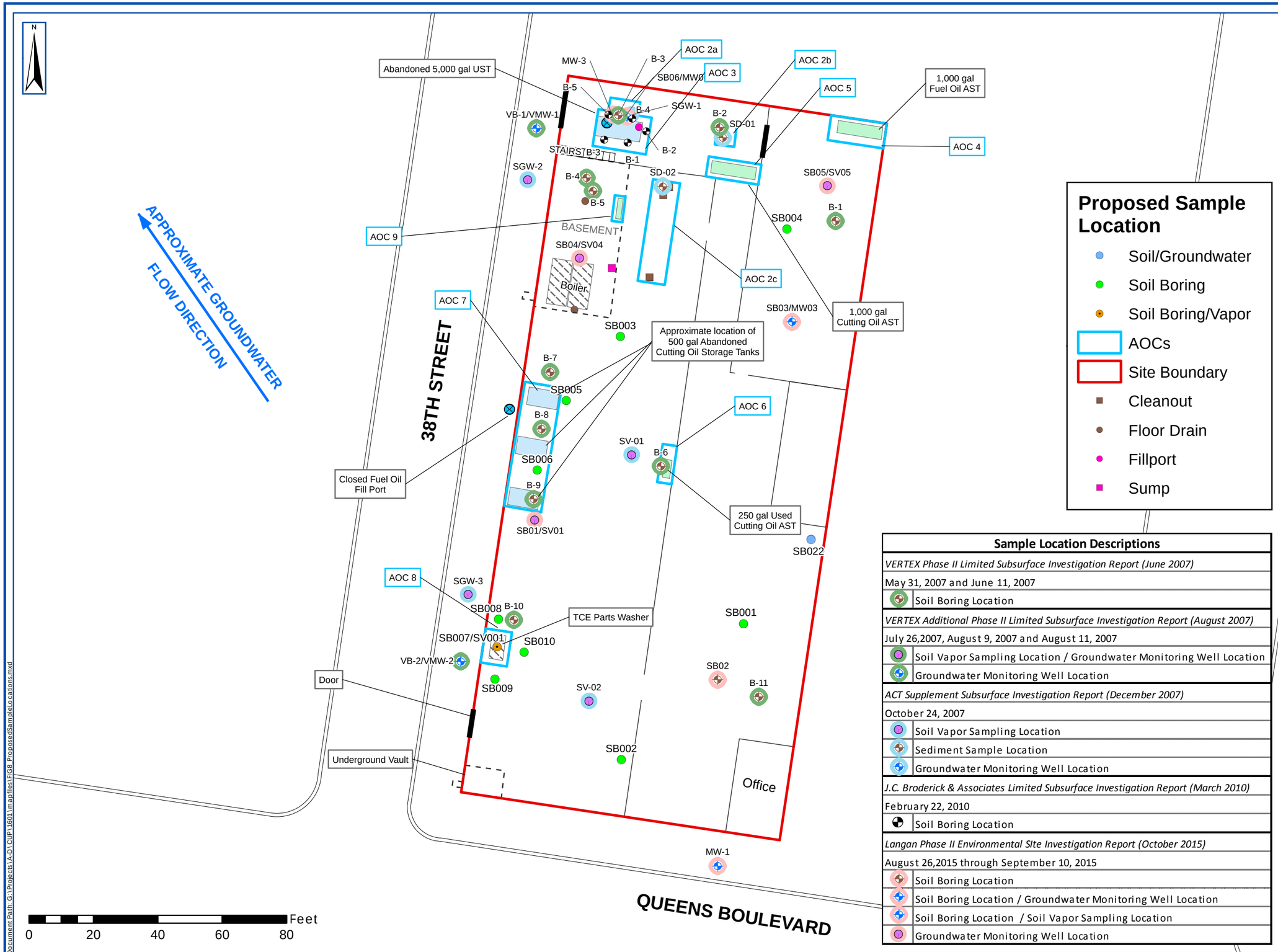
AREAS OF CONCERN NORTH DETAIL

38-01 QUEENS BLVD
QUEENS, NY

FIGURE NO:
7

SHEET:

Document Path: G:\Projects\A-D\CUP1601\mapfiles\FIG7_North_AOCs.mxd



Proposed Sample Location

- Soil/Groundwater
- Soil Boring
- Soil Boring/Vapor
- AOCs
- Site Boundary
- Cleanout
- Floor Drain
- Fillport
- Sump

Sample Location Descriptions

VERTEX Phase II Limited Subsurface Investigation Report (June 2007)
May 31, 2007 and June 11, 2007
Soil Boring Location
VERTEX Additional Phase II Limited Subsurface Investigation Report (August 2007)
July 26,2007, August 9, 2007 and August 11, 2007
Soil Vapor Sampling Location / Groundwater Monitoring Well Location
Groundwater Monitoring Well Location
ACT Supplement Subsurface Investigation Report (December 2007)
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Soil Vapor Sampling Location
Sediment Sample Location
Groundwater Monitoring Well Location
J.C. Broderick & Associates Limited Subsurface Investigation Report (March 2010)
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Soil Boring Location
Soil Boring Location / Groundwater Monitoring Well Location
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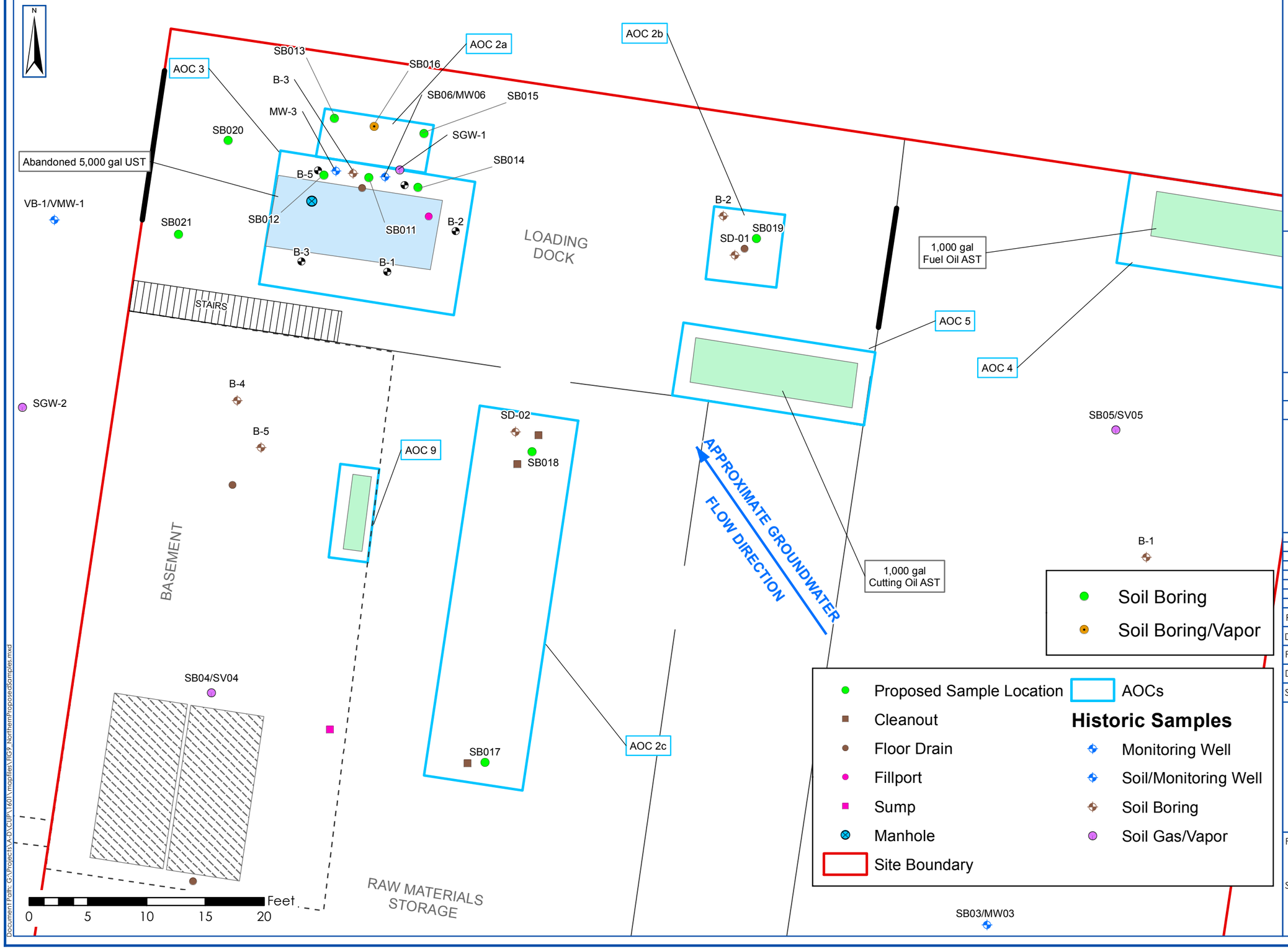
Project:	CUP1601	Designed by:	RK
Date:	1/18/2016	Drawn by:	JCG
Scale:	AS SHOWN	Approved by:	RK

PROPOSED SOIL BORING & MONITORING WELL LOCATIONS
38-01 QUEENS BLVD
QUEENS, NY

FIGURE NO: 8

SHEET:

Document Path: G:\Projects\A-D\CUP1601\mapfiles\1568 ProposedSampleLocations.mxd



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REVISION	DATE	INITIAL	COMMENTS

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Date:	1/18/2016	Drawn by:	JCG
Scale:	AS SHOWN	Approved by:	RK

PROPOSED SOIL BORING & MONITORING WELL LOCATIONS NORTHERN AOCs

38-01 QUEENS BLVD
QUEENS, NY

FIGURE NO:

9

SHEET:

TABLES

Table 1
Summary of Proposed Sampling Locations and Analysis

Location	Matrix	Sample Depth	Analytical Parameters	Sampling Methods	Rationale
SB001	Soil / Soil Vapor	Soil samples as necessary based on field screening to 20 ft bgs; soil vapor sample at 22'	VOCs, SVOCs, Metals, Pesticides, PCBs / TO15	Geoprobe	Characterize Historic Fill Material, Soil Vapor
SB002 Through SB004	Soil	Soil samples as necessary based on field screening to approx 20 ft bgs	VOCs, SVOCs, Metals, Pesticides, PCBs	Geoprobe	Characterize Historic Fill Material
SB005	Soil	2 foot section below bottom of USTs, add additional samples as necessary based on field screening to 12 ft bgs	VOCs (CP-51) / SVOCs (CP-51)	Geoprobe	Supplement Soil Quality Beneath 3 Abandoned 500-gallon UST Cluster
SB006	Soil	2 foot section below bottom of USTs, add additional samples as necessary based on field screening to 12 ft bgs	VOCs, SVOCs, Metals, Pesticides, PCBs	Geoprobe	Supplement Soil Quality Beneath 3 Abandoned 500-gallon UST Cluster, Characterize Historic Fill Material
SB007	Soil / Soil Vapor	Soil samples as necessary based on field screening to 20 ft bgs; soil vapor sample at 22'	VOCs	Geoprobe	Characterize TCE Parts Washer, Soil Vapor
SB008 Through SB009	Soil	0-2', add additional samples as necessary based on field screening (minimum 12 ft bgs)	VOCs	Geoprobe	Characterize TCE Parts Washer
SB0010	Soil	0-2', add additional samples as necessary based on field screening (minimum 12 ft bgs)	VOCs, SVOCs, Metals, Pesticides, PCBs	Geoprobe	Characterize TCE Parts Washer, Characterize Historic Fill Material
SB011 Through SB015	Soil	Soil samples as necessary based on field screening (minimum 12 ft bgs)	VOCs	Geoprobe	Delineate TCE Impacts
SB016	Soil / Soil Vapor	Soil samples as necessary based on field screening to 20 ft bgs; soil vapor sample at 22'	VOCs, SVOCs, Metals, Pesticides, PCBs / TO15	Geoprobe	Delineate TCE Impacts, Characterize Historic Fill Material, Soil Vapor
SB017 through SB019	Soil	2 foot section below bottom of floor drain, add additional samples as necessary based on field screening (minimum 12 ft bgs)	VOCs, SVOCs, Metals, Pesticides, PCBs	Geoprobe	Characterize Soil Quality Beneath Floor Drains / Cleanouts, Characterize Historic Fill Material
SB020	Soil	2 foot section below bottom of UST, add additional samples as necessary based on field screening (approx 20 ft bgs)	VOCs, SVOCs, Metals, Pesticides, PCBs / TO15	Geoprobe	Supplement Existing Data Around 5,000-gallon UST, Characterize Historic Fill Material
SB021	Soil	Soil boring into saturated zone, samples as necessary based on field screening (approx 48-50 ft bgs)	VOCs, SVOCs, Metals, Pesticides, PCBs	Geoprobe	Supplement Existing Data Around 5,000-gallon UST, Characterize Historic Fill Material
SB022	Soil / Groundwater	Soil boring into saturated zone, samples as necessary based on field screening (approx 48-50 ft bgs)	VOCs, SVOCs, Metals, Pesticides, PCBs	Geoprobe	Characterize Groundwater and Historic Fill Material
VMW-1, VMW-2, MW-1, MW-3, MW03, MW06	Groundwater	Approx. 48-50 ft bgs	VOCs, SVOCs, Metals (total & Dissolved), Pesticides, PCBs, MNA Parameters	Low Flow	Characterize groundwater quality

APPENDIX A

RESUMES

PWGC
Strategic Environmental Engineering Solutions

Richard T. Kampf, PG - Director, NYC Office

Professional Experience
PWGC: 2014 to present
PRIOR: 16 years

Education
- BS, Geology, College of William & Mary, Williamsburg, VA
- Graduate Certificate, Real Estate Finance & Investment, 2008, New York University
- Hydrogeology, University of Stony Brook
- City and Regional Planning, Pratt Institute

Areas of Expertise
- Environmental Risk Management
- Environmental Due Diligence
- Real Estate Advisory Services
- Contaminant Fate and Transport
- Hydrogeology
- Remedial Alternatives Analysis
- Regulatory Negotiation
- Litigation Support

Affiliations
- Urban Land Institute
- National Groundwater Association
- Center for Watershed Protection
- New York State Wetlands Forum
- New Jersey Future
- Gowanus Canal Conservancy - Secretary, Executive Committee Member

Certifications and Registrations
- Licensed Professional Geologist – Washington State
- Gold Certified Professional - New York City Office of Environmental Remediation
- OSHA 40-Hr HAZWOPER
- OSHA 10-Hr Construction Industry Outreach

Profile

Richard T. Kampf, PG is the Director of the New York City office for P.W. Grosser Consulting. He is a Professional Geologist with over 15 years of experience providing environmental consulting, due diligence, risk management, and real estate advisory services to developers, real property owners and investors, Fortune 100 companies, municipalities, regulatory agencies, and attorneys. Richard's proven success in providing cost-beneficial value-added services is rooted in his commitment to achieving client objectives, his practical approach to environmental risk management, and his creative leadership.

Richard tailors his approach for each project based on site-specific conditions and client objectives. He utilizes his expertise in hydrogeology and contaminant fate and transport to develop and refine site conceptual models based upon multiple lines of technical evidence to support strategic negotiations. He has successfully utilized this approach to meet client's goals in several environmental dispute and litigation support cases and leverages his refined regulatory negotiation skills to gain the approval of practical and cost-beneficial remedial alternatives.

Richard performs, directs, and oversees the investigation and remediation of small to medium sized spill, e-designation, and brownfield sites within various programs, including the New York City Voluntary Cleanup Program (VCP) and New York State Brownfield Cleanup Program (BCP). As such, he works closely with, and under the oversight of, various local, state, and federal agencies including NYCOER, NYSDEC, NJDEP, LSRPs, and USEPA. He has led numerous complex, large-scale, multi-phase remedial investigation and remedial actions at urban brownfield and Superfund redevelopment sites throughout the New York metropolitan area, including numerous waterfront redevelopment projects.

Richard also directs and performs Phase I and Phase II Environmental Site Assessments (ESAs), Preliminary Assessments and Site Investigations (PA/SI), and Property Condition Assessments (PCAs), and provides transactional support, including cost to cure estimates, to support real estate transactions and limit client liabilities. In addition, Richard works to integrate environmental risk management practices with watershed, waterfront, and land use planning, stormwater and natural resource management, and sustainable development to meet the needs and objectives of clients and stakeholders in urban environments.

Richard serves on the Board of Directors and sits on the Executive Committee for the Gowanus Canal Conservancy, a 501(c)(3) community-based not-for-profit organization based in Brooklyn, New York. The Gowanus Canal Conservancy works to improve water quality, preserve open space, and promote public access to the ecological, cultural, and recreational resources of the Gowanus Canal and its watershed.

Richard Kampf, PG - Director, NYC Office

Professional Experience

Environmental Consulting & Risk Management

Richard provides environmental consulting and risk management services to real estate developers, real property owners and investors, Fortune 100 companies, PRP groups, municipalities, and regulatory agencies. He directs and oversees teams of professionals in the performance of environmental due diligence, remedial investigations, remedial alternatives analyses, and the preparation of client deliverables. Richard manages remediation and redevelopment projects of all sizes, from small to medium sized spill, e-designation sites, and New York State Brownfield cleanup Program (BCP) sites in New York City to complex, large-scale, multi-phase remedial investigation and remedial actions at state and federal Superfund redevelopment sites. As project coordinator for PRPs and / or PRPs groups on multiple Superfund sites, Richard works closely with experienced environmental attorneys to manage potential environmental risks and liabilities and prepare sensitive and strategic communications to achieve client objectives. He has performed directed, and overseen the investigation and remediation of LNAPLs and DNAPLs, petroleum hydrocarbons, chlorinated aliphatic, coal tar, creosote, PCBs, historic fill and metals in all environmental media.

Environmental Due Diligence and Real Estate Advisory Services

Richard has performed and overseen dozens of environmental due diligence investigations, including Phase I and Phase II Environmental Site Assessments (ESA), as well as Preliminary Assessments and Site Investigations (PA/SI), throughout the New York and New Jersey metropolitan area. He manages the investigation and remediation of small to medium sized e-designation sites in New York City and has led numerous complex, large-scale, multi-phase remedial investigations and remedial actions at urban redevelopment and waterfront sites throughout the New York metropolitan area. Richard provides cost-beneficial real estate advisory services to manage potential client liabilities and provide purchasers with the information and protection they need to move forward with a real estate transaction. He pays attention to the details that are important to a prospective buyer while providing deliverables and communicating with the client in a timely manner in order to meet key deadlines and schedule needs.

Owner's Representative Services

Richard acts as owner's representative for the redevelopment of contaminated properties. He has led contractor bid and selection processes in connection with the abatement, demolition, decommissioning, site preparation, and remediation of numerous redevelopment sites in New York and New Jersey. As the eyes and ears for the developer, Richard directs and oversees contractors to ensure that the contracted activities are performed consistent with agency-approved work plans, relevant contracts and agreements, and applicable laws and regulations and are completed on time and within budget.

Technical Support for Environmental Dispute Resolution

Richard provides technical support on a variety of environmental dispute resolution cases. He works closely with project attorneys to develop technical and strategic approaches to limit client liabilities in connection with source apportionment and cost allocation for environmental liabilities. He prepares allocation reports that present multiple lines of evidence to distinguish sources and manage liabilities on behalf of commercial and industrial clients. Richard also provides peer review for mediating attorneys in connection with the evaluation of alternative contaminant fate and transport scenarios and environmental forensic arguments.

Watershed and Stormwater Management and Evaluation

Richard investigates and evaluates stormwater and wastewater infrastructure, prepares stormwater management and pollution prevention plans and permits, and designs and oversees the construction of wastewater / stormwater infrastructure as part of contaminant source and fate and transport investigations and remediation projects. Richard evaluates stormwater infrastructure in connection with long-term watershed planning initiatives in urban, suburban, and coastal environments. Richard works with communities and not-for-profit organizations to identify and evaluate opportunities and alternatives for infrastructure improvements and / or interventions to help reduce combined sewer overflows (CSOs) and mitigate the impacts of storm surge and flooding.

Richard Kampf, PG - Director, NYC Office

NOTABLE PROJECTS

Environmental Due Diligence, Phelps Dodge Superfund Site
Real Estate Developer, Maspeth, Queens, New York

Responsible for directing and overseeing performance of a comprehensive environmental due diligence investigations and reporting in connection with the redevelopment of a portion of the former Phelps Dodge Superfund Site in Maspeth, Queens, New York. The properties, consisting of portions of a former copper refinery, are being remediated under an Order on Consent and Record of Decision with NYSDEC. The NYSDEC-approved remedy for the properties includes capping and groundwater treatment and monitoring. The capping plan is being coordinated with New York State Department of Transportation (NYSDOT) which has taken multiple easements on the properties in connection with the construction of the new Kosciuszko Bridge. Responsibilities include developing and executing the overall environmental risk management strategy for the client, providing support to attorneys on contract negotiations with the seller with respect to retained liabilities and potential reopeners, and working with the architect to integrate the redevelopment plan with the remedial requirements. Additional activities include supporting the buyer's risk management objective to limit subsurface excavation, supporting attorney negotiations with the seller regarding subsurface investigations, coordinating with NYSDOT regarding future property usage and rights, directing and coordinating geotechnical and civil engineering review, cost estimating, and design activities, and directing and overseeing Phase I ESA activities and reporting.

Environmental Due Diligence, Multiple City Blocks
Real Estate Developer, Irvington, New Jersey

Responsible for directing and overseeing performance of environmental due diligence investigations and reporting for over 30 properties encompassing multiple city blocks within a key area targeted for redevelopment in Jersey City, New Jersey. Due diligence reporting met the requirements of Phase I and Phase II Environmental Site Assessments (ESA) as put forth by ASTM, as well as the requirements for performing Preliminary Assessments and Site Investigations (PA/SI) as put forth by NJDEP. The due diligence process addressed historical industrial uses of numerous properties, including gasoline service station and dry cleaning operations, as well as the potential historic use of chromate ore processing residue (COPR). Engaged a local environmental attorney with experience working with the Jersey City Redevelopment Agency (JCRA) to designate our client as developer of the properties within the context of the JCRA redevelopment plan. Led negotiations with NJDEP in the preparation of an Administrative Order on Consent (ACO) to manage potential client liabilities in connection with the acquisition of a former gasoline service station with a long history of regulatory non-compliance

Environmental Due Diligence, Former Fuel Oil Terminal
Real Estate Developer, Newark, New Jersey

Responsible for directing and overseeing performance of environmental due diligence investigation and reporting in connection with a former fuel oil terminal in Newark, New Jersey. The property had a confirmed release of petroleum hydrocarbons as well as chlorinated aliphatic hydrocarbons in groundwater from an up-gradient, off-property source. Performed supplemental due diligence and prepared costs estimates for closing out Areas of Concern (AOCs) and achieving regulatory compliance to support the client's negotiations with the seller and its successful acquisition of the property.

Subsurface Investigation & Remediation / Liability Management, Redevelopment
Real Estate Developer, Brooklyn, New York

Provided risk management and real estate advisory services in connection with the redevelopment of a former industrial property into a six-story residential condominium in Williamsburg, Brooklyn. Responsible for directing and overseeing the remedial investigation and remedial actions under the oversight of the NYC Mayor's Office of Environmental Remediation (OER). The property had a history of gas production and the presence of historic fill containing arsenic, lead, and copper at concentrations well-above acceptable standards. Developed a technical and strategic approach based upon an accurate a conceptual site model and multiple lines of technical evidence to successfully negotiate a risk-based remedial action plan that involved pre-negotiated hot spot removal of soils containing unusually high concentrations of metals without the potential for additional soil removal requirements based on sampling results. The approach provided the client with additional certainty regarding cost and schedule and resulted in cost savings in connection with soil excavation and related transportation and disposal fees.

Richard Kampf, PG - Director, NYC Office

Environmental Due Diligence, Redevelopment
Real Estate Developer, Brooklyn, New York

Directed and oversaw environmental due diligence investigation and reporting in connection with a commercial property consisting of six parcels with a history of electronics manufacturing and automotive repair / body work operations in Brooklyn, New York. The property was successfully acquired and is targeted for re-use as a medical facility.

Environmental Due Diligence, Charter School
Not-for-Profit Developer, Brooklyn, New York

Provided technical support in connection with the due diligence Phase I / Phase II ESA), acquisition, and redevelopment of eight commercial lots into a charter school in Crown Heights, Brooklyn. The properties consisted of a former automotive repair and furniture repair / manufacturing facilities. The Phase II ESA and supplemental environmental investigation was performed to reduce uncertainty in connection with environmental mitigation, construction schedule, and related costs. A remedial action work plan (RAWP) was prepared to mitigate risk, reduce costs, and prevent construction delays within a strict demolition and construction schedule. The project was performed in partnership with the New York City School Construction Authority (NYC SCA).

Subsurface Investigation & Remediation / Liability Management, Retail Shopping Center
Asset Management Firm, Irvington, New Jersey

Responsible for directing and overseeing the remedial investigation and remedial actions in connection with a site with a 20-year regulatory history in connection with multiple heating oil UST releases and dissolved-phase chlorinated aliphatic hydrocarbons (CAHs) in groundwater. Applied for and obtained extension of May 2014 RI completion deadline. Developed technical and strategic approach that significantly reduced client's costs by utilizing deed restrictions rather than performing unnecessary soil excavation. Achieved soil-only Response Action Outcome within 12 months.

Subsurface Investigation & Remediation / Liability Management, Industrial Business Park
Property Owner, Whippany, New Jersey

Responsible for directing and overseeing the remedial investigation and remedial actions in connection with heating oil UST release in advance of the sale of the property. Developed technical and strategic approach for a remedial strategy that saved client $500K+ by avoiding unnecessary soil excavation and utilizing monitored natural attenuation and a CEA for groundwater in close proximity to the Whippany River. Provided technical support for cost recovery from insurance carrier. Provided technical and strategic support for attorney-led negotiations in connection with an off-property source of a dissolved-phase chlorinated solvent groundwater plume that had migrated onto the client's property. Established multiple lines of evidence to support an alternative site conceptual model which demonstrated that leaking sanitary and stormwater infrastructure at the adjacent property was the most likely source of the dissolved-phase chlorinated solvent groundwater plume onto the client's property. Client is suing to recover costs / damages in excess of $1MM based upon environmental findings.

Stormwater Infrastructure / Watershed Planning, Gowanus Canal
Not-for-Profit Organization, Brooklyn, New York

Provided peer-review and technical advisory services in connection with the design, construction, and monitoring of a chain of bioswales (rain gardens) in the Gowanus Canal watershed. Evaluated opportunities and challenges in connection with reducing combined sewer overflows (CSOs) and mitigating the potential for storm surge and flooding within the Gowanus Canal watershed. Investigated and evaluated watershed-level hydrology, low-impact development alternatives, potential green and grey stormwater infrastructure improvements and interventions, and climate resiliency and adaptation as part of a visioning process for long-term waterfront and watershed planning. Evaluated opportunities for incentivizing investment in stormwater infrastructure including innovative stormwater financing and public-private partnerships.

Richard Kampf, PG - Director, NYC Office

Subsurface Investigation & Remediation / Liability Management, Active Fuel Oil Terminal
Property Owner, Brooklyn, New York

Responsible for directing and overseeing remedial investigation and in connection with release of petroleum hydrocarbon-related materials at an active fuel oil terminal located on Gravesend Bay. Developed and executed a strategy to manage client's liability in connection with light non-aqueous phase liquid (LNAPL) that had allegedly migrated from a major oil storage facility (MOSF) onto an adjacent property that was being redeveloped. Established multiple lines of evidence to support an alternative site conceptual model which raised uncertainty concerning the source of the petroleum hydrocarbons on the adjacent property. Confirmed that the LNAPL was limited in volume and extent, immobile, and did present any unacceptable risks to human health or the environment thereby rendering unnecessary NYSDEC's requirement to excavate over 10,000 cubic yards of soil at a projected cost of over $2MM. Negotiated an alternative remedial action for the adjacent property that was projected to cost less than $100K, which benefitted the adjacent property and NYSDEC while eliminating client from liabilities at the adjacent property. Investigated and evaluated stormwater infrastructure, and included an updated stormwater management plan, as part of a sustainable groundwater remedy. On-property remedy also proposed the use of solar powered skimmers to address LNAPL.

Project Coordination / Liability Management, Quanta Resources Superfund Site
PRP Group, Edgewater, New Jersey

Provided technical and strategic environmental risk management for multi-member PRP group in connection with the investigation and selection of a remedy for a former coal tar processing plant, sulfuric acid plant, and other industrial uses, under CERCLA. Provided peer review in connection with site characterization and development of remedial alternatives to address dissolved arsenic and dissolved and non-aqueous phase coal tar constituents in groundwater. Instrumental in developing the overall NAPL remedy involving in-situ stabilization and solidification of shallow coal tar and arsenic hot spots and installation of a reactive sediment cap within tidal mud flats in the Hudson River. Developed and executed a strategy for obtaining approval from NJDEP for a Technical Impracticability Waiver of groundwater ARARs. Developed and presented an approach that was instrumental in convincing EPA to support the preservation of an historic building located within the Superfund site in a manner that protects human health. Oversaw preparation of technical work plans and sensitive and strategic deliverables in connection with source-apportionment, cost allocation, and settlement negotiations for the upland portion of the site as well the adjacent surface water body and associated sediments. Coordinated the preparation of an allocation report, utilizing Gore factors and other allocation criteria, based on historical operations, release scenarios, and key chemical forensic characteristics resulting in a cash-out settlement which significantly limited client's future potential liabilities at an extremely low percentage of total costs and with limited additional premium.

Project Coordination / Liability Management, Quanta Resources Superfund Site
PRP Group, Long Island City, New York

Provided technical and strategic environmental risk management for multi-member PRP group in connection with a former oil recycling facility in the New York State Superfund & Brownfield Cleanup Programs. Successfully negotiated a remedy with sufficient flexibility to accommodate the significant uncertainty surrounding future redevelopment plans and address the concerns of multiple stakeholders. Directed and oversaw LNAPL remedy and the development of risk management strategies in connection with off-property vapor intrusion concerns. Oversaw the decommissioning and demolition of the facility which included the removal and disposal of a one million gallon capacity above-ground tank farm, associated piping, and asbestos-containing brick buildings, air monitoring, tire disposal, crushing and on-site beneficial reuse of concrete structures, segregation of soils suitable for on-site beneficial reuse, site grading, and stormwater management planning. Obtained regulatory approval for an interim property use which included the preparation of a stormwater management plan consistent with the site remedy and future potential re-use.

Technical Support for Liability Mediation, Fuel Oil Terminal
Mediating Attorney, Cold Springs, New York

Provided technical support to mediating attorney on a multiparty settlement and cost-sharing agreement in connection with a wide variety of co-mingled petroleum product plumes of varying age. Critically reviewed PRP advocacy materials, including technical presentations and position papers, site conceptual models, constituent fate and transport mechanisms, and chemical forensics. Prepared technical questions for experts to help resolve discrepancies among alternative environmental forensic arguments and fate and transport scenarios for LNAPL and dissolved-phase constituents.

Richard Kampf, PG - Director, NYC Office

Subsurface Investigation & Remediation, Active Dry Cleaning Facility and Retail Shopping Center
Asset Management Firm, Great Neck, New York

Directed and oversaw the investigation of chlorinated aliphatic hydrocarbon (CAH) vapors in sub-slab soil gas beneath an active dry cleaning facility and retail shopping center in the New York State Inactive Hazardous waste (Superfund) Program. Directed and oversaw the design of a sub-slab depressurization system and site reclassification.

Owner's Representative / Litigation Support, Former Manufactured Gas Plant
Real Estate Developer, First Avenue, New York, New York

Provided peer review and field oversight in connection with the abatement, demolition, decommissioning, and remediation of a former steam generating plant, manufacturing gas plant, and former fuel depot located on multiple properties encompassing nine-acres under the NYS Voluntary / Brownfield Cleanup Program. Provided oversight and evaluation to ensure that work conducted by an independent third party consultant under a $100MM+ liability transfer arrangement was performed consistent with NYSDEC-approved work plans and an exit strategy contract on time and within budget. Attended weekly meetings involving the lead remedial contractor, project attorneys and technical representatives for key project stakeholders, including Con Edison and the developer. Prepared, reviewed, and commented on technical and strategic deliverables and provided litigation and dispute resolution support.

Groundwater Investigation and Remediation, Gasoline Service Station Release
New York State Department of Environmental Conservation - Region I, Uniondale, NY

Designed and executed real-time expedited remedial investigations using modified TRIAD technique, including the use of direct push (DP) sampling and mobile laboratory gas chromatograph (GC) analytical techniques, to characterize a dissolved-phase petroleum hydrocarbon plume extending several thousand feet from the source area. Performed aquifer characterization testing, including pumping tests, slug tests, and electromagnetic borehole flow meter testing. Coordinated the preparation of a robust groundwater fate and transport model that was used to design a groundwater pump-and-treat remedial measure to prevent the contamination of a regional public drinking water supply well field. Directed and oversaw the design and installation of a pump-and-treat groundwater remediation system on New York State-owned property along a major highway. Reviewed local stormwater drainage plans, conducted visual inspections of the drainage system, including catch basins and outfalls, and conducted a dye test to confirm the design and function of the local stormwater management system. Prepared and submitted design plans and for the installation and connection of pump-and-treat system effluent piping to the existing municipal stormwater drainage system. Negotiated construction permit approvals from NYSDEC, Nassau County Department of Public Works, Long Island State Park Commission, Town of Hempstead, and New York State Department of Transportation.

PWGC
Strategic Environmental Engineering Solutions

John D. Eichler, Project Manager

Professional Experience

PWGC: 11 years

PRIOR: 6 years

Education

- BS, Environmental Studies, University at Buffalo, NY

Registrations/Certificates

- Lead-Based Paint Inspector (USEPA)
- UST Decommissioning (Int'l Council of Building Officials)
- OSHA Health & Safety 8-hr Supervisor, 40-hr HAZWOPER

Areas of Expertise

- Environmental Compliance
- Hydrogeology
- Soil/Groundwater/Subsurface Investigation & Sampling
- Environmental Site Assessments
- Sub-Slab Vapor Investigation and Mitigation
- Remediation
- Storage Tank Decommissioning

Profile

Mr. Eichler works closely with clients, sub-contractors, and regulatory agencies and manages field activities according to project plans, such as work plans, sampling and analysis plans, Health and Safety plans as well as Quality Assurance and Quality Control. To ensure efficient workflow and reliable data collection, he draws from his hydrogeological/geoscientific background and experience with groundwater, soil, and air quality investigation techniques. PWGC's role on these projects include soil/groundwater investigations, air quality studies, and remedial measures. His clients, ranging from developers to attorneys, and municipal agencies, benefit from his expertise in overseeing Phase II, RI/FS, cost to cure estimates for financial institutions, and Brownfield projects.

Notable Projects

Wastewater Management

Penetrex Processing, Glenwood Landing, New York

Subsurface Investigation, NYS Class II Inactive Hazardous Waste Site - Mr. Eichler manages the investigative fieldwork, such as groundwater/soil sampling in accordance with NYSDEC-approved work plan. Further, he prepared and implemented the NYSDEC-approved work plan for the sub-slab vapor & indoor air sampling, coordinated the implementation of sub-slab depressurization systems designed to mitigate the vapors associated with chlorinated hydrocarbons, prepared the investigation reports, and implemented a chemical oxidant injection program as an interim remedial measure which will facilitate the closure of this project.

Groundwater Remediation

Safeguard Storage, Baldwin, New York

Remedial Investigation, NYS Voluntary Cleanup Program Site - Mr. Eichler manages and oversees the investigative fieldwork which is involved with this project. Aspects of the investigation included soil and groundwater sampling, sub-slab vapor and indoor air sampling, a tidal influence and saltwater intrusion evaluation, and an underground injection control investigation. He prepared various NYSDEC-approved work plans for the project and prepared the investigation reports, which will facilitate the closure of this project.

Brookhaven National Laboratory (BNL), Upton, NY

BNL HFBR and g-2 Tritium Investigations – Supported field engineering and oversaw installation and sampling of temporary monitoring and Geoprobe® wells. He managed groundwater sampling/analysis and water disposal, provided health and safety oversight, coordinated necessary permits, and oversaw project work to ensure compliance with the radiological work permit.

John D. Eichler, Project Manager

Brownfield Redevelopment

Brownfield Cleanup (BCP)/Environmental Restoration Program (ERP)

Mr. Eichler manages BCP and ERP projects for both private and municipal clients. He prepares technical documents and interfaces with NYSDEC project managers to ensure project schedules and scopes meet the NYSDEC's requirements for approval of incentives/reimbursements. These sites require preparation of BCP and ERP applications, technical work plans, RI reports, human health and ecological assessments, remedial alternatives reports, citizens participation plans, public meetings and completion reports. Under contract with the Suffolk County Department of Health Services (SCDHS) and the Department of Public Works (DPW), Mr. Eichler assists the County in managing the technical aspects of County owned sites in the NYSDEC Brownfields Cleanup and Environmental Restoration Programs. These sites include former industrial and gasoline service stations which are currently vacant or unused because the redevelopment of the sites are hampered by the historical site uses which have contaminated soil and groundwater.

Renaissance Realty Group (RRG), Brooklyn, NY

Phase II Investigation – PWGC conducted the investigation to support the client in a pending real estate transaction. Mr. Eichler's on-site tasks included Geoprobe™ oversight, soil/groundwater sampling, and field note preparation. He used on-site findings and data observations for accurate soil/groundwater classification and reports preparation.

Phase I Environmental Site Assessments

Project Management – Mr. Eichler routinely performs Phase I ESA's for PWGC clients. Fluent in Phase I ASTM Standards, he is highly efficient in verifying that each Phase I meets these standards. He is familiar with the latest applicable regulatory laws, such as the new federal All Appropriate Inquiry (AAI) guidance, a Brownfield law, which refers to requirements for assessing a property's environmental conditions prior to its acquisition.

Avalon Bay, Rockville Center, NY

Field Investigation Oversight– Mr. Eichler was responsible for the oversight and documentation of the field investigation for this Brownfield Redevelopment Project. The investigation consisted of soil and groundwater sampling using direct push technology to track the source of an on-site perchloroethylene plume. The investigation also included the installation of several monitoring wells. He evaluated the results and incorporated the data into a report.

Tank Management

Allied Aviation, JFK International Airport

Subsurface Investigation – Mr. Eichler is responsible for the management of this petroleum UST investigation. He prepared a NYSDEC-approved work plan for the sampling of soil and groundwater to determine if petroleum fuel tanks had impacted the subsurface. He coordinated the effort with the client, the property owner, field personnel, and subcontractors to meet the objectives of the investigation.

Wastewater Management

Minmilt Realty, East Farmingdale, NY

Remediation System Monitoring – Mr. Eichler was responsible for quarterly monitoring at the site. He supported efforts that assisted in shutting down the SVE system. While on site, he performed collection of air and water samples at the on-site pump and treat/SVE remediation system and water table monitoring in the area of the system.

Expeditors, Inwood, NY

Petroleum Remediation - Mr. Eichler provided field oversight for the remediation of a former Shell Oil terminal, contaminated with petroleum. His responsibilities included excavation management, soil sampling, coordination with the NYSDEC, and report preparation, to expedite an extensive remediation. His management of the project facilitated the closure of the site by the NYSDEC.

John D. Eichler, Project Manager

Brookhaven National Laboratory (BNL), Upton, NY

BNL Peconic River Remediation - Mr. Eichler supported field engineering and oversaw fieldwork and waste disposal for the remediation. He was responsible for riverbed sediment sampling, management of disposal documentation, and quality assurance for the dredging of impacted sediments from the Peconic River for disposal via railcar.

Environmental Compliance

Storm Water Pollution Prevention Plan (SWPPP) Inspections and Reports

Mr. Eichler inspects SWPPP erosion and sediment control for various demolition and construction projects including the Neptune Regional Transmission System, Liberty Industrial Finishing, and the Ross School. He prepares reports detailing findings, and coordinates with contractors to ensure that the site is compliant with the state-approved plan.

Soil Excavation

New York University, New York, NY

Soil Quality Investigation - He oversaw and documented the field investigation for this project. The investigation consisted of soil sampling using direct push technology to define the extent on impacted soil at the site. Upon completion of the fieldwork, Mr. Eichler assisted in the evaluation of the results and incorporated the data into a final report.

General Consulting

Allstate Insurance Company

Mr. Eichler oversees projects, such as petroleum spill remedial activities. He prepares spill reports, and coordinates with contractors and the NYSDEC to ensure that the client's goals are met in accordance with regulatory guidelines.

Computer Circuits, Hauppauge, New York

Mr. Eichler performed air sampling in accordance with the USEPA-approved work plan for the investigation at this Federal Superfund site. The investigation consisted of soil, groundwater, and air sampling, and the installation and operation of a soil/vapor extraction system. Mr. Eichler performed sampling activities following the QA/QC procedures detailed in the work plan.

Previous Experience

Petro Oil, Stamford, CT

Remediation Management - Mr. Eichler served as primary contact for clients, contractors, and regulatory agencies on remedial issues for Fuel Oil Tanks. His position involved meticulous communication and coordination between diverse clientele, ranging from property owners & developers to attorneys and insurance agents. Additional responsibilities pertained to field & contractor oversight, soil and groundwater sampling, laboratory data analyses, and field documentation to monitor the project process. For each project completed under his oversight, he prepared UST tank closure reports, detailing findings and field observations.

DOE/Brookhaven National Laboratory Certifications

- Back Safety (TQ-BACKSAFE)
- Chain of Custody Training (ES-COC)

John D. Eichler, Project Manager

- Contamination Performance (HP-RWT-300A)
- Contamination, High Cont. and Airborne Areas (HP-RWT-300)
- Cyber Security Training (GE-CYBERSEC)
- Emergency Planning & Response (GE-EMERGPLAN)
- Environmental Protection Training (GE-ENV-GET)
- Fall Protection (GE-FALLPROTECT)
- Groundwater Program Environmental Training (ER-DENV2)
- Hazard Communication (HP-IND-200)
- Hazardous Waste Generator Training (HP-RCRIGEN3)
- Lyme and Tick-borne Disease Prevention (TQ-LYME1)
- Radioactive Waste Generator (HP-RADIGEN)
- RadWorker I Final (TQ-RW1)
- Surface Program (ER-DENV1)
- Transportation, Hazardous Material-On/Off-site (TQ-HAZMAT-A)

PWGC
Strategic Environmental Engineering Solutions

Usman Chaudhry, Field Hydrogeologist

Professional Experience

PWGC: 1 year

Education

- MS, Energy Management and Systems Technology, New York Institute of Technology, May 2014
- BS, Earth Science, COMSATS Institute of Technology

Skills

- ArcGIS (ESRI)
- Petrel Schlumberger
- Strater (Golden Software)
- Surfer (Golden Software)
- AutoCARD

Languages

- English
- Urdu
- Punjabi

Profile

Usman Chaundhry earned his Bachelor of Science degree in Earth Science from Pakistan-based COMSATS Institute of Technology. Though recent to PWGC he has already proved himself in the realm of hydrogeology, soil sampling and field studies. Mr. Chaudhry is continuously improving his skills as a field inspector in the areas of civil, structural, and environmental engineering. He has an excellent record in timely completion and maintenance of project coordination, monitoring, and document preparation, while successfully maintaining communication between clients, government agencies, and other parties involved.

Notable Projects

1107 Broadway
Usman provided oversight for remedial activities, community air monitoring and vapor barrier inspections for the E-Designation site.

583 Lorimer Street
Brooklyn, NY
Usman provided oversight for remedial activities and community air monitoring for the E-Designation site.

Schermerhorn Street
Brooklyn, NY
Usman provided oversight for remedial activities, community air monitoring and vapor barrier inspections for the E-Designation site.

Saint Patrick's Cathedral
New York, NY
Usman provided oversight for well drilling, provided water quality testing, analyzed geophysical data from wells and prepared well completion reports for the geothermal system.

Long Island City Taxi
Long Island City, NY
Usman was responsible for oversight of remedial activities, community air monitoring, environmental consulting and preparation of storm water pollution presentation inspection and reports for the E-Designation site.

Huntington Mining Project - 3D Modeling
Usman was responsible for the 3D modeling of lake data, analyzing data and creating contours form the data, and creating 3D models for volume calculations.

Dan Sergison, Staff Engineer

PUBLICATIONS

Integration of Seismic and Rock Physics Interpretation to Confirm Hydrocarbon Bearing Zone of Meyal Area-Pakistan (Journal of Himalayan Earth Sciences, 2012)

APPENDIX B

HEALTH AND SAFETY PLAN

38-01 QUEENS BOULEVARD
QUEENS, NEW YORK

HEALTH AND SAFETY PLAN

SUBMITTED TO:

New York State Department of Environmental Conservation
Division of Environmental Remediation
Hunters Point Plaza
47-40 21st Street
Long Island City, New York 11101

PREPARED FOR:

Curbcut Queens Boulevard LLC
c/o Laundry Capital
95-25 Queens Boulevard, 10th Floor
Rego Park, New York 11374

PREPARED BY:

P.W. Grosser Consulting Engineer & Hydrogeologist, PC
630 Johnson Avenue, Suite 7
Bohemia, New York 11716
Phone: 631-589-6353
Fax: 631-589-8705

Richard Kampf, PG, Director, New York City Office rkampf@pwgrosser.com
John Eichler, Project Manager JohnE@pwgrosser.com

PWGC Project Number: CUP1601

JANUARY 2016

HEALTH AND SAFETY PLAN
38-01 QUEENS BOULEVARD, QUEENS, NEW YORK

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1.0 STATEMENT OF COMMITMENT

This Health and Safety Plan (HASP) has been prepared to ensure that workers are not exposed to chemical, biological, and physical hazards during implementation of the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) at 38-01 Queens Boulevard, Queens, New York. P.W. Grosser Consulting Engineer & Hydrogeologist, PC's (PWGC's) policy is to minimize the possibility of work-related exposure through awareness and qualified supervision, health and safety training, medical monitoring, use of appropriate personal protective equipment (PPE), and the following activity specific safety protocols contained in this HASP. PWGC has established a guidance program to implement this policy in a manner that protects personnel to the maximum reasonable extent.

This HASP, which applies to persons present at the site actually or potentially exposed to safety or health hazards, describes emergency response procedures for actual and potential physical, biological, and chemical hazards. This HASP is also intended to inform and guide personnel entering the work area or exclusion zone. Persons are to acknowledge that they understand the potential hazards and the contents of this health and safety policy.

2.0 INTRODUCTION

2.1 Purpose

This HASP addresses the minimum health and safety practices that will be employed by site workers participating in implementation of NYSDEC BCP activities at the project site located at 38-01 Queens Boulevard, Queens, New York.

The HASP takes into account the specific hazards inherent to the site and presents the minimum requirements which are to be met by PWGC, its subcontractors, and other on-site personnel in order to avoid and, if necessary, protect against health and/or safety hazards. PWGC sub-contractors will have the option of adopting this HASP or developing their own site-specific document. If a subcontractor chooses to prepare their own HASP, it must meet the minimum requirements as detailed in this HASP and must be made available to PWGC.

Activities performed under this HASP will comply with applicable parts of Occupational Safety and Health Administration (OSHA) Regulations, primarily 29 Code of Federal Regulations (CFR) Parts 1910 and 1926 and all other applicable federal, state, and local regulations. Modifications to the HASP may be made with the approval of the PWGC Health and Safety Manager (HSM) and/or Project Manager (PM). A copy of this HASP will be maintained on-site during all work activities.

Refusal to comply with the HASP or violation of any safety procedures by field personnel may result in their immediate removal from the site following consultation with the HSM and the Field Team Leader (FTL).

2.2 Scope

This HASP addresses the potential hazards related to implementation of NYSDEC BCP activities. The primary BCP activities may include the following:

- Site mobilization/demobilization;
- Drilling, and;
- Soil, groundwater, and soil-vapor sampling.

The potential hazards associated with this scope are listed below and are discussed in more detail in this HASP after the project organization and responsibilities section.

- Chemical hazards;
- Biological hazards; and
- Physical hazards.

2.3 Application

The HASP applies to all personnel involved in the above tasks who wish to gain access to active work areas, including but not limited to:

- PWGC employees and subcontractors;
- Client representatives; and
- Federal, state, or local representatives.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

This section specifies the project organization and responsibilities.

3.1 Project Manager

- Participates in major incident investigations;
- Ensures that the HASP has all of the required approvals before site work is conducted; and
- Has the overall project responsibility for project health and safety.

3.2 Field Team Leader / Site Health and Safety Officer (SHSO)

- Ensures that the HASP is implemented in conjunction with the HSM;
- Ensures that field work is scheduled with adequate equipment to complete the job safely;
- Enforces site health and safety rules;
- Ensures that proper PPE is utilized;
- Ensures that the HSM is informed of project changes that require modifications to the HASP;
- Ensures that the procedure modifications are implemented;
- Investigates incidents;
- Conducts the site safety briefing;
- Reports to HSM to provide summaries of field operations and progress; and
- Acts as emergency coordinator.

3.3 Health and Safety Manager

- Provides for the development of the HASP;
- Serves as the primary contact to review health and safety matters that may arise;
- Approves individuals who are assigned SHSO responsibilities;
- Coordinates revisions of this HASP with field personnel; and
- Assists in the investigation of major accidents.

3.4 Site Personnel

- Report any unsafe or potentially hazardous conditions to the FTL/SHSO;
- Maintain knowledge of the information, instructions and emergency response actions contained in this HASP; and
- Comply with rules, regulations and procedures as set forth in this HASP and any revisions.

4.0 SITE HISTORY AND PROJECT DESCRIPTION

4.1 Project Background

This HASP has been prepared by PWGC, on behalf of Curbcut Queens Boulevard, LLC. Previous investigations have identified semi-volatile organic compounds (SVOCs) and metals above standards in soil, volatile organic compounds (VOCs), SVOCs and metals above standards and/or guidance levels in groundwater and VOCs above guidance values in soil vapor at the site.

4.2 Site Description

The site is located at 38-01 Queens Boulevard in Queens, New York and is identified as Block 219, Lot 9 on the New York City Tax Map. The site occupies an area of about 22,500- square feet and is improved by a 1-story building. The site is bound by 45-15 38th Street (Lot 18) followed by 43rd Avenue to the north, 38-15 Queens Boulevard (Lot 34) followed by 9th Street to the east, Queens Boulevard to the south, and 38th Street to the west. An elevated New York City Transit (NYCT) platform (7 Line) adjoins the site to the south beyond Queens Boulevard.

4.3 Site History

The Site has a long history of manufacturing brass hardware parts. From 1970 until 2006 manufacturing of screw machine products and hardware occurred on the Site. The manufacture of the brass spray tops for perfume bottles and metal plating was conducted on the site from 1917 to approximately 1950. The Site was vacant pre-1915.

4.4 Site Features

The project site elevation is approximately 65 feet above mean sea level, and is generally level with a very slight slope to the west. The site is improved with a one-story building which occupies the entire area of the site.

4.5 Current and Future Site Use

The site is currently vacant and is proposed for redevelopment. The proposed redevelopment of the property will include the demolition of the existing building followed by the construction of a new 9-story commercial (office and retail) building which will include a basement parking garage. Construction of the foundation for the proposed building will include the excavation of soils throughout the majority of the property footprint to approximately 20 feet below ground surface (bgs).

5.0 POTENTIAL HAZARDS OF THE SITE

This section presents an assessment of the chemical, biological, and physical hazards that may be encountered during the tasks specified under Section 1.0. Additional information can be found in **Appendix A** - Material Safety Data Sheets or in **Appendix B** - Activity Hazard Analyses (AHA).

5.1 Chemical Hazards

Review of historical information from the site indicates that the soil, soil vapor and groundwater at the site is contaminated with the constituents listed in Table 5-1. These compounds may present an occupational exposure hazard during site operations. Specific information on the primary chemicals identified at the Site can be found in Table 5-1 and specific information on each chemical identified at the site can be found on the Material Safety Data Sheets found in **Appendix A**.

Table 5-1

Chemical Hazards

COMPOUND	CAS#	OSHA PEL	ROUTES OF EXPOSURE	SYMPTOMS OF EXPOSURE	TARGET ORGANS	PHYSICAL DATA
1,2-Dichloroethene	156-59-2	200 ppm	Inhalation Ingestion Skin Absorption Skin Contact	Irritates eyes, nose, and throat; nausea; drowsiness.	Skin, eyes, respiratory system	Colorless liquid, ether-like slightly acrid odor
Arsenic	7440-38-2	TWA 0.01 mg/m^3	Inhalation Ingestion	Cough, sore throat, shortness of breath, weakness, abdominal pain, diarrhea, nausea, vomiting	Liver, bone marrow, peripheral nervous system	Grey metallic-looking crystals
Benzene	71-43-2	TWA 0.5 mg/m^3	Inhalation Ingestion Skin/Eye	Confusion, cough, dizziness, drowsiness, headache, sore throat, vomiting, redness, dry skin, pain.	Skin, lungs, central nervous system, eyes, respiratory tract	Colorless liquid, with characteristic odor
Benzo(a) anthracene	56-55-3	None	Inhalation Ingestion Skin/Eye	None	None	Flakes or Powder
Benzo(a) Pyrene	50-32-8	None	Inhalation Ingestion Skin/Eye	None	None	Crystals
Cadmium	7440-43-9	TWA 0.002 mg/m^3	Inhalation Ingestion	Cough, sore throat, redness, pain, abdominal pain, diarrhea, headache, nausea, vomiting	Kidneys	Soft Blue-White Metal Lumps or Grey powder
Chromium	7440-47-3	TWA 0.5 mg/m^3	Inhalation Eye	Cough Redness	None	BP-2642°C
Copper	7440-50-8	TWA 0.2 mg/m^3	Inhalation Ingestion	Cough, headache, shortness of breath, sore throat, redness, pain, abdominal pain, nausea, vomiting	None	Red powder
Isopropylbenzene	98-82-8	TWA 50 mg/m^3	Inhalation Ingestion Skin/Eye	Dizziness, skin and eye irritation	Skin, liver, kidney, lungs	Colorless liquid, with characteristic odor
Lead	7439-92-1	TWA 0.05 mg/m^3	Inhalation Ingestion	None	Blood, bone marrow, central nervous system, kidneys	Bluish-White or Silvery-Grey Solid
Magnesium	7439-95-4	None	Inhalation Ingestion	None	None	Silver or grey Rod

COMPOUND	CAS#	OSHA PEL	ROUTES OF EXPOSURE	SYMPTOMS OF EXPOSURE	TARGET ORGANS	PHYSICAL DATA
Mercury	7439-97-6	TWA 0.025 mg/m^3	Inhalation Ingestion Skin/Eye	Abdominal pain, cough, diarrhea, shortness of breath, vomiting, fever	Central nervous system, kidneys	Silvery liquid metal
n-Propylbenzene	103-65-1	None	Inhalation Ingestion Skin/Eye	Lung, skin, eye irritation	Lungs, eyes, kidneys	Colorless liquid
Naphthalene	91-20-3	TWA 10 ppm	Inhalation Ingestion Skin	Headache, weakness, nausea, vomiting, sweating, confusion, jaundice, dark urine	Blood, eyes	White solid in various forms, with characteristic odor
m+p-xylene	179601-23-1	TWA 100 mg/m^3	Inhalation Ingestion Skin/Eye	Dizziness, drowsiness, headache, nausea, dry skin, redness, pain	Skin, central nervous system, ears	Colorless liquid, with characteristic odor
Tetrachloroethene	127-18-4	100 ppm	Inhalation Ingestion Skin Absorption Skin Contact	Irritates eyes, nose, throat; nausea; flushed face & neck; vertigo, dizziness, incoordination, headache, somnolence; skin erythema; potential human carcinogen.	Skin, eyes, respiratory system, kidneys, liver, CNS	Vapor pressure, 14 mm Hg Chloroform like odor, IP= 9.32 eV
Trichloroethene	79-01-6	100 ppm	Inhalation Ingestion Skin Contact	Irritates eyes, throat; redness, tearing, blurred vision, vertigo, dizziness, incoordination, irregular heart beat, potential human carcinogen.	Heart, liver, kidneys, CNS	Vapor pressure, 60 mm Hg Irritating odor at high concentrations
Zinc	7440-66-6	None	Inhalation Ingestion	Metallic taste, dry skin, abdominal pain, nausea, vomiting	None	Odorless Grey to Blue Powder

Abbreviations

C = Ceiling limit, not to be exceeded
CNS = Central Nervous System
PEL=Permissible Exposure Limit
TWA = Time-weighted average (8 hours)
ppm = parts per million
VP = vapor pressure at approximately 68□ F in mm Hg (mercury)

5.2 Biological Hazards

Work will be performed in an urban environment; however, during the course of the project there is potential for workers to come into contact with biological hazards such as animals, insects, and plants. The AHAs found in **Appendix B** includes specific hazards and control measures for each task, if applicable.

5.2.1 *Animals*

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

5.2.2 *Insects*

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

5.2.3 *Plants*

The site is currently improved with a one story building that encompasses the entire footprint of the property. No exposure to plant life is expected.

5.3 Physical Hazards

Most safety hazards are discussed in the AHAs in **Appendix B** for the different phases of the project. In addition to the AHAs, general work rules and other safety procedures are described in Section 10 of this HASP.

5.3.1 *Temperature Extremes*

Heat Stress

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

Cold Stress

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

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

5.3.2 *Steam, Heat and Splashing*

Exposure to steam/heat/splashing hazards can occur during steam cleaning activities. Splashing can also occur during well development and sampling activities. Exposure to steam/heat/splashing can result in scalding/burns, eye injury, and puncture wounds.

5.3.3 *Noise*

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

5.3.4 *Fire and Explosion*

When conducting drilling activities, the opportunity of encountering fire and explosion hazards may exist from encountering underground utilities, from the use of diesel engine equipment, and other potential ignition sources. During dry periods there is an increased chance of forest and brush fires starting at the job site. If these conditions occur no smoking will be permitted at the site and all operations involving potential ignition sources will be monitored continuously (fire watch).

5.3.5 *Manual Lifting/Material Handling*

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

5.3.6 *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 rough terrain, surfaces that are steep inclines, surfaced debris, or surfaces which are wet from rain or ice. Falls may result in twisted ankles, broken bones, head trauma or back injuries.

5.3.7 *Heavy Equipment Operation*

An drill rig will be used to install borings where required. Working with or near heavy equipment poses many potential hazards, including electrocution, fire/explosion, being struck by or against, or pinched/caught/crushed by, and can result in serious physical harm.

5.3.8 *Electrocution*

Encountering underground utilities may pose electrical hazards to workers. Additionally, overhead electrical lines can be a concern during drilling operations. Potential adverse effects of electrical hazards include burns

and electrocution, which could result in death.

6.0 ACTIVITY HAZARD ANALYSES

The AHA is a systematic way of identifying the potential health and safety hazards associated with major phases of work on the project and the methods to avoid, control, and mitigate those hazards. The AHAs will be used to train work crews in proper safety procedures during phase preparatory meetings.

AHAs have been developed by PWGC for the following phases of work:

1. Site mobilization/demobilization;
2. Drilling;
3. Soil, groundwater and soil-vapor sampling; and
4. Decontamination

Copies of these AHAs are included in **Appendix B** of this HASP.

7.0 PERSONAL PROTECTIVE EQUIPMENT

The PPE specified in **Table 7-1** represents the hazard analysis and PPE selection required by 29 CFR 1910.132. Specific information on known potential hazards can be found under Section 4.0 and **Appendix B** - AHA. For the purposes of PPE selection, the HSM and FTL/SHSO are considered competent persons. The signatures on the approval page of the HASP constitute certification of the hazard assessment. For activities not covered by **Table 7-1**, the FTL/SHSO will conduct the hazard assessment, select the PPE, and document changes in the appropriate field logs. PPE selection will be made in consultation with the HSM.

Modifications for initial PPE selection may also be made by the FTL/SHSO in consultation with the HSM and changes documented accordingly. If major modifications occur, the HSM will notify the PM.

7.1 PPE Abbreviations

HEAD PROTECTION

HH = Hard Hat

HEARING PROTECTION

EP = ear plugs

EM = ear muffs

EYE/FACE PROTECTION

APR = Full Face Air Purifying Respirator

MFS = Mesh Face shield

PFS =Plastic Face shield

SG = ANSI approved safety glasses with side shields

FOOT PROTECTION

Neo = Neoprene

OB = Overboot

Poly = polyethylene coated boot

Rub = rubber slush boots

STB = Leather work boots with steel toe

HAND PROTECTION

Cot = cotton

But = Butyl

LWG = Leather Work Gloves

Neo = Neoprene

Nit = Nitrile

Sur = Surgical

BODY PROTECTION

WC = work clothes

Cot Cov = Cotton Coveralls

Poly = Polyethylene coated Tyvek® coveralls

Saran = Saranex coated coveralls

Tyvek® = Uncoated Tyvek® coveralls

RESPIRATORY PROTECTION

APR = Full-face air purifying respirator with organic vapor cartridges

ASR = Full face air supplied respirator with escape bottle

SCBA = Self-contained breathing apparatus

7.2 Hazard Assessment for Selection of Personal Protective Equipment

The initial selection of personal protective equipment for each task was done by performing a hazard assessment taking into consideration the following:

- Potential chemical and physical present;
- Work operations to be performed;
- Potential routes of exposure;
- Concentrations of contaminants present; and
- Characteristics, capabilities and limitations of PPE and any hazard that the PPE presents or magnifies.

A review of the analytical data from previous sampling events indicates that VOCs and metals identified in **Table 5-1** are the primary contaminants of concern.

The exposure routes for these chemicals are inhalation, skin absorption, skin/eye contact, and ingestion. Chemical protective gloves will be required for all activities that involve sample handling and the likelihood for skin contact. The proper use of PPE and strict adherence to decontamination and personal hygiene procedures will effectively minimize skin contact and ingestion as potential routes of exposure.

Table 7-1

Personal Protective Equipment Selection

TASK	HEAD	EYE/FACE	FEET	HANDS	BODY	HEARING	RESPIRATOR
Mobilization/ Demobilization	HH	SG	STB	WG	WC	None	None
Drilling Activities	HH	SG	STB	WG	WC	EM or EP	None initially APR if action levels exceeded
Environmental sampling	HH	SG	STB	WG, Nit & Sur as needed	WC, Tyvek® as needed	None	None initially APR if action levels exceeded
Decontamination	HH	SG	STB	Nit + Sur	WC, Tyvek® as needed	None	None initially APR if action levels exceeded

7.3 Respirator Cartridge Change-Out Schedule

A respirator cartridge change-out schedule has been developed in order to comply with 29 CFR 1910.134. If the use of respirators is necessary, the respirator cartridge change-out schedule for this project will be as follows:

1. Cartridges shall be removed and disposed of at the end of each shift, when cartridges become wet or wearer experiences breakthrough, whichever occurs first; and
2. If the humidity exceeds 85%, then cartridges shall be removed and disposed of after 4 hours of use.

Respirators shall not be stored at the end of the shift with contaminated cartridges left on. Cartridges shall not be worn on the second day, no matter how short of time period they were used the day before.

The schedule was developed based on the following scientific information and assumptions:

- Analytical data that is available regarding site contaminants;
- Using the rule of thumb provided by the AHA;
- All of the chemicals have boiling points greater than 70^{o}C;
- Total airborne concentration of contaminants is anticipated to be less than 200 ppm;
- The humidity is expected to be less than 85%; and
- Desorption of the contaminants (including those with poor warning properties) after partial use of the chemical cartridge can occur after a short period (hours) without use (eg, overnight) and result in a non-use exposure.

The following is a partial list of factors that may affect the usable cartridge service life and/or the degree of respiratory protection attainable under actual workplace conditions. These factors have been considered when developing the cartridge change-out schedule.

Type of contaminant(s);

- Contaminant concentration;
- Relative humidity;
- Breathing rate; Temperature; Changes in contaminant concentration, humidity, breathing rate and temperature;
- Mixtures of contaminants;
- Accuracy in the determination of the conditions;
- The contaminant concentration in the workplace can vary greatly. Consideration must be given to the quality of the estimate of the workplace concentration;

- Storage conditions between multiple uses of the same respirator cartridges. It is recommended that the chemical cartridges be replaced after each work shift. Contaminants adsorbed on a cartridge can migrate through the carbon bed without airflow;
- Age of the cartridge;
- Condition of the cartridge and respirator;
- Respirator and cartridge selection respirator fit;
- Respirator assembly, operation, and maintenance;
- User training, experience and medical fitness;
- Warning properties of the contaminant; and
- The quality of the warning properties should be considered when establishing the chemical cartridge change schedule. Good warning properties may provide a secondary or back-up indication for cartridge change-out.

8.0 AIR MONITORING

Air monitoring will be performed for protection for on-site workers and the downwind community (i.e., off-site receptors including residences, businesses, and on-site workers not directly involved in the remedial work) from potential airborne contaminant releases resulting from remedial activities at the site in accordance with the project Community Air Monitoring Plan (CAMP). The site specific CAMP provides measures for protection for on-site workers and the downwind community from potential airborne contaminants as a direct result of the Supplemental Investigation. The CAMP will be implemented and executed in accordance with 29 CFR 1910.120(h), the New York State Department of Health's (NYSDOH) Generic Community Air Monitoring Plan, and the New York State Department of Environmental Conservation (NYSDEC) TAGM #4031.

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

Detailed information on the types, frequency, and location of real-time monitoring and community air monitoring requirements are provided in the CAMP prepared for this project.

9.0 ZONES, PROTECTION AND COMMUNICATION

9.1 Site Control

Site zones are intended to control the potential spread of contamination throughout the site and to assure that only authorized individuals are permitted into potentially hazardous areas. A three-zone approach will be utilized. It shall include an Exclusion Zone (EZ), Contamination Reduction Zone (CRZ) and a Support Zone (SZ). Specific zones shall be established on the work site when operations begin.

This project is a hazardous waste remediation project, and any person working in an area where the potential for exposure to site contaminants exists, will only be allowed access after providing the FTL/SHSO with proper training and medical documentation.

The zones are based upon current knowledge of proposed site activities. It is possible that the zone configurations may be altered due to work plan revisions. Should this occur, the work zone will be adjusted accordingly, and documented through use of a field-change request form.

The following shall be used for guidance in revising these preliminary zone designations, if necessary.

Support Zone **-** The SZ is an uncontaminated area that will be the field support area for most operations. The SZ provides for field team communications and staging for emergency response. Appropriate safety equipment will be located in this zone. Potentially contaminated personnel/materials are not allowed in this zone. The only exception will be appropriately packaged/decontaminated and labeled samples.

Contamination Reduction Zone **-** The CRZ is established between the EZ and the SZ. The CRZ contains the contamination reduction corridor and provides for an area for decontamination of personnel and portable hand-held equipment, tools and heavy equipment. A personnel decontamination area will be prepared at each exclusion zone. The CRZ will be used for EZ entry and egress in addition to access for heavy equipment and emergency support services.

Exclusion Zone **-** All activities, which may involve exposure to site contaminants, hazardous materials and/or conditions, should be considered an EZ. The FTL/SHSO may establish more than one EZ where different levels of protection may be employed or different hazards exist. The size of the EZ shall be determined by the site HSO allowing adequate space for the activity to be completed, field members and emergency equipment.

9.2 Contamination Control

Decontamination areas will be established for the following activities.

- Drilling/Sampling Activities

9.2.1 *Personnel Decontamination Station*

All personnel and portable equipment used in the EZ shall be subject to a thorough decontamination process, as deemed necessary by the FTL/SHSO. Sampling equipment shall be decontaminated. As necessary, all boots and gloves will be decontaminated using soap and water solution and scrub brushes or simple removal and disposal. All used respiratory protective equipment will be decontaminated daily and sanitized with appropriate sanitizer solution.

All drums generated as a result of sampling and decontamination activities will be marked and stored at a designated area at the site until the materials can be property disposed of off-site.

All non-expendable sampling equipment will be decontaminated. This usually entails the use of Alconox, solvent and distilled/deionized water rinses to eliminate contaminants.

9.3 Communication

- Each team member will have a cell phone for communication with the PM, HSO, and other team members during field activities.
- Hand Signals - Hand signals shall be used by field teams, along with the buddy system. The entire field team shall know them before operations commence and their use covered during site-specific training. Typical hand signals are the following:

SIGNAL	MEANING
Hand gripping throat	Out of air, can't breathe
Grip on a partner's wrist or placement of both hands around a partner's waist.	Leave the area immediately, no debate.
Hands on top of head	Need assistance
Thumbs up	Okay, I'm all right, I understand.
Thumbs down	No, negative.

10.0 MEDICAL SURVEILLANCE PROCEDURES

All contractor and subcontractor personnel performing field work where potential exposure to contaminants exists at the site are required to have passed a complete medical surveillance examination in accordance with 29 CFR 1910.120(f).

10.1 Medical Surveillance Requirements

A physician's medical release for work will be confirmed by the HSM before an employee can work in the exclusion zone. The examination will be taken annually at a minimum and upon termination of hazardous waste site work if the last examination was not taken within the previous six months. Additional medical testing may be required by the HSM in consultation with the Corporate Medical Consultant and the FTL/SHSO if an over-exposure or accident occurs, if an employee exhibits symptoms of exposure, or if other site conditions warrant further medical surveillance.

10.2 Medical Data Sheet

A medical data sheet is provided in **Appendix D**. This medical data sheet is voluntary and should be completed by all on-site personnel and will be maintained at the site. Where possible, this medical data sheet will accompany the personnel needing medical assistance. The medical data sheet will be maintained in a secure location, treated as confidential, and used only on a need-to-know basis.

11.0 SAFETY CONSIDERATIONS

11.1 General Health and Safety Work Practices

A list of general health and safety work practices is included as an included in **Appendix E**. The work rules will be posted in a conspicuous location at the site.

11.2 The Buddy System

At a minimum, employees shall work in groups of two in such a manner that they can observe each other and maintain line-of-sight for each employee within the work group. The purpose of the buddy system is to provide rapid assistance to employees in the event of an emergency.

11.3 Sample Handling

Personnel responsible for the handling of samples should wear the prescribed level of protection. Samples should be identified as to their hazard and packaged as to prevent spillage or breakage. Sample containers shall be decontaminated in the CRZ or EZ before entering a clean SZ area. Any unusual sample conditions, odors, or real-time readings should be noted. Laboratory personnel should be advised of sample hazard level and the potential contaminants present. This can be accomplished by a phone call to the lab coordinator and/or including a written statement with the samples reviewing lab safety procedures in handling, in order to assure that the practices are appropriate for the suspected contaminants in the sample.

11.4 Drill Rigs

When conducting drilling activities, the opportunity of encountering fire and explosion hazards exists from underground utilities and gases. The locations of underground utilities will be verified prior to performing any intrusive activities. Additionally, because of the inherently hazardous nature of drilling operations, safety and accident prevention are crucial when drilling operations are performed. Most drilling accidents occur as a direct result of lack of training and supervision, improper handling of equipment, and unsafe work practices. Hazards include: assembling and disassembling rigs, rotary and auger drilling, and grouting. The drilling contractor shall perform drilling in accordance with its own Health & Safety Program for Drill Rig Safety.

11.4.1 *Safety During Drilling Operations*

- Safety requires the attention and cooperation of every worker and site visitor.
- Do not drive the drill rig from hole to hole with the mast (derrick) in the raised position.
- Before raising the mast (derrick), look up to check for overhead obstructions.
- Maintain a minimum of 15 feet clearance from all overhead electric lines.

- Before raising the mast (derrick), all drill rig personnel (with the exception of the operator) and visitors shall be cleared from the areas immediately to the rear and the sides of the mast. All drill rig personnel and visitors shall be informed that the mast is being raised prior to raising it.
- Before the mast (derrick) of a drill rig is raised and drilling is commenced, the drill rig must first be leveled and stabilized with leveling jacks and/or solid cribbing. Lower the mast (derrick) only when the leveling jacks are down and do not raise the leveling jack pads until the mast (derrick) is lowered completely.
- The operator of a drill rig shall only operate a drill rig from the position of the controls.
- Throwing or dropping tools shall not be permitted. All tools shall be carefully passed by hand between personnel or a hoist line shall be used.
- Do not consume alcoholic beverages or other depressants or chemical stimulants prior to starting work on a drill rig or while on the job.
- All unattended boreholes must be adequately covered or otherwise protected to prevent drill rig personnel, site visitors, or animals form stepping or falling into the hole.
- Terminate drilling operations during an electrical storm and move the entire crew away from the drill rig.

12.0 DISPOSAL PROCEDURES

All discarded materials, waste materials or other objects shall be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard or causing litter to be left on site.

All potentially contaminated materials, e.g., clothing, gloves, etc., will be bagged or drummed as necessary, labeled and segregated for disposal. All non-contaminated materials will be collected and bagged for appropriate disposal as non-hazardous solid waste. Additional waste disposal procedures may be developed as applicable.

13.0 EMERGENCY RESPONSE PLAN

This section establishes procedures and provides information for use during a project emergency. Emergencies happen unexpectedly and quickly, and require an immediate response; therefore, contingency planning and advanced training of staff is essential. Specific elements of emergency support procedures which are addressed in the following subsections include communications, local emergency support units, preparation for medical emergencies, first aid for injuries incurred on site, record keeping, and emergency site evacuation procedures.

13.1 Responsibilities

13.1.1 *Health and Safety Manager (HSM)*

The HSM oversees and approves the Emergency Response/Contingency Plan and performs audits to determine that the plan is in effect and that all pre-emergency requirements are met. The HSM acts as a liaison to applicable regulatory agencies and notifies OSHA of reportable accidents.

13.1.2 *Field Team Leader/Site Health and Safety Officer (FOL/HSO)*

The FTL/SHSO is responsible for ensuring that all personnel are evacuated safely and that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation. The FTL/SHSO is required to immediately notify the HSM of any fatalities or catastrophes (three or more workers injured and hospitalized) so that the HSM can ensure that OSHA is notified within the required time frame. The HSM will be notified of all OSHA recordable injuries, fires, spills, releases or equipment damage in excess of $500 within 24 hours.

13.1.3 *Emergency Coordinator*

The Emergency Coordinator for the project is the FTL/SHSO.

The Emergency Coordinator shall make contact with Local Emergency Response personnel prior to beginning work on site. In these contacts the emergency coordinator will inform interested parties about the nature and duration of work expected on the site and the type of contaminants and possible health or safety effects of emergencies involving these contaminants. The emergency coordinator will locate emergency phone numbers and identify hospital routes prior to beginning work on site. The emergency coordinator shall make necessary arrangements to be prepared for any emergencies that could occur.

The Emergency Coordinator will implement the Emergency Response/Contingency Plan whenever conditions at the site warrant such action.

13.1.4 *Site Personnel*

Site personnel are responsible for knowing the Emergency Response/Contingency Plan and the procedures contained herein. Personnel are expected to notify the Emergency Coordinator of situations that could constitute a site emergency.

13.2 Communication

A variety of communication systems may be utilized during emergency situations. These are discussed in the following sections.

13.2.1 *Hand Signals*

Downrange field teams will employ hand signals where necessary for communication during emergency situations. Hand signals are found in Section 8.3.

13.2.2 *Field Radios and Cell Phones*

PWGC field personnel are provided cellular phones for site communication and emergency use.

13.3 Local Emergency Support Units

A route map from the site to the nearest hospital can be found in **Appendix F**. This map will be placed with the above emergency telephone numbers in all on-site vehicles.

13.4 Pre-Emergency Planning

PWGC will communicate directly with administrative personnel from the emergency room at the hospital to determine whether the hospital has the facilities and personnel needed to treat cases of trauma resulting from exposure to any of the contaminants expected to be found on the site. Instructions for finding the hospital will be posted conspicuously in the site office and in each site vehicle.

Before the field activities begin, the local emergency response personnel will be notified of the schedule for field activities and about the materials that are thought to exist on the site so that they will be able to respond quickly and effectively in the event of a fire, explosion, or other emergency. Before fieldwork on the site commences, each person who will be working there or observing the operations will complete a medical data sheet (**Appendix D**). These data sheets will be filled out during site-specific training and will be kept on the site.

In the event of an incident where a team member becomes exposed or suffers from an acute symptom of exposure to site materials and has to be taken to a hospital, a copy of his/her medical data sheet will be

presented to the attending physician.

Table 13-1

Emergency Telephone Numbers

Contact	Firm or Agency	Telephone Number
Police		911
Fire		911
Hospital	Mount Sinai Hospital Queens	(718) 932-1000
Ambulance		911
Project Manager/Health and Safety Manager	Richard Kampf, PG PWGC	(212) 786-7420
Health & Safety Officer	John Eichler PWGC	(631) 589-6353
NYSDEC Site Contact	Robert Filkins	(518) 402-9706
Poison Control Center		(800) 962-1253
Chemtrec		(800) 424-9300

13.5 Emergency Medical Treatment

The procedures and rules in this HASP are designed to prevent employee injury. However, should an injury occur, no matter how slight, it will be reported to the FTL/SHSO immediately. First aid equipment will be available on site at the following locations:

- First Aid Kit: Support Zone (or designated by FTL/SHSO upon arrival)
- Emergency Eye Wash: Support Zone (or designated by FTL/SHSO upon arrival)

During site-specific training, project personnel will be informed of the location of the first aid station(s) that has been set up. Unless they are in immediate danger, severely injured persons will not be moved until paramedics can attend to them. Some injuries, such as severe cuts and lacerations or burns, may require immediate treatment. Any first aid instructions that can be obtained from doctors or paramedics, before an emergency-response squad arrives at the site or before the injured person can be transported to the hospital, will be followed closely.

There will be at least one person with current First Aid and CPR certification on each active work shift. When personnel are transported to the hospital, the FTL/SHSO will provide a copy of the Medical Data Sheet to the

paramedics and treating physician.

Only in non-emergency situations will an injured person be transported to the hospital by means other than an ambulance. **A map and directions to the hospital can be found in Appendix F.**

13.6 Emergency Site Evacuation Routes and Procedures

In order to mobilize the manpower resources and equipment necessary to cope with a fire or other emergency, a clear chain of authority will be established. The EC will take charge of all emergency response activities and dictate the procedures that will be followed for the duration of the emergency. The EC will report immediately to the scene of the emergency, assess the seriousness of the situation, and direct whatever efforts are necessary until the emergency response units arrive. At his/her discretion, the EC also may order the closure of the site for an indefinite period.

All project personnel will be instructed on proper emergency response procedures and locations of emergency telephone numbers during the initial site safety meeting. If an emergency occurs, including but not limited to fire, explosion or significant release of toxic gas into the atmosphere, an air horn will be sounded on the site. The horn will sound continuously for one blast, signaling that immediate evacuation of all personnel is necessary due to an immediate or impending danger. All heavy equipment will be shut down and all personnel will evacuate the work areas and assemble at the evacuation meeting point, which will be determined upon arrival at the site by the FTL/SHSO, prior to work beginning. This will then be conveyed to all crew members during the site-specific briefing.

The EC will give directions for implementing whatever actions are necessary. Any project team member may be assigned to be in charge of emergency communications during an emergency. He/she will attend the site telephone specified by the EC from the time the alarm sounds until the emergency has ended.

After sounding the alarm and initiating emergency response procedures, the EC will check and verify that access roads are not obstructed. If traffic control is necessary, as in the event of a fire or explosion, a project team member, who has been trained in these procedures and designated at the site safety meeting, will take over these duties until local police and fire fighters arrive.

The EC will remain at the site to provide any assistance requested by emergency-response squads as they arrive to deal with the situation. A map showing evacuation routes, meeting places and the location of emergency equipment will be posted in all trailers and used during site-specific training.

13.7 Fire Prevention and Protection

In the event of a fire or explosion, procedures will include immediately evacuating the site (air horn will sound for a single continuous blast), and notification of local fire and police departments. No personnel will fight a fire beyond the stage where it can be put out with a portable extinguisher (incipient stage).

13.7.1 *Fire Prevention*

Adhering to the following precautions will prevent fires:

- Good housekeeping and storage of materials;
- Storage of flammable liquids and gases away from oxidizers;
- No smoking in the exclusion zone or any work area;
- No hot work without a properly executed hot work permit;
- Shutting off engines to refuel;
- Grounding and bonding metal containers during transfer of flammable liquids;
- Use of UL approved flammable storage cans;
- Fire extinguishers rated at least 10 pounds ABC located on all heavy equipment, in all trailers and near all hot work activities; and
- Monthly inspections of all fire extinguishers.

13.8 Overt Chemical Exposure

The following are standard procedures to treat chemical exposures. Other, specific procedures detailed on the Material Safety Data Sheet or recommended by the Corporate Medical Consultant will be followed, when necessary.

SKIN AND EYE CONTACT: Use copious amounts of soap and water. Wash/rinse affected areas thoroughly, and then provide appropriate medical attention. Eyes should be rinsed for 15 minutes upon chemical contamination. Skin should also be rinsed for 15 minutes if contact with caustics, acids or hydrogen peroxide occurs.

INHALATION: Move to fresh air. Decontaminate and transport to hospital or local medical provider.

INGESTION: Decontaminate and transport to emergency medical facility.

PUNCTURE WOUND OR LACERATION: Decontaminate and transport to emergency medical facility.

13.9 Decontamination during Medical Emergencies

If emergency life-saving first aid and/or medical treatment is required, normal decontamination procedures may need to be abbreviated or postponed. The FTL/SHSO or designee will accompany contaminated victims to the medical facility to advise on matters involving decontamination, when necessary. The outer garments can be removed if they do not cause delays, interfere with treatment or aggravate the problem. Respiratory equipment must always be removed. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed on-site, a plastic barrier placed between the injured individual and clean surfaces should be used to help prevent contamination of the inside of ambulances and/or medical personnel. Outer garments may then be removed at the medical facility. No attempt will be made to wash or rinse the victim if his/her injuries are life threatening, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material which could also cause severe injury or loss of life to emergency response personnel. For minor medical problems or injuries, the normal decontamination procedures will be followed.

13.10 Accident/Incident Reporting

As soon as first aid and/or emergency response needs have been met, the following parties are to be contacted by telephone:

- HSM;
- PM; and
- The employer of any injured worker who is not a PWGC employee.

Written confirmation of verbal reports are to be completed by the FTL/SHSO using the Incident Report Form and submitted within 24 hours. The incident report and investigation form is found in **Appendix G**. If the employee involved is not a PWGC employee, his employer will receive a copy of the report.

13.11 Adverse Weather Conditions

In the event of adverse weather conditions, the FTL/SHSO will determine if work can continue without potentially risking the safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress and heat-related injuries;
- Potential for cold stress and cold-related injuries;
- Treacherous weather-related working conditions (hail, rain, snow, ice, high winds);
- Limited visibility (fog);

- Potential for electrical storms;
- Earthquakes; and
- Other major incidents.

Site activities will be limited to daylight hours, or when suitable artificial light is provided, and acceptable weather conditions prevail. The FTL/SHSO will determine the need to cease field operations or observe daily weather reports and evacuate, if necessary, in case of severe inclement weather conditions.

13.12 Spill Control and Response

All small hazardous spills/environmental releases shall be contained as close to the source as possible. Whenever possible, the MSDS will be consulted to assist in determining the best means of containment and cleanup. For small spills, sorbent materials such as sand, sawdust or commercial sorbents should be placed directly on the substance to contain the spill and aid recovery. Any acid spills should be diluted or neutralized carefully prior to attempting recovery. Berms of earthen or sorbent materials can be used to contain the leading edge of the spills. Drains or drainage areas should be blocked. All spill containment materials will be properly disposed. An exclusion zone of 50 to 100 feet around the spill area should be established depending on the size of the spill. The following seven steps should be taken by the Emergency Coordinator:

- Determine the nature, identity and amounts of major spill components;
- Make sure all unnecessary persons are removed from the spill area;
- Notify appropriate response teams and authorities;
- Use proper PPE in consultation with the FTL/SHSO;
- If a flammable liquid, gas or vapor is involved, remove all ignition sources and use non-sparking and/or explosive proof equipment to contain or clean up the spill (diesel only vehicles, air operated pumps, etc.);
- If possible, try to stop the leak with appropriate material; and,
- Remove all surrounding materials that can react or compound with the spill.

13.13 Emergency Equipment

The following minimum emergency equipment shall be kept and maintained on-site:

- Industrial first aid kit;
- Burn kit and portable eye washes (one per field team);
- Fire extinguishers (one per work area); and
- Absorbent material /spill kit.

14.0 TRAINING

14.1 General Health and Safety Training

In accordance with PWGC corporate policy, and pursuant to 29 CFR 1910.120, hazardous waste site workers shall, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste site operations unless otherwise noted in the above reference. At a minimum, the training shall have consisted of instruction in the topics outlined in the standard. Personnel who have not met the requirements for initial training shall not be allowed to work in any site activities in which they may be exposed to hazards (chemical or physical).

14.1.1 *Three Day Supervised On the Job Training*

In addition to the required initial hazardous waste operations training, each employee shall have received three days of directly supervised on-the-job training. This training will address the duties the employees are expected to perform.

14.2 Annual Eight-Hour Refresher Training

Annual eight-hour refresher training will be required of all hazardous waste site field personnel in order to maintain their qualifications for fieldwork. The training will cover a review of 1910.120 requirements and related company programs and procedures.

14.3 Site-Specific Training

Prior to commencement of field activities, all field personnel assigned to the project will have completed training that will specifically address the activities, procedures, monitoring, and equipment used in the site operations. It will include site and facility layout, hazards and emergency services at the site, and will highlight all provisions contained within this HASP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity.

14.4 On-Site Safety Briefings

Project personnel and visitors will be given on-site health and safety briefings daily by the FTL/SHSO to assist site personnel in safely conducting their work activities. A copy of the Daily Briefing Sign-In Sheet is contained in **Appendix H**. The briefings will include information on new operations to be conducted, changes in work practices or changes in the site's environmental conditions, as well as periodic reinforcement of previously discussed topics. The briefings will also provide a forum to facilitate conformance with safety requirements

and to identify performance deficiencies related to safety during daily activities or as a result of safety inspections. The meetings will also be an opportunity to periodically update the crews on monitoring results. Prior to starting any new activity, a training session using the Activity Hazard Analysis will be held for crew members involved in the activity.

14.5 First Aid and CPR

The HSM will identify those individuals requiring first aid and CPR training to ensure that emergency medical treatment is available during field activities. It is anticipated that a minimum of one field person on-site at any one time will have first aid and CPR training. The training will be consistent with the requirements of the American Red Cross Association or American Heart Association. If none are available on-site, then the HSM shall be notified.

14.6 Supervisory Training

Supervisors and health and safety personnel shall have completed an additional eight hours of specialized training in accordance with 29 CFR 1910.120.

15.0 LOGS, REPORTS AND RECORDKEEPING

Changes to the HASP will be documented in the Health and Safety log book and as appropriate, the HSM and/or PM will be notified. Daily tailgate meetings will be documented in the H&S log book as well as personnel on-site.

15.1 Medical and Training Records

Copies or verification of training (40-hour, 8-hour, supervisor, site-specific training and documentation of three day OJT) and medical clearance for hazardous waste site work and respirator use will be maintained on-site. Records for all subcontractor employees will also be kept on-site.

15.2 Incident Report and Investigation Form

The incident report and investigation form is to be completed for all accidents and incidents, including near misses. The form can be found in **Appendix G**.

15.3 Health and Safety Logbooks

The FTL/SHSO will maintain a logbook during site work. The daily site conditions, personnel, monitoring results and significant events will be recorded. The original logbooks will become part of the exposure records file.

16.0 FIELD PERSONNEL REVIEW

This form serves as documentation that field personnel have read, or have been informed of, and understand the provisions of the HASP. It is maintained on site by the FTL/SHSO as a project record. Each field team member shall sign this section after site-specific training is completed and before being permitted to work on site.

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

Name (Print and Sign)	***Date***

Appendix A
Material Safety Data Sheets

ARSENIC

0013
October 1999

CAS No: 7440-38-2
RTECS No: CG0525000
UN No: 1558
EC No: 033-001-00-X

Grey arsenic
As
Atomic mass: 74.9

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 when exposed to hot surfaces or flames in the form of fine powder or dust.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		**PREVENT DISPERSION OF DUST! AVOID ALL CONTACT! AVOID EXPOSURE OF (PREGNANT) WOMEN!**	**IN ALL CASES CONSULT A DOCTOR!**
Inhalation	Cough. Sore throat. Shortness of breath. Weakness. See Ingestion.	Closed system and ventilation.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness.	Face shield 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	Abdominal pain. Diarrhoea. Nausea. Vomiting. Burning sensation in the throat and chest. Shock or collapse. Unconsciousness.	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	PACKAGING & LABELLING	
Evacuate danger area! Sweep spilled substance into sealable containers. Carefully collect remainder, then remove to safe place. Chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment.	T Symbol N Symbol R: 23/25-50/53 S: (1/2-)20/21-28-45-60-61 UN Hazard Class: 6.1 UN Pack Group: II	Do not transport with food and feedstuffs. Marine pollutant.

EMERGENCY RESPONSE	SAFE STORAGE
Transport Emergency Card: TEC (R)-61GT5-II	Separated from strong oxidants, acids, halogens, food and feedstuffs. Well closed.

IPCS
International Programme on Chemical Safety

Prepared in the context of cooperation between the International Programme on Chemical Safety and the European Commission

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IMPORTANT DATA

Physical State; Appearance
ODOURLESS, BRITTLE, GREY, METALLIC-LOOKING CRYSTALS.

Chemical dangers
Upon heating, toxic fumes are formed. Reacts violently with strong oxidants and halogens, causing fire and explosion hazard. Reacts with acids to produce toxic arsine gas (see: ICSC 0222).

Occupational exposure limits
TLV: 0.01 mg/m^3 as TWA; A1 (confirmed human carcinogen); BEI issued; (ACGIH 2004).
MAK: Carcinogen category: 1; Germ cell mutagen group: 3A; (DFG 2004).

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
The substance is irritating to the eyes, the skin and the respiratory tract. The substance may cause effects on the gastrointestinal tract, cardiovascular system, central nervous system and kidneys, resulting in severe gastroenteritis, loss of fluid, and electrolytes, cardiac disorders, shock, convulsions and kidney impairment. Exposure above the OEL 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. The substance may have effects on the mucous membranes, skin, peripheral nervous system, liver and bone marrow, resulting in pigmentation disorders, hyperkeratosis, perforation of nasal septum, neuropathy, liver impairment, anaemia. This substance is carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Sublimation point: 613/C
Density: 5.7 g/cm^3

Solubility in water: none

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms. It is strongly advised that this substance does not enter 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 suggested.
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).
Card has been partly updated in October 2004. See sections Occupational Exposure Limits, EU classification, Emergency Response.
Card has been partly updated in October 2005 in section Effects of long-term or repeated exposure.

ADDITIONAL INFORMATION

BENZENE	ICSC: 0015

Date of Peer Review: May 2003

Cyclohexatriene
Benzol

CAS #	71-43-2	C_6H_6
RTECS #	CY1400000	Molecular mass: 78.1
UN #	1114	
EC #	601-020-00-8	

TYPES OF HAZARD / EXPOSURE	ACUTE HAZARDS / SYMPTOMS	PREVENTION	FIRST AID / FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive. Risk of fire and explosion: see Chemical Dangers.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		**AVOID ALL CONTACT!**	
Inhalation	Dizziness. Drowsiness. Headache. Nausea. Shortness of breath. Convulsions. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Dry skin. Redness. Pain. (Further see Inhalation).	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
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. Sore throat. Vomiting. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	**PACKAGING & LABELLING**
Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Personal protection: complete protective clothing including self-contained breathing apparatus.	Do not transport with food and feedstuffs. **EU Classification** Symbol: F, T R: 45-46-11-36/38-48/23/24/25-65 S: 53-45 Note: [E] **UN Classification** UN Hazard Class: 3 UN Pack Group: II
EMERGENCY RESPONSE	**SAFE STORAGE**
Transport Emergency Card: TEC (R)-30S1114 / 30GF1-II NFPA Code: H2; F3; R0	Fireproof. Separated from food and feedstuffs oxidants and halogens.

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BENZENE — ICSC: 0015

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID, WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.

CHEMICAL DANGERS:
Reacts violently with oxidants, nitric acid, sulfuric acid and halogens causing fire and explosion hazard. Attacks plastic and rubber.

OCCUPATIONAL EXPOSURE LIMITS:

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

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:
The substance is irritating to the eyes, the skin and the respiratory tract. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous

TLV: 0.5 ppm as TWA; 2.5 ppm as STEL; (skin); A1; BEI issued; (ACGIH 2004). MAK: H; Carcinogen category: 1; Germ cell mutagen group: 3A; (DFG 2004).	system, resulting in lowering of consciousness. Exposure far above the occupational exposure limit value may result in unconsciousness and death. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The liquid defats the skin. The substance may have effects on the bone marrow and immune system, resulting in a decrease of blood cells. This substance is carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 80°C Melting point: 6°C Relative density (water = 1): 0.88 Solubility in water, g/100 ml at 25°C: 0.18 Vapour pressure, kPa at 20°C: 10 Relative vapour density (air = 1): 2.7	Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2 Flash point: -11°C c.c. Auto-ignition temperature: 498°C Explosive limits, vol% in air: 1.2-8.0 Octanol/water partition coefficient as log Pow: 2.13

ENVIRONMENTAL DATA

The substance is very toxic to aquatic organisms.

NOTES

Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is indicated. The odour warning when the exposure limit value is exceeded is insufficient.
Card has been partly updated in October 2004. See sections Occupational Exposure Limits, EU classification, Emergency Response.

ADDITIONAL INFORMATION

BENZ(a)ANTHRACENE

0385
October 1995

CAS No: 56-55-3
RTECS No: CV9275000
EC No: 601-033-00-9

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

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Combustible.		Water spray, powder. In case of fire in the surroundings: use appropriate extinguishing media.
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	PACKAGING & LABELLING
Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Personal protection: complete protective clothing including self-contained breathing apparatus.	T Symbol N Symbol R: 45-50/53 S: 53-45-60-61

EMERGENCY RESPONSE	SAFE STORAGE
	Well closed.

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IMPORTANT DATA

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.

Occupational exposure limits
TLV: A2 (suspected human carcinogen); (ACGIH 2004).

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 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

Bioaccumulation of this chemical may occur 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.
Card has been partly updated in October 2005. See sections Occupational Exposure Limits, EU classification.

ADDITIONAL INFORMATION

BENZO(a)PYRENE

0104
October 2005

CAS No: 50-32-8
RTECS No: DJ3675000
EC No: 601-032-00-3

Benz(a)pyrene
3,4-Benzopyrene
Benzo(d,e,f)chrysene
$C_{20}H_{12}$
Molecular mass: 252.3

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, foam, powder, carbon dioxide.
EXPLOSION			
EXPOSURE	**See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE.**	**AVOID ALL CONTACT! AVOID EXPOSURE OF (PREGNANT) WOMEN!**	
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.
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.	Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Evacuate danger area! Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place.	T Symbol N Symbol R: 45-46-60-61-43-50/53 S: 53-45-60-61

EMERGENCY RESPONSE	SAFE STORAGE
	Separated from strong oxidants.

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IMPORTANT DATA

Physical State; Appearance
PALE-YELLOW CRYSTALS

Chemical dangers
Reacts with strong oxidants causing fire and explosion hazard.

Occupational exposure limits
TLV: Exposure by all routes should be carefully controlled to levels as low as possible A2 (suspected human carcinogen); (ACGIH 2005).
MAK: Carcinogen category: 2; Germ cell mutagen group: 2; (DFG 2005).

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 when dispersed.

Effects of long-term or repeated exposure
This substance is carcinogenic to humans. May cause heritable genetic damage to human germ cells. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 496/C
Melting point: 178.1/C
Density: 1.4 g/cm^3

Solubility in water: none (<0.1 g/100 ml)
Vapour pressure : negligible
Octanol/water partition coefficient as log Pow: 6.04

ENVIRONMENTAL DATA

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish, in plants and in molluscs. The substance may cause long-term effects in the aquatic environment.

NOTES

Do NOT take working clothes home.
Benzo(a)pyrene is present as a component of polycyclic aromatic hydrocarbons (PAHs) in the environment, usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.

ADDITIONAL INFORMATION

CADMIUM

0020
April 2005

CAS No: 7440-43-9
RTECS No: EU9800000
UN No: 2570
EC No: 048-002-00-0

Cd
Atomic mass: 112.4

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Flammable in powder form and spontaneously combustible in pyrophoric 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 acid(s).	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! AVOID ALL CONTACT!**	**IN ALL CASES CONSULT A DOCTOR!**
Inhalation	Cough. Sore throat.	Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	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	Abdominal pain. Diarrhoea. Headache. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rest. Refer for medical attention.

SPILLAGE DISPOSAL	**PACKAGING & LABELLING**	
Evacuate danger area! Personal protection: chemical protection suit including self-contained breathing apparatus. Remove all ignition sources. Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place.	T+ Symbol N Symbol R: 45-26-48/23/25-62-63-68-50/53 S: 53-45-60-61 Note: E UN Hazard Class: 6.1	Airtight. Unbreakable packaging; put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs.

EMERGENCY RESPONSE	**SAFE STORAGE**
	Fireproof. Dry. Keep under inert gas. Separated from igntion sources, oxidants acids, food and feedstuffs.

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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 forming flammable/explosive gas (hydrogen - see ICSC0001). Dust reacts with oxidants, hydrogen azide, zinc, selenium or tellurium, causing fire and explosion hazard.

Occupational exposure limits
TLV: (Total dust) 0.01 mg/m^3; (Respirable fraction) 0.002 mg/m^3; as TWA; A2 (suspected human carcinogen); BEI issued; (ACGIH 2005).
MAK: skin absorption (H); Carcinogen category: 1; Germ cell mutagen group: 3A; (DFG 2004).

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

Effects of short-term exposure
The fume is irritating to the respiratory tract. Inhalation of fume may cause lung oedema (see Notes). Inhalation of fumes may cause metal fume 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 kidney impairment. This substance is carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 765/C
Melting point: 321/C
Density: 8.6 g/cm^3

Solubility in water: none
Auto-ignition temperature: (cadmium metal dust) 250/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.
Cadmium also exists in a pyrophoric form (EC No. 048-011-00-X), which bears the additional EU labelling symbol F, R phrase 17, and S phrases 7/8 and 43. UN numbers and packing group will vary according to the physical form of the substance.

ADDITIONAL INFORMATION

CHROMIUM

0029
October 2004

CAS No: 7440-47-3
RTECS No: GB4200000

Chrome
(powder)
Cr
Atomic mass: 52.0

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Combustible under specific conditions.	No open flames if in powder form.	In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION		Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		**PREVENT DISPERSION OF DUST!**	
Inhalation	Cough.	Local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness.	Safety goggles.	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	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Personal protection: P2 filter respirator for harmful particles.	

EMERGENCY RESPONSE	SAFE STORAGE

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IMPORTANT DATA

Physical State; Appearance
GREY POWDER

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
Chromium is a catalytic substance and may cause reaction in contact with many organic and inorganic substances, causing fire and explosion hazard.

Occupational exposure limits
TLV: (as Cr metal, Cr(III) compounds) 0.5 mg/m^3 as TWA; A4; (ACGIH 2004).
MAK not established.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of short-term exposure
May cause mechanical irritation to the eyes and the respiratory tract.

PHYSICAL PROPERTIES

Boiling point: 2642/C
Melting point: 1900/C
Density: 7.15 g/cm^3
Solubility in water: none

ENVIRONMENTAL DATA

NOTES

The surface of the chromium particles is oxidized to chromium(III)oxide in air.
See ICSC 1531 Chromium(III) oxide.

ADDITIONAL INFORMATION

COPPER

0240
September 1993

CAS No: 7440-50-8
RTECS No: GL5325000
UN No:
EC No:

Cu
Atomic mass: 63.5

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	PACKAGING & LABELLING
Sweep spilled substance into containers. Carefully collect remainder. Then remove to safe place (extra personal protection: P2 filter respirator for harmful particles).	Symbol R: S:

EMERGENCY RESPONSE	STORAGE
	Separated from: see Chemical Dangers.

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IMPORTANT DATA

Physical State; Appearance
RED POWDER, TURNS GREEN ON EXPOSURE TO MOIST AIR.

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
TLV: ppm; 0.2 mg/m^3 fume (ACGIH 1992-1993).
TLV (as Cu, dusts & mists): ppm; 1 mg/m3 (ACGIH 1992-1993).

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 (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

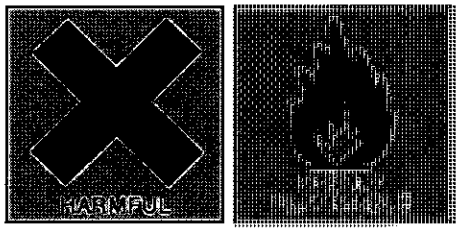
ENVIRONMENTAL DATA

NOTES

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

ADDITIONAL INFORMATION

Safety data for cis-1,2-dichloroethylene



Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: (Z)-1,2-dichloroethene, cis-1,2-dichloroethene
Molecular formula: $C_2H_2Cl_2$
CAS No: 156-59-2
EC No: 205-859-7

Physical data

Appearance: colourless liquid
Melting point: -80 C
Boiling point: 60 C
Vapour density:
Vapour pressure: 200 mm Hg at 25 C
Specific gravity: 1.284
Flash point: 4 C
Explosion limits: 9.7 - 12.8 %
Autoignition temperature: 460 C
Water solubility: slight

Stability

Stable, but may decompose slowly on exposure to light, air or moisture. Incompatible with bases, oxidizing agents, sodium, sodium hydroxide, potassium hydroxide, copper, copper alloys, most metals. Highly flammable.

Toxicology

Harmful if swallowed, inhaled, or absorbed through skin. Irritant. Narcotic. Suspected carcinogen.

Toxicity data
(The meaning of any abbreviations which appear in this section is given here.)
IHL-MUS LCLO 65000 mg/m3/2h
IHL-CAT LCLO 20000 mg/m3/6h

Risk phrases
(The meaning of any risk phrases which appear in this section is given here.)
R11 R20 R21 R22 R36 R37 R39.

Transport information

(The meaning of any UN hazard codes which appear in this section is given here.)
Hazard class 3.0. Packing group II. UN No 1150.

Personal protection

Safety glasses, good ventilation.

Safety phrases
(The meaning of any safety phrases which appear in this section is given here.)
S16 S26.

[Return to Physical & Theoretical Chemistry Lab. Safety home page.]

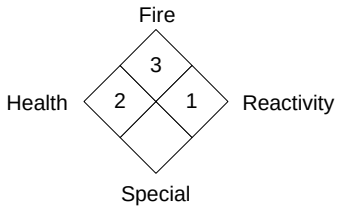
Georgia Gulf

Chemicals and Vinyls, LLC

Material Safety Data Sheet: Isopropylbenzene [Cumene]

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product name	**Isopropylbenzene [Cumene]**
Effective date	August 2007
Synonyms	Isopropylbenzene, cumol, 2-phenylepropane, (1-methylethyl) benzene, cumene
Chemical formula	$(CH_3)_2 CHC_6 H_5$
CAS name & no.	Benzene, (1-methylethyl), 98-82-8
Manufacturer's name and address	Georgia Gulf Chemicals and Vinyls, LLC P.O. Box 1959 Pasadena, TX 77501
Emergency telephone number	For transportation emergencies: CHEMTREC (800) 424-9300 For all other emergencies: (225) 685-2500
MSDS contact	Corporate Health & Safety Department P.O. Box 629 Plaquemine, LA 70765 Phone Number (225) 685-2500



NFPA Hazard Rating

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS No.	Wt.%.
Isopropylbenzene [Cumene]	98-82-8	99.97

3. HAZARDS IDENTIFICATION

PRECAUTIONARY INFORMATION

Flammable liquid. Eye, skin and respiratory tract irritant. May cause narcosis. Causes dizziness, drowsiness and unconsciousness.

POTENTIAL HEALTH EFFECTS

Primary Routes of Entry

Inhalation, ingestion, skin, and eye contact.

Acute Effects

Isopropylbenzene may act as a central nervous system depressant and a narcotic. Inhalation of high vapor concentrations may cause dizziness, slight incoordination, and unconsciousness. This chemical may also be toxic to the liver, spleen, and gall bladder, but there is little human evidence of these effects. This chemical is also a skin and eye irritant.

Chronic Effects

Prolonged skin contact may result in skin rashes. Chronic experiments in animals found isopropylbenzene to cause damage to the spleen and fatty changes in the liver, but no renal or pulmonary irritancy. Subacute inhalation experiments showed no significant changes in peripheral blood, but exhibited some liver, kidney, and lung effects.

Potential Adverse Chemical Interactions

Persons with kidney diseases, liver diseases, skin diseases or respiratory diseases, especially obstructive airway disease, may be at increased risks due to the toxic effects of isopropylbenzene on these organs.

Carcinogen Status

Isopropylbenzene is not considered to be carcinogenic by OSHA, NIOSH, NTP, IARC, or EPA.

4. FIRST AID MEASURES

Inhalation
If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, begin artificial respiration and if heart action has stopped, CPR. Get medical attention as soon as possible.

Skin Contact
If this chemical contacts the skin, flush the contaminated skin with copious quantities of water for at least 15 minutes. If this chemical penetrates the clothing, immediately remove clothing and flush the skin with water promptly. If irritation persists after washing, get medical attention.

Eye Contact
If the chemical contacts the eyes, immediately wash the eyes with large amounts of room temperature water for at least 15 minutes, occasionally lifting the lower and upper lids. Get medical attention immediately.

Ingestion
If the chemical is ingested do not induce vomiting. Get medical attention immediately.

5. FIRE FIGHTING MEASURES

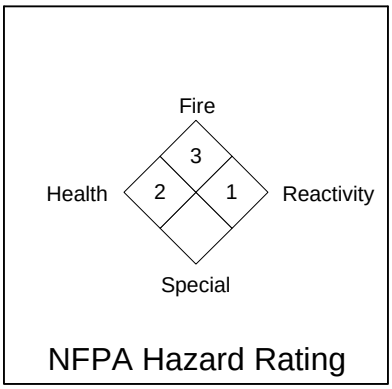
Flash Point	33°C (closed cup)
Flammable Limits (% By Vol.)	
Lower Explosive Limit (LEL)	0.9
Upper Explosive Limit (UEL)	6.5
Autoignition Temperature	425° C

Fire Fighting Procedures/Fire Extinguishing Media
Keep unnecessary people away; isolate hazard area and deny entry. Avoid breathing vapors, stay upwind. Use NIOSH approved self-contained respirator in the positive pressure mode as combustion of isopropylbenzene produces toxic vapors. Structural firefighter's protective clothing is NOT effective for this material. Use an acceptable halon replacement such as carbon dioxide extinguishers, alcohol foam or dry chemical for small fires. Large fires should be extinguished with alcohol foam. Water sprays may be used to keep the containers cool but may be insufficient to extinguish the fire. Direct water streams may promote the spread of isopropylbenzene flames, as isopropylbenzene is lighter than water. Stay away from ends of tanks. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. Isolate for 1/2 mile in all directions if tank car or truck is involved in fire.

Unusual Fire and Explosion Hazards
Dangerous fire and explosion hazard when exposed to heat or flame. Isopropylbenzene vapor forms explosive mixtures in air. Flowing isopropylbenzene may ignite by self-generated static electricity. Do not weld, cut, drill, grind, or perform similar operations on or near containers (even empty containers, as even residues of isopropylbenzene can ignite explosively).

5. FIRE FIGHTING MEASURES (continued)

Isopropylbenzene vapors are heavier than air and may travel back a considerable distance to a source of ignition and flash back. Containers exposed to heat from fires should be cooled with water to prevent vapor pressure buildup, which could result in container rupture. Combustion of isopropylbenzene produces irritants and toxic gases.



National Fire Protection Association Hazard Rating
4 = Extreme
3 = High
2 = Moderate
1 = Slight
0 = Insignificant

6. ACCIDENTAL RELEASE MEASURES

Shut off all sources of ignition. No smoking or flares allowed in the spill area. Restrict access to spill area, and move unprotected personnel upwind of the area. Keep out of low areas. Allow only trained personnel wearing appropriate protective clothing and self-contained respirator in the vicinity of the spill. Do not touch spilled material; stop leak if you can without risk. If fire potential exists, cover spill with foam. Prevent isopropylbenzene from entering water bodies, drains and any sewage collection systems. Isopropylbenzene will float on water and the runoff will present an explosion or fire hazard. For small spills take up with sand or other non-combustible absorbent material, and place into containers for later disposal. Control large spills by diking. Dispose all spill material in accordance with federal, state and local regulations. Isopropylbenzene spills over the reportable quantity (5,000 lbs) should be reported to the National Response Center (800-424-8802).

7. HANDLING AND STORAGE

Store in a well ventilated place away from sources of ignition, and oxidizing agents and in accordance with 29 CFR 1910.106. Store in metal containers. Ground and bond all storage and transfer equipment to prevent possible ignition from static sparks. Use spark resistant equipment (tools) in the isopropylbenzene area. Store in an area equipped with automatic sprinklers or fire extinguishing system. Wear appropriate protective equipment when handling isopropylbenzene. All seals, gaskets, liners and other such parts exposed to isopropylbenzene service should be made of aromatic resistant elastomers. Do not use rubber- lined tanks. Since emptied containers retain product residues, assume emptied containers to have the same hazards as full containers. Follow all federal, state and local regulations as well as all insurance codes when storing and handling isopropylbenzene.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Respiratory Protection
Use appropriate NIOSH approved respirators in accordance with 29 CFR 1910.132 and 1910.134, to prevent overexposure. Respirators must be selected based on the airborne levels found in the workplace and must not exceed the working limits of the respirator.

Eye Protection
Use splash proof chemical safety goggles or appropriate full-face respirator. Follow the eye and face protection guidelines of 29 CFR 1910.132 and 1910.133. Where there is any possibility that an individual's eyes may be exposed to isopropylbenzene, an eye wash fountain (in accordance with 29 CFR 1910.151) should be within the immediate work area for emergency use.

Protective Gloves
Use gloves in accordance with 29 CFR 1910.132 and 29 CFR 1910.138.

Ventilation
Provide local ventilation to maintain exposure levels below recommended exposure limits, and to prevent accumulation of isopropylbenzene in explosive levels. Use explosion proof ventilation equipment. Local exhaust ventilation should comply with OSHA regulations and the American Conference of Governmental Industrial Hygienists, Industrial Ventilation - A Manual of Recommended Practice.

Exposure Guidelines
The OSHA-PEL, NIOSH-REL and ACGIH-TLV for Isopropylbenzene [Cumene] is 50 ppm (8-hr TWA). The IDLH is 900 ppm [10% LEL].

Other
Where there is a possibility of exposure of an individual's body to isopropylbenzene, facilities for quick drenching of the body should be provided (in accordance with 29 CFR 1910.151) within the immediate work area for emergency use. Such individuals should be provided with and required to use impervious clothing in accordance with 29 CFR 1910.132.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Clear colorless liquid
Odor	Sharp penetrating aromatic odor
Molecular Weight	120.2
Boiling Point	152°C
Melting Point	-96°C
Solubility	Insoluble in water, soluble in alcohol, ether, benzene, and chlorinated solvents
Specific Gravity (Water = 1.0)	0.86
Vapor Density (Air = 1.0)	4.14
Vapor Pressure	3.2 mm Hg @ 20°C
pH	Not Available

10. STABILITY AND REACTIVITY

Stability
Stable under normal conditions.

Polymerization
Hazardous polymerization does not occur.

Hazardous Decomposition Products
Combustion products of isopropylbenzene may include styrene, benzaldehyde, acetophenone, benzene, carbon monoxide, and carbon dioxide. Other unidentified organic compounds may be formed during combustion.

Incompatible Materials
Violent reactions may take place between isopropylbenzene and nitric acid, oleum and chlorsulphonic acid. Isopropylbenzene reacts with oxidizing agents to form isopropylbenzene hydroperoxide, which may cause explosive hazards.

11. TOXICOLOGICAL INFORMATION

Animal Toxicity:

Oral:	Rat LD_{50}	1.4 g/kg
Inhalation:	Rat LC_{LO}	8,000 ppm (4hr)
	Mouse LC_{LO}	5,042 ppm (2hr)
	Human LC_{LO}	200 ppm (somnolence, irritability)

LC_{LO} = Lowest air concentration that is lethal to a given species in a given time.
LC_{50} = Dose that is lethal to 50% of a given species by a given route of exposure.

Animal experiments indicate that isopropylbenzene may be toxic at very high concentrations to the spleen and liver. Cataract formation has also been observed in experimental animals exposed to high concentrations of isopropylbenzene vapor.

12. ECOLOGICAL INFORMATION

Environmental Fate: The following information on isopropylbenzene [cumene] is extracted from the TOXNET database maintained by the National Library of Medicine.

Atmosphere: According to a model of gas/particle partitioning of semi-volatile organic compounds in the atmosphere, cumene, which has a vapor pressure of 4.5 mm Hg at 25 deg C, is expected to exist solely as a vapor in the ambient atmosphere. Vapor-phase cumene is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 2.5 days, calculated from its rate constant of $6.5x10^{-12}$ cu cm/molecule-sec at 25 deg C. Vapor-phase cumene is also degraded in the atmosphere by reaction with ozone radicals; the half-life for this reaction in air is estimated to be 3 yrs, calculated from its estimated rate constant of $1.0x10^{-20}$ cu cm/molecule-sec at 25 deg C.

12. ECOLOGICAL INFORMATION (continued)

Terrestrial: Based on a classification scheme, an estimated Koc value of 820, determined from a structure estimation method, indicates that cumene is expected to have low mobility in soil. Volatilization of cumene from moist soil surfaces is expected to be an important fate process given a Henry's Law constant of 0.0115 atm-cu m/mole. The potential for volatilization of cumene from dry soil surfaces may exist based upon a vapor pressure of 4.5 mm Hg. However, adsorption to soil is expected to attenuate volatilization. After a 10 and 20 day exposure of wastewater inoculum to cumene, a theoretical BOD of 62% and 70% was observed, respectively. Based on these results, cumene is expected to undergo considerable biodegradation in soil environments.

Aquatic: Based on a classification scheme, an estimated Koc value of 820, determined from an estimation method, indicates that cumene is expected to adsorb to sediment and suspended solids in water. Volatilization from water surfaces is expected based upon a Henry's Law constant of 0.0115 atm-cu m/mole. Using this Henry's Law constant and an estimation method, volatilization half-lives for a model river and model lake are 1.2 hrs and 4.4 days, respectively. In natural waters, cumene is degraded by reaction with hydroxyl radicals; the half-life for this reaction in water is estimated to be 107 days, calculated from its rate constant of $7.5x10^9$ L/mol sec at pH 7.

Biodegradation:
Aerobic: Using river water and sediment in a test system, the aerobic biodegradation of cumene was studied in a closed system. The disappearance rate constant of cumene (avg concn 2.5 mg/l) for total mineralization was 0.02/day; this equates to a half-life of 34.6 days. However, when volatilization was considered coupled with biodegradation, the half-life for cumene became 2.5 days. Cumene biodegradation experienced a lag time of approximately 5 days. Based on the results of this experiment, residence time of cumene in aquatic ecosystems will likely be brief.

Anaerobic: In an in-situ anaerobic biodegradation study of various alkyl benzene compounds, cumene was found to undergo considerable biodegradation. Biodegradation proceeded via methanogenic and fermentative bacteria.

Ecotoxicity:

LC_{50} Daphnia magna 0.6 ppm/48 hr /Conditions of bioassay not specified
LD_{50} Agelaius phoeniceus (red-winged blackbird) oral 98 mg/kg
Mytilus edulis (mussel larvae): no significant alteration of growth rate at concentrations of 1 to 50 ppm.

13. DISPOSAL CONSIDERATIONS

Waste Management Information: Any disposal practice must be in compliance with local, state and federal laws and regulations.

14. TRANSPORTATION INFORMATION

Proper shipping name	Isopropylbenzene
DOT Hazard class	3, (Flammable liquid)
DOT Shipping I.D. No.	UN 1918
PG	III
Labeling	Flammable
RQ	Cumene

15. REGULATORY INFORMATION

SARA Title III

Section 302 and 304 of the Emergency Planning and Community Right to Know Act; Extremely Hazardous Substances (40 CFR 355)

COMPONENT	CAS No.	TPQ (lbs)	RQ
None	Not Applicable	Not Applicable	Not Applicable

NOTE: TPQ - Threshold Planning Quantity RQ - Reportable Quantity

Section 311 and 312 Hazard Categorization (40 CFR 370)

ACUTE	CHRONIC	FIRE	PRESSURE	REACTIVE
X	X	X		

Section 313 Toxic Chemicals (40 CFR 372.65)

COMPONENT	CAS No.	WT. %
Isopropylbenzene	98-82-8	99.97

CERCLA

Section 102(a) Hazardous Substances (40 CFR 302.4)

COMPONENT	CAS No.	WT. %	RQ (lbs)
Isopropylbenzene	98-82-8	99.97	5,000

RCRA

40 CFR 261.21 Hazardous Waste Number:
Isopropylbenzene waste and material contaminated with isopropylbenzene would be regulated as a hazardous waste material under the hazardous waste number U055.

TSCA

Isopropylbenzene is listed on the TSCA inventory.

Canadian Regulations

This product has been classified according to the hazard criteria of the Canadian Controlled Products Regulations, Section 33 and the MSDS contains all information required by this regulation. WHMIS Classification- BD2

Canadian Environmental Protection Act (CEPA)

All substances in this product are listed on the Canadian Domestic Substances (DSL) list or are not required to be listed.

16. OTHER INFORMATION

IMPORTANT: The information and data herein are believed to be accurate and have been compiled from sources believed to be reliable. It is offered for your consideration, investigation and verification. Buyer assumes all risk of use, storage and handling of the product in compliance with applicable federal, state and local laws and regulations. **GEORGIA GULF CHEMICALS AND VINYLS, LLC MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, CONCERNING THE ACCURACY OR COMPLETENESS OF THE INFORMATION AND DATA HEREIN.** Georgia Gulf will not be liable for claims relating to any party's use of or reliance on information and data contained herein regardless of whether it is claimed that the information and data are inaccurate, incomplete or otherwise misleading. This information relates to the material designated and may not be valid for such material used in combination with any other materials nor in any process.

MSDS Status: Revision Date: 08/24/2007 Supersedes: 6/10/04

LEAD

0052
October 2002

CAS No: 7439-92-1
RTECS No: OF7525000

Lead metal
Plumbum
(powder)
Pb
Atomic mass: 207.2

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.		In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE	**See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE.**	**PREVENT DISPERSION OF DUST! AVOID EXPOSURE OF (PREGNANT) WOMEN!**	
Inhalation		Local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. 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. Give plenty of water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment. Personal protection: P3 filter respirator for toxic particles.	

EMERGENCY RESPONSE	SAFE STORAGE
	Separated from food and feedstuffs and incompatible materials. See Chemical Dangers.

IPCS
International Programme on Chemical Safety

Prepared in the context of cooperation between the International Programme on Chemical Safety and the European Commission

IMPORTANT DATA

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
On heating, toxic fumes are formed. Reacts with oxidants. Reacts with hot concentrated nitric acid, boiling concentrated hydrochloric acid and sulfuric acid. Attacked by pure water and by weak organic acids in the presence of oxygen.

Occupational exposure limits
TLV: 0.05 mg/m^3 as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued; (ACGIH 2004).
MAK: Carcinogen category: 3B; Germ cell mutagen group: 3A; (DFG 2004).
EU OEL: as TWA 0.15 mg/m^3; (EU 2002).

Routes of exposure
The substance can be absorbed into the body by inhalation and by ingestion.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

Effects of long-term or repeated exposure
The substance may have effects on the blood, bone marrow, central nervous system, peripheral nervous system and kidneys, resulting in anaemia, encephalopathy (e.g., convulsions), peripheral nerve disease, abdominal cramps and kidney impairment. Causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 1740/C
Melting point: 327.5/C
Density: 11.34 g/cm^3
Solubility in water: none

ENVIRONMENTAL DATA

Bioaccumulation of this chemical may occur in plants and in mammals. It is strongly advised that this substance does not enter the environment.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
Do NOT take working clothes home.
Card has been partly updated in April 2005. See section Occupational Exposure Limits.

ADDITIONAL INFORMATION

Safety data for magnesium

Click here for data on magnesium in student-friendly format, from the HSci project

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Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: magnesium ribbon, magnesium wire, magnesium powder
Molecular formula: Mg
CAS No: 7439-95-4
EC No: 231-104-6

Physical data

Appearance: silver or grey rod, turnings or ribbon
Melting point: 650 C
Boiling point: 1107 C
Vapour density:
Vapour pressure: 1 mm at 621 C
Specific gravity: 1.73
Flash point: 634 C (closed cup)

Explosion limits:
Autoignition temperature: 510 C

Stability

Stable. Reacts violently with halogens, chlorinated solvents, chloromethane. Air and moisture sensitive. Incompatible with acids, acid chlorides, strong oxidizing agents. Highly flammable.

Toxicology

Harmful if swallowed or inhaled. Severe irritant. Vesicant.

Risk phrases

(The meaning of any risk phrases which appear in this section is given here.)
R11 R20 R22.

Transport information

(The meaning of any UN hazard codes which appear in this section is given here.)
Hazard class 4.1 Packing group III

Personal protection

Safety glasses.

Safety phrases

(The meaning of any safety phrases which appear in this section is given here.)
S16 S26 S33 S36 S37 S39.

[Return to Physical & Theoretical Chemistry Lab. Safety home page.]

This information was last updated on May 20, 2005. We have tried to make it as accurate and useful as possible, but can take no responsibility for its use, misuse, or accuracy. We have not verified this information, and cannot guarantee that it is up-to-date.

MERCURY

0056
April 2004

CAS No: 7439-97-6
RTECS No: OV4550000
UN No: 2809
EC No: 080-001-00-0

Quicksilver
Liquid silver
Hg
Atomic mass: 200.6

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.		In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION	Risk of fire and explosion.		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. Fever or elevated body temperature.	Local exhaust or breathing protection.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
Skin	MAY BE ABSORBED! Redness.	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	PACKAGING & LABELLING	
Evacuate danger area in case of a large spill! Consult an expert! Ventilation. Collect leaking and spilled liquid in sealable non-metallic containers as far as possible. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Chemical protection suit including self-contained breathing apparatus.	T Symbol N Symbol R: 23-33-50/53 S: (1/2-)7-45-60-61 UN Hazard Class: 8 UN Pack Group: III	Special material. Do not transport with food and feedstuffs.

EMERGENCY RESPONSE	STORAGE
Transport Emergency Card: TEC (R)-80GC9-II+III	Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs. Well closed.

IPCS
International Programme on Chemical Safety

Prepared in the context of cooperation between the International Programme on Chemical Safety and the European Commission

SEE IMPORTANT INFORMATION ON THE BACK.

IMPORTANT DATA

Physical State; Appearance
ODOURLESS, HEAVY AND MOBILE SILVERY LIQUID METAL.

Chemical dangers
Upon heating, toxic fumes are formed. Reacts violently with ammonia and halogens causing fire and explosion hazard. Attacks aluminium and many other metals forming amalgams.

Occupational exposure limits
TLV: 0.025 mg/m^3 as TWA; (skin); A4; BEI issued; (ACGIH 2004).
MAK: 0.1 mg/m^3; Sh; Peak limitation category: II(8); Carcinogen category: 3B; (DFG 2003).

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour 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
The substance is irritating to the skin. Inhalation of the vapours may cause pneumonitis. The substance may cause effects on the central nervous system and kidneys. 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 irritability, emotional instability, tremor, mental and memory disturbances, speech disorders. May cause inflammation and discoloration of the gums. 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

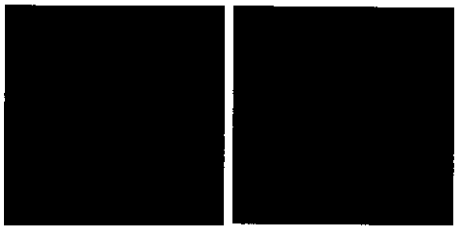
The substance is very toxic to aquatic organisms. In the food chain important to humans, bioaccumulation takes place, specifically in fish.

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

Safety data for propylbenzene



Glossary of terms on this data sheet.

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General

Synonyms: 1-propylbenzene, n-propylbenzene, propyl benzene, 1-phenylpropane, isocumene
Molecular formula: C_9H_{12}
CAS No: 103-65-1
EC No: 203-132-9
Annex I Index No: 601-024-00-X

Physical data

Appearance: colourless or light yellow liquid
Melting point: -99 C
Boiling point: 159 C
Vapour density: 4.14
Vapour pressure: 2 mm Hg at 20C
Specific gravity: 0.862
Flash point: 47 C
Explosion limits: 0.8 - 6%
Autoignition temperature: 450 C

Stability

Stable. Flammable. Incompatible with strong oxidizing agents.

Toxicology

Harmful if swallowed. Respiratory irritant.

Toxicity data
(The meaning of any toxicological abbreviations which appear in this section is given here.)
ORL-RAT LD50 6040 mg kg^{-1}
IHL-RAT LC50 65000 ppm/2h

Risk phrases
(The meaning of any risk phrases which appear in this section is given here.)
R10 R37 R51 R53 R65.

Environmental information

Harmful in the environment - may cause long-term damage to the aquatic environment.

Transport information

(The meaning of any UN hazard codes which appear in this section is given here.)
UN No 2364. Hazard class 3.0. Packing group III.

Personal protection

Safety glasses, adequate ventilation. Do not release into the environment.

Safety phrases
(The meaning of any safety phrases which appear in this section is given here.)
S24 S37 S61 S62.

[Return to Physical & Theoretical Chemistry Lab. Safety home page.]

NAPHTHALENE

0667
April 2005

CAS No: 91-20-3
RTECS No: QJ0525000
UN No: 1334 (solid); 2304 (molten)
EC No: 601-052-00-2

Naphthene
$C_{10}H_8$
Molecular mass: 128.18

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 80/C explosive vapour/air mixtures may be formed. 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!**	
Inhalation	Headache. Weakness. Nausea. Vomiting. Sweating. Confusion. Jaundice. Dark urine.	Ventilation (not if powder), local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! (Further see Inhalation).	Protective gloves.	Rinse skin with plenty of water or shower.
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. Diarrhoea. Convulsions. Unconsciousness. (Further see Inhalation).	Do not eat, drink, or smoke during work. Wash hands before eating.	Rest. Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING	
Personal protection: filter respirator for organic gases and vapours. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place.	Xn Symbol N Symbol R: 22-40-50/53 S: (2-)36/37-46-60-61 UN Hazard Class: 4.1 UN Pack Group: III	Do not transport with food and feedstuffs. Marine pollutant.

EMERGENCY RESPONSE	SAFE STORAGE
Transport Emergency Card: TEC (R)-41S1334 (solid); 41GF1-II+III (solid); 41S2304 (molten) NFPA Code: H2; F2; R0	Separated from strong oxidants, food and feedstuffs. Store in an area without drain or sewer access.

IPCS
International Programme on Chemical Safety

Prepared in the context of cooperation between the International Programme on Chemical Safety and the European Commission

IMPORTANT DATA

Physical State; Appearance
WHITE SOLID IN VARIOUS FORMS, WITH CHARACTERISTIC ODOUR.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
On combustion, forms irritating and toxic gases. Reacts with strong oxidants.

Occupational exposure limits
TLV: 10 ppm as TWA; 15 ppm as STEL; (skin); A4 (not classifiable as a human carcinogen); (ACGIH 2005).
MAK: skin absorption (H); Carcinogen category: 2; Germ cell mutagen group: 3B; (DFG 2004).

Routes of exposure
The substance can be absorbed into the body by inhalation, 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. See Notes.

Effects of short-term exposure
The substance may cause effects on the blood, resulting in lesions of blood cells (haemolysis). See Notes. The effects may be delayed. Exposure by ingestion may result in death. Medical observation is indicated.

Effects of long-term or repeated exposure
The substance may have effects on the blood, resulting in chronic haemolytic anaemia. The substance may have effects on the eyes, resulting in the development of cataract. This substance is possibly carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 218/C Sublimation slowly at room temperature
Melting point: 80/C
Density: 1.16 g/cm^3
Solubility in water, g/100 ml at 25/C: none
Vapour pressure, Pa at 25/C: 11
Relative vapour density (air = 1): 4.42
Flash point: 80/C c.c.
Auto-ignition temperature: 540/C
Explosive limits, vol% in air: 0.9-5.9
Octanol/water partition coefficient as log Pow: 3.3

ENVIRONMENTAL DATA

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

NOTES

Some individuals may be more sensitive to the effect of naphthalene on blood cells.

ADDITIONAL INFORMATION

m-XYLENE

0085
August 2002

CAS No: 108-38-3
RTECS No: ZE2275000
UN No: 1307
EC No: 601-022-00-9

meta-Xylene
1,3-Dimethylbenzene
m-Xylol
$C_6H_4(CH_3)_2$ / C_8H_{10}
Molecular mass: 106.2

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 27/C explosive vapour/air mixtures may be formed.	Above 27/C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		**STRICT HYGIENE!**	
Inhalation	Dizziness. Drowsiness. Headache. Nausea.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.)	**EU classification** Xn Symbol R: 10-20/21-38 S: (2-)25 Note: C **UN classification** UN Hazard Class: 3 UN Pack Group: III

EMERGENCY RESPONSE	SAFE STORAGE
NFPA Code: H 2; F 3; R 0; Transport Emergency Card: TEC (R)-30S1307-III	Fireproof. Separated from strong oxidants and strong acids.

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Prepared in the context of cooperation between the International Programme on Chemical Safety and the European Commission

IMPORTANT DATA

Physical State; Appearance
COLOURLESS LIQUID, WITH CHARACTERISTIC ODOUR.

Physical dangers
As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers
Reacts with strong acids and strong oxidants.

Occupational exposure limits
TLV: 100 ppm as TWA; 150 ppm as STEL A4 (ACGIH 2001). BEI specified by (ACGIH 2001).
MAK: 100 ppm, 440 mg/m^3. Peak limitation category: II(2) skin absorption (H); Pregnancy risk group: D (DFG 2005).
EU OEL: 50 ppm as TWA; 100 ppm as STEL (skin) (EU 2000).

Routes of exposure
The substance can be absorbed into the body by inhalation, 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 is irritating to the eyes and the skin. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

Effects of long-term or repeated exposure
The liquid defats the skin. The substance may have effects on the central nervous system. Exposure to the substance may enhance hearing damage caused by exposure to noise. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 139/C
Melting point: -48/C
Relative density (water = 1): 0.86
Solubility in water: none
Vapour pressure, kPa at 20/C: 0.8
Relative vapour density (air = 1): 3.7
Relative density of the vapour/air-mixture at 20/C (air = 1): 1.02
Flash point: 27/C c.c.
Auto-ignition temperature: 527/C
Explosive limits, vol% in air: 1.1-7.0
Octanol/water partition coefficient as log Pow: 3.20

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is indicated.
The recommendations on this Card also apply to technical xylene.
See ICSC 0084 o-Xylene and 0086 p-Xylene.

ADDITIONAL INFORMATION

TETRACHLOROETHYLENE

0076
April 2000

CAS No: 127-18-4
RTECS No: KX3850000
UN No: 1897
EC No: 602-028-00-4

1,1,2,2-Tetrachloroethylene
Perchloroethylene
Tetrachloroethene
C_2Cl_4 / $Cl_2C=CCl_2$
Molecular mass: 165.8

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.		In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			

EXPOSURE		**STRICT HYGIENE! PREVENT GENERATION OF MISTS!**	
Inhalation	Dizziness. Drowsiness. Headache. Nausea. Weakness. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
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	Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give plenty of water to drink. Rest.

SPILLAGE DISPOSAL	**PACKAGING & LABELLING**	
Ventilation. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. Personal protection: filter respirator for organic gases and vapours.	Xn Symbol N Symbol R: 40-51/53 S: (2-)23-36/37-61 UN Hazard Class: 6.1 UN Pack Group: III	Do not transport with food and feedstuffs. Marine pollutant.

EMERGENCY RESPONSE	**SAFE STORAGE**
Transport Emergency Card: TEC (R)-61S1897 NFPA Code: H2; F0; R0	Separated from metals, (see Chemical Dangers), food and feedstuffs. Keep in the dark. Ventilation along the floor.

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SEE IMPORTANT INFORMATION ON THE BACK.

IMPORTANT DATA

Physical State; Appearance
COLOURLESS LIQUID, WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air.

Chemical dangers
On contact with hot surfaces or flames this substance decomposes forming toxic and corrosive fumes (hydrogen chloride, phosgene, chlorine). The substance decomposes slowly on contact with moisture producing trichloroacetic acid and hydrochloric acid. Reacts with metals such as aluminium, lithium, barium, beryllium.

Occupational exposure limits
TLV: 25 ppm as TWA, 100 ppm as STEL; A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued; (ACGIH 2004).
MAK: skin absorption (H); Carcinogen category: 3B; (DFG 2004).

Routes of exposure
The substance can be absorbed into the body by inhalation 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 is irritating to the eyes, the skin and the respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system. Exposure at high levels may result in unconsciousness.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver and kidneys. This substance is probably carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 121/C
Melting point: -22/C
Relative density (water = 1): 1.6
Solubility in water, g/100 ml at 20/C: 0.015
Vapour pressure, kPa at 20/C: 1.9
Relative vapour density (air = 1): 5.8
Relative density of the vapour/air-mixture at 20/C (air = 1): 1.09
Octanol/water partition coefficient as log Pow: 2.9

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
The odour warning when the exposure limit value is exceeded is insufficient.
Do NOT use in the vicinity of a fire or a hot surface, or during welding.
An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.
Card has been partly updated in April 2005. See section Occupational Exposure Limits.

ADDITIONAL INFORMATION

TRICHLOROETHYLENE

0081
October 2000

CAS No: 79-01-6
RTECS No: KX4550000
UN No: 1710
EC No: 602-027-00-9

1,1,2-Trichloroethylene
Trichloroethene
Ethylene trichloride
Acetylene trichloride
C_2HCl_3 / $ClCH=CCl_2$
Molecular mass: 131.4

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Combustible under specific conditions. See Notes.		In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION		Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		**PREVENT GENERATION OF MISTS! STRICT HYGIENE!**	
Inhalation	Dizziness. Drowsiness. Headache. Weakness. Nausea. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	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	Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give plenty of water to drink. Rest.

SPILLAGE DISPOSAL	PACKAGING & LABELLING	
Ventilation. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Personal protection: filter respirator for organic gases and vapours. Do NOT let this chemical enter the environment.	T Symbol R: 45-36/38-52/53-67 S: 53-45-61 UN Hazard Class: 6.1 UN Pack Group: III	Do not transport with food and feedstuffs. Marine pollutant.

EMERGENCY RESPONSE	SAFE STORAGE
Transport Emergency Card: TEC (R)-61S1710 NFPA Code: H2; F1; R0	Separated from metals (see Chemical Dangers), strong bases, food and feedstuffs. Dry. Keep in the dark. Ventilation along the floor.

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IMPORTANT DATA

Physical State; Appearance
COLOURLESS LIQUID, WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers
On contact with hot surfaces or flames this substance decomposes forming toxic and corrosive fumes (phosgene, hydrogen chloride). The substance decomposes on contact with strong alkali producing dichloroacetylene, which increases fire hazard. Reacts violently with metal powders such as magnesium, aluminium, titanium, and barium. Slowly decomposed by light in presence of moisture, with formation of corrosive hydrochloric acid.

Occupational exposure limits
TLV: 50 ppm as TWA; 100 ppm as STEL; A5; BEI issued; (ACGIH 2004).
MAK: Carcinogen category: 1; Germ cell mutagen group: 3B; (DFG 2004).

Routes of exposure
The substance can be absorbed into the body by inhalation and by ingestion.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20/C.

Effects of short-term exposure
The substance is irritating to the eyes and the skin. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system, resulting in respiratory failure. Exposure could cause lowering of consciousness.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the central nervous system, resulting in loss of memory. The substance may have effects on the liver and kidneys (see Notes). This substance is probably carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 87/C
Melting point: -73/C
Relative density (water = 1): 1.5
Solubility in water, g/100 ml at 20/C: 0.1
Vapour pressure, kPa at 20/C: 7.8
Relative vapour density (air = 1): 4.5
Relative density of the vapour/air-mixture at 20/C (air = 1): 1.3
Auto-ignition temperature: 410/C
Explosive limits, vol% in air: 8-10.5
Octanol/water partition coefficient as log Pow: 2.42

ENVIRONMENTAL DATA

The substance is harmful to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

NOTES

Combustible vapour/air mixtures difficult to ignite, may be developed under certain conditions.
Use of alcoholic beverages enhances the harmful effect.
Depending on the degree of exposure, periodic medical examination is suggested.
The odour warning when the exposure limit value is exceeded is insufficient.
Do NOT use in the vicinity of a fire or a hot surface, or during welding.
An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.
Card has been partly updated in October 2004. See sections Occupational Exposure Limits, EU classification, Emergency Response.

ADDITIONAL INFORMATION

ZINC POWDER

1205
October 1994

CAS No: 7440-66-6
RTECS No: ZG8600000
UN No: 1436 (zinc powder or dust)
EC No: 030-001-00-1

Blue powder
Merrillite
(powder)
Zn
Atomic mass: 65.4

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), base(s), water 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	PACKAGING & LABELLING
Extinguish or remove all ignition sources. Do NOT wash away into sewer. Sweep spilled substance into containers. then remove to safe place. Personal protection: self-contained breathing apparatus.	F Symbol N Symbol R: 15-17-50/53 S: (2-)7/8-43-46-60-61 UN Hazard Class: 4.3 UN Subsidiary Risks: 4.2 Airtight.

EMERGENCY RESPONSE	SAFE STORAGE
Transport Emergency Card: TEC (R)-43GWS-II+III NFPA Code: H0; F1; R1	Fireproof. Separated from acids, bases oxidants. Dry.

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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 forming flammable/explosive gas (hydrogen - see ICSC0001). Reacts violently with sulfur, halogenated hydrocarbons and many other substances causing fire and explosion hazard.

Occupational exposure limits
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 fumes may cause metal fume 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: 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 ICSC0001 and ICSC0222).
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.
Card has been partly updated in April 2005. See sections EU classification, Emergency Response.

ADDITIONAL INFORMATION

Appendix B
Activity Hazard Analyses

Project Identification 38-01 Queens Blvd	**Location** Various	**Estimated Dates** TBD
Phase of Work Mobilization/ Demobilization	**Page 1 of 1**	**Analysis Approved by** Richard Kampf, PM/HSM
TASKS	**HAZARDS**	**CONTROL MEASURES**
1. Mobilization and demobilization of equipment site tools, personnel	Slips/trips/falls	• Maintain alertness to slip/trip/fall hazards; • Maintain good housekeeping; • Walk, do not run; • Wear footwear with soles that grip; • Unloading areas should be on even terrain; and • Mark and repair if possible tripping hazards.
	Manual lifting and material handling	• Instruct personnel on proper lifting techniques; • Use proper lifting techniques; and • Team lifting will be used for heavy loads or use mechanical lifting devices.
	Temperature extremes	• Drink plenty of fluids: • Train personnel of signs/symptoms of heat/cold stress; • Monitor air temperatures when extreme weather conditions are present; and • Stay in visual and verbal contact with your buddy.
	Vehicular traffic	• Spotters will be used when backing up trucks and heavy equipment and when moving equipment.
	Overhead hazards	• Personnel will be required to wear hard hats that meet ANSI Standard Z89.1; • Ground personnel will stay clear of suspended loads; • Equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects; and • Overhead hazards will be identified prior to commencing work operations.
	Noise	• Ear plugs or ear muffs shall be worn for operations that exceed 85 decibels.
	Electrocution	• Equipment will be equipped with GFCI; • A licensed electrician will conduct electrical work; • Equipment will stay a minimum of 15 feet from overhead-energized electrical lines and the electrified third rail (up to 50 kV). This distance will increase 0.4 inches for each 1 kV above 50 kV.
	Biological hazards	• Be alert to the presence of biological hazards; • Wear insect repellent; • Follow procedures in Section 4.2.2 for tick bites; • FTL/SHSO should be aware of on-site personnel with allergic reactions in insect bites and stings.

Project Identification 38-01 Queens Blvd	**Location** Various	**Estimated Dates** TBD
Phase of Work Drilling	**Page 2 of 2**	**Analysis Approved by** Richard Kampf, PM/HSM
TASKS	**HAZARDS**	**CONTROL MEASURES**
	Noise	• Hearing protection mandatory at or above 85 dBA. • Instruct personnel how to properly wear heating protective devices. • Disposable ear plugs or other hearing protection required when working near noisy equipment.
	Steam/Heat/Splashing	• Use face shield and safety glasses or goggles; • Stay out of the splash/steam radius; • Do not direct steam at anyone; • Do not hold objects with your foot and steam area near it; • Direct spray to minimize spread of constituents of concern; and • Use shielding as necessary.
	Excavation hazards	• Follow 29 CFR 1926 Subpart P.
	Overhead hazards	• Personnel will be required to wear hard hats that meet ANSI Standard Z89.1; • Ground personnel will stay clear of suspended loads; • Equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects; and • Overhead hazards will be identified prior to commencing work operations.
	Electrocution	• Equipment will be equipped with GFCI; • A licensed electrician will conduct electrical work; • Equipment will stay a minimum of 15 feet from overhead-energized electrical lines and the electrified third rail (up to 50 kV). This distance will increase 0.4 inches for each 1 kV above 50 kV.
	Track Hazards	• Caution will be used when working in close proximity to the electrified third rail (see “Electrocution” above). • Workers are required to have completed NYCT Track Safety Training • Flag men will be used when necessary (e.g., working in limited access track areas).

Project Identification 38-01 Queens Blvd	**Location** Various	**Estimated Dates** TBD
Phase of Work Environmental Sampling	**Page 1 of 1**	**Analysis Approved by** Richard Kampf, PM/HSM
TASKS	**HAZARDS**	**CONTROL MEASURES**
1. Collect soil/soil vapor/groundwater samples.	Chemical hazards	• Wear appropriate PPE per Table 6-1; • Practice contamination avoidance; • Follow proper decontamination procedures; and • Wash hands/face before eating, drinking or smoking.
	Temperature extremes	• Drink plenty of fluids: • Train personnel of signs/symptoms of heat/cold stress; • Monitor air temperatures when extreme weather conditions are present; and • Stay in visual and verbal contact with your buddy.
	Manual lifting and material handling	• Site personnel will be instructed on proper lifting techniques; mechanical devices should be used to reduce manual handling of materials; team lifting should be utilized if mechanical devices are not available.
	Slips/Trips/Falls	• Maintain alertness to slip/trip/fall hazards; • Maintain good housekeeping; • Walk, do not run; • Wear footwear with soles that grip; • Unloading areas should be on even terrain; and • Mark and repair if possible tripping hazards.
	Electrocution	• Equipment will be equipped with GFCI; • A licensed electrician will conduct electrical work; • Equipment will stay a minimum of 15 feet from overhead-energized electrical lines and the electrified third rail (up to 50 kV). This distance will increase 0.4 inches for each 1 kV above 50 kV.
	Track Hazards	• Caution will be used when working in close proximity to the electrified third rail (see “Electrocution” above). • Workers are required to have completed NYCT Track Safety Training • Flag men will be used when necessary (e.g., working in limited access track areas).

Project Identification 38-01 Queens Blvd	**Location** Various	**Estimated Dates** TBD
Phase of Work Decontamination	**Page 1 of 1**	**Analysis Approved by** Richard Kampf, PM/HSM
TASKS	**HAZARDS**	**CONTROL MEASURES**
1. Decontaminate equipment	Chemical hazards	• Wear appropriate PPE per Table 6-1; • Practice contamination avoidance; • Follow proper decontamination procedures; and • Wash hands/face before eating, drinking or smoking.
	Temperature extremes	• Drink plenty of fluids: • Train personnel of signs/symptoms of heat/cold stress; • Monitor air temperatures when extreme weather conditions are present; and • Stay in visual and verbal contact with your buddy.
	Manual lifting and material handling	• Site personnel will be instructed on proper lifting techniques; mechanical devices should be used to reduce manual handling of materials; team lifting should be utilized if mechanical devices are not available.
	Slips/Trips/Falls	• Maintain alertness to slip/trip/fall hazards; • Maintain good housekeeping; • Walk, do not run; • Wear footwear with soles that grip; • Unloading areas should be on even terrain; and • Mark and repair if possible tripping hazards.
	Electrocution	• Equipment will be equipped with GFCI; • A licensed electrician will conduct electrical work; • Equipment will stay a minimum of 15 feet from overhead-energized electrical lines and the electrified third rail (up to 50 kV). This distance will increase 0.4 inches for each 1 kV above 50 kV.
	Track Hazards	• Caution will be used when working in close proximity to the electrified third rail (see "Electrocution" above). • Workers are required to have completed NYCT Track Safety Training • Flag men will be used when necessary (e.g., working in limited access track areas).

Appendix C
Heat/Cold Stress Protocols

HEAT STRESS

Heat Stress (Hyperthermia)

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

1. Prior to site activity, the field team leader may make arrangements for heat stress monitoring (i.e., monitoring heart rate, body temperature, and body water loss) during actual site work if conditions warrant. In addition, the FTL is to ensure that each team member has been acclimatized to the prevailing environmental conditions, that personnel are aware of the signs and symptoms of heat sickness, that they have been adequately trained in first aid procedures, and that there are enough personnel on-site to rotate work assignments and schedule work during hours of reduced temperatures. Personnel should not consume alcoholic or caffeinated beverages but rather drink moderate levels of an electrolyte solution and eat well prior to commencing site work.

2. Although there is no specific test given during a baseline physical that would identify a person's intolerance to heat, some indicators are tobacco or medication use, dietary habits, body weight, and chronic conditions such as high blood pressure or diabetes.

3. *Heat cramps*, caused by profuse perspiration with inadequate fluid intake and salt replacement, most often afflict people in good physical condition who work in high temperature and humidity. Heat cramps usually come on suddenly during vigorous activity. Untreated, heat cramps may progress rapidly to heat exhaustion or heat stroke. First aid treatment: remove victim to a cool place and replace lost fluids with water.

4. Thirst is not an adequate indicator of heat exposure. Drinking fluid by itself does not indicate sufficient water replacement during heat exposure. A general rule, the amount of water administered should replace the amount of water lost, and it should be administered at regular intervals throughout the day. For every half pound of water lost, 8 ounces of water should be ingested. Water should be replaced by drinking 2 – 4 ounce servings during every rest period. A recommended alternative to water is an electrolyte drink split 50/50 with water.

5. *Heat exhaustion* results from salt and water loss along with peripheral pooling of blood. Like heat cramps, heat exhaustion tends to occur in persons in good physical health who are working in high temperatures and humidity. Heat exhaustion may come on suddenly as dizziness and collapse. Untreated, heat exhaustion may progress to heat stroke.

6. *Treatment for heat exhaustion*: Move the victim to a cool environment (e.g. air-conditioned room/car), lay victim down and fan him/her. If the air-conditioning is not available, remove the victim to a shaded area, remove shirt, and fan. If symptoms do not subside within an hour, notify 911 to transport to hospital.

7. *Heat stroke* results from the body's inability to dissipate excess heat. A true medical emergency that requires immediate care, it usually occurs when one ignores the signs of heat exhaustion and continues strenuous activities. Working when the relative humidity exceeds 60% is a particular problem. Workers in the early phase of heat stress may not be coherent of they will be confused, delirious or comatose. Changes in behavior, irritability and combativeness are useful early signs of heat stroke.

8. *Treatment of heat stroke*: Move the victim to a cool, air-conditioned environment. Place victim in a semi-reclined position with head elevated and strip to underclothing. Cool victim as rapidly as possible, applying ice packs to the arms and legs and massaging the neck and torso. Spray victim with tepid water and constantly fan to promote evaporation. Notify 911 to transport to hospital as soon as possible.

TABLE 1

SYMPTOMS OF HEAT STRESS

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

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

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

- Pale, cool moist skin
- Core temperature elevated 1-2^{o}
- Thirst
- Anxiety
- Rapid heart rate
- Heavy sweating
- Dizziness
- Nausea

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

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

TABLE 2

HEAT STRESS INDICATORS

Heat stress indicator	When to measure	If Exceeds…	Action
Heart rate (pulse)	Beginning of rest period	110 beats per minute	Shorten next work period by 33%
Oral temperature	Beginning of rest period	99°F (after thermometer is under tongue for 3 minutes) 100.6°F	Shorten next work period by 33% Prohibit work in impermeable clothing
Body weight	1. Before workday begins (a.m.) 2. After workday ends (p.m.)		Increase fluid intake

COLD STRESS

Cold stress (Hypothermia)

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

Prevention

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

1. Maintain body core temperature at 98.6°F or above by encouraging workers to drink warm liquids during breaks (preferably not coffee) and wear several layers of clothing that can keep the body warm even when the clothing is wet.
2. Avoid frostbite by adequately covering hands, feet and other extremities. Clothing such as insulated gloves or mittens, earmuffs and hat liners should be worn. To prevent contact frostbite (from touching metal and cold surfaces below 20°F), workers should wear gloves. Tool handles should be covered with insulating material.
3. Adjust work schedules to provide adequate rest periods. When feasible, rotate personnel and perform work during the warmer hours of the day.
4. Provide heated shelter. Workers should remove their outer layer(s) of clothing while in the shelter to allow sweat to evaporate.
5. In the event that wind barriers are constructed around an intrusive operation (such as drilling), the enclosure must be properly vented to prevent the buildup of toxic or explosive gases or vapors. Care must be taken to keep a heat source away from flammable substances.
6. Using a wind chill chart such as the one in Table 3, obtain the equivalent chill temperature (ECT) based on actual wind speed and temperature. Refer to the ECT when setting up work warm-up schedules, planning appropriate clothing, etc. Workers should use warming shelters at regular intervals at or below an ECT of 20°F. For exposed skin, continuous exposure should not be permitted at or below an ECT of -25°F.

Frostbite

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

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

1. *Frostnip* is the incipient stage of frostbite, brought about by direct contact with a cold object or exposure of a body part to cool/cold air. Wind chill or cold water also can be major factors. This condition is not serious. Tissue damage is minor and the response to care is good. The tip of the nose, tips of ears, upper cheeks and fingers (all areas generally exposed) are most susceptible to frostnip.

2. *Treatment of frostnip*: Care for frostnip by warming affected areas. Usually the worker can apply warmth from his/her bare hands, blow warm air on the site, or, if the fingers are involved, hold them in the armpits. During recovery, the worker may complain of tingling or burning sensation, which is normal. If the condition does not respond to this simple care, begin treatment for frostbite.

3. *Frostbite*: The skin and subcutaneous layers become involved. If frostnip goes untreated, it becomes superficial frostbite. This condition is serious. Tissue damage may be serious. The worker must be transported to a medical facility for evaluation. The tip of the nose, tips of ears, upper cheeks and fingers (all areas generally exposed) are most susceptible to frostbite. The affected area will feel frozen, but only on the surface. The tissue below the surface must still be soft and have normal response to touch. *DO NOT* squeeze or poke the tissue. The condition of the deeper tissues can be determined by gently palpating the affected area. The skin will turn mottled or blotchy. It may also be white and then turn grayish-yellow.

4. *Treatment of frostbite*: When practical, transport victim as soon as possible. Get the worker inside and keep him/her warm. Do not allow any smoking or alcohol consumption. Thaw frozen parts by immersion, re-warming in a 100^{o}F to 106^{o}F water bath. Water temperature will

drop rapidly, requiring additional warm water throughout the process. Cover the thawed part with a dry sterile dressing. Do not puncture or drain any blisters.

NOTE: Never listen to myths and folk tales about the care of frostbite. *Never* rub a frostbitten or frozen area. *Never* rub snow on a frostbitten or frozen area. Rubbing the area may cause serious damage to already injured tissues. Do not attempt to thaw a frozen area if there is any chance it will be re-frozen.

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

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

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

PWGC
Strategic Environmental Engineering Solutions

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

Estimated wind Speed (in mph)	Actual Temperature Reading (^{o}F)P											
	50	40	30	20	10	0	10	20	30	40	50	60
	Equivalent Chill Temperature (^{o}F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	15	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-146
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER in < hr with dry skin. Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute			GREAT DANGER Flesh may freeze within 30 seconds.				
	Trench foot and imersion foot may occur at any point on this chart											

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

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

Appendix D
Medical Data Sheet

MEDICAL DATA SHEET

The brief medical data sheet shall be completed by on-site personnel and will be kept in the Support Zone by the HSO as a project record during the conduct of site operations. It accompanies any personnel when medical assistance is needed or if transport to a hospital is required.

Project:
Name: Home Telephone: _____
Address: _____
Age: _____ Height: _____ Weight: _____ Blood Type: _____

Name and Telephone Number of Emergency Contact: _____

Drug or Other Allergies: _____

Particular Sensitivities: _____

Do You Wear Contacts? _____

Provide A Check List Of Previous Illnesses: _____

What Medications Are You Presently Using?_____

Do You Have Any Medical Restrictions? _____

Name, Address, And Phone Number Of Personal Physician:

Appendix E
General Health and Safety Work Practices

GENERAL HEALTH AND SAFETY WORK PRACTICES

1. Site personnel must attend each day's Daily Briefing and sign the attendance sheet.

2. Any individual taking prescribed drugs shall inform the FTL/HSO of the type of medication. The FTL/HSO will review the matter with the HSM and the Corporate Medical Consultant (CMC), who will decide if the employee can safely work on-site while taking the medication.

3. The personal protective equipment specified by the FTL/HSO and/or associated procedures shall be worn by site personnel. This includes hard hats and safety glasses which must be worn in active work areas.

4. Facial hair (beards, long sideburns or mustaches) which may interfere with a satisfactory fit of a respirator mask is not allowed on any person who may be required to wear a respirator.

5. Personnel must follow proper decontamination procedures and shower as soon as possible upon completion of work shift.

6. Eating, drinking, chewing tobacco or gum, smoking and any other practice that may increase the possibility of hand-to-mouth contact is prohibited in the exclusion zone or the contamination reduction zone. (Exceptions may be permitted by the HSM to allow fluid intake during heat stress conditions).

7. Lighters, matches, cigarettes and other forms of tobacco are prohibited in the Exclusion Zone.

8. Signs and demarcations shall be followed. Such signs and demarcation shall not be removed, except as authorized by the FTL/HSO.

9. No one shall enter a permit-required confined space without a permit and appropriate training. Confined space entry permits shall be implemented as issued.

10. Personnel must follow Hot Work Permits as issued.

11. Personnel must use the Buddy System in the Exclusion Zone.

12. Personnel must follow the work-rest regimens and other practices required by the heat stress program.

13. Personnel must follow lockout/tagout procedures when working on equipment involving moving parts or hazardous energy sources.

14. No person shall operate equipment unless trained and authorized.

15. No one may enter an excavation greater than four feet deep unless authorized by the Competent Person. Excavations must be sloped or shored properly. Safe means of access and egress from excavations must be maintained.

16. Ladders and scaffolds shall be solidly constructed, in good working condition, and inspected prior to use. No one may use defective ladders or scaffolds.

17. Fall protection or fall arrest systems must be in place when working at elevations greater than six feet for temporary working surfaces and four feet for fixed platforms.

18. Safety belts, harnesses and lanyards must be selected by the Supervisor. The user must inspect the equipment prior to use. No defective personal fall protection equipment shall be used. Personal fall protection that has been shock loaded must be discarded.

19. Hand and portable power tools must be inspected prior to use. Defective tools and equipment shall not be used.

20. Ground fault interrupters shall be used for cord and plug equipment used outdoors or in damp locations. Electrical cords shall be kept out walkways and puddles unless protected and rated for the service.

21. Improper use, mishandling, or tampering with health and safety equipment and samples is prohibited.

22. Horseplay of any kind is prohibited.

23. Possession or use of alcoholic beverages, controlled substances, or firearms on any site is forbidden.

24. Incidents, no matter how minor, must be reported immediately to the Supervisor.

25. Personnel shall be familiar with the Site Emergency Action Plan, which is contained in Section 12 of the HASP/EAP.

The above Health and Safety Rules are not all inclusive and it is your responsibility to comply with regulations set forth by OSHA, the client, PWGC Supervisors, and the FTL/HSO.

Appendix F
Hospital Route Map and Directions

Document Path: G:\Projects\A-D\CUP\1601\mapfiles\HospitalRouteMap.mxd

PWGC
Strategic Environmental and Engineering Solutions
P.W. GROSSER CONSULTING, INC.
630 Johnson Avenue, • Suite 7
Bohemia • NY • 11716-2618
Phone: (631) 589-6353 • Fax: (631) 589-8705
E-mail: INFO@PWGROSSER.COM

SUBJECT SITE VICINITY

38-01 QUEENS BLVD
QUEENS, NY

0 ¼ ½ ¾ 1 Miles

Project:	CUP1601
Date:	1/14/2016
Designed by:	DE
Drawn by:	JCG
Approved by:	DE
Figure No:	1

Appendix G
Incident Report Form / Investigation Form

INCIDENT / NEAR MISS REPORT AND INVESTIGATION - PAGE 1 OF 2
TYPE OF INCIDENT - CHECK ALL THAT APPLY
☐ INJURY/ILLNESS ☐ VEHICLE DAMAGE ☐ PROPERTY DAMAGE ☐ FIRE
☐ SPILL/RELEASE ☐ PERMIT EXCEEDENCE ☐ NEAR MISS ☐ OTHER
GENERAL INFORMATION
PROJECT NAME: DATE OF REPORT: REPORT NO.:
DATE OF INCIDENT: TIME: DAY OF WEEK:
LOCATION OF INCIDENT:
WEATHER CONDITIONS: ADEQUATE LIGHTING AT SCENE? ☐ YES ☐ NO ☐ N/A
DESCRIBE WHAT HAPPENED (STEP BY STEP - USE ADDITIONAL PAGES IF NECESSARY)
AFFECTED EMPLOYEE INFORMATION
NAME: EMPLOYEE: ☐ YES ☐ NO
HOME ADDRESS:
SOCIAL SECURITY NO.: HOME PHONE NO.:
JOB CLASSIFICATION: YEARS IN JOB CLASSIFICATION:
HOURS WORKED ON SHIFT PRIOR TO INCIDENT: AGE:
DID INCIDENT RELATE TO ROUTINE TASK FOR JOB CLASSIFICATION? ☐ YES ☐ NO
INJURY/ILLNESS INFORMATION
NATURE OF INJURY OR ILLNESS:
OBJECT/EQUIPMENT/SUBSTANCE CAUSING HARM:
FIRST AID PROVIDED? ☐ YES ☐ NO
IF YES, WHERE WAS IT GIVEN: ☐ ON-SITE ☐ OFF-SITE
IF YES, WHO PROVIDED FIRST AID:
WILL THE INJURY/ILLNESS RESULT IN: ☐ RESTRICTED DUTY ☐ LOST TIME ☐ UNKNOWN

INCIDENT / NEAR MISS REPORT AND INVESTIGATION - PAGE 2 OF 2 REPORT NO.
MEDICAL TREATMENT INFORMATION
WAS MEDICAL TREATMENT PROVIDED? ☐ YES ☐ NO
IF YES, WAS MEDICAL TREATMENT PROVIDED: ☐ ON-SITE ☐ DR.'S OFFICE ☐ HOSPITAL
NAME OF PERSON(S) PROVIDING TREATMENT:
ADDRESS WHERE TREATMENT WAS PROVIDED:
TYPE OF TREATMENT:
VEHICLE AND PROPERTY DAMAGE INFORMATION
VEHICLE/PROPERTY DAMAGED:
DESCRIPTION OF DAMAGE:
SPILL AND AIR EMISSIONS INFORMATION:
SUBSTANCE SPILLED OR RELEASED: FROM WHERE: TO WHERE:
ESTIMATED QUANTITY/DURATION:
CERCLA HAZARDOUS SUBSTANCE? ☐ YES ☐ NO
REPORTABLE TO AGENCY? ☐ YES ☐ NO SPECIFY:
WRITTEN REPORT: ☐ YES ☐ NO TIME FRAME:
RESPONSE ACTION TAKEN:
PERMIT EXCEEDENCE
TYPE OF PERMIT: PERMIT #:
DATE OF EXCEEDENCE: DATE FIRST KNOWLEDGE OF EXCEEDENCE:
PERMITTED LEVEL OR CRITERIA:
EXCEEDENCE LEVEL OR CRITERIA:
REPORTABLE TO AGENCY? ☐ YES ☐ NO SPECIFY:
WRITTEN REPORT: ☐ YES ☐ NO TIME FRAME:
RESPONSE ACTION TAKEN:
NOTIFICATIONS
NAMES OF PERSONNEL NOTIFIED: DATE/TIME:
CLIENT NOTIFIED: DATE/TIME:
AGENCY NOTIFIED: DATE/TIME:
CONTACT NAME:
PERSONS PREPARING REPORT
EMPLOYEE'S NAME:(PRINT) SIGN:
SUPERVISOR'S NAME:(PRINT) SIGN:

INVESTIGATIVE REPORT			
DATE OF INCIDENT:	DATE OF REPORT:	REPORT NUMBER:	
INCIDENT COST: ESTIMATED: $_____	ACTUAL: $_____		
OSHA RECORDABLE(S): ☐ YES ☐ NO # RESTRICTED DAYS ____ # DAYS AWAY FROM WORK ____			
CAUSE ANALYSIS			
IMMEDIATE CAUSES - WHAT ACTIONS AND CONDITIONS CONTRIBUTED TO THIS EVENT?			
BASIC CAUSES - WHAT SPECIFIC PERSONAL OR JOB FACTORS CONTRIBUTED TO THIS EVENT?			
ACTION PLAN			
REMEDIAL ACTIONS - WHAT HAS AND OR SHOULD BE DONE TO CONTROL EACH OF THE CAUSES LISTED?			
ACTION	PERSON RESPONSIBLE	TARGET DATE	COMPLETION DATE
PERSONS PERFORMING INVESTIGATION			
INVESTIGATOR'S NAME: (PRINT)	SIGN:	DATE:	
INVESTIGATOR'S NAME: (PRINT)	SIGN:	DATE:	
INVESTIGATOR'S NAME: (PRINT)	SIGN:	DATE:	
MANAGEMENT REVIEW			
PROJECT MANAGER: (PRINT)	SIGN:	DATE:	
COMMENTS:			
H&S MANAGER: (PRINT)	SIGN:	DATE:	
COMMENTS:			

EXAMPLES OF IMMEDIATE CAUSES

Substandard Actions

1. Operating equipment without authority
2. Failure to warn
3. Failure to secure
4. Operating at improper speed
5. Making safety devices inoperable
6. Removing safety devices
7. Using defective equipment
8. Failure to use PPE properly
9. Improper loading
10. Improper placement
11. Improper lifting
12. Improper position for task
13. Servicing equipment in operation
14. Under influence of alcohol/drugs
15. Horseplay

Substandard Conditions

1. Guards or barriers
2. Protective equipment
3. Tools, equipment, or materials
4. Congestion
5. Warning system
6. Fire and explosion hazards
7. Poor housekeeping
8. Noise exposure
9. Exposure to hazardous materials
10. Extreme temperature exposure
11. Illumination
12. Ventilation
13. Visibility

EXAMPLES OF BASIC CAUSES

Personal Factors

1. Capability
2. Knowledge
3. Skill
4. Stress
5. Motivation
6. Work Standards
7. Wear and tear
8. Abuse or misuse

Job Factors

1. Supervision
2. Engineering
3. Purchasing
4. Maintenance
5. Tools/equipment

MANAGEMENT PROGRAMS FOR CONTROL OF INCIDENTS

1. Leadership and administration
2. Management training
3. Planned inspections
4. Task analysis and procedures
5. Task observation
6. Emergency preparedness
7. Organizational rules
8. Accident/incident analysis
9. Personal protective equipment
10. Health control
11. Program audits
12. Engineering controls
13. Personal communications
14. Group meetings
15. General promotion
16. Hiring and placement
17. Purchasing controls

Appendix H
Daily Briefing Sign-In Sheet

DAILY BRIEFING SIGN-IN SHEET

Date: _____ Project Name/Location: _____

Person Conducting Briefing: _____

1. AWARENESS (topics discussed, special safety concerns, recent incidents, etc.)

_____

_____

_____

2. OTHER ISSUES (HASP/EAP changes, attendee comments, etc.)

_____

_____

_____

3. ATTENDEES (Print Name):

1.	21.
2.	22.
3.	23.
4.	24.
5.	25.
6.	26.
7.	27.
8.	28.
9.	29.
10.	30.
11.	31.
12.	32.
13.	33.
14.	34.
15.	35.
16.	36.
17.	37.
18.	38.
19.	39.
20.	40.

APPENDIX C

COMMUNITY AIR MONITORING PLAN

38-01 QUEENS BOULEVARD
QUEENS, NEW YORK

COMMUNITY AIR MONITORING PLAN

SUBMITTED TO:

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

PREPARED FOR:

Curbcut Queens Boulevard LLC
c/o Laundry Capital
95-25 Queens Boulevard, 10th Floor
Rego Park, New York 11374

PREPARED BY:

P.W. Grosser Consulting Engineer & Hydrogeologist, PC
630 Johnson Avenue, Suite 7
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PWGC Project Number: CUP1601

JANUARY 2016

COMMUNITY AIR MONITORING PLAN
38-01 QUEENS BOULEVARD, QUEENS, NEW YORK

TABLE OF CONTENTS **PAGE**

1.0 INTRODUCTION

This Community Air Monitoring Plan (CAMP) provides measures for protection for on-site workers and the downwind community (i.e., off-site receptors including residences, businesses, and on-site workers not directly involved in site activities) from potential airborne contaminant releases resulting from Remedial Investigation (RI) at 38-01 Queens Boulevard, Queens, New York.

The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that the investigative work did not spread contamination off-site through the air.

Based on previous investigations at the site, the primary concerns for this site are volatile organic compounds (VOCs) and dust particulates.

1.1 Regulatory Requirements

This CAMP was established in accordance with the following requirements:

- 29 code of federal regulations (CFR) 1910.120(h): This regulation specifies that air shall be monitored to identify and quantify levels of airborne hazardous substances and health hazards, and to determine the appropriate level of protection for workers.
- New York State Department of Environmental Conservation's (NYSDEC) DER-10, Appendix 1A (New York State Department of Health's (NYSDOH) Generic Community Air Monitoring Plan): This guidance specifies that a community air-monitoring program shall be implemented to protect the surrounding community and to confirm that the work does not spread contamination off-site through the air.
- NYSDEC DER-10, Appendix 1B (Fugitive Dust and Particulate Monitoring): This guidance provides a basis for developing and implementing a fugitive dust suppression and particulate monitoring program as an element of a hazardous waste site's health and safety program.

2.0 AIR MONITORING

The following sections contain information describing the types, frequency and location of real-time monitoring.

2.1 Real-Time Monitoring

This section addresses the real-time monitoring that will be conducted within the work area, and along the site perimeter, during intrusive activities such as excavation, product recovery, manipulation of soil piles, extraction of sheet piling, etc.

2.1.1 *Work Area*

The following instruments will be used for work area monitoring:

- Photo-ionization Detector (PID); and
- Dust Monitor.

Table 1-1 presents a breakdown of each main activity and provides the instrumentation, frequency and location of the real-time monitoring for the site. Table 1-2 lists the Real-Time Air Monitoring Action Levels to be used in all work areas.

2.1.2 *Community Air Monitoring Requirements*

To establish ambient air background concentrations, air will be monitored at several locations around the site perimeter before investigation activities begin. These points will be monitored periodically in series during the site work.

Fugitive respirable dust will be monitored using a MiniRam Model PDM-3 aerosol monitor or equivalent. Air will be monitored for VOCs with a portable Photovac MicroTip PID or equivalent. Table 1-1 presents a breakdown of each main activity and provides the instrumentation, frequency and location of the real-time monitoring for the site. Table 1-2 lists the Real-Time Air Monitoring Action Levels to be used in all work areas. All air monitoring data is documented in a site log book by the designated site safety officer. PWGC's site safety officer or delegate must ensure that air monitoring instruments are calibrated and maintained in accordance with manufacturer's specifications. All instruments will be zeroed daily and checked for accuracy. A daily log will be kept. If additional monitoring is required, the protocols will be developed and appended to this plan.

Table 1-1

Frequency and Location of Air Monitoring

ACTIVITY	AIR MONITORING INSTRUMENT	FREQUENCY AND LOCATION
Drilling, Sampling	PID, Dust Monitor	Continuous in Breathing Zone (BZ) during intrusive activities or if odors become apparent, screening in the BZ every 30 minutes during non-intrusive activities

Table 1-2

Real-Time Air Monitoring Action Levels

AIR MONITORING INSTRUMENT	MONITORING LOCATION	ACTION LEVEL	SITE ACTION	REASON
PID	Breathing Zone	0-25 ppm, non-transient	None	Exposure below established exposure limits
PID	Breathing Zone	25-100 ppm, non-transient	Don APR	Based on potential exposure to VOCs
PID	Breathing Zone	>100 ppm, non-transient	Don ASR or SCBA, Institute vapor/odor suppression measures, Notify HSM.	Increased exposure to site contaminants, potential for vapor release to public areas.
PID	Work Area Perimeter	< 5 ppm	None	Exposure below established exposure limits.
PID	Work Area Perimeter	> 5 ppm	Stop work and implement vapor release response plan until readings return to acceptable levels, Notify HSM.	Increased exposure to site contaminants, potential for vapor release to public areas
Aerosol Monitor	Work Area Perimeter	>100 but < 150 $\mu g/m^3$ for 15 minutes	Institute dust suppression measures, Notify HSM.	Work to continue if particulate concentrations remain below 150 $\mu g/m^3$
Aerosol Monitor	Work Area Perimeter	>150 $\mu g/m^3$	Don ASR or SCBA, Institute dust suppression measures, Notify HSM.	Stop work and implement dust suppression techniques until readings return to acceptable levels, Notify HSM.

3.0 VAPOR EMISSION RESPONSE PLAN

This section is excerpted from the NYSDOH guidance for Community Air Monitoring Plan - Ground Intrusive Activities.

If the ambient air concentration of organic vapors exceeds 5 ppm above background at the perimeter of the work area, activities will be halted and monitoring continued. Vapor suppression measures can also be taken at this time. If the organic vapor level decreases below 5 ppm above background, work activities can resume. If the organic vapor levels are greater than 5 ppm over background but less than 25 ppm over background at the perimeter of the work area, activities can resume provided:

- The organic vapor level 200 feet downwind of the work area or half the distance to the nearest residential or commercial structure, whichever is less, is below 5 ppm over background.

If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shut down. When work shutdown occurs, downwind air monitoring as directed by the Site Health & Safety Officer (SHSO) will be implemented to ensure that vapor emission does not impact the nearest residential or commercial structure at levels exceeding those specified in the Major Vapor Emission Response Plan Section.

4.0 MAJOR VAPOR EMISSION RESPONSE PLAN

If any organic levels greater than 5 ppm over background are identified 200 feet downwind from the work area or half the distance to the nearest residential or commercial property, whichever is less, all work activities must be halted.

If, following the cessation of the work activities, or as the result of an emergency, organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest residential or commercial property from the work area, then the air quality must be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20 Foot Zone).

If efforts to abate the emission source (see Section 5.0) are unsuccessful and if organic vapor levels are approaching 5 ppm above background for more than 30 minutes in the 20 Foot Zone, then the Major Vapor Emission Response Plan shall automatically be placed into effect.

However, the Major Vapor Emission Response Plan shall be immediately placed in effect if organic vapor levels are greater than 10 ppm above background.

Upon activation, the following activities will be undertaken:

1. All emergency Response Contacts as listed in the Health & Safety Plan will go into effect.
2. The local police authorities will immediately be contacted by the Health & Safety Officer and advised of the situation.
3. Frequent air monitoring will be conducted at 30-minute intervals within the 20 Foot Zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the Health and Safety Officer.

5.0 VAPOR SUPPRESSION TECHNIQUES

Vapor suppression techniques must be employed when action levels warrant the use of these techniques.

The techniques to be implemented for control of VOCs from stockpiled soil or from the open excavation will include one or more of the following:

- cover with plastic
- cover with “clean soil”
- application of hydro-mulch material or encapsulating foam
- limit working hours to favorable wind and temperature conditions DUST SUPPRESSION TECHNIQUES

Reasonable dust-suppression techniques must be employed during all work that may generate dust, such as drilling, excavation, grading, and placement of clean fill. The following techniques were shown to be effective for controlling the generation and migration of dust during remedial activities:

- Wetting equipment and excavation faces;
- Spraying water on buckets during excavation and dumping;
- Hauling materials in properly covered containers; and,
- Restricting vehicle speeds to 10 mph.

It is imperative that utilizing water for suppressing dust will not create surface runoff.

6.0 DATA QUALITY ASSURANCE

6.1 Calibration

Instrument calibration shall be documented in the designated field logbook. All instruments shall be calibrated before each shift. Calibration checks may be used during the day to confirm instrument accuracy. Duplicate readings may be taken to confirm individual instrument response.

6.2 Operations

All instruments shall be operated in accordance with the manufacturer's specifications. Manufacturers' literature, including an operations manual for each piece of monitoring equipment will be maintained on-site by the FOL/HSO for reference.

6.3 Data Review

The Field Team Leader FOL/SHSO will interpret all monitoring data based on Table 1-2 and his/her professional judgment. The FOL/HSO shall review the data with the HSM to evaluate the potential for worker exposure, upgrades/downgrades in level of protection, comparison to direct reading instrumentation and changes in the integrated monitoring strategy.

Monitoring and sampling data, along with all sample documentation will be periodically reviewed by the HSM.

7.0 RECORDS AND REPORTING

All readings must be recorded and available for review by personnel from NYSDEC and NYSDOH. Should any of the action levels be exceeded, the NYSDEC Division of Air Resources must be notified in writing within five (5) working days.

The notification shall include a description of the control measures implemented to prevent further exceedances.